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Crisis-driven innovation of products new to firms: the sensitization response to COVID-19

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How firms address pressing societal needs during crises is not well understood. The COVID-19 pandemic disrupted societies worldwide, and many firms quickly developed new product innovations in personal protective equipment – an area outside of their core businesses and with uncertain profitability but demanded by stakeholders. We conducted inductive case studies of eight firms to understand why firms pivot from shareholder- to stakeholder-oriented innovation of product categories new to the firm and how they satisfy new stakeholder needs during crises. The findings suggest a three-stage process model that explains how firms (1) internalize information signalling a lack of product supply that leads to urgent innovation needs, which in turn triggers a shift, (2) how the firm’s extant resources are understood and (3) thus how the capability assembly of new product innovation is initiated. We theorize that the increase in responsiveness to societal crises is a sensitization process. This process explains how for-profit product innovation prior to the pandemic led to the crisis-driven innovation of products new to the firm by temporarily suspending a profit orientation to respond quickly to calls for help. Implications for theory and practice are discussed.

1. Introduction

On 11 March 2020, the World Health Organization (WHO) classified the COVID-19 outbreak as a pandemic. Many companies responded by developing personal protective equipment, even though they lacked experience developing such equipment and

had limited knowledge of the market, making potential profits uncertain (Corsini et al., 2021; De Minin et al., 2021; Ferrigno and Cucino, 2021; Liu et al., 2021). Firms’ success with meeting stakeholder needs was often evident only after several weeks. Crises facilitate firms’ exploitation of new product innovations developed rapidly by others (Bessant et al., 2015).

Some companies create crises internally to accelerate new product innovation (Takeuchi and Nonaka, 1986; Kim, 1998), thus meeting shareholder expectations. Steve Jobs created crises at Apple to help new product innovation teams excel, and Jeff Bezos used a similar approach (Isaacson, 2011, 2021). Although crises appear to help companies develop commercial products that accord with shareholders' expectations, why firms pivot from shareholder- to stakeholder-oriented new product innovation and how they satisfy new stakeholder needs during crises remain unknown.

We use inductive case research to show how firms motivated required temporary organizational reorientations by internalizing external needs and expectations, and by social norming of product innovation outside of the firm's existing business portfolio. All firms were influenced emotionally by the pandemic, but none experienced existential threats due to the crisis. The firms discussed how resources could be used to address needs and expectations for personal protective equipment. Understanding such new applications of resources opened ways for firms to collaborate with existing and new stakeholders, including regulators and public authorities, to experiment and prototype products new to the firm, which led to scaling up operations. These activities served new stakeholders' and societal needs, while creating new capabilities. Developing understanding of novel resources is theorized in this paper as sensitization, a habituation process of capability assembly that increases a firm's responsiveness through exposure.

Although extant theory explains resource understanding (i.e., cognition) during capability assembly (e.g., rapid new product innovation), the origin of resource recognition remains largely unknown, and empirical studies are scarce (Danneels, 2011; Eggers and Kaplan, 2013), especially regarding how firms alter organizational members' understanding of resources. Our model suggests that resource understanding originates when new external stakeholders perceive that a firm's resources offer potential solutions, and when organizational members' emotional commitment to exploring alternative uses of assets (e.g., raw materials and networks) triggers capability assembly outside of core businesses (i.e., production technologies and/or customer types new to the firm). Research demonstrates that relief arrives faster and nations recover more fully when they rely on disaster aid by firms if they can activate such firms' capacity for fast capability assembly (Ballesteros et al., 2017). The process theory developed in this paper explains why and how capability assembly is activated to develop new products. We find that capability assembly is accomplished rapidly with stakeholders, even though profits remain unclear.

2. Literature review

The literature offers insights into firms' new product innovations that respond to societal crises. Societal crises come in many forms, including pandemics, earthquakes and other extreme events, requiring collaboration among organizations because joint action mitigates uncertainty and time pressures to ensure safety (Van der Vegt et al., 2015; George et al., 2016). Since uncertainty during societal crises is characterized by open-ended actions that demand innovative solutions to upcoming issues, private firms play a focal role (Williams et al., 2017; Luo and Kaul, 2019). Countries benefit from firms' involvement when disasters strike. For-profit firms are able to identify needs, exploit response opportunities and reconfigure resources for fast, effective relief following a societal crisis (Ballesteros et al., 2017). However, mobilizing new product innovations early during a societal crisis is difficult because private firms must first focus, in the short term, on securing existing operations, which often means layoffs and other cost-cutting measures (Wenzel et al., 2020). Mobilizing to innovate in rapid response to urgent societal needs while companies are securing continuity of basic operations is unlikely because of a lack of consensus to increase spending rather than cut costs. Even if survival and severe financial losses are not at stake, crisis-driven product innovation by corporations is difficult because it challenges existing structures (Bessant et al., 2015); path dependence, organizational inertia and commitments are difficult to overcome (Schreyögg and Kliesch-Eberl, 2007). Cognitive limitations among both organizations and their members inhibit these actors from performing fast capability assembly from existing structures and related routines (Prahalad and Bettis, 1986; Bettis and Prahalad, 1995; Eggers and Kaplan, 2013), identifying existing resources and recognizing resource fungibility (Danneels, 2011), requiring both arrangements that lie outside of the core and structural changes (Taylor and Helfat, 2009).

Contributing to societal crisis relief by driving new product innovations is difficult for firms because their structures and information processes are designed for existing business operations. The dominant logic (Bettis and Prahalad, 1995) in top managers' business thinking must, therefore, be broadened to include changes to production technology and/or customer competences to permit product innovations that lie outside the firm's core operations. This is even more challenging if the reorientation addresses rapid, crisis-driven needs in society because only changes similar to

core business functions yield capability assembly quickly and with short project durations during new product innovation; increasingly longer durations characterize less-related or unrelated business logics (Prahalad and Bettis, 1986; Danneels, 2002). Theory development is required to explain why and how firms can quickly diversify into new product innovations to address societal crises.

According to capability research on the cognitive-emotional roots of action (Hodgkinson and Healey, 2011; Helfat and Peteraf, 2015; Huy and Zott, 2019) and private-public interaction for effective responses to new needs during societal crises (Van der Vegt et al., 2015; Williams et al., 2017), how such experiences translate to action is part of organizational cognition, influenced by social norms. Defined as shared understanding regarding actions that are obligatory, permitted or forbidden (Ullmann-Margalit, 1977; Crawford and Ostrom, 1995, p. 144), social norms are strong. They are part of the contexts that trigger collective action (Ostrom, 2000) and entrepreneurial-driven radical innovation (Autio et al., 2014). Organizational members and collaborative partners adopt social norms as prescriptions (Conte and Castelfranchi, 1999), which enable capability assembly due to close links to emotion and the affective system of the brain (Helfat and Peteraf, 2015).

However, precise social norms are not necessarily available as fixed entities, and they are inappropriate in uncertain and emergent environments; stakeholders and managers must enact and renegotiate them for organizations to become a new collective action (Tsoukas and Chia, 2002; Langley et al., 2013). Information about a crisis is distributed and shared among members of society, including firms and employees (Hussain et al., 2019), but diffusion of such information does not encourage all recipients to act; the bystander effect causes witnesses to remain inactive because others are aware and could also act (Koocher and Keith-Spiegel, 2010; Fischer et al., 2011; Hussain et al., 2019). When the normative expression of obligations, such as ‘firms should do something’, is shared widely, firms doing something about a problem is not guaranteed (cf., Eggers and Kaplan, 2013). Given numerous societal issues, including pollution, climate change, nationalism and xenophobia, it is unclear whether firms will rush to act during a crisis. Within shared awareness of a crisis, preconditioning elements, such as purpose or entrepreneurial vision (Kaplan, 2008; Bessant et al., 2015), affect information and experience, and thereby help firms respond with new product innovations. Exchanges of information and experiences that energize a firm and stakeholders help them enact

social norms of action towards relief, suggesting sensitization that enables fast capability assembly.

3. Methodology

During spring 2020, Swedish media reported firms’ innovation responses to rapidly emerging needs for personal protective equipment due to the pandemic. We explore this phenomenon using inductive methods to construct an emerging framework because ‘they excel in situations for which there is limited theory and on problems without clear answers’ (Eisenhardt et al., 2016, p. 1,113).

3.1. Case sampling and data collection

Since the phenomenon remains unexplored, we use case research and multiple case studies to make comparisons (Yin, 1994). Industries and firms were selected based on whether the new product required new customer relationships, and the extent to which a firm’s production technology (i.e., machines, manufacturing process and outbound logistics) required changes (Prahalad and Bettis, 1986; Danneels, 2002). Change variations among firms provided replication logic to the multiple case designs (Yin, 1994) among firms engaged in a new product innovation during the crisis. One firm did not engage in new product innovation, but it pursued radical growth of a crisis-related product – ventilators – so we used it as a control case of ‘contrasting results but for predictable reasons’ (Yin, 1994, p. 46). Table 1 summarizes sample firms.

Sampling accounted for disparate product categories and a variety of industries, and allowed greater theoretical generalizability of findings (Seidel and O’Mahony, 2014). We collected process data by identifying the starting point of a firm’s engagement in new product innovation, assessing how it changed until the beginning of June 2020 (Langley, 1999). We thus analysed crisis-driven, new product innovations over 4 months (March–June 2020). Process observation, combined with case sampling across categories, enabled a multiple-case research design (Yin, 1994), which increased the likelihood of identifying ‘specific theoretical mechanisms recurring over time’, and thereby added robustness to theoretical advancement of the underlying process (Langley et al., 2013, p. 7). Using this research design, we collected data and tracked sources.

Table 2 presents an overview of the data sources and their use. Initial sources were archival, including media reports on new product innovation by the eight companies and the firms’ press releases.

Table 1. Key characteristics of the firms and types of reorientation responses to new stakeholder needs

Firm	Industry	Major products	Revenue in BSEK (2019)	No. of employees	Owner(s)	Product innovation new to the firm in response to Covid-19	Relatedness to core business [†]
Absolut Company	Beverage	Vodka	5,7	500	Pernod Ricard (private)	Hand sanitizers Production and distribution of ethanol to hand sanitation producers	New type of production; new customer type ¹
H&M	Fashion	Fast fashion products	233	126,000	Public firm listed on NASDAQ Stockholm; controlled by the founding family	Protective aprons Orchestration of supply chain production and distribution of protective aprons to users	New type of production; new customer type ²
Essity	Hygiene and healthcare	Consumer tissue, baby diapers, hand sanitizers	129	46,000	Public firm listed on NASDAQ Stockholm	Face masks Production of face masks and distribution to users	New type of production; existing customer type ³
Trioplast	Polyethylene film	Packaging solutions	5,4	2,500	Private equity-owned (Altor AB)	Protective aprons Production of protective aprons and distribution to users	New type of production; existing customer type ⁴
Camfil	Air filtration	Clean air solutions	8,7	4,500	Family owned	Face mask Production of advanced face masks for the healthcare system	New type of production; existing customer type ⁵
Lantmännen	Agriculture	Trading grain, bioproducts, sales of farm machinery	40	10,000	Members/Swedish farmers	Hand sanitizers Production and distribution of ethanol to hand sanitation producers	Existing production; new customer type ⁶
Sekab	Chemical and biofuel	Production of biofuels and chemicals based on wood material	2	111	Consortium of energy firms based in Sweden	Hand sanitizers Production and distribution of ethanol to hand sanitation producers	Existing production; new customer type ⁷
Getinge	Healthcare and life science	Medical tech; advanced monitoring; practice-oriented monitoring systems	22,5	15,000	Public firm listed on NASDAQ Stockholm	n/a Radical growth of critical care ventilators from 10,000 to 26,000	Existing production; existing customer type ⁸

¹VP COO, Absolut Company: We realized that 'we do have ethanol, can we help in any way?' Here began our thoughts, 'How do we get out to society and authorities?' I mean, we're a consumer goods firm. We are used to exporting finished bottles; 99% of what we produce is exported. We know the consumer market, we know retail, on-trade, off-trade, bars, restaurants, global retail. Swedish healthcare? We have no idea. Because we were completely... this is not our industry.

²Project manager, H&M: I have now handed over everything to a venture firm. It was launched well last winter sometime, a B2B business, where we explore small and competing brands. They (other brands) can come to us and have their products produced. Protective equipment might fit with that venture.

³HR director, Essity: We deliver to hospitals today, we make incontinence products, we have a sales force that goes to healthcare and so on; VP Communication, Essity: We also have our medical area, which we bought three years ago and those who manufacture products for incontinence and baby diapers now suddenly needed to have contact with them, as eco-labeling is in a completely different way; Plant manager, Essity: We knew nothing about masks. Now we have bought three new machines. One of them will be in Mölnlycke (Sweden), one in the USA and one in Mexico.

⁴CEO, Trioplast: It was not that far away. We had medicine-classified materials, we know what it takes to make hospital products for the operating room, very high demands on these plastics, very high quality requirements. Everything you find then in an operating room, for example, the coats that the doctors are wearing, surgical drapes, the small garbage bag that you put the instruments in and soft parts after an operation that is then used for incineration, for which we manufacture input materials. However, we send it to customers who then send it to Asia, where they convert the input material into finished products. We now instead established our own assembly production in Sweden.

⁵CEO, Camfil: The production is completely new. It's new infrastructure, it's new processes, everything is new (although we deliver our existing products to hospitals among many other customers).
⁶CEO, Lantmännen: What my business has done is a reorientation to get ethanol out as a raw material for hand sanitizers. We produce spirits and we produce fuel ethanol, and to be able to change this, we had to engage hand sanitizer manufacturers as new customers. They had to have a tax warehouse, or they had to denature before the spirits left the factory. There are very strong regulations, which of course we had to follow. Because we wanted to work only with serious new customers who had these parts so that we could handle it properly.

⁷VP Sales and VP Legal, Sekab: Hand alcohol is a biocidal product or classified as a biocidal product, which has many rules that are governed at the EU level. If companies are to be allowed to sell, they must be included in an Article 95 list, which is a rather expensive cost. We have not had any customers who have been able to cover the large cost required to join that list. Brand new customer relationships now. Here is a consumer product that we have developed and worked with, which goes as an end product directly. Another customer clientele, much smaller... we are talking about many more customers in number, which we will all go through with a new customer's introduction, so to speak, in credit limits and registration and invoicing routines and logistics solutions. We did not have an organization to handle such a customer base.

⁸VP CSO, VP COO, VP CMO, Getinge: A normal volume rate for us, for our products [ventilators], is 200 per week. We set extremely challenging goals. Everything from institutes, universities, car manufacturers, came to us, wanted to make fans, said 'can you help?' You can do this with ventilation'. We made a small box of these requests, as much as just noise.

[†]Classification of reorientation responses based on descriptions by key informants.

Table 2. Overview of the data sources and their use

Data source	Type of data	Use in analysis
Interviews (<i>n</i> = 42)	Key informants: Absolut Company (<i>n</i> = 3), H&M (<i>n</i> = 1), Essity (<i>n</i> = 3), Trioplast (<i>n</i> = 1), Camfil (<i>n</i> = 1), Lantmännen (<i>n</i> = 1), Sekab (<i>n</i> = 2), Getinge (<i>n</i> = 3)	Developing an understanding of the decisions and activities by the firm
	Supplementary informants: Armed Forces (<i>n</i> = 2), Swedish Association of Local Authorities and Regions (<i>n</i> = 2), Research-based Pharmaceutical Industry (<i>n</i> = 1), RISE, Research Institutes of Sweden (<i>n</i> = 3), National Board of Health and Welfare (<i>n</i> = 1), Chemical Technical Companies (Trade association) (<i>n</i> = 1)	Familiarize with the new emergent context
	Follow-up emails: Absolut Company (<i>n</i> = 1), H&M (<i>n</i> = 1), Essity (<i>n</i> = 1), Trioplast (<i>n</i> = 1), Camfil (<i>n</i> = 1), Getinge (<i>n</i> = 1), National Board of Health and Welfare (<i>n</i> = 1), Swedish Association of Local Authorities and Regions (<i>n</i> = 1), Research-based Pharmaceutical Industry (<i>n</i> = 1), Chemical Technical Companies (Trade association) (<i>n</i> = 2), Swedish Civil Contingencies Agency (<i>n</i> = 5)	Confirmation of interpretations and final research result
Archival data (<i>n</i> = 40)	Company-related documents: Annual reports 2019 (<i>n</i> = 8), Annual reports 2020 (<i>n</i> = 8), Website press releases 2020 (<i>n</i> = 8)	Familiarize with the firm's industry and organizational context Support and triangulate evidence from the interviews regarding the impact of the innovation initiative
	Public-related documents: Business press articles (<i>n</i> = 14), Government agency reports (<i>n</i> = 2)	Identifying firms Support descriptions of timeline of events
Workshops (<i>n</i> = 3)	Group-based discussions: Absolut Company (<i>n</i> = 1), Essity (<i>n</i> = 1), Camfil (<i>n</i> = 1), Getinge (<i>n</i> = 1), Chemical Technical Companies (Trade association) (<i>n</i> = 2), Region Stockholm (<i>n</i> = 3), Armed Forces (<i>n</i> = 2), Swedish Association of Local Authorities and Regions (<i>n</i> = 1), Research-based Pharmaceutical Industry (<i>n</i> = 1), RISE, Research Institutes of Sweden (<i>n</i> = 3), Swedish Work Environment Authority (<i>n</i> = 2), Swedish Civil Contingencies Agency (<i>n</i> = 15)	Identification of relational processes Interpretation of previously mapped processes Member checks and confrontation of preliminary results of analysis

We contacted the firms and collected primary data through interviews with top managers (e.g., CEOs), since from the press releases, we identified executives responsible for innovation as potential informants (Kumar et al., 1993). Archives and documents are paramount to reducing retrospective bias during case research on processes, but without documentation of changes to managers' perspectives, it is difficult, if not impossible, to understand the strategic dynamics they confronted, which are crucial to advancing theory and practice (Van de Ven, 1992). The managers described their experiences freely while we used an interview protocol and took notes to control for blanked periods of the processes they described (Appendix A). Members of trade associations and government agencies related to new product innovations were interviewed because informants at the firms described them as relevant. Although two researchers who collected data were present during the interviews and took notes, the interviews were

recorded with 22 hr transcribed verbatim into 602 pages of text.

Archival data comprised two types – firm- and industry-related documents. Business press articles identified company initiatives, and recent annual reports provided context. We analysed a 223-page document of two reports from the Swedish Commission of Inquiries related to crisis-driven new product innovation, and nine letters from government agencies regarding the production of focal product categories. From late June to September 2020, we conducted two workshops with officials who represented the trade associations and government agencies. The two workshops provided new data and corroborated both observed data patterns and initial interpretations. Later, we conducted a third workshop with interviewees that allowed member checks of data interpretation (Lincoln and Guba, 1985). We conducted member checks of the results using emails. We thus strived for deep immersion in

the phenomenon over time (Eisenhardt et al., 2016). Table 2 summarizes all sources of data and their use.

3.2. Data analysis

Analyses were performed according to a grounded theory approach (Glaser and Strauss, 1967; Gioia et al., 2013; Eisenhardt et al., 2016), which included three steps. The first consisted of writing short case memos, which the researchers discussed, and validating the sample criteria for each firm and generating initial observations as patterns across firms. Klag and Langley (2013) argue that insights can either appear suddenly or develop incrementally, with the former applying to this study. After interviews with managers during early June, we noted that new products appeared to relate to companies' alternative uses of existing assets. We thus coded data openly to assess how new resource understanding unfolded. This direction change marked the second step of the analysis. We continued open coding to search for explanations for why changes to resource understanding occurred, and therefore, comparisons across cases were important (Yin, 1994). We coded all data into potential first-order concepts and second-order themes (Gioia et al., 2013), and we began to consider theoretical perspectives further. Social norms appeared as an important concept to the process, justifying coding data selectively (Glaser and Strauss, 1967), with focus on dynamic relationships between social norms and resource understanding, leading to a construct of *social norming*. This change to the research direction marked the third step of data analysis. Employing a devil's advocate perspective (Evered and Louis, 1981) helped mirror the most salient theoretical aspects of

the findings, while increasing coding objectivity. The third step generated a data structure (Figure 1) that allowed us to develop a process model (Figure 2) that explained the relationship between social norming and resource understanding. Using the data structure, we gained theoretical insights into the novel sensitization by which firms created emerging social norms, furthering our understanding of potential applications of resources with new stakeholders for fast capability assembly in response to societal crises. Supplementary evidence appears in Appendices B and C.

4. Findings

Before introducing the sensitization model, it is important to understand the firms' rationale. Through the decision to suspend for-profit innovations of personal protective equipment products between winter and spring, the firms had advanced their stakeholder orientation by early June 2020 (Appendix C). The companies pivoted because of sensitization, or 'non-associative learning characterized by an increase in responsiveness upon repeated exposure to a stimulus' (Merriam-Webster). Such habituation links to rising tolerances and increasing reaction speeds (Blumstein, 2016) of firms in the study, and to suspension of for-profit product innovation orientations. Sensitization unfolded across three episodes – internalizing crisis-driven innovation signals, alternating resource understanding and initiating capability assembly. Figure 2 shows the episodes of sensitization as the firms' responses to fatal lack of personal protective equipment as COVID-19 spread. We detail these three episodes (Appendix B).

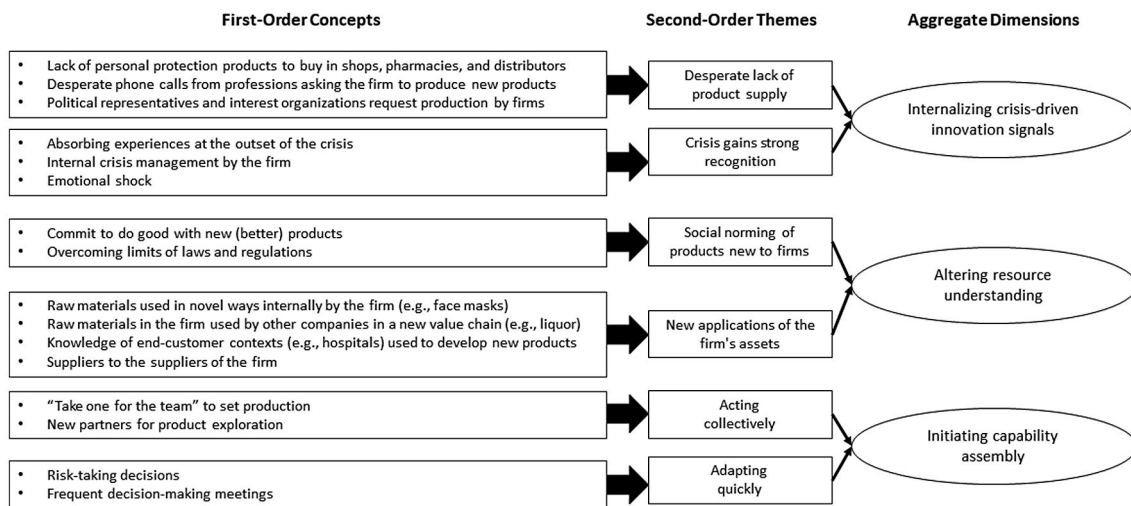


Figure 1. Data structure. See Appendix B for supplementary evidence of codes.

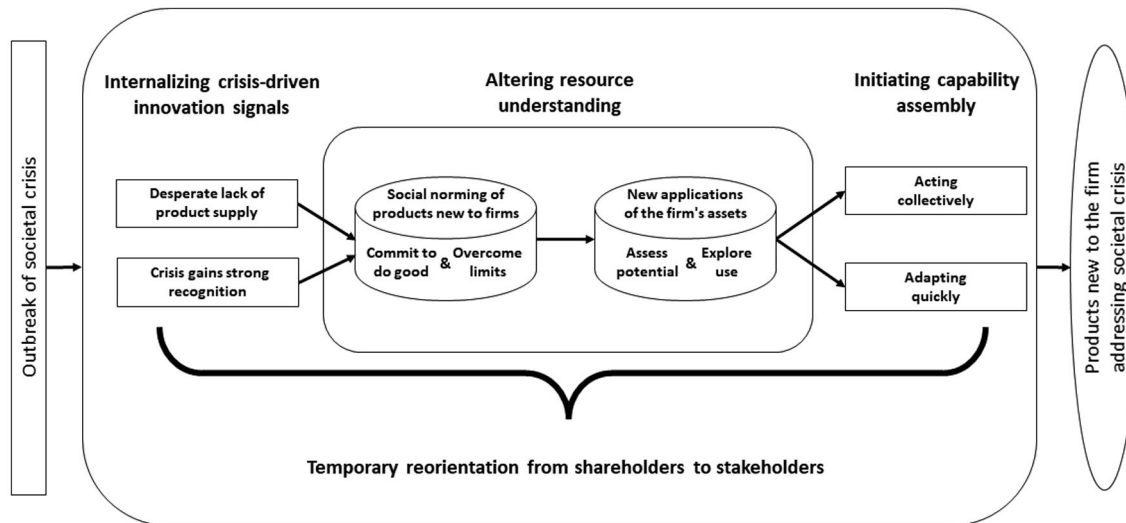


Figure 2. The firm's sensitization response to societal crisis. See Appendix C for supplementary evidence of temporary reorientation.

4.1. Internalizing crisis-driven innovation signals

Two signals triggered the initial episode – a desperate lack of product supply and a need for innovation. Firms were informed of local scarcities of urgently needed products, especially hand sanitizers and protective masks:

Primarily, our sales representatives were approached by [organizations in] the regional county. Or actually doctors, not purchasers but medical doctors who called our firm and said, “We’re desperate, do you have products (i.e., hand sanitizers)? You do ethanol, right?” (Sekab)

High demand and low supply in the value chain represented a shock in society. When professionals who were expected to solve life-threatening situations as part of their daily routines resorted to begging, it signalled that society’s emergency services and provisions were inadequate; the social model appeared to be threatened. Other signals were also influential, such as when political institutions requested product supplies from the firms.

Those representing the European Union (EU), they were very, very clear: “What we need you is to help us source these products. Not that you should pay for them, but if you can help us make them available?” (H&M)

The confrontation of firms with a severe lack of supply in the personal protection market due to an extremely fast-growing need for personal protective equipment represented one of two themes that underpinned the aggregate dimension that we call

crisis-driven innovation signals. The second theme of the dimension describes how crisis-driven innovation signals manifested as a need for innovation, which the firms also sensitized. For example, by absorbing information from desperate phone calls from medical doctors and business council representatives, the firms’ employees experienced an emerging, shared expectation to help quickly. One manager observed:

Because of these desperate phone calls, I noticed how, especially, one of our sales representatives reacted emotionally and expressed, “Yes, we may be able to help but how can we actually do something?” (Sekab)

How to help was unclear. As with any organization during the coronavirus outbreak, firms had to consider the protection and safety of personnel. Internal crisis management was prioritized to secure employees’ health, with some firms managing resources to protect staff members early:

We began to manufacture hand sanitizers only for our own firm’s need, and somewhere along the line, it was recognized by employees, “Can’t we scale this production?” So we took a decision early that “No, but we should of course...” We cannot...well, hand sanitizers, it contains many ingredients that we don’t use normally. Then you should not only have the ethanol. (The Absolut Company)

Internalizing crisis-driven innovation signals was thus particularly important. Results suggest that if such signals sensitize companies to the needs of innovation, they are more likely to act. This is remarkable because at the time of the outbreak, news about scarcity was widespread, and lack of supply

was known to most, if not all, Swedish companies. The high, affective charge of crisis-driven innovation signals was complementary to rethinking the profit motive of shareholder-oriented firms; a sense that the pursuit of profit should be postponed was growing (Appendix C).

A very strange feeling when you look at the market that just died and family businesses were destroyed. Many had to do layoffs. We could continue though. There was a strong need to help and to be able to contribute. People felt that, “Wow, a pleasure to be able to contribute.” (Trioplast)

When information led to an affectively charged response, it was internalized and processed. Affect appears to activate the alteration of a firm’s understanding of alternative applications of its resources and their use to innovate new products quickly. Although there were no formal obligations, decisions addressed perceived obligations and internalized signals (Appendix C).

4.2. Altering resource understanding

While society appeared to cease functioning and was unable to resolve the crisis, after absorbing information about COVID-19 for days, managers no longer accepted the severe lack of product supplies and that the need for innovation that the firm sensitized remained unaddressed. Following internalization of crisis-driven innovation signals, managers decided that their firms should contribute to resolving urgent demand-supply issues:

Well, at that stage it was something like, “Wow, we just have to push out products, because people need them and we have a major crisis throughout the society.” (Sekab)

Helping stakeholders, rather than considering economic opportunities, was the new norm, even though regulations remained unchanged. We refer to this as social norming – the interactions by which firms enact and cocreate norms. A manager at Trioplast Corporation remarked:

Our employees have not always been so super proud to talk about working at the firm because of these plastic debates that are in society and still exist. Now, I noticed how people really [ask] “Can’t we do something? What can we do? Felt that we can contribute, now we realize how important plastic is. Can we do anything? It was a very big, strong driving force.” (Trioplast)

Becoming sensitized to the need for innovation triggered firms into social norming alternative uses of

their resources. Even when it was unclear how and which assets should be deployed, managers decided to contribute to society’s struggle by focussing on one or several products in the personal protective category. Rethinking resources was crucial. Drawing and acting on needs and motivations, companies focussed on finding novel solutions. The intent to address an urgent societal need led companies to take risks by exploring solutions that laws or regulations might not have permitted:

When you end up in the conviction that it is the right thing to do, then you become solution-oriented rather than problem-oriented. It’s all about how you should overcome roadblocks. And these will of course be many. (The Absolut Company)

Rooted in internalizing crisis-driven innovation signals, social norming is influential. Through it, firms explored new uses of assets for product categories new to their core businesses. Camfil Corporation’s CEO described how the firm assessed and explored new applications of its assets:

We have 30 more factories [within air filters and air filtration] in the world, and many if not all considered, “Well, but this material we have, can you use it in any way to make respiratory protection?” Something...waste material. We may need our own protection for our staff, so perhaps we can use the waste material, which we only discard because the pieces are too small to use for air filters. That same idea came up in a number of our factories around the world: “We know air filters, we can...have materials, can we make any [face mask] of it?” ...We have one of the most advanced air labs in the world...with our existing materials.... We compared the results of testing the material with three face masks. (Camfil)

New product social norming enabled new applications of firms’ assets, regardless of major changes to production technologies or customer bases. Prior to the pandemic, H&M focussed exclusively on consumers and clothes, rather than public-sector organizations and personal protection products, but by assessing and exploring its supplier network of 900 suppliers, it quickly identified suppliers’ suppliers who could provide face masks. The firm did not fear a new customer category; it began by approaching new stakeholders. Rethinking the supplier network as an asset began with the CEO, who contacted the European Commission when acting on the firm’s corporate obligation of ‘helping customers who had made the firm successful by buying its products’. Directed to face masks by the European Commission, H&M assessed and explored its supplier asset networks differently. A contrasting but similar example

was evident with Trioplast's reorientation. Drawing on renewed strength of employees' emotional commitment to plastic products, Trioplast gathered and developed new application ideas for its productive assets to innovate new products. The firm's CEO explained:

Instead of sending components for processing in Asia or Europe, we could weld together the whole product in Sweden. Use our plastic, extrude and then maybe weld together a protective coat in one of our welding machines that otherwise is used to manufacture plastic bags, shopping bags and so forth. And that was the start, then we started tinkering with it. (Trioplast)

Sensitizing crisis-driven innovation signals of a desperate lack of product supplies and the need for innovation absorbed by the firm activated the alternation of resource understanding. New product social norming represented a step towards new applications of a firm's assets. Managers' actions of social norming reinforced activation of alternative and new resource understanding that contributed to addressing stakeholders' problems.

Rethinking how familiar resources could be used differently to address societal needs and new expectations, the firms recognized that such capability assembly does not satisfy the standard performance criteria of profit and shareholder orientation. Considering urgent needs and heightened expectations, executives accepted that capability assembly required suspension of business as usual:

We filled up a large tank of a couple of 100,000 liters with 96% alcohol quite quickly, actually, even before we knew if we were going to get it going. And it was there, and people started asking, "what does this cost then?" We said that "we have not even counted, we just have to make sure it goes. (The Absolute Company)

4.3. Initiating capability assembly

Results suggest that the capability assembly of developing personal protective equipment depended on whether firms sustained new products' social norming. Firms drew on two additional actions – acting collectively, which allowed internal and external social norming, and innovating products new to the firm quickly. Some firms simply assigned senior executives to coordinate issues with external stakeholders, such as customers and regulators related to new product innovation, and others engaged in collective, internal cooperation between blue- and white-collar workers:

We do not have a machine line to label cans...but all the officials...those in the office have been out in the factory, and we have been pounding and sticking sticky notes on cans. (Sekab)

Putting politics and prestige aside was thus essential to acting collectively to cope with turbulent environments. As Camfil exemplified, a domestic R&D centre was assigned to lead corporate responses, and H&M assigned a senior corporate project manager, whose internal social network quickly provided the required experience. Organizing social obligations implied working through and developing relationships with new partners during product exploration. Achieving speed collectively was easier when professionals recognized the potential for speed:

The occupational safety specialists [at Karolinska] were extremely fast and told us, "Wow, here is someone who knows what we are really thinking about." They informed us that the Karolinska purchased protective equipment products from all over the world [because of the disrupted supplies], and asked us, "Can you also test if our received goods [face masks] are good?" So, we also tested, maybe, 70 different face masks. (Camfil)

In contrast, some companies needed laboratory partners to test crisis-driven product innovations, and they thus partnered based on social obligations to help society. Other firms continued social norming of the product concept through media tweets to find partners to initiate capability assembly.

The second actions, adapting quickly, unfolded to counterbalance risks. Fast entrepreneurial and collective actions to build capability included risk-taking, such as changing production before prototypes were available, and frequent decision-making meetings. An executive at Absolut Company reported that this involved not risking safety, but acting quickly. Another decision-maker detailed the balancing:

A gold digger [i.e., unserious market actor] approached us, and there were plenty of...one may want to get a piece of.... Then, we felt that this is not, well we're talking about handling alcohol and liqueur, and there are tax warehouses, and everything must be done seriously. (Lantmännen)

Companies innovated extremely quickly in response to the pandemic by forcing capability assembly processes for new product innovations into months rather than years, but they avoided risks inconsistent with their social norming of mutual obligations, which required balancing action over time. Unsurprisingly, many risk-taking decisions to innovate quickly with new partners required frequent decision-making

meetings, increasing groups' weekly meetings to daily online team chats (Appendix B).

During June, when the pandemic appeared to peak, suspension of profit-driven product innovation was questioned. Companies continued to change production setups for new personal protective equipment, but the market began to change, and Swedish municipalities and other authorities began to make purchase decisions based on lowest price, which favoured, for example, Chinese firms.

That Swedish regions should forget about cost is just a dream in my world. I told my sales director that "I do not even get angry because it is natural." The public purchaser has worked 20 years with doing the task, it's in the genes, an automatic response that he does not care at all whether the product is manufactured by us or a Chinese manufacturer. (Trioplast)

Stakeholder changes forced firms to consider global markets and secure economic interests while doing social good. H&M identified a new internal venture subsidiary suitable to integrating its new personal protective equipment business. Others invested in manufacturing facilities and machines to expand, aware that within 6 months they might have to end the market entry attempt; suspension of for-profit product innovation concluded, as was the first COVID-19 wave.

5. Discussion

How firms address pressing societal needs during crises is not understood well. We develop a process model derived from case studies of eight firms to understand better that question using data from the COVID-19 outbreak. The model explains how for-profit product innovation, prior to the pandemic, led to crisis-driven innovation of products new to firms, suspending profit orientation, and led to quick responses to calls for help, or sensitization, a habituation process of capability assembly that increases a firm's responsiveness through exposure. Before considering alternative explanations of the model, we expand its contribution by discussing theoretical implications.

5.1. Theoretical implications

The process model illustrates how firms overcame rigidities (Leonard-Barton, 1992) from technologies, organizational structures and related commitments in their core businesses. Rather than being bystanders (Koocher and Keith-Spiegel, 2010; Fischer et al., 2011; Hussain et al., 2019), firms can mobilize

to serve new stakeholders by internalizing calls for innovation and motivating new actions, not with the intention of profiting, but due to perceived obligations to enact social norms urgently – dynamics we call social norming.

During early stages of new product innovation, becoming aware of and monitoring capability dynamization are essential to countering internally rigidity (Schreyögg and Kliesch-Eberl, 2007). The process model instead suggests that during crisis-driven product innovation, internalizing societal expectations, which new potential stakeholders express, is critical. Managers enact social norms when crisis signals are internalized by absorbing initial shocks and committing to help without surplus because of the emotional dimension (cf. Van Kleef, 2014; Netz et al., 2020), thereby remaining immune to for-profit capability rigidities. Social norming of new product innovations is important throughout capability assembly, which also counters subsequent wakes of rigidities in the external environment (Senge et al., 2007) that threaten to undermine a firm's efforts to innovate for stakeholders.

The sensitization process model corroborates that a firm's alteration of resource understanding in organizational members originates from internal actions (Danneels, 2011; Eggers and Kaplan, 2013), but not exclusively (Enkel et al., 2009; Gassmann et al., 2010; Chesbrough et al., 2021). Internalizing stakeholders' understanding of the firm and its potential to use resources appears to be important to a firm's sensitization when it is at risk of becoming like most others – bystanders. Assessing unfamiliar stakeholder-originated ideas carefully (cf., Chesbrough and Crowther, 2006) and exploring how to use resources for new purposes matter during a crisis (Ferrigno and Cucino, 2021). Campbell (2007, p. 992) discusses institutionalized dialogues with stakeholders in an institutional context, but the current study suggests that during a crisis, stakeholders' urgent needs must be internalized ad hoc (Mintzberg and McHugh, 1985) towards resource recognition and capability assembly to obtain socially desired innovative outcomes. Where others identify how companies change relationships with stakeholders because they failed (Hampel et al., 2020), the sensitization we model explains why and how successful companies pivot during crises to develop new products with stakeholders.

Firms are presumed to have superior abilities to sense needs following a societal crisis (Ballesteros et al., 2017), which suggests a greater ability to internalize new external stakeholder ideas. Current findings show that this presumption does not hold during unanticipated global crises because many firms did

not act to help. One explanation is that ‘the possibilities an environment affords depends on empirical sensitivity, a collectively shared and finely honed observational capacity to discriminate among the situations’ (Nayak et al., 2020, p. 286). Our model characterizes social norms as a platform for innovation that arises from relationships with new stakeholders, perceived obligations and mutual emotional commitment, suggesting that in addition to sensing (Teece, 2007; Ballesteros et al., 2017), even when a business is unrelated to a core business’s production and/or customer base (Prahalad and Bettis, 1986; Danneels, 2002), sensitization is required during a crisis. Sensitization, a progressive inclination to act following repeated calls by distressed stakeholders or exposure to signals of stakeholder distress, facilitates internalizing and propagating stakeholder needs, which allows them to act collectively and innovate quickly.

The model allows for theoretical extensions that explain how and why some firms, during the pandemic, undertook new modes of crisis-driven product innovation by suspending a profit orientation to respond to societal needs; they understood their resources differently after internalizing societal needs, and they reconciled them with social norms enactment – social norming – as a platform on which to act collectively while innovating quickly. Cooperation among organizations that would otherwise have maximized self-interest can now be explained by societal crises’ exogenous forces and urgent human needs, manifested through evolving social norms (Ostrom, 2000, 2010). Restoring the market function in a nation motivates locally active firms to contribute to societal crisis relief valuably through resources (Ballesteros et al., 2017), but new product innovations from firms added social value by coevolving with suppliers, government agencies, end-users, professional organizations and firms (Klein et al., 2013) as they reoriented outside core businesses.

Central to the sensitization model is social norming and its influences on decisions regarding product innovations new to the firms under study. Processual understanding of social norms was outlined in the theory section and further theorized as sensitization of capability assembly, but we now discuss alternative explanations for current findings (Yin, 1994).

5.2. Alternative explanations

Within the capability-oriented perspective, firms do not need to respond if they possess superior resources, greater exposure and superior organizational capabilities. We ascertained that the firms in this study

represented a subset of Sweden’s large- and medium-sized companies, and that their resources were atypical. The firms’ histories and geographic footprints did not evidence that they were exposed or prepared more than firms that did not act. Beyond capabilities, the empirical phenomenon invites other perspectives, the most obvious of which concerns shareholders’ goal orientation, including opportunities for profit in new markets, political pressures and a firm’s reputation. Although the executives interviewed confirmed the process model, biases could imply alternative motives and thus explanations, unless they can be excluded. We therefore discuss profiteering, political pressures and reputation as rival explanations.

Not all distilleries and chemical companies began manufacturing hand sanitizers and created a value chain to reregulate and redeploy industry ethanol to scale up other hand sanitizer production. Valid across industry contexts represented by the sample of firms in this study, the question and reasoning suggest that something more than shocks from a crisis and urgent customer needs matters. Firms’ top managers reoriented beyond their core businesses (Hambrick and Mason, 1984; Hambrick, 2007), and other, very similar firms remained bystanders (Koocher and Keith-Spiegel, 2010; Fischer et al., 2011; Hussain et al., 2019). If the profit opportunity appeared attractive, more firms would have sought to seize it. Instead, evidence suggests that firms pivoted from shareholder- to stakeholder-oriented product innovation, and the sensitization model explains why firms’ behaviours occurred.

The control case – Getinge Group – adopted a nuanced perspective, and we gained insights regarding how it scaled up its core business of ventilators. Since customer orders increased dramatically, the firm decided to scale up production outside the ordinary organization. With ventilators part of the core business, the economic rationale could be stretched directly, without social norming or the need to change the understanding of resources or discover alternative uses. Rethinking was required only when crucial component deliveries were held up in customs and a shortage of components disrupted innovation. The executives explained, ‘Nothing could be transported in and out of China in particular. ...we needed components to...make ventilators’. Economic rationale explains the actions of companies whose core businesses included products that suddenly experienced high demand. In the other seven cases, the reverse was true; they justified reorientation outside familiar core businesses by socially norming the decision and engaging in collaboration. Later at the end of the first pandemic wave, the firms began to consider financial sustainability to ensure needed supplies had there been a second wave.

Swedish media reported frequently about industry firms reorienting operations in June 2020, with financial support from VINNOVA, the Swedish Government Agency for Innovation. Productive initiatives were reported to have been accomplished as rapidly as within 3 weeks, but the seven firms examined in this paper did so approximately 2 months earlier. The duration thus allowed government finance-supported firms to monitor global needs and take advantage of the cost-benefit experience, in line with a shareholder-affine goal orientation and consistent with theoretical predictions of diversification through product innovation (Prahalad and Bettis, 1986; Danneels, 2002). In contrast, firms in the sample assembled new capabilities much more quickly, and projects were executed immediately when the WHO classified the COVID-19 outbreak as a pandemic. At that point, required experience for cost-benefit analyses was absent because needs remained uncertain due to limited knowledge about the virus, which made commercial shareholder-oriented motives unlikely. While addressing new stakeholder needs, the firms treated shareholders as another stakeholder.

Another rival explanation is whether political pressures and, relatedly, reputation motivated firms' engagement beyond core businesses. Executives reported that they did not experience political pressures as primary motivators for a firm becoming stakeholder-oriented. The context clarifies why pressures from political institutions are unlikely since Swedish policy for civil defense was still emerging. Sweden's government was not initially a primary voice, but after business trade associations shared what various sectors could contribute, the country became more vocal. At that stage, the seven firms had started to manufacture and supply the country with new products for approximately 2 to 3 months. Their reputations certainly improved, but one question is whether it motivated engagement. Reputation represents one aspect of how a firm discusses how others expect it to act, which relates to social norms and processes that drive collective actions (Ostrom, 2010). However, the firms were well-established global corporations, and thus global perceptions of them were unlikely to change through non-core product manufacturing in relatively small scales.

Excluding rival explanations suggests that the inductively developed process model comprises a set of grounded explanations that stimulate further understanding of the phenomenon. The sensitization on which fast capability assembly depends warrants further research, largely due to boundary conditions, discussed next.

5.3. *Boundary conditions and future research*

Technical complexity and contracts represent boundary conditions that relate to the sensitization documented in this study, and which future research should examine. Technologies that underpin personal protective equipment, such as hand sanitizers and face masks, are less complex than, for example, ventilators, which suggests that current findings pertain only to simple technologies.

The unusual cases in this study illustrate a previously unexplained phenomenon, but the extent to which culture bounds sensitization represents a topic for future research. The current cases are Swedish among Swedish firms that took no action; distilleries such as Brewdog innovated hand sanitizers early during the pandemic outbreak,¹ and comparable UK firms remained bystanders. Sensitization is important not only in terms of sustainable social dimensions, but economic and environmental dimensions of alternative applications of a firm's resources. For example, changing market competition for personal protective equipment includes new, low-cost providers (Jaju et al., 2021). Which boundary conditions apply, and to which type of stakeholder-oriented product innovation they apply in response to societal crises, remains unclear, requiring more research.

Effects on companies of crisis-driven innovation in the medium- and long-term lie beyond the scope of this paper, and thus remain unaddressed. Annual reports indicate that some companies integrated new product businesses regardless of the type of pivoting path (Table 1), but future research should clarify medium- and long-term effects on pivoting companies' business model(s) and financial results (Axelson et al., 2017; Seetharaman, 2020).

5.4. *Managerial implications*

This study suggests that firms should nurture their sensitivity to detect the consequences of a crisis and understand how mobilizing resources can have an influence. Top management teams can map stakeholder orientations and stakeholder needs to facilitate discussions about potential applications of resources and thereby begin social norming. Our process model provides a framework for mapping signals and voices, ideas about alternative applications of resources and potential paths for capability assembly, suggesting not only a process for overcoming rigidity to thinking differently, but that firms should consider crises more generally as opportunities. One point of departure is internal dialogues regarding a firm's purpose, building awareness and deeper understanding of its role, not

only for shareholders, but also stakeholders. Dialogues with stakeholders that explore their needs and build trusting relationships represent good investments in future win-win rapid responses to the unforeseen.

Regarding policy, this study prescribes a need for better planning before societal crises. Businesses and firms' capacities should, to some extent, be prepared for flexible, robust actions, building on insights concerning social norming to facilitate unexpected needs for fast innovation. Such policies can be ensured through exercises and strategy games that involve scenarios similar to the process model developed in this paper, but among other types of global crises. The benefit to firms is that they can provide insights into their capacities for R&D management, combined with other actors in society.

5.5. Conclusion

This study responds to calls for empirical research on for-profit firms' product innovation responses to humanitarian crises (Bessant et al., 2015), contributing to how firms suspend profit orientations to address new societal needs. We construct a sensitization process in which social norming provides firms with a platform for innovation because internalized signals and perceived obligations result in rethinking and acting. Changing understanding of alternative uses of a firm's resources by cocreating and enacting social norms, firms enhance innovation of products new to the firm without surplus objectives to meet stakeholder needs. The process model of this phenomenon complements recent capability theory research (Danneels, 2011; Eggers and Kaplan, 2013; Ballesteros et al., 2017), extending it to explain why companies move towards stakeholder-oriented, new product innovation in markets outside, or only partially related to, core business operations, and how they did so unexpectedly quickly.

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Note

- ¹ <https://www.brewdog.com/blog/sanitiser-sharing-what-we-have-learned>. Downloaded 2021-05-01

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APPENDIX A

Interview protocol

1. Background.
 - We as researchers/respondents
 - The COVID-19 research project
2. What was the starting point for the change?
 - The beginning?
 - The motive(s)? Has it changed since the start?
3. Describe the change made in the firm's production.
 - Examples of new ways of thinking?
 - Examples of new ways of acting?
4. What has the firm delivered and how?
 - With whom has the firm collaborated?
 - Were there any obstacles during collaboration?
 - Existing customer relationships relevant to the new product?
 - Other external relations that have been important and/or changed?
5. In summary, how do you perceive that coordination of capability assembly occurred between the firm and other actors?
 - Who was responsible?
 - Whom do you perceive as responsible in the other organizations?

APPENDIX B

Supplementary evidence

Aggregate dimension: Internalizing crisis-driven innovation signals

Second-order themes	Selected evidence of first-order concepts
Desperate lack of product supply	<p>Lack of personal protection products to buy in shops, pharmacies and distributors</p> <p>‘People went to the pharmacy and looked; there was no hand sanitizer, and [it was] not possible to buy it anywhere. There was a fight when someone claimed a bottle of hand sanitizer.’ (Lantmännen)</p> <p>‘Suddenly toilet paper runs out all over Sweden. Empty. Then work double shifts and fight to make sure that the toilet paper does not run out [again].’ (Essity)</p> <p>‘When we worked with health care clinics and observed how their staff struggled and the risks they and patients were exposed to ...’ (Camfil)</p> <p>Desperate calls from professionals asking the firm to produce new products</p> <p>‘People started calling from hospitals and said, ‘Yes [the firm does not make the protective apron], but you make this [other plastic product for hospitals]; could you make protective aprons? Because we are scared when we look at our stores that we don’t have enough. Seeing what’s happening in Italy, now here and Southern Europe, we do not feel prepared.’ When the medical-doctor-in-chief calls from and cries on the phone, cries, and says, ‘we do not know how to ... we are afraid for our lives. I cannot support my colleagues and help them, what should we do?’ For us, to contribute ...’ (Trioplast)</p> <p>‘Talked to a buyer at one of these hand sanitizer or disinfectant companies. How come there is such a panic around ethanol?’ (The Absolut Company)</p> <p>Exchange between political representatives, organizations, and firms</p> <p>‘A dialogue with Ibrahim Baylan [Minister for Enterprise and Energy], who invited the business community to a dialogue ... what can the business sector contribute with? Our CEO participated in that dialogue. And there, the authorities looked at the technology and the opportunities that the companies have, what can we do to contribute?’ (Essity)</p> <p>‘We contacted ... via Coor, we often sell via service companies, and via Coor we have delivered to the Karolinska Hospital. We asked them, ‘Do you see any need for respiratory protection?’ They had contact with the work environment specialists at Karolinska Hospital.’ (Camfil)</p>
Crisis gains strong recognition	<p>Absorbing experiences at the outset of the crisis</p> <p>‘If you go to the pharmacy one day or you may have a close relative who is somewhere in an elderly home or a patient at a hospital and there is no disinfectant or hand sanitizer. ... And then you go back to work at our company that produces millions liters [of ethanol], then of course you feel that there should be a commitment and that one should contribute to reorganize [the production] in a good way.’ (Lantmännen)</p>

Table B. (Continued)

	<p>‘In combination with [writings in the press] ... some approached us: ‘Would you not be able to make hand alcohol?’ We realized they were not joking. There were many factors that just, somehow, signaled to us that this was the right thing to do ...’ (The Absolut Company)</p> <p>Internal crisis management by the firm</p> <p>‘There in January, February: ‘I think we need a crisis team on this.’ ‘This will probably get bigger.’ ‘We must ensure that people do not get sick in the factories.’ We realized early on, if this is going to be global, then sourcing, logistics, [and] IT are super important. We flew down to our factories in Italy with face masks because we wanted our own employees to feel safe. We have taken measures, especially in our factories, to make them safe for work.’ (Essity)</p> <p>‘Quite suddenly we had to set up a small staff that only had to keep track of all incoming calls.’ (The Absolut Company)</p> <p>Emotional shock</p> <p>‘It was a bit shocking. That is why we chose ... there was very, very much heart involved in making this change. As individuals we were also in a crisis based on the coronavirus, personally. It affected our work. Sweden as a whole was in shock.’ (Sekab)</p> <p>‘We felt that we have alcohol in large quantities, we need to find someone who can convert that alcohol in large quantities.’ (The Absolut Company)</p> <p>‘An incredibly good and strengthening feeling for the company to help.’ (Trioplast)</p>
Aggregate dimension:	Altering resource understanding
Second-order themes	Selected evidence of first-order concepts
Social norming of products new to the firm	<p>Commit to do good with new (better) products</p> <p>‘We are used to evaluating the risks and starting to process what we need to prepare. But here it was more, ‘It has to happen. How do we make it happen?’ Otherwise, you might back off. It was more, ‘This is what we have to do.’’ (Sekab)</p> <p>‘Clearly, we ... should not waste. Why should we go out and buy hand sanitizer and consume these supplies when we can actually provide [them] ourselves [by producing them]?’ (Absolut Company)</p> <p>‘Very much in our DNA [it] is reinforced ... we have talked for years about the simple importance of, for example, hand washing. We have been campaigning to save lives and prevent infections.’ (Essity)</p> <p>‘Then we felt that everyone ... it cannot be that while one goes home for time off over the week, then those people do not have protective equipment to use ... that is good enough.’ (Camfil)</p> <p>Overcoming limits of laws and regulations</p> <p>‘You will not die because of toilet paper being a little thinner or so. Then [the authorities and we] just say, ‘Yes, do it.’ But in this case [face masks], premises arise that neither we nor the authorities could easily say, ‘Yes, let’s just do it.’ While we need to hurry ... safety [was paramount] ... so, we said, ‘RISE [Government agency lab] must do what they can here ... properly. All other processes we can speed up.’ That was the trick.’ (Essity)</p> <p>‘There are a number of government directives to relate to when the firm is about to do something different than what it usually does. As long as we stick to making alcohol and send it from the distillery to our factory where we make vodka, then everything is within the regulations. All of a sudden, we would go into completely different areas, which do not have a ... business model ... but if we can put ourselves together with others in a new [value] chain, then it will still be the relatively easiest [solution]. We had to apply for a lot of permits anyway with local environment and health. We have a permit to produce food alcohol for vodka, but not for it to be hand sanitizer.’ (The Absolut Company)</p>
New applications of the firm’s assets	<p>Raw materials used in novel ways internally by the firm (e.g., face masks)</p> <p>‘We have looked at that; it is a process and a cost which we have not considered in the past. Now, however, we aim forward and see what the need looks like. It might be valuable to become certified 100% in doing hand sanitizers, and that is an ongoing discussion. So I would say no, we would not have done that before [COVID-19].’ (Lantmännen)</p> <p>‘Since we do not know anything about face masks, so from the beginning, [we reasoned,] ‘We can at least try to laminate different materials.’ But we had no idea about dimensions. We knew nothing about face masks.’ (Essity 2)</p> <p>‘They had to think completely new. That R&D department, which is actually R&D for diapers and incontinence, had to begin working with the pharmaceutical division ... that is, friends you do not work with normally. It was new, and it happened super-fast.’ (Essity 3)</p>

(Continues)

Table B. (Continued)

	<p>Raw materials in the firm used by other companies in a new value chain (e.g., liquor)</p> <p>‘Since we basically had the raw materials, in addition to some additives that were needed for hand sanitizers, we said, ‘Yes, we can do it, we can contribute by doing it.’ (Sekab)</p> <p>‘Called the MSB [Swedish Civil Contingencies Agency] on a Friday and said, ‘We can make our firm available. We can make alcohol, but we cannot produce hand sanitizer. But we can do it if we are combined with someone who can make hand sanitizer or the next part of the value chain.’ (The Absolut Company)</p> <p>Knowledge of end-customer contexts (e.g., hospitals) used to develop new products</p> <p>‘We had medicine-classified materials, we know what it takes to start a ... make hospital products and for surgery rooms, so-called homologation, that it takes several months to test because it must absolutely not leak. ... These plastics must meet challenging criteria, very high quality requirements.’ (Trioplast)</p> <p>‘We saw that we could help and reached out to Karolinska Hospital, who took the ball. After all, we have air cleaners for hospitals and other things that may be needed in a pandemic. That inventory, what skills do we have in different areas, what skills are there, and what is the capacity of things we do?’ (Camfil)</p> <p>Suppliers to the suppliers of the firm</p> <p>‘At that stage, we went back to our supplier network and found quite quickly that none of our existing suppliers produce[d] face masks. However, we were able to quickly identify suppliers’ suppliers that did it. So, there it was in the network.’ (H&M)</p>
Aggregate dimension: Initiating capability assembly	
Second-order themes	Selected evidence of first-order concepts
Acting collectively	<p>‘Take one for the team’ to set production</p> <p>‘We started production during the Easter weekend, and I did not even have to mention that we would do it until ten volunteers said, “We will line up and work over the Easter weekend; we want to help the heroes in healthcare.” (Trioplast)</p> <p>‘People worked evenings and weekends because you saw this need, and so you could park maybe a number of other issues for some time. When there is such a clear need and you feel that you are doing something that is very good, then these forces mobilize. I do not think we would have ... ‘Now Volvo wants a new passenger compartment filter; you can work all day and night and Easter and the weekend to get it done within a month,’ then many would probably say, ‘No, forget it,’ it may take three months ... But very fast ... when needed, there is energy and power; it’s fun.’ (Camfil)</p> <p>New partners for product exploration</p> <p>‘The key to it all was that we tried ... partnerships. We did not sit alone on a solution. No one sat alone on a solution, but chased after each other, where everyone sat on parts of a solution that together could become a whole.’ (Absolut Company)</p> <p>‘First we got in touch via the Armed Forces because they had been assigned by the National Board of Health and Welfare to try to help. We were in contact with them, and they were quite good at formalizing that “these are the five products we would like help with.” (H&M)</p>
Adapting quickly	<p>Risk-taking decisions</p> <p>‘We started the production without even having seen the material sample, because we had to guess.’ (H&M)</p> <p>‘The force of daring to talk a little about doing something without having the ready-made solution. We were not into something that could be bad. There were so many of us along the [value] chain, and everyone sat on a small part and had a pretty good idea of what to do.’ (The Absolut Company)</p> <p>Frequent decision-making meetings</p> <p>‘In one hour, you could have a product from one place to another, but everyone could work within their areas. There were a lot of team chats where everyone got all the [product] information very frequently and became updated. It went very quickly. In two weeks, we actually had a complete design [of a new advanced face mask] and a production that started to produce large volumes.’ (Camfil)</p> <p>‘Much closer meetings with our management teams and then ... everyone had the same platform and knew what the priorities were. So we, you could say, made it possible to be fast, I would say, and we also set the framework. To go fast, we cannot discuss products for an hour and something else for an hour. Then we just sit and discuss. Rather, “Yes, you take responsibility for this. You get to see ... you get to do what you can. The best you can. Maybe skip some steps or cut something. Only it goes fast. Next time we meet, everyone should have done their part.” (Essity)</p>

APPENDIX C

Supplementary evidence

Firm	Decision to temporarily suspend for-profit innovation	Emergent stakeholder orientation at firm	Stakeholders
Absolut Company	<p>We were a set of executives who just decided to make this happen. ... I said we [would] support the initiative no matter what happens ... it was just the right thing to do. (VP COO)</p> <p>Sometimes you just have to gather everyone with the right skills and mandate [that they] make something happen quickly. If we have a crisis in the firm, then we have a crisis management team. We worked like that when the pandemic arrived, and [there was] also a large group in the production to ensure changes. (VP Communication)</p>	<p>In a normal situation, this should be a business opportunity for someone else. This is not a business opportunity for us. We became part of a solution to an urgent need. (VP COO)</p> <p>A distillery should be continuously operated 24/7 to keep it optimized regarding energy efficiency. Stopping it would have created problems in the by-product chain as well. The demand for our products also decreased, considering that all airports closed, all restaurants closed, in the world. So, we had a capacity which we could then use. (VP COO)</p>	<p>Examples: Swedish Civil Contingencies Agency Swedish Tax Agency Swedish Government Swedish Chemicals Agency Chemical Technical Companies (Trade Association)</p>
H&M	<p>We are a company that is quite used to crises, and we have pioneered sustainability work for decades, even though it is often the H&M name that gets attacked. So we are quite used to manage crisis, relate to it and what can we contribute. We want to help everyone who has in some way contributed to our success. So, our CEO, Helena, contacted the European Commission. (Project manager)</p>	<p>The face mask operation is marginal. ... This is nothing for us. We make millions of T-shirts, jeans, pants. So in terms of both volume and money, this is a small business for us. That said, if you look at the potential in the future, it can be a good deal for us. (Project manager)</p>	<p>Examples: Karolinska/Command Center European Commission Swedish Armed Forces Foreign Governments Suppliers' Supplier Region Stockholm</p>
Essity	<p>Normally, when you do something like this, you consider: 'Well, what does the business model look like? And what should we charge? And which product brand should own this product?' Imagine doing it that way then we would have delivered next year. So we just said: 'Listen, skip everything else! Just bring about face masks so we can deliver to the National Board of Health and Welfare and help Sweden.' (VP Communication)</p>	<p>Many companies had to shut down because people refused to go to work. Our factory employees, they trudge to work because they feel that they are doing something important and want to contribute. Our ordinary products sell. In my factory, the volumes have gone up between 15% and 20% just because there is a need. Then we have a basic idea that helping people in need is even more important. It is like the next step in our core values. (Plant manager)</p>	<p>Examples: Swedish Government National Board of Health and Welfare Research Institutes of Sweden Swedish Work Environment Authority Foreign Governments</p>
Trioplast	<p>We started formulating a group ... we put together a group, because we said, 'Here is actually something we can do.' (CEO)</p>	<p>Our firm has not currently been particularly affected by the downturn in the market. Our products are wanted: garbage bags ... and now that people [are] at home, they are rebuilding summer cottages, so [they need] garbage bags ... and silage plastic for farmers, to get the best feed for cows, and milk and meat – food plastic and packaging, as well as packaging plastic for toilet paper.</p>	<p>Examples: Karolinska/Command Center Research Institutes of Sweden Swedish Work Environment Authority Chemical Technical Companies (Trade Organization) Region Stockholm</p>

(Continues)

Table C. (Continued)

Firm	Decision to temporarily suspend for-profit innovation	Emergent stakeholder orientation at firm	Stakeholders
Camfil	We got a late mandate from our board and owners to invest in a project like this because we had ... we knew what we were doing; we knew there was a customer need. Karolinska [hospital] had ... almost zero [protection equipment] for a number of days. We worked with them so that they did not have to stop care, conducted tests of prototypes. Before that, we had the production started to test and verify ourselves. (CEO)	It is about a 10% increase this year for the division, and for the corporation, it is only a few percent. So why go into an area like this when the downside is so big if anything would go wrong compared to what the [financial] upside is? (CEO)	Examples: Research Institutes of Sweden Karolinska/Command Center Swedish Work Environment Authority Foreign Governments
Lantmännen	I am sitting on one of the Nordic region's largest producers [of ethanol], so we looked at how to step in and support the market [of hand sanitizer]. That was the starting shot, help the market suppliers. It was a decision to be able to enter the market quickly. If you create everything ... then you have bottles, you have bottling, you have other mixtures, and then you fail to enable a quick response, so therefore we chose to go with the existing chain. We had a quality that was very good, and we discussed it with the [hand sanitizer] market suppliers, because we felt that if we step in, we could have taken the entire value chain. But in this case, we wanted to help quickly to get products to market in large quantities. We therefore became part of an existing chain. (CEO)	In ordinary ethanol production, there are annual contracts that we must follow up on. But we always have a buffer, an excess capacity. As long as the market ... there is a need, we will continue to deliver ethanol for hand sanitizer. We now are also discussing if we see that this is a continued opportunity for us, commercially, in the future. Had we entered and optimized profits, then it would have been a different matter, but we did not. (CEO)	Examples: Swedish Civil Contingencies Agency Swedish Tax Agency Swedish Government Swedish Chemicals Agency Chemical Technical Companies (Trade Organization)
Sekab	The CEO was initially present ... and was also clear that 'yes, this is what we are going to do.' Very involved in, say, the decision-making process and the dialogues with municipal politicians, the chamber of commerce. Even our owners, as well as the board. (CMO, Legal director)	We have been very careful, because we noted the shameless prices by some, so there we did quite a lot of work to try to understand what a reasonable price is on the market. What is reasonable? It must not be too cheap either. It goes without saying that there are costs that cannot be counted. Some [say,] 'oh, you are very cheap, I prefer to buy from you.' But that is not what we should be, it is the need that should be covered, it is not that we should be the cheapest. When the channels that existed before the pandemic begin to recover, we may see that the market is the same and therefore we do not know if we will ... that this [hand sanitizer] will be a new product, or if this was a temporary solution.	Examples: Swedish Civil Contingencies Agency Swedish Tax Agency Swedish Government Swedish Chemicals Agency Chemical Technical Companies (Trade Organization) Local Municipality
Getinge	n/a	n/a	n/a