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Strategic alignment, uncertainties, and realignment of project portfolios

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1. Introduction

Organizations typically have several innovation projects in their project portfolio, since they need to develop multiple products and services for different markets in parallel and prepare for alternative futures. Some innovation projects may be planned to follow the organization's official strategy and process, while some projects may emerge in an unplanned manner (Globocnik et al., 2022; Kopmann et al., 2017; Loch, 2000). In project portfolio management (PPM), project portfolios and their single projects are expected to fit the organization's strategy, and projects are often assessed in terms of strategic alignment to prioritize them for selection (Archer & Ghasemzadeh, 1999; Cooper et al., 1997; Dye & Pennypacker, 1999; Englund & Graham, 1999). Similarly, strategic alignment is often treated as a success criterion, when evaluating the project portfolio's performance (Cooper et al., 1999; Jonas et al., 2013; Kock & Gemünden, 2019; Kock et al., 2016; Kopmann et al., 2017). Between the beginning of projects and the periodic assessment of project portfolio success, however, anything can happen.

Projects and portfolios face uncertainties both from projects and the environment, and managers may need to readjust, realign, and reconfigure the project portfolio, to fulfill the strategic aspirations. Uncertainty is very commonly experienced both concerning single projects and the project portfolio as a whole, so there is a need to understand any uncertainty sources that affect project portfolios and the consequent managerial actions taken for realignment. Some previous research has already mapped the types of uncertainties experienced in project portfolios and related managerial responses (Kock & Gemünden, 2016; Korhonen et al., 2014; Martinsuo et al., 2014; Petit, 2012; Petit & Hobbs, 2010; Teller et al., 2014). While such research acknowledges the consequent reconfiguration of the project

portfolio, to adjust and realign it either with the earlier or with a completely new strategy, this realignment will deserve more attention.

Here, project behavior is understood as the behavior *of* projects, which should also include considerations of behavior *in* projects (Unterhitzenberger, 2021), within a portfolio of multiple projects. When organizations strive for strategic alignment in their project portfolios, behavior in projects and external uncertainties may either drive or threaten that alignment. Behavior in projects is susceptible to various assumptions, heuristics, and biases in thinking, stemming from incomplete and uncertain information and potentially leading to project misperformance (Ika et al., 2022). Some (organizational and environmental) uncertainties may reside completely outside of managers' own control, but also they may require mitigation and coping in terms of new project behaviors. Thereby, behavior *in* projects is expected to be connected with behavior *of* projects in various ways (Unterhitzenberger, 2021). There is a need to understand these connections underlying the behavior of projects.

The goal of this chapter is to reveal the sources of uncertainties firms face in their innovation project portfolios and characterize their approaches to strategic realignment, as means to resolve the uncertainties. We generally assume that organizations pursue strategic alignment both in their project and portfolio selection and as a performance criterion and they also experience uncertainty stemming from both project behavior and the surrounding context. We seek answers to the following questions:

1. From where, which sources, do uncertainties emerge in innovation project portfolios? In particular, how do firms of different sizes differ in their uncertainty experiences?
2. How, through what kinds of phases, do managers realign the portfolios with strategy, when responding to uncertainty?

The next section characterizes the organizations' common pursuit of strategic alignment in their project portfolios. We then introduce the necessity to acknowledge the environment, organizational complexity, and single projects as possible sources of uncertainty for project portfolios. We explain the need for managers to monitor the events surrounding the project portfolio, to be able to take action upon uncertainties and to strategically realign the project portfolio, when needed. We report empirical evidence and examples from qualitative, interview-based case studies in five industrial firms representing somewhat different sizes and industries, and each managing at least two innovation project portfolios (based on

Anttila, 2021; Martinsuo & Anttila, 2022; Martinsuo & Tuominen, 2021; Tuominen, 2020). Table 1 summarizes the contexts of the studied firms (labeled with pseudonyms to retain anonymity).

Table 1. Overview to empirical examples used in this chapter.

	Industry	Turnover M€	Nr of employees	Nr of project portfolios
Large firms, data: 12 interviewees				
ForestCo	Forest industry	> 1 800	> 2 000	2
MechaniCo	Mechanical engineering	> 3 000	> 10 000	>3
AutomatiCo	Automation and mechanical engineering	> 1 500	> 10 000	>3
Medium-sized firms, data: 8 interviewees				
SoftwareCo	Software solutions	> 60	> 900	2
MachineryCo	Heavy machinery	> 600	> 1700	2

We use empirical examples from some of the studied companies concerning the pandemic-induced chaos that generated a flood of uncertainties, to highlight the steps leading to the project portfolios' strategic realignment. As conclusions, we reveal some firm size-related differences in the uncertainty sources, map the managers' cognitive process of project portfolio's strategic realignment, and advocate perceiving project behavior not just as a source of uncertainty, but as a mechanism for reaching strategic realignment in a project portfolio.

2. The pursuit of strategic alignment in project portfolios

Innovation projects represent organization's means to develop new products and services and establish new revenue streams. Because firms may operate on multiple different markets and serve different market segments, they need to involve in multiple parallel innovation projects and organize the projects into project portfolios. Similarly, they need to prepare for alternative futures with different projects, because the future is unknown.

The compilation of innovation projects is typically guided by the firm's business or innovation strategy that communicates choices concerning key markets, technologies, channels, and capabilities. Firms' strategies differ clearly from each other, but the suitability of the project portfolio is often assessed in very generic terms merely as *strategic alignment* (Martinsuo & Geraldi, 2020). Next to value maximization and portfolio balance, strategic

alignment or fit is typically considered as a key goal for PPM (Cooper et al., 1997). Also exploitation of synergies and average project or product success may occasionally be considered as goals and success criteria in PPM (Jonas et al., 2013; Kock & Gemünden, 2019; Kock et al., 2016; Kopmann et al., 2017). While any of these measures may be used as episodic success criteria in evaluating the project portfolio performance, they are also considered carefully when screening and assessing projects and proposing, prioritizing, and selecting projects to the portfolio (Archer & Ghasemzadeh, 1999; Cooper et al., 1997; Dye & Pennypacker, 1999; Englund & Graham, 1999). Projects, thereby, are reviewed strategically and often treated as vehicles or mechanisms of strategy implementation.

A single project's strategic alignment requires that the project and its goals, benefits and ways of operating are planned with the strategy in mind (Englund & Graham, 1999). This strategic pursuit may be challenging and paradoxical in the context of innovations. On the one hand, innovations are expected to drive renewal in the firm and potentially enable the emergence of completely new strategies (Kopmann et al., 2017; Loch, 2000). On the other hand, if the strategy already communicates such renewal intentions, then the strategy is expected to guide projects' goal setting and planning directly (Cooper et al., 1997; Englund & Graham, 1999). This intent of innovation project portfolios to serve both strategy implementation and renewal may be reflected in the types of practices used for PPM (Kopmann et al., 2017). Firms may even use different project portfolios to implement different strategies, e.g., concerning incremental vs. radical innovations (Loch, 2000).

The five example companies all had specified strategies to guide the project portfolios and derived from a more general business or innovation strategy. As they all had two or more project portfolios, each portfolio served a somewhat different innovation strategy, for example differentiated by the incremental vs. radical nature of innovations or dedicated to specific business areas or product segments (e.g., oriented toward specific customer markets or hardware vs. software). Regardless of this division, all companies considered their innovation strategies to be integral parts of the organization's high-level strategy serving ultimately the same purpose. All the firms had some routines and practices in place, to ensure the alignment of their innovation projects with such strategies, ranging from the use of strategic evaluation criteria to comprehensive PPM systems. Informants in our study acknowledged quite well that strategies and circumstances change and that also the project portfolios evolve over time, when facing uncertainty.

3. Uncertainty in project portfolios

Even if all projects are planned so that they and the project portfolio are aligned with strategy originally, they are susceptible to changing circumstances and surprising events. PPM research already acknowledges that managers need to pay attention to their uncertain environments (Petit, 2012; Petit & Hobbs, 2010), ensure that new information is brought into the social decision-making events (Blichfeldt & Eskerod, 2008; Christiansen & Varnes, 2008), and use information on uncertainties in managing the project portfolios (Korhonen et al., 2014). Where risks are known occurrences that can be assessed in terms of their probability and impact and affect the project performance positively or negatively (Chapman & Ward, 1997; Knight, 2006), uncertainties are such occurrences that cannot necessarily be known and whose outcomes cannot be anticipated (De Meyer et al., 2002). In innovation projects, various uncertainties are prevalent, but organizations cope with them and reduce them by accessing new information and preparing for alternative outcomes during the innovation process (De Meyer et al., 2002; Pich et al., 2002). Managing uncertainty does not deal with managing threats, opportunities, and their implications only, but understanding the sources of uncertainty, already before starting to plan any responses to such uncertainty (Ward & Chapman, 2003)

This study considers uncertainty in project portfolios, where portfolio uncertainties may stem from any occurrences, changes, and deviations arising from within the projects or the context. Project portfolio managers face uncertainty from three main types of sources: the environment, parent organization's complexity, and single projects (Korhonen et al., 2014; Martinsuo et al., 2014). We mapped the sources of uncertainty experienced by project portfolio managers in the studied five firms into these three categories. Martinsuo et al., (2014) suggest that through understanding these sources of uncertainties, the managers frame the uncertainties into threats, neutral and opportunities that will consequently affect how they potentially respond to the uncertainties.

3.1 Sources of uncertainty in the external environment

External environment is broadly considered as a substantial source of project portfolio uncertainty (Hoffmann et al., 2020; Kaufmann et al., 2021; Kock & Gemünden, 2016; Korhonen et al., 2014; Petit 2012; Petit & Hobbs 2010; Voss & Kock 2013). Various external uncertainty sources seem to affect PPM regardless of the organizations' industry and size. For instance, **changing customer needs** are often considered a significant source of portfolio

uncertainty, as they provide inputs and direction to new innovation projects and may change in an unforeseen manner (Hoffmann et al., 2020; Kock & Gemünden, 2016; Korhonen et al., 2014; Petit & Hobbs, 2010; Petit, 2012; Voss, 2012). Customer needs, therefore, demand continuous business intelligence activities and external monitoring as part of PPM. Another common portfolio uncertainty is **technology** (Hoffmann et al., 2020; Korhonen et al., 2014; Voss & Kock, 2013), as novel technologies may spark ideas for new product development projects, evolve in an unknown pace, and also cause changes to existing technology choices. New technologies have been positively associated with portfolio innovativeness and therefore eventual portfolio success (Kaufmann et al., 2021). Continuous technology monitoring and scouting offer important information for PPM.

In addition to uncertainty sources in the closest business environment of firms, also broader societal issues may appear as relevant for innovation project portfolios. Some studies have identified **legislation and regulations** as an influential source of portfolio uncertainty (Hoffmann et al., 2020; Korhonen et al., 2014; Petit 2012), along with the company's **competitors** (Kock & Gemünden, 2016; Korhonen et al., 2014; Petit, 2012). Changes in legislation and regulations may drive new innovations or cause pressures to existing projects, and competitors' actions are typically monitored carefully, to ensure timely responses. Some studies have mentioned various **third parties**, i.e., other organizations within or nearby the company's supply chain, as a source of portfolio uncertainty (Korhonen et al., 2014; Petit & Hobbs, 2010). Lastly, Petit and Hobbs (2010) have recognized **global economy** as another source of portfolio uncertainty not belonging to any of the categories described above, but still important to be considered when practicing PPM.

The findings of case studies conducted in large and medium-sized companies in different industries offer evidence of how portfolio managers experienced the sources of external uncertainty in their innovation project portfolios. Figure 3.1 summarizes sources of uncertainty in the external environment, as experienced in the studied firms. In this and the next figures, the significance of the uncertainty source was assessed by the frequency of expressions in the interview data. *High significance* indicates that the majority of the interviewees mentioned portfolio uncertainties arising from such a source, whereas *low significance* indicates that the uncertainty source was mentioned merely by a single interviewee. *Moderate significance* then falls between these two categories with the frequency of expressions between high and low significance.

Company size	Large	Medium
Industries	Automation, manufacturing, forestry	Software solutions, machinery
Uncertainty source		
Customers	● ● ●	● ● ●
Technology	● ● ●	● ● ●
Competitors	● ● ●	● ● ●
Legislation and regulation	● ● ●	● ● ○
Third parties	● ○ ○	● ● ●
Other external uncertainty	● ● ○	● ○ ○
Significance	● = Low ● ● = Moderate ● ● ● = High	

Figure 3.1. Sources and significance of portfolio uncertainties stemming from the external environment.

Managers in both the large and medium-sized firms experienced **customers**, **technology** and **competitors** as the most significant uncertainty sources affecting PPM. The expectations of customers vary and change over time, the actions of competitors may be surprising, and the emergence, pace, and direction of new technologies is perceived as uncertain. Some of our informants characterized these issues more generally, as part of the industry domain in which they operated: certain industries are more fast-paced and uncertain than others. Particularly the digitalization trend has been experienced in all firms and had influenced decisions concerning innovation project portfolios, too.

On top of these three sources, **legislation and regulations** were seen as a significant source of uncertainty in large companies and moderate in medium-sized companies. Informants in large companies experienced legislation and regulations both as a driver to change the strategic direction and as a source of operative requirements throughout the supply chain, consequently filtered to innovation project portfolios. The pace of changes in legislation might be slow, but the large firms had to be sensitive to regulatory changes on different market areas and customer industries in their global operations and the implications on innovation strategies and portfolios appeared as more influential. As the medium-sized companies had more restricted markets and industry domains and a more agile way of operating to begin with, the regulatory evolution was not equally visible as in the large firms.

Third parties were experienced as a significant source of project portfolio uncertainty more in medium-sized companies, and less so in large companies, even if third-party cooperation is used in innovation projects in both types of firms. Such uncertainties dealt with access to suppliers and partners, start-up cooperation, and research cooperation and it enabled (or disabled) access to relevant information that guides the innovation projects. The difference between firms of different sizes may be explained through the differences in portfolio size and hierarchies of decision making. It is likely that third-party cooperation is handled at the project level and will be reflected onto the portfolio level better in smaller portfolios with lower decision hierarchies. Alternatively, large companies may have better internal access to critical resources and capabilities, whereas medium-sized companies might need to rely on external resources more frequently in their projects, which could increase the significance of third-party related portfolio uncertainties in them. Additionally, some **other external uncertainties** such as the turbulence caused by COVID pandemic and influence of labor unions were identified in both large and medium-sized companies. The medium-sized firms were studied in the early phase of the pandemic (when the effects were not yet fully seen) and large firms were studied in the middle of the pandemic and additionally emphasized the influence of labor unions (both in their own firms and in customer firms), which could explain their difference better than the difference the industry or company size.

3.2 Sources of uncertainty from organizational complexity

Organizational complexity concerns strategies, structural arrangements, resources and responsibilities, and culture and power within the organization, as the parent organization's internal surroundings in which the project portfolios are located. It, too, is a significant and well-understood source of uncertainty for project portfolios (Hoffman et al., 2020; Kauffman et al., 2021; Kock & Gemünden, 2016; Korhonen et al., 2014; Petit, 2012; Petit & Hobbs 2010; Teller et al., 2012; Voss & Kock 2013). As such, organizational sources of uncertainties seem to influence companies regardless of their size and industry.

Many studies have emphasized the company's **resource availability** as a significant source of portfolio uncertainty (Hoffman et al., 2020; Kock & Gemünden, 2016; Korhonen et al., 2014; Petit 2012), as resource limitations often guide the prioritization decisions during portfolio reconfiguration (Hoffman et al., 2020). Specifically concerning human resources, the **company's employees**, their competences, roles, and responsibilities have an impact on PPM (Hoffman et al., 2020; Korhonen et al., 2014; Teller et al., 2012). Ways of allocating

resources between projects and specifying the roles and responsibilities of individuals may change over time, and this has implications on the project portfolio. Also actions to promote employees' motivation and well-being may have an influence (Hoffmann et al., 2020), particularly if the objectives are ambitious and if employees need to prioritize between different projects in their daily work. Generally, it is important to consider **organizational culture** as a source of portfolio uncertainty (Hoffmann et al., 2020; Kaufmann et al., 2021; Petit, 2012; Teller et al., 2014), so that processes and portfolio management mechanisms can be developed to fit the organization's norms (Hoffmann et al., 2020). For example, the organization's norms, processes, and ways of operating may vary between very simple and highly complex, and the extent of intra-organizational complexity may be reflected in various degrees of uncertainty tolerance vs. uncertainty avoidance.

Portfolio structure has been mentioned as significant source of portfolio uncertainty in multiple studies (Hoffman et al., 2020; Kaufmann et al., 2021; Korhonen et al., 2014; Petit, 2012; Petit & Hobbs, 2010; Voss & Kock, 2013). For instance, Hoffmann et al. (2020) identified the risk of portfolio's strategic misalignment and ultimately failure, if new projects are constantly added without considering their implications on the portfolio and if PPM does not handle project prioritization and approval in a timely manner. Some portfolio uncertainties might emerge from the general **organizational structure**, where structural changes might occur and require actions in the project portfolio (Korhonen et al., 2014; Petit & Hobbs, 2010). Structural changes might mean adding or deleting a new organizational unit, or allocating new responsibilities for a specific unit, and any of such changes could cause pressures to change the location or composition of project portfolios. According to Petit and Hobbs (2010), however, such uncertainties stemming from organizational structure seemed to have only a minor impact on the portfolio level. Similarly, changes in **organization's strategy** are assumed have an impact portfolio's strategic alignment (PMI, 2008; Petit & Hobbs, 2010), but such uncertainties have not been observed widely in previous studies.

Companies of different sizes and industries in our empirical exploration differed in their perceptions of organizational complexities as sources of uncertainty. This difference can be seen in Figure 3.2.

Company size	Large	Medium
Industries	Automation, manufacturing, forestry	Software solutions, machinery
Uncertainty source		
Resource availability	● ● ○	● ● ●
Portfolio structure	● ● ○	● ● ○
Culture	● ● ●	○ ○ ○
People	● ○ ○	● ● ○
Organizational structure	○ ○ ○	○ ○ ○
Strategy	○ ○ ○	○ ○ ○
Significance	● = Low ● ● = Moderate ● ● ● = High	

Figure 3.2. Sources and significance of portfolio uncertainties stemming from organizational complexity.

In the medium-sized companies, the most significant source of uncertainty stemming from organizational complexity concerned the companies' **resources**, whereas larger companies deemed the resource-related uncertainties less significant. This could be explained by the availability of resources, as medium-sized companies may hit the resource capacity limit quicker compared to larger organizations. In the larger firms, **organizational culture** was seen as the most significant source of organizational complexity, particularly in terms of the historical legacy in technical systems and somewhat rigid ways of operating, whereas cultural uncertainties were not discussed in the medium-sized companies. This difference in perception could be explained by a potentially more conservative and stable organizational cultures in larger organizations, which might imply reduced flexibility compared to more agile smaller companies.

People, especially in terms of their competences, roles, and responsibilities, were expressed as a source of portfolio uncertainty in both large and medium-sized companies, for example, concerning the allocation of certain competences to innovation projects and risk of losing critical competences. In medium-sized companies the significance of this uncertainty source was seen greater compared to larger organizations. This difference could be related to the access to the right types of competences and capabilities in light of the job demands, where

medium-sized companies might have fewer employees with key competences compared to larger organizations. Alternatively, larger organizations may have more established procedures concerning the allocation of roles and responsibilities, whereas medium-sized companies might have to assign key employees to multiple different roles at the same time especially when resources are scarce.

During the study period, uncertainties rising from **organizational structure** or **strategy** were not discussed in the target firms due to such adjustments being relative rare and due to our informants representing those involved in PPM (not the general top management). The lack of observations does not mean that such changes should be overlooked in PPM; rather, it is likely that such sources of uncertainty are experienced elsewhere in the organization and that the informants experienced strategies and structures as clear, not causing particular uncertainty at the moment.

3.3 Sources of uncertainty in individual projects

Uncertainties and their sources have been widely studied at the single project level (Ward & Chapman, 2003), but they also have clear implications at the level of the project portfolio. These uncertainties can be classified into three different categories, where the most common source of project uncertainty is related to **project parameters**: time, cost, and quality (Korhonen et al., 2014; Petit & Hobbs, 2010; Ward & Chapman 2003). Such uncertainty may mean that issues concerning time, cost, or quality are for some reason unknown, or that these parameters are sensitive to changes due to how they are managed. The **assessment quality** on these parameters has also been suggested as a source portfolio uncertainty (Petit & Hobbs, 2010; Ward & Chapman, 2003). This deals with deficient estimations concerning the project parameters and causes uncertainty, as poor project planning might be reflected on the portfolio level and multiply due to project interrelations. Lastly, **project complexity**, including project characteristics and scope, has been highlighted as a source of portfolio uncertainty stemming from single projects (Korhonen et al., 2014; Petit & Hobbs, 2010). While many of the single-project sources of uncertainty may be monitored and resolved at the single-project level, they may also have ramifications at the project portfolio level due to projects' interdependencies and competition for resources, and they therefore require some monitoring and consideration in the portfolio, too.

Company size	Large	Medium
Industries	Automation, manufacturing, forestry	Software solutions, machinery
Uncertainty source		
Project parameters	● ● ●	● ● ●
Assessment quality	○ ○ ○	● ● ●
Project complexity	○ ○ ○	○ ○ ○
Significance	● = Low ● ● = Moderate ● ● ● = High	

Figure 3.3. Sources and significance of portfolio uncertainties stemming from single projects.

Figure 3.3 shows how the single-project uncertainties appeared in the portfolios of the five studied firms. Uncertainties stemming from **project parameters** were apparent in both large and medium-sized companies. In fact, interviewees in all companies reported uncertainties related to project schedule, budget, or quality and their implications at the level of the project portfolio. When single projects stretch their schedules or budgets or fail to produce expected innovation outcomes, it appears in a need to rearrange resources and budgets for other projects. In turn, uncertainties related to **assessment quality** were only discussed in the medium-sized companies, where multiple instances of insufficient estimations of projects' resource need, schedule, quality, and budget were reported and caused changes and pressures to the portfolio level. It may be that large organizations considered such assessment quality uncertainties to be embedded in project parameters, and therefore they were not reported separately. Project complexity as a separate uncertainty source was not observed in either large or medium-sized companies, potentially due to the fact that different types of projects were divided into separate portfolios, each with their processes and guidelines.

4. Tackling uncertainty through strategic realignment

The above overview to the sources of uncertainty in innovation project portfolios has drawn attention to the managers' need to monitor events and changes and take action, to ensure that the portfolio stays on its course over time. If managers notice that the project portfolio is insufficiently strategy-aligned, they should engage in **strategic realignment** which means making the necessary portfolio-level changes to regain the pursued balance and alignment

between the portfolio and the innovation strategy. Strategic realignment may occur on a regular interval, such as annual or semi-annual portfolio review meetings, episodically following a more significant event that has caused turmoil in the portfolio, or also in the micro-level actions of managers, when re-allocating resources or prioritizing between projects in a sub-portfolio. Petit (2012) discusses reconfiguring, i.e., changes in the portfolio in terms of what is done and how resources are allocated. He also acknowledges the possibility to transform the portfolio management processes, due to the experienced changes.

Excessive monitoring is not necessary or even desired for project portfolios, even if some processes of uncertainty and risk identification and management are needed. A study concerning the formalized aspects of risk management in project portfolios revealed that redundant risk monitoring may even have a negative effect on project portfolio success (Teller & Kock, 2013). Another study on managers' uncertainty handling approaches suggests that unnecessary control may damage organizational learning and communication (Martinsuo et al., 2014). Due to this, some flexibility needs to be present in effective PPM especially in a highly dynamic context (Martinsuo et al., 2014). In our view, managers just need to stay alert to the sources of uncertainty and be prepared to act on them upon need.

In order to understand how strategic realignment takes place, we explored our five case companies for such very topical occurrences where managers had to respond to an episodic turmoil and go through strategic realignment. We noticed that all the studied companies had experienced the COVID-19 pandemic as a source of external uncertainty, influencing many other uncertainties and causing a necessity for managers to reconsider the project portfolio's strategic alignment. This can be considered as an extreme event, demonstrating the interconnectedness of multiple different uncertainties and, thereby, enabling pattern discovery in companies' responses to the uncertainties.

4.1 Chaos emerging through interlinked uncertainties

When the COVID-19 pandemic emerged, companies around the globe and across industries were hit by a shock. The uncertainties rising from the external environment and country-specific lockdowns were so severe that customers temporarily stopped using the solutions supplied by the studied firms for weeks or months, these process interruptions occurred at different times on the different market areas, and the companies had to stall recruitment processes, spare resources, and slow down investments. Instead of investing into innovations

for the longer-term future, the firms we studied had to concentrate more on resolving crises and problems, by the side of their day-to-day operations.

The changes permeated through the supply chains broadly and quickly. As a result, uncertainties concerning organizational complexity and single projects also started to surface. Resources had to be rearranged, responsibilities had to be reconsidered, and project parameters faced new unknowns, and all these movements required consideration also at the portfolio level. The snowball effect led to a complete chaos, i.e., unforeseen event with high severity (De Meyer et al., 2002), where a series of severe and unforeseen events started to invalidate innovation project portfolios' previously planned objectives.

During the early phases of the pandemic, the core project portfolio actors in three companies MechaniCo, SoftwareCo, and MachineryCo, started to behave in an interestingly similar manner when practicing their PPM. After noticing the chaos, they first became alarmed about it which triggered managerial action, then began considerations on refocusing the portfolio through drastic reconfiguration, and finally completed a strategic realignment in the project portfolio. We describe these phases below, in how it appeared in these firms.

4.2 Alarms triggering managerial action

COVID-19 was experienced in the firms both as a “shock”, “heavy blow”, and “misty outlook”, and all these metaphors acted as alarms that the firms needed to take seriously. Particularly the larger firm MechaniCo started seeing signs of uncertainty immediately after China's first lockdowns in the form of cancelled customer orders, difficulties in getting components from the suppliers, and remote monitoring systems informing the reduced or stalled use of their equipment in customers' processes. As one manager reported: *“It is fortunate that we have access to remote data on our systems in customer's processes. We could see the reduction in equipment use rather fast, and in just one or two months we were in a totally different mode of operating [as a response to the identified uncertainty]”*. In SoftwareCo, the focus of the innovation project portfolios changed drastically due to COVID-19, as the company's customers were facing completely new challenges in the quickly transforming and unpredictable environment. At the same time, MachineryCo was struggling with similar uncertainties in their own, completely different industry and market. The rapidly emerging new requirements and demands from customers, suppliers, and various partners alerted the firms to a new situation: their innovation project portfolios were no

longer appropriate, and they could not handle the innovation project portfolios with the resources that they possessed.

These distressing alarms rising from the external environment forced the companies to stall recruitment as a precaution. In a global research and development organization, lockdowns required remote work arrangements, which was challenging to handle as all employees do not have personal laptops and remote connections from home. These resource-related issues meant that the resources for innovation projects began to suffer. As an unexpected consequence, new uncertainties began to emerge from organizational complexity and single projects. In the middle of changing customer needs, pressing resource limitations, and distorted project plans, the companies had to try and understand the nature of these alarms (i.e., uncertainties that required immediate responses) and their impact on the innovation project portfolios.

4.3 Management teams reconfiguring the portfolios

After identifying and assessing the uncertainty, the project portfolio actors in MechaniCo, SoftwareCo and MachineryCo had to develop adequate responses to the various uncertainties quickly and efficiently in order to realign the portfolio towards the new and constantly changing strategic objectives. According to one manager, the chaotic circumstances required dramatic actions: *“Well, our actions were rather significant, in response to the misty outlook. We did not have much insight into whether we would sell anything at all, for a while. So we had to switch our spending to such a [lower] level, too, and really fast.”* In the companies, the portfolios were heavily reconfigured during the pandemic, for example, by adding and deleting projects, rearranging resources between them, and changing project scopes, schedules, and budgets. It also meant a momentary scale-down of some portfolios and projects and shifting managers’ day-to-day attention to even very minor details within the portfolios. In SoftwareCo, portfolio reconfiguration was carried out by the product council, as explained by one of the company’s portfolio managers:

“We did a lot of reconfiguration during the spring, as the focus points changed drastically when the markets were hit by the shock. One thing that was previously deemed important was not as crucial anymore, and even if we did not necessarily terminate an initiative, we might have put some things on hold or on a lower priority. At the same time, if we recognized some other projects that we wanted to push forward, we increased their priority and reallocated resources to those initiatives. Due to that,

we of course had to then lower the priority of some other projects, so we would get more resources out of it.”

The reconfiguration actions in MachineryCo were very similar, as the company was also trying to realign the project portfolio with the company’s renewing strategic objectives, while the strategy was being reconsidered to match the new circumstances in the business environment. During this portfolio refocusing, the portfolio components were re-prioritized, resources reallocated, new projects added, and some projects were backlogged.

4.4 Achieving strategic realignment

During heavy reconfiguration and re-focusing the portfolios, new projects had been added to serve the reformed customer needs, redundant projects had been terminated or backlogged to free resources, projects had been reprioritized to respond to the new demands, and resources were reallocated according to the new prioritization. As a result, innovation project portfolios in the companies were more responsive to the identified uncertainties rising from the external environment, organizational complexity, and single projects, and again realigned with the companies’ renewed strategies. Particularly at the later phase of our research, the firms had already “returned back to almost normal” and adjusted their innovation projects to prepare for the future after the pandemic, as one manager explained: *“Last summer we had to adjust various things quite a bit, but then we could turn the knobs [readjust the portfolio] to a more ordinary position.”*

The strategic alignment of an innovation project portfolio is a moving target, and the future after pandemic appears as different from the future anticipated before the pandemic.

Therefore, portfolio’s strategic alignment requires continuous monitoring of portfolio uncertainties and frequent reconfiguration, as explained by one of the portfolio actors in MachineryCo:

“We have a huge number of projects, even a bit too many. In that sense, the spring [2020] and COVID-19 pandemic was a good time to pause and seek for focus again. We should remember that during the good times as well, that we should sit down for a bit and review the things that are on-going in the portfolio –.”

5. Conclusions

We have above portrayed PPM as a pursuit of strategic alignment and, yet, a sensitive endeavor facing various uncertainties. In response to the first research question, we mapped

sources of uncertainties stemming from the surrounding environment, organizational complexity, and single projects. In our study, project behavior in the form of performance criteria, assessment quality, and complexity is only one uncertainty dimension, with the other sources of uncertainties faced at the project portfolio level. Our exploration of five firms indicates that the influence of behavior in projects stemming from single-project uncertainties toward the project portfolio is minor, compared to uncertainties from the environment and organization. It is likely that the majority of project-level uncertainties are treated within the projects and only rarely accumulate to such concerns that should be considered at the project portfolio level. However, changes in project behavior become necessary as ways to respond to and mitigate the uncertainties stemming from the environment and organizational complexity, as project portfolio decisions need to be implemented in the affected projects, too. Thereby, we portray project behavior both as a possible source of uncertainty and as a way to mitigate uncertainty to achieve strategic realignment.

While the various uncertainty sources have been covered in different ways in earlier research, our study offers novel information on the differences potentially stemming from different firm sizes (and industries). In our interpretation, the differences may result from a combination of portfolio positioning, organizational history, and industry clockspeed, as these differentiate the large firms from the medium-sized firms. **Portfolio positioning** deals with the portfolio's span and centrality or hierarchical location in the organization. In the large firms (particularly MechaniCo and AutomatiCo), there were several portfolios and portfolios were distributed at the different levels of the organization, whereas in the medium-sized firms (also ForestCo) there were just two main portfolios located centrally. This positioning may be reflected in access to dedicated resources and competences, sensitivity to project-level assessment quality, and need for third-party support, in particular.

Organizational history concerns the legacy built over time, reflected both in developed technologies and related knowledge and competences. In the larger firms, this history appeared in considerations of culture as a source of both domain-specific knowledge and slowness, in the attention to slower-paced legislation changes, and in the sensitivity with regards to labor union's actions. In the medium-sized firms the history of development was shorter and such concerns were barely mentioned. **Industry clockspeed** concerns the general pace of changes and technology development in the industry field. In the larger firms, with more mature industries, the clockspeed was slower in general and PPM routines thereby less frequent. However, also the larger firms were already familiar with the faster clockspeed

concerning digital technologies. In the medium-sized firms, the pace was faster and responses to some external pressures were built into more frequent PPM routines. These identified differences and factors may explain other differences in PPM implementation and performance, too, and should potentially be taken into account in forthcoming research.

To respond to the second research question, we selected an extreme event faced by all companies in the past years, namely the COVID-19 pandemic, to discover how managers realigned their innovation project portfolios with strategy in response to environmental uncertainty. While the pandemic is generally viewed as something affecting individuals and their lives, also industrial firms have experienced severe consequences, due to the chaos and turmoil that emerged. This is also what our exploration of five firms revealed. We reported four main phases that switched the firms from a state of strategic alignment through to a new state of strategic realignment, namely: experiencing the emerging chaos including multiple interlinked uncertainties, paying attention to alarms that trigger managerial action, using the ordinary management team routines to reconfigure the project portfolio, and moving to a new state of strategic realignment, different from the original idea of strategic alignment. Thereby, our findings offer a project portfolio example concerning the chaos-type uncertainty (De Meyer et al., 2002).

This extreme case by no means reflects all types of strategic realignment in organizations. As described earlier, some strategic realignment appears quite routinely and regularly and on the different levels of the organization. However, our examples draw attention to the fact that all project portfolios may occasionally face multiple different uncertainties simultaneously and then they need to consider strategic realignment holistically, not just one uncertainty at a time. Our findings complement previous research that has covered the various responses to portfolio uncertainties (Korhonen et al., 2014; Petit, 2012; Petit & Hobbs, 2010), particularly through revealing the cognitive process for managers to initiate and go through their portfolio's strategic realignment holistically, acknowledging the compilation of uncertainties surrounding them at the given moment.

As a key contribution of our study, the actions required for the portfolio's strategic realignment draw attention back to project behavior. Behavior in projects is not merely a source of uncertainty, but managers and project personnel use it as a central mechanism to respond to environmental and organizational uncertainties. The findings offer a portfolio-centric view to the behavior *of* projects and reveal its two-way connection to behavior *in* projects, thereby, responding to an earlier call for context-sensitive research on project

behavior (Unterhitzenberger, 2021). The findings revealed that managers clearly adjust and redirect project behavior on purpose, to cope with and overcome uncertainties in the innovation project portfolio. This demonstrates that they have agency in their decisions and actions and they can “make best of the evolving context” (cf. Ika et al., 2022) also in the face of severe uncertainty. We showed that new projects were needed, projects had to be terminated or delayed, resources had to be released to new activities, and reprioritization occurred between projects, when refocusing the project portfolios toward the renewed strategic alignment. While our study revealed evidence concerning responses to the pandemic, organizations adjust project behavior through these different decisions constantly, not just in selecting projects and not just once a year. Thereby, project behavior is not only a source of uncertainty, but a prospective solution to the need of strategic realignment. Forthcoming research should increasingly consider alternative portfolio decisions such as selecting, delaying, terminating, and reprioritizing projects together, as complementary and combined approaches to project portfolios’ strategic alignment.

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