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# Stress tests for public service resilience: introducing the possible-worlds thinking

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## ABSTRACT

Tackling the COVID-19 pandemic and reverting to normal life and services requires resilience. This qualitative case study aims to help public sector managers understand service resilience and its accompanying breaking points by proposing a scenario planning model that tests resilience by applying possible-worlds thinking to public services. The proposed scenario planning model is based on empirical evidence showing how service design incorporated assumptions that became inaccurate in the pandemic, and how these inaccurate assumptions created pressures for change in the service design and production. The model we propose can help public managers apply such stress tests in practice.

**KEYWORDS** Resilience; public service organization; scenario planning; public service management; strategic planning


## Introduction

Every organization exists to serve a distinct purpose. When that existence is jeopardized by unexpected events, the organization is required to bounce back to an acceptable state of normality (Wildavsky 1988) and learn from the crisis (Weick and Sutcliffe 2001). In this context, several scholars have emphasized the crucial role of resilience in public service organizations (PSOs) (e.g. Boin and van Eeten 2013; Stark 2014). The literature elucidates attributes of resilient organizations (e.g. Duchek 2020) and general principles of resilience (e.g. Barton et al. 2020), but tangible techniques used to test the service resilience are difficult to find (e.g. Boin and Lodge 2016; Duit 2016). Therefore, in this study, we ask how the resilience of public sector services can be tested. We divide this research question into two sub-questions:

1. What attributes makes public services more resilient?
2. How could public service resilience be stress-tested?

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The significance of service resilience has been amply exemplified during the ongoing coronavirus pandemic (COVID-19). The task confronting national governments went beyond controlling the spread of the virus and necessitated a detailed understanding of the chain reactions where changes in one domain demanded novel solutions in other parts of the society. Governments globally have been criticized for their responses to the pandemic, and PSOs found themselves in dire situations as many normal practices, norms, and thinking proved to be inadequate or inappropriate. While some sort of pandemic was predicted (e.g. Daszak 2020; Henig 2020), many PSOs were ill-prepared for the transboundary consequences of the pandemic (e.g. Bryce et al. 2020). It is apparent that the activation of a predefined crisis management plan has been inadequate in extreme crises such as the COVID-19 pandemic (Ansell, Sørensen, and Torfing 2021).

The problems arising from tackling the pandemic are perhaps not so surprising: scholars have argued that bureaucratic PSOs lack flexibility in the output production (see Osborne 2006). Nevertheless, the COVID-19 pandemic has been a harsh reality check that has alerted the research community and practitioners to the need to develop innovative scientific and managerial methods with a view to understanding future scenarios and government action. Despite the vast body of research that has been conducted on the topic of resilience, numerous scholars have opined that organizational resilience is similar to a black box where the actual state of resilience is unknown and can only be observed retrospectively. For example, (Duchek 2020, 211) contends that studies have primarily aimed at explicating resilient outcomes amidst the crisis by identifying factors that have had a positive impact in the particular context. Organizations that have survived crises have been considered resilient. Much less is known about the manner in which they created their resilience.

Thus far, studies have investigated the trade-offs between resilience and other values of public administration (Duit 2016); the ways in which bureaucratic agencies manage the tension between rules and improvisation (Stark 2014); how risk perception contribute to adaptive responses in public organizations (Kominis et al. 2021; Zhang, Welch, and Miao 2018); and the role employee resilience plays in contributing to the resilience of public organizations (Plimmer et al. 2021). However, there is a dearth of studies investigating how to test the resilience of public sector services. By understanding such tests, public managers could identify situations in which services would no longer work owing to the service design and the assumptions it incorporates. This identification process contributes to anticipatory resilience in the public sector.

This study addresses the issue of resilience in three phases. In phase one, we introduce possible-worlds thinking and scenario planning and have these applied to the resilience and strategic planning literature. In phase two, we elucidate our content analysis and various information sources and use these to understand whether possible-worlds thinking provides adequate explanations for service resilience against the backdrop of the COVID-19 pandemic. In particular, we examine service resilience in Finnish home care provided for the elderly as service resilience was put to the test in the study context owing to environmental factors. In mid-March 2020, the Finnish Government initiated extensive measures at all levels of public administration after declaring emergency conditions. It soon became apparent that the ramifications of COVID-19 would be most severe for the elderly, who would require the most assistance after the introduction of national restrictions (Safety Investigation Authority 2021). It can be contended that many *axioms* – established rules, assumptions, and principles – related to home care were disturbed, almost over one night. Inexorably, public service resilience was put under an acid test.

The third and last phase of this study concentrates on the theoretical investigation of how the public sector could use scenario planning to examine service resilience. Our approach to scenario planning deviates from past literature where scenario planning was rarely used to develop services as it is essentially regarded as a tool for strategy formulation (e.g. Frith and Tapinos 2020). This study suggests that public service management could benefit from applying our scenario planning model for service development (e.g. Berry 2007). As a practical contribution, this article provides concrete suggestions on how to test service resilience.

## Theory

### *Introducing possible-worlds thinking for service management*

In philosophical studies of logic, the possible-worlds concept expounds on the many forms the world might take, thus offering an imaginary reconstruction of such worlds (e.g. Lewis 1986). Possible world thinking becomes useful for service management when there is a change in service axioms. Here, the service axioms refer to fundamental assumptions concerning the service user, service provider, as well as service context. These assumptions operate as foundations for service design, and changes in the assumptions require checking the service design. Modalities used in possible-worlds thinking can be applied to build resilience into public organizations in order to respond to changing service axioms with new service design solutions. Typically, philosophers identify four cases of modality: the possible, necessary, impossible, and contingent (Divers 2006).

Applying modalities in a service system means that necessary service axioms are always true assumptions about the service user, service production space, or service provider. In contrast, impossible service axioms are never true. Contingent axioms reveal assumptions about the service user, service provider, or service production space, which are sometimes true and other times false, depending on the context. Possible axioms present scenarios of a changed service system wherein new contingent, necessary, and impossible axioms related to the service user, service producer, or service production space, are reality (e.g. Divers 2006). In the examples of modalities, a service system is defined as 'a configuration of people, technologies, organization and shared information, able to create value to providers, users and other interested entities, through service' (Maglio and Spohrer 2008, 18).

The application of these four modalities encourages managers to think about the four aspects of services (c.f., Huber 2014). Necessary public services are mandatory in the service system (e.g. the service provider is legally mandated to provide them each time) and also possible to produce. Contingent public services may or may not be required, depending on the service situations in the service system, whereas impossible public services are those that cannot be delivered in the service system. The possible public services are new services adopted under the new circumstances. Possible services become necessary, contingent, or impossible services following the changes because a specific possible service works in some worlds but not in all. Each possible service system has a unique combination of necessary, possible, impossible, and contingent service axioms and services. When the world changes, one moves from one possible service system to another.

Currently, national risk assessments use possible-worlds thinking to describe situations that countries may find themselves in. However, those assessments neither call anticipated risks possible-worlds nor do they utilize concepts applied in the context of those possible-worlds (e.g. Chakraborty and McMillan 2015). A risk is typically defined as the probability of the occurrence of an adverse event (Turner and Pidgeon 1997). In contrast, possible-worlds thinking does not merely highlight risks embedded in changed situations; they also show positive opportunities associated with possible worlds.

The national risk assessments and the problems seen during the COVID-19 pandemic hint that the public sector could apply possible-worlds thinking more systematically in operative management and scenario planning to elicit more effective responses. From a PSO perspective, the COVID-19 pandemic goes beyond risk assessment and more closely resembles ‘deep uncertainty’ (Ansell and Boin 2019) than a calculable probability, which makes possible-worlds thinking relevant as such thinking is not contingent on the ability to calculate probabilities. Although probabilities can be incorporated, the possible-worlds thinking may only ask whether a service axiom is necessary, impossible, contingent, or possible in different situations and what are the implications of this axiom to resilient service design. This type of thinking offers tools for developing what (Ansell et al. 2021, 954) call a ‘new organizational vocabulary, mindset and set of routines’.

### ***Scenario planning and possible worlds***

In scenario planning, the term scenario refers to rich and detailed descriptions of a plausible future world, which enables decision-makers to comprehend the various opportunities/challenges of a changed world (Peterson, Cumming, and Carpenter 2003). It is not a specific forecast of the future, but a plausible explication of what might transpire. Scenarios are stories based on possible events and trends. They assist in the selection of strategies by activating the imagination and initiating learning processes that map uncertainties (Bowman 2016). Besides incorporating foresight into strategic planning, scenario planning can concentrate on turbulent environments (e.g. Grant 2003) in which strategies decrease agility. Scenario planning has advantages over traditional strategic planning tools in resilience development because it expands perspectives on the future while fostering creativity and strategic thinking (Fink et al. 2005).

One significant predicament in existing scenario planning studies is the absence of consensus on how to explore uncertainty (Tapinos 2012). A key argument that this study makes is that possible-worlds thinking can be used in scenario planning to address the underlying uncertainty in service management and production. As scenario planning (Peterson, Cumming, and Carpenter 2003) and possible-worlds thinking (Lewis 1986) address what the world could be, applying philosophical concepts that elucidate modalities can benefit scenario planning by pinpointing the areas of importance, such as variations in necessary, impossible, possible, and contingent service axioms concerning different scenarios and implications of these variations for resilience in service production. We contend that public organizations are forced to address fundamental questions related to their ability to provide

services when the service axioms become incorrect, outdated, or disconnected from reality. This study suggests that possible-worlds thinking can help anticipate changes in service axioms.

Scenario planning supported by possible-worlds thinking not only focuses on exploring various future scenarios, but also helps envisioning a desired future state. In doing so, it differs from contingency planning used in crisis management for analysing a particular event that is limited in scope (Bloom and Menefee 1994). Contingency planning assumes that anticipation of a future event maximizes the chances of a successful response when there is a crisis. As desirable as this assumption may sound, studies demonstrate a complex relationship between planning and crisis management outcomes. For example, (Eriksson and McConnell 2011, 89) argue that ‘contingency planning which is successful in the pre-crisis stage, does not guarantee a successful crisis response’ whereas ‘contingency planning failures in the pre-crisis stage, do not automatically lead to a flawed crisis response’. Put differently, not everything that counts can be anticipated, and not everything that can be anticipated counts. The possible-worlds thinking in scenario planning attempts to break free from the shackles of contingent planning based on anticipated events by asking what impossible things can occur.

### ***Resilience, scenario planning and possible-worlds thinking***

The operationalization of the resilience concept has proved elusive in an organizational context, thereby resulting in definitional lacuna (Eppel and Rhodes 2018, 956). In this regard, (Horne and Orr 1998, 31) refer to resilience as ‘a fundamental quality to respond productively to significant change that disrupts the expected pattern of an event without engaging in an extended period of regressive behaviour’, whereas Vogus and Sutcliffe (2007, 3418) define organizational resilience as ‘the maintenance of positive adjustment under challenging conditions such that the organization emerges from those conditions strengthened and more resourceful’. On the other hand, Somers (2009) believes that organizational resilience is ‘more than mere survival; it involves identifying potential risks and taking proactive steps to ensure that an organization thrives in the face of adversity’.

While the above definitions do explain different aspects of resilience, they do not describe precise instruments used for developing resilience. Scenario planning based on possible-worlds concepts can deepen the understanding of the mechanisms strengthening different types of resilience. The usefulness of scenario planning and possible-worlds thinking for resilience is predicated on their ability to provide information about the mechanisms of service resilience.

The public management literature has devoted little space to scenario planning (e.g. Berry 2007), although such planning is a management tool used to develop resilience in both public and private organizations (Hillmann et al. 2018). By creating an understanding of different possible situations, scenario planning prepares people for new and unforeseen circumstances (Fink et al. 2005). Building skills to analyse changes before any transformations occur serves the type of resilience that enhances the ability of an organization to learn, adapt, self-organize, and retain the same functions in the changing world (Linnenluecke and Griffiths 2010). Resilience against uncertainty is built by thinking about different future scenarios and how to deal with them (Hillmann et al. 2018). One can build this type of resilience by tackling cognitive biases affecting

assessments of probability, by enhancing collective sense-making in strategic thinking, and by creating an understanding of possible changes in the environment (Rohrbeck and Schwarz 2013).

### ***Resilience continues where strategic planning ends***

Both resilience and strategic planning have an impact on multiple factors in organizations. Strategic planning guides behaviour and justifies the existence of PSO (Bryson 2010). Resilience also affects behaviour because it requires the use of coping mechanisms in changed situations. If the PSO is able to cope with change by making itself relevant and valuable, it has justified its existence.

Strategic planning reflects collecting and analysing information, formulating strategic options, choosing goals, and selecting the right means to achieve goals (George and Walker 2019). Sometimes resilience manifests itself as a strategic plan that helps to adopt changes, but it can also mean that we abandon the chosen strategic plan in situations where it has become harmful and counterproductive from the perspectives of survival. Letting go from strategies and engaging with the idea of emerging order can be beneficial when dealing with ‘unknown unknowns’ (Pawson et al., 2011), ‘unruly problems’ (Ansell and Bartenberges 2016), or ‘deep uncertainty’ (Ansell and Boin 2019). To that end, a resilient PSO can momentarily operate without strategic planning if its process is too time-consuming and unable to produce effective responses dealing with the challenges stemming from the turbulent environment. In these tumultuous times, possible-worlds thinking and scenarios reveal the possible imminent decisions faced by PSOs when one of the scenarios becomes a reality.

Strategic planning ‘works best when it extrapolates the present or deals with incremental change within the existing strategic perspective’ and ‘less well in unstable, unpredictable situations or quantum change in the organizations’ (Mintzberg 1993, 36). Instead of just extrapolating the present, building resilience via scenario planning and possible-worlds thinking considers alternatives to present and organizational trajectories that cannot be formulated by using extrapolation. Thus, resilience tries to handle the unpredictable and quantum changes that strategic planning is unable to deal with efficaciously. In this type of resilience building, it is essential for one to find alternatives to known facts and behavioural patterns that can adapt to the changes in the known facts. Here, resilience presumes ‘a perturbation that is unusual’ (Ungar 2021, 10), and the need for resilience increases in unexpected and adverse situations, whereas the usefulness of strategic planning declines because it is not possible to forecast unexpected events based on altered facts.

To conclude, strategic planning aims to avoid the uncertainty stemming from unpredictability, while resilience usually focuses on coping with this type of uncertainty. Building resilience by using scenario planning and possible-worlds thinking aims to map out what we are uncertain of, what unpredictable events might occur, and how could we react to those unpredictable events.

### ***Developing offensive and defensive resilience with scenario planning***

One interesting typology classifies resilience in two ways: as defensive resilience pointing to the ability to react, recover, and bounce back to a state of normality; and offensive resilience denoting either the ability to anticipate emerging problems and

prevent them (Boin and van Eeten 2013) or the capability to develop new capabilities to cope with the unexpected (Sudmeier-Rieux 2014). We suggest there can be an alternative to the ideas of Boin and van Eeten (2013), in that defensive resilience might have an anticipatory element (e.g. the established prevention techniques used for the mitigation of avalanches). Boin and Eeten (2013) seem to address reactive and anticipatory forms of resilience when talking about the differences between defensive and offensive resilience. In contrast, we argue the main difference between defensive and offensive resilience is that defensive resilience defends an old belief, practice, value, service, or status, whereas offensive resilience either replaces something old with the new or adopts a novel belief, practice, value, service, or status while replacing nothing. It can be argued that the pandemic has called for both an offensive response and a defensive response.

In exploring defensive and offensive resilience, many studies discuss resilience factors, sources of resilience, and also provide empirical evidence of resilience in practice (Meek and Marshall 2018; Normandin and Therrien 2016; Reinmoeller and van Baardwijk 2005; Weick 1993). Many individual, organizational, and environmental factors have been identified as important for resilience (Duchek 2020). In service axioms relating to context, service user, and service provider, the individual factors driving resilience connect to attributes of the latter two. The service context axioms describe what type of organizational resilience is assumed in the service design and what environmental factors are crucial for service resilience.

The service provider is often an individual employee providing the service and necessary service axioms about the service provider include individual factors that the service designer assumes the service provider to possess. Employees' resilience depends on the amount and quality of disposable resources they possess and the contextual demands of the situation. This also implies that employees' resilience cannot be addressed as a stable characteristic but as a modifiable variable that changes over time via the accumulation or constraint of individuals' cognitive, emotional, and physical capacities (Crane 2021, 457). Thus, resilience of the service provider is a contingent service axiom according to the terminology we proposed above. However, possible-worlds thinking enables us to see what services become impossible if one assumes that the employees' resilience becomes an impossible service axiom. This type of test reveals how dependent the services are on employee resilience.

The service user is an individual who receives the services and service design also assumes something about this individual. Service user's resilience manifests in his/her ability to pursue and realize the desired goals (e.g. Sen 1985). By changing service user axioms in the scenario planning based on possible-worlds thinking, it becomes possible to understand the magnitude of change required in services if service users change and our assumptions about them change simultaneously.

While an individual's agency is important (Sen 1985), several authors have highlighted the role of micro- and macrolevel factors in culture and society in realizing such goals. For example, Walsh (2021) speaks of family resilience by which she means 'members who are or could become, invested in the positive development and well-being of vulnerable people'. The service design is based on some assumptions about the organization (e.g. the number and diversity of service providers), external environmental factors (e.g. support of family or size of the population availing of a service), the institutional context encompassing institutional arrangements (i.e. a set of rules or



agreements governing the activities of service providers) and the economic development phase of a country (e.g. organizations in resource-rich countries versus resource-poor countries).

Different scenarios make it possible to anticipate what modification the services require when certain assumptions about service context change. The context can point to political governance that sets a contextual frame in which the PSO functions (Grönroos 2019, 776). The service context can also refer to the PSOs resilience capabilities (e.g. anticipation, coping and adaptation, latent, path-dependent), resources (i.e. tangible and intangible resources), and behaviours (e.g. information sharing, interaction, improvisation) (Duchek 2020). From the perspective of service resilience, the key question is what the services assume about organizational resilience and environmental factors supporting resilience. For example, the changed service axiom may be an assumption about organizational resilience, and the change can mean that the axiom turns from necessary to impossible. It could be anticipated that services are not resilient when they assume that the impossible service axiom relating to organizational resilience is always true, but we test this idea in the empirical section.

Scenario planning utilizes the above-mentioned resilience factors to spark innovations (e.g. Worthington, Collins, and Hitt 2009), whereas development of defensive and offensive resilience can use crisis as an ‘opportunity for innovation’. Adapting Jansen, Van Den Bosch, and Volberda (2006) and Barrutia and Echebarria (2019), the defensive resilience is required for exploitative innovations based on the existing knowledge and incremental changes in the PSO’s practices, whereas the offensive resilience celebrates explorative innovations, which require acquirement of new knowledge and radical changes in organizational practices. Exploitative innovations manifest themselves as practices that assist in societal coping, while explorative innovations are required for societal shaping (see Haavik 2020). Of course, innovations are not always needed in defensive resilience, as some challenges can be tackled by deploying more resources alongside established thinking and practices.

Innovations stemming from defensive and offensive resilience can be developed with scenarios dealing with modalities. By changing only one or few service axioms at a time, scenario planning operates incrementally in service design and promotes the development of defensive resilience. To advance offensive resilience, it is also possible to change many or all service axioms in simulations of more radical changes.

### ***Searching the balance between offensive and defensive resilience by applying scenarios***

If the COVID-19 virus becomes endemic (Shamanti and Galanti 2020), the need for adaptation to a new normal will be greater. This adaptation depends on dynamic balance between defensive and offensive resilience. The dynamic balance between the defensive and offensive resilience can be approached from the service perspective by asking ‘what’ is delivered and ‘how’ it is delivered. The ‘what’ component encompasses the core offering provided by the service provider, whereas the ‘how’ component refers to supplementary services enabling the core offering (e.g. Lovelock and Yip 1996). In possible-worlds thinking, core

offerings and supplementary services are attached to necessary services and contingent services. Some core and supplementary services delivered to citizens are necessary in the sense that all service recipients need them, while some services are only delivered to some but not to all service recipients.

Defensive resilience is required for ensuring the core and supplementary services that can be categorized as necessary services. Using defensive resilience in elderly home care means that core offerings (e.g. home care) and supplementary services (e.g. client care plan) are provided regardless of the situation. In defensive resilience, getting necessary service deliveries back up running after disruptions is a priority. On the other hand, the PSO also needs offensive resilience for finding new ways of delivering the necessary core and supplementary services and offering novel necessary and contingent services. To improve the development of offensive resilience, the analysis of impossible services reveals situations in which the resilience of services breaks down and offensive resilience is needed to develop new necessary or contingent services.

To summarize, defensive resilience attempts to preserve normalcy in abnormal times by safeguarding the delivery of necessary services and relying on activities justified with past knowledge. In contrast, offensive resilience aims to adapt to the new normal by considering possible services arising from new knowledge. Overall, Figure 1 in Appendix 1 reflects the theoretical ideas we presented and proposes a set of mechanisms of service resilience that we examine empirically (these mechanisms are presented in italics within the arrows in Figure 1 in Appendix 1).

## The Research Context And Methods

Finland is the fastest-ageing society in Europe (Valkama and Oulasvirta 2021) and elderly care has been the subject of intense public debate in recent years. Finland has introduced the Act on Elderly Care Service, which aims to provide the elderly with an opportunity to live at home for as long as possible and avoid a move to an institution (Pekkarinen and Melkas 2019). While the overall aim is deemed legitimate, elderly care is a politically sensitive issue because it mirrors the core values of society. Elderly home care services are provided by a combination of public, private, and third-sector organizations operating under different institutional arrangements and partly under different jurisdictions. Elderly home-care services aim to maintain and improve the well-being of the elderly population and include various tasks performed by a home-care aid at the homes of the elderly (Municipality A 2021). Such tasks can include home-care medical treatments, rehabilitation, assistance with personal hygiene, care of clothing, housekeeping, shopping, cooking, other home delivery food services, instructed exercise, security services, and transportation to medical and other appointments (Municipality B 2018).

To study service resilience in elderly care and to answer the first sub-research question asking what attributes make the public services more resilient, we utilize an explanatory case study design (e.g. Yin 1998). The chosen instrumental case study attempts to gain a broader understanding of the relationship between possible, impossible, contingent, and necessary service axioms and resilient services in home care for the elderly (e.g. Stake 1995). George and Bennett (2005) would call our investigation a 'heuristic case study' since the aim is to propound

new causal mechanisms in service design. The cases of this multiple-case design are presented in Figure 2 in Appendix 2. The usage of multiple cases from micro, meso and macro level serves replication logic that increases external validity (e.g. Yin 1998). The cross-case analysis enables hypothesis generation (Seaman 1999). We apply data triangulation by using different data sources. As a sampling method, the study utilizes critical case sampling (e.g. Patton 1990). The examined cases were considered important or *critical* because they involve diverse set of key actors in the home care for the elderly context.

The empirical data are elucidated in Figure 3 in Appendix 3. According to the terminology of Lethbridge, Sim, and Singer (2005), this study uses direct methods (i.e. interviews), indirect methods (i.e. document data), and analysis of work artefacts (i.e. secondary data). Combining different data collection methods is an often-used approach in methodological triangulation, and it enhances construct validity (Yin 1998).

We deployed the qualitative theory-guided content analysis to investigate the empirical data. First, we focused on finding examples of possible, impossible, contingent, and necessary service axioms and services in elderly care to confirm the relevance of possible-worlds concepts. The study subjects described their assumptions about the world by expressing reasons for their functions, and we coded these reasons in the analysis as service axioms. Second, we used the coding framework in Figure 4 in Appendix 4 to identify relationships demonstrating that axioms affect service changes. The coding framework aims to promote internal validity by enabling explanation building. Establishing a chain of evidence is also known to enhance construct validity (e.g. Yin 1998). Overall, our approach is based on scientific realism as we are examining less-observable forces looming behind the public service design and underlying orders explaining service changes (Payne and Payne 2004).

The second part our research is theoretical and concentrates on examining how to conduct a stress test to examine the key attributes of the resilience of public services. We aim to deduce the scenario planning process from the results of the theory-guided content analysis. The proposed scenario planning process is illustrated in detail with flowcharts (please refer to Appendices 6 and 7) accompanied by instructions explaining the process.

## Findings

### ***Non-resilient services are based on service axiom(s) turning into impossible***

In examining what attributes make the services less resilient, we observed that non-resilient services are based on service axiom(s) turning into impossible. Demonstrating the relationship between service axioms and resilient public services necessitates validating the ideas that there are service axioms, and these axioms affect services. Therefore, we first provide some illustrations of what types of service axioms we identified and how these axioms affected the service design and resilience. These illustrative examples are not intended to be an exhaustive listing of all axioms. After describing some service axioms and their implications for service design and resilience, we reveal how services either changed or were terminated because some service axioms changed during the COVID pandemic from the form that preceded the advent of the COVID-19 pandemic.

The cases demonstrated that actors have contingent, necessary, impossible, and possible axioms about the service users, service providers (see Figure 2 in Appendix 2 to see the organizations of the service providers), as well as service production spaces. Below are listed examples of these assumptions (in the below listing, the contingent assumptions impel the PSO to customize the service design for each service user):

1. A service user is a person who cannot survive independently at home; this necessary axiom determines the fact that services, such as washing, cleaning, cooking, and medical guidance, are offered
2. Every service provider knows how to speak Finnish to an adequate level, and this necessary axiom provides the opportunity to promise that services are provided in the Finnish language
3. The primary service production space is in the home of the senior citizen, and this necessary axiom affects the meals and medical treatments offered on a daily basis (i.e. the objective is to provide meals and medical treatments that can be done in different types of homes)
4. The service provider can diagnose an ear infection using telemedicine techniques is an impossible assumption used to determine what cannot be offered in telemedicine practices
5. The home for the elderly contains the same medical equipment as a local health centre is an impossible assumption that is used to determine what medical treatments can be done at home and what needs to be done in health centres
6. The service user needs help with domestic cleaning (contingent axiom as some users need help while others do not)
7. The service provider offers cleaning services (contingent assumption as some service providers offer cleaning services while others do not)
8. Service production space has a basic level of accessibility (contingent assumption as some service production spaces have a basic level of accessibility, but not all do)

Services that ignore the listed service axioms tend to have poor resilience. For example, diagnosing ear infections as a telemedicine practice would not be a resilient service because it cannot produce reliable medical checks. Moreover, this type of telemedicine practice would be replaced with doctor appointments in health centres if the aim is to have accurate diagnoses. From the perspective of defensive resilience, home care cannot have such resiliency if it never reached a state where it served citizens. Resilience assumes adequate past performance, which can be continued despite the hardships. Bouncing back to serving citizens is not possible if the capability to serve people was non-existent in the first place. Offensive resilience operates at a service level by adding new services based on novel information, which indicates in our example that old dysfunctional telemedicine service would be replaced with new enhanced (telemedicine) service capable of diagnosing ear infections.

To understand the attributes that make the services more resilient, we look at stabilized service axioms and changed axioms and their implications. The COVID-19 pandemic did not alter all the axioms related to service users and providers (see Table 3 in Appendix 5 and Table 4 in Appendix 6). The unchanged necessary and contingent axioms in Appendices 5 and 6 mean that public managers can maintain service design solutions capable of addressing seniors' service demands. Thus, innovations and offensive resilience are not required as the old services are aligned with

unaltered assumptions. For example, the assessment of service needs, such as home-care services offered during the pandemic was still based on the assumption that a service user is a person who cannot survive independently at home because senior citizens need assistance with daily activities (Table 3 in Appendix 5). For this reason, assessing the needs of senior citizens for medical treatment, food services, and assistance with washing and dressing was one service before and during the pandemic, which the municipal actor conducted with the senior or her family. Similarly, some service users needed food services, for example, in the pre-COVID and post-COVID era, while others did not (Table 4 in Appendix 6), which emphasized the need to conduct service planning (Table 3 in Appendix 5). In addition, not all service providers could offer these food services, which was the case before and during the pandemic. Lastly, another unchanged axiom during the investigated era related to health: some service users and providers had respiratory tract infections while others did not (Table 4 in Appendix 6).

In cleaning services, the COVID-19 era did not alter the assumption pertaining to the production space or service producers. Before and during COVID-19, cleaning services were provided by public, private or third sector actors in the senior citizen's home. Therefore, the service remained relevant in the pandemic as service providers did not change and services were already designed to suit that production space. Overall, the unchanged axioms in Appendices 4 and 5 do not introduce pressures for the public manager to change the elderly home-care services. Past practices aligned with unchanged assumptions continue to work, all else being equal, and service resilience is not tested.

The changed *necessary service axioms* test the service resilience. Table 1 demonstrates how one *necessary service axiom* used before the pandemic turned into an *impossible service axiom* when the coronavirus entered Finland. This change in one service axiom proved to be quite a major one because people became health threats to each other as the virus spread through human contact (see Table 1). The service design had to be redesigned because safety is an important value in elderly care and the new service axiom assumed that each person in the service system is a potential spreader of a generally hazardous communicable disease (i.e. COVID-19). According to the binding instructions of the Finnish Institute for Health and Welfare 2020, the redesigned elderly home-care service required the following services from the municipal providers, hospital district workers, private sector actors, and third-sector producers:

1. Although the service user has no symptoms related to COVID-19 disease, the service provider uses a respiratory mask during home visits when social distancing cannot be applied.
2. When treating patients with respiratory inflammation at close range, the service provider wears protective gloves, a respiratory mask, safety goggles, and a protective apron.

The above two health security procedures in the list became new *necessary services* in the COVID-19 era, whereas the subsequent service turned into an *impossible service*: the service provider does not use a respiratory mask during home visits when working in close proximity to the seniors who have no respiratory tract infections. The Regional State Offices monitored the implementation of the new necessary services. It is notable that the necessary services relating to health security services are a prime example of

**Table 1.** Examples of changed necessary axioms in the pandemic.

<i>Example of home-care service user or provider axiom before COVID-19</i>	<i>Example path of evidence showing the change in home-care service user or service provider axiom</i>
<p>Every service user and provider is not a potential carrier and spreader of generally hazardous communicable disease.*</p>	<p><b>Pre-COVID and mid-COVID:</b></p> <ol style="list-style-type: none"> <li>1. The pandemic and health protection issues conveyed in the media have changed thinking about security, and other people have turned into a threat in a new way never experienced before in the history of Finland' (Suomen pelastusalan keskusjärjestö 2021)</li> <li>2. The threat of Corona means that one has to wear protective gear all the time in home care. Before Corona, protective gear was used only on special occasions' (Local newspaper O 2021)</li> <li>3. 'Super-spreaders explain the vast amount of corona infections ... Anyone can be a super-spreader without knowing it ... The highest risk of getting corona infection is in situations where one is in close contact with other persons and the exposure time is long' (Private media company A 2021)</li> <li>4. The severe infection caused by the novel coronavirus will from now on be included in the list of generally hazardous communicable diseases. The amendment to the Government Decree on Communicable Diseases will enter into force on 14 February ... On 30 January 2020 the World Health Organization (WHO) declared the new coronavirus detected in the Chinese city of Wuhan a Public Health Emergency of International Concern. All countries must therefore actively monitor infections caused by the novel coronavirus, identify cases of the disease early, isolate the infected persons and trace the people who have been exposed to the infection to prevent further infections.' (Press release of Ministry of Social Affairs and Health 2020)</li> </ol>
<p>Every service user and provider is a potential carrier and spreader of a generally hazardous communicable disease known as the coronavirus.**</p>	<ol style="list-style-type: none"> <li>5. The incubation period for COVID-19, which is the time between exposure to the virus and symptom onset, is on average 5–6 days but can be as long as 14 days. (WHO 2020)</li> <li>6. 'Whether or not they have symptoms, infected people can be contagious, and the virus can spread from them to other people. Laboratory data suggest that infected people appear to be most infectious just before they develop symptoms (namely 2 days before they develop symptoms) and early in their illness. People who develop severe diseases can be infectious for longer ...' (WHO 2021 and similar statement given later by Finnish Institute for Health and Welfare 2021)</li> </ol>

\*In the thinking of focal actors presented in Figure 2 in Appendix 2, this axiom turned into an impossible axiom in the COVID-19 era

\*\*In the thinking of focal actors presented in Figure 2 in Appendix 2, this was an impossible assumption in the pre-COVID era

innovations and offensive resilience (i.e. bouncing forward by using novel information about COVID-19). Providing home care without masks in the pandemic would have been defensive resilience in health security services as these services would have been provided in a similar manner than before the spread of the virus. Core service production without masks would be more difficult due to infections but still doable, assuming that possible infections or casualties do not pose a too big challenge for legitimacy.

In practice, the defensive resilience concentrated on providing home care because this needed to be done despite the pandemic. The offensive resilience establishing new health security services supports the defensive resilience aiming at protecting the home care. The offensive resilience required that *previously contingent service* (i.e. the use of protective mask) was turned into *necessary service* in the pandemic. In the elderly care, the pre-COVID service design became impossible to retain because of the sense of emergency and the timing of the crisis created pressure to adopt more protective equipment. The crisis took place at a time when there were a lot of vulnerable old people in home care in Finland

Table 2 demonstrates how the pandemic turned some *contingent axioms* into *impossible axioms*. At the same time, the lockdown era provided evidence of new contingent axioms describing the features of service users and providers (see Table 2). During the lockdown, none of the senior citizens could participate in group exercise sessions that required being in the same physical space with other people. Therefore, the *contingent service user axiom* in Table 2, column 1 and row 2 turned into an *impossible axiom*. As a part of the home help services, the service providers' (see Figure 2 in Appendix 2) ability to arrange group exercise sessions in person turned into an *impossible service axiom* during the lockdown phase. Contingent axioms which turned into impossible ones tested defensive resilience. That was because the provision of required home care was affected by the regulations designed to contain the spread of COVID. For example, physical rehabilitation services and exercise lessons had been part of group exercise sessions in a shared physical space (these services are referred to in Table 2, column 1 and row 3). However, exercise sessions were not dependent on the ability to meet in person as it was a contingent assumption. Consequently, the internet was used to provide these exercise services. These new service production spaces in a virtual world manifested the offensive resilience of some service providers as not all could provide these (see Table 2, columns 2 or 3 and row 3). The diversity of service providers contributed to the offensive resilience utilizing new technology as we witnessed various remote exercise applications offered by different actors (see Figure 2 in Appendix 2 to see the diversity). The offensive resilience, built using information technology, supported defensive resilience that protected the provision of home care.

The fact that, unlike others, some seniors as service users were able to participate in remote exercise groups required new *contingent services* (i.e. service provided to some but not to all). Some care providers in municipalities, associations, hospital districts, and companies organized remote sessions for those who could use the internet while other providers sent exercise instructions via mail or text messages. Changes in exercise sessions were organizational level changes that swept through managerial and individual levels as they implemented the changes. The interactive remote exercise session was a *possible service* before COVID-19, but it became *contingent service* in the COVID era as it was used in some municipalities but not in all. Changes in *service user and provider axioms* introduced by the pandemic meant that remote exercise session as a *possible service* became relevant for resilience in the lockdown phase.



**Table 2.** Examples of changed contingent axioms in the pandemic.

Example of home-care service user or provider axiom before the COVID-19	Example of home care service user or provider axiom during the COVID-19	Example path of evidence showing a change in service user or service provider axiom
Service user is physically capable of participating in exercise groups in person (a contingent axiom as some users were able to participate while others were not due to poor physical condition or some other reason)*	Service user physically capable of participating in exercise groups in person and not carrying generally hazardous disease can participate in remote exercise groups while being in quarantine-like conditions (a contingent axiom as some service users who were capable of participating in exercise groups in person could participate in remote exercise groups while others could not, and some users were in quarantine-like condition while other were not)**	<p><b>Pre-COVID:</b></p> <ol style="list-style-type: none"> <li>1. 'Elderly people living at home are in increasingly poor shape: in Kuopio, for example, some home-care clients are completely immobile ...' (State-owned media company 2014)</li> <li>2. 'The number of participants in the chair gymnastics, which is important to many, decreased at the turn of the year ... Gym shifts also became chargeable ... for many seniors, the price is too expensive.' (State-owned media company 2019)</li> </ol> <p><b>Mid-COVID:</b></p> <ol style="list-style-type: none"> <li>1. 'According to the instructions [of Ministry of Social Affairs and Health issues given in March 2020], all individuals over the age 70 would have to refrain from being in contact with other people in quarantine-like conditions (Ministry of Social Affairs and Health, 2020)'</li> <li>2. '[based on research conducted by Finnish Institute for Health and Welfare] Customer of home care are usually in better shape ... they have felt that they do not get enough exercise ... The home isolation of senior citizens is alarming from the perspective of maintaining the capability to perform activities ... Remote connections have not replaced hobbies and recreational activities that occurred in face-to-face meetings. Customers of home-care services are mostly in poor condition and memory disorders are common among the customers, which limits the use of remote connections.' (Private media company A 2021)</li> </ol>

(Continued)





**Table 2.** (Continued).

<p>Service provider can provide personalized training in person for senior groups (a contingent assumption as some service providers are capable of providing such services while others are not)*</p>	<p>Service providers can offer personal training via interactive remote exercise sessions (a contingent assumption as some service providers are capable of providing such services while others are not)</p>	<p><b>Pre-COVID:</b> For example, 'Laitilan terveyskoti (a private company) offers physical rehabilitation, beauty and wellness services as well as past-time activities'. In comparison, Lempi-ravintola (a private company) offers only 'meal services'.</p>
<p><b>Mid-COVID:</b></p>		
<ol style="list-style-type: none"> <li>1. 'In Rovaniemi***, an association put gymnastic instructions to shopping bags delivered to the homes of the senior citizens who were over 70 years old ... In Kuopio***, the department of sports services send a text message to encourage the seniors to gymnastics ...' (Association D 2020)</li> <li>2. 'Interactive remote exercise sessions have been tried in some municipalities' (Association D 2021) One such municipality is Pietarsaari.</li> </ol>		

\*In the thinking of focal actors in Figure 2 in Appendix 2, this axiom turned into an impossible axiom in the COVID-19 lockdown era

\*\*In the thinking of focal actors in Figure 2 in Appendix 2, this axiom was an impossible axiom in the pre-COVID era

\*\*\*A municipality in Finland

The above empirical analysis lends credence to the argument that simulating different *service user axioms*, *service provider axioms*, *service production space axioms*, and building *possible services* that work with the different axioms is key to creating resilient public organizations. Accordingly, we argue that service axioms and *possible services* provide a useful framework for scenario planning used for enhancing capabilities relating to service resilience. The above empirical analysis also showed that understanding how contingent services can turn into necessary services is crucial for building offensive resilience. The importance of offensive resilience is linked to defensive resilience because defensive resilience seemed to require the support of offensive resilience in examined cases.

Another important thing in understanding service resilience is the dynamic changes that can turn *contingent* and *necessary service axioms* into *impossible service axioms*. The biggest shock for service design in COVID-19 was that *one impossible service axiom* in the pre-COVID era turned into a *necessary service axiom* in the mid-COVID period. Seemingly, these dynamic changes seem to put service resilience to the test.

### ***Service resilience in possible worlds – describing the stress test***

The proposed stress test is a scenario planning process that is divided into four phases (see Figure 5 in Appendix 7 and Figures 6, 7, 8 and 9 in Appendix 8). The first phase starts with the identification of assumptions related to service users, service providers, and service production space. The second step in the first phase focuses on creating a set of services that form the public service offered to the service user. Here, there are two types of services: the contingent and the necessary. Some of these services might require assumptions X and Y about the service user, service producer, and service space to be true, while other services may rely on other assumptions about the user, provider, and service space to be true.

In the third step of phase one, the planner introduces a well-known shock, which modifies the conditions of the world. Alternatively, the planner can arbitrarily or randomly change either the assumptions about the service user, service provider, and/or the service production space to impossible, contingent, or necessary assumptions.

In scenario planning, phase two is devoted to identifying new assumptions about service users, providers, and production spaces. The first question addressed in this phase two addresses whether new conditions arising from the introduced shock create new assumptions. If a specific new assumption about a service user, service provider, or service space arises, it is categorized either as an impossible, contingent, or necessary assumption. If the changed situation introduces no new assumptions, then it can be checked whether new conditions change any of the pre-shock assumptions. The changed assumption is categorized as new necessary, contingent, or impossible assumption if a pre-shock assumption changes due to the introduction of a shock. Phase two ends when all the pre-shock assumptions are tested and categorized.

Phase three will only be undertaken if new or changed assumptions were found in previous phases. The third phase commences with testing to understand how new or changed assumptions affect services defined before the shock. The assumptions of each service are checked sequentially to ensure how assumptions changed. Services whose necessary assumptions became impossible assumptions should be marked as impossible services. On the other hand, necessary services whose necessary

assumption(s) turned into contingent are renamed contingent services. Similarly, contingent services wherein all contingent assumptions changed into necessary assumptions are re-categorized as necessary or impossible services depending on the case. Services whose assumptions did not change remain the same.

In the fourth phase, the new service toolkit for post-era is constructed. If the new assumptions about the service user, service provider, or service space do not change any services, the same pre-shock service toolkit may be used in the post-shock era. Meanwhile, if a service turned into impossible, it is removed from the service toolkit in the post-shock era. Changed services that did not turn into impossible services are added to post-shock services. Some new services can be designed to replace the impossible services or respond to new demands arising from new assumptions.

## Discussion

As past studies have focused on individual, organizational and environmental factors important for resilience (Duchek 2020; Meek and Marshall 2018; Normandin and Therrien 2016), our study provides new knowledge by describing important factors of service resilience. The content analysis conducted in this study concluded that non-resilient services were based on service axiom(s) turning into impossible assumptions about the world in disruptive states. Non-resilient services were abandoned due to these impossible assumptions, and public services were redesigned as a reaction. Thus, our results pointed out an important relationship between service axioms, service resilience, and service redesign. Our results imply that it becomes important to the resilient PSO to be aware of what assumptions are included in its services.

According to our data, defensive resilience and offensive resilience operated side by side. From a service resilience perspective, both restorative and adaptive skills seem necessary. Offensive resilience supported defensive resilience, and it was needed to replace the outdated services that transformed into impossible ones because the truth value of the axioms underlying these services turned from true to false when the pre-COVID era switched to the mid-COVID era. Defensive resilience as the ability to restore the past situation or to bounce back to a state of normality (e.g. Lengnick-Hall, Beck, and Lengnick-Hall 2011; Linnenluecke, Griffiths, and Winn 2012) was applied with resilient services based on service axioms which remained valid throughout the transition period from pre-pandemic normalcy to a crisis in the pandemic. These findings challenge the theoretical models of resilience that do not identify the intertwined nature of these two forms of resilience (e.g. Barrutia and Echebarria 2019; Jansen, Van Den Bosch, and Volberda 2006). Moreover, by suggesting that offensive service resilience depends on the ability to adopt innovative services compatible with the changed or new service axioms, we are proposing extensions to current theoretical models presenting in limited fashion the factors driving offensive resilience (e.g. Boin and van Eeten 2013; Somers 2009).

As a conceptual contribution to scenario planning literature (e.g. Hillmann et al. 2018) as well as resilience literature (e.g. Ortiz-de-mandojana and Bansal 2016), we proposed impossible, possible, necessary, and contingent service axioms

and services. By simulating these service axioms and modalities in scenario planning, it is possible to test the breaking points of services by examining what type of changes in the world modify service axioms and create new ones, and how many services become impossible (i.e. non-resilient) in different scenarios due to the inaccurate assumptions embedded into the current services. This type of stress testing of public actors' assumptions and expectations has been requested in prior literature (Cairney, Heikkila, and Wood 2019).

Our stress test also provides opportunities to 'bounce forward' by developing innovative services responding to extraordinary times requiring alterations to fundamental rules, assumptions, and principles, and which lead to changed service axioms. Offering tools for offensive resilience promulgates both theoretical and practical developments as the extant resilience literature lacks what we refer to as new normal theories of resilience where change is natural in situations where attempts to restore the past world will not build better resilience (e.g. Hynes et al. 2020).

## Conclusions

The current study has shown how scenario planning and possible-worlds thinking can be used as a testing tool to build resilience before a crisis. Obviously, thinking the (im)possible is easier said than done. Many barriers can be identified (Battaglio et al. 2019; Grabher 1993). First, bounded rationality is typical of humans. Accordingly, people are often locked into seeing what they want to see and ignoring information that does not make sense to them: That *functional lock-in*, can make it difficult to change the course of action in new situations, and owing to a *cognitive lock-in*, people tend to interpret information cues from the surrounding environment through a world view developed and cemented through social reinforcement processes in the past. Similarly, owing to *political lock-in*, people prefer to accept the future that is in consonance with vested interests and disregard the version of the future that threatens it (Grabher 1993). Second, extensive literature shows that individuals' cognitive biases can morph into organizations' thinking flaws affecting public organizations' management decisions, behaviours, and performance evaluations (Andersen and Hjortskov 2016; Bellé, Cantarelli, and Belardinelli 2018). For many organizations, the unexpected 'is less unknowable than it is unthinkable, less inscrutable than unpalatable' (Hamel and Välikangas 2003, 55).

This research provides several avenues for further research. First, we conducted an instrumental case study based on an unrepresentative sample to obtain an insight into service resilience and its testing. To validate the model in Figure 1 in Appendix 1, practical scenario planning applications must be developed: a more comprehensive analysis of practices of possible-worlds thinking is required as the test may not work in a similar fashion with all types of services and public values. Additionally, the population using the specific service may affect service design changes because services with a larger scope might be more likely to be modified. Lack of resources can also be important if one compares developed countries and developing countries: Developing countries may not be able to respond to present scenarios, let alone make service design changes or conduct scenario planning. The model in Figure 1 in Appendix 1 worked in our study, although resources and service demand varied in

each examined case. However, we did also identify the existence of mediating variables, such as emergency and timing of crisis. These mediating variables could be studied more.

Second, it would be useful to explore whether possible-worlds thinking can be connected to the emerging public service logic approach (e.g. Grönroos 2019; Osborne 2018). Of particular interest would be the applicability of possible-worlds thinking for analysing the consequences of crises to the user value axioms and how changes in value axioms reflect in services. Third, the scenario planning process proposed can be combined with complexity thinking acknowledging the intertwined nature of services (e.g. Byrne and Callaghan 2014; Cilliers 1998). Concepts from complexity research, such as value conflicts and confusing information landscapes, can be used to create shocks in scenarios testing service resilience. Fourth, a distinction could still be made between possible ideal futures (e.g. futures relating to strategic goal achievement) and non-ideal futures (e.g. Mintzberg 1993) when developing the scenario planning model in Figure 1 in Appendix 1. Moreover, one could separate more likely possible futures from less likely ones (e.g. Turner and Pidgeon 1997). The proposed avenues for future research are invitations to public management scholars interested in service resilience testing. The work is important because the well-being of nations is predicated on them having resilient services.

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