A Designerly Approach to Exploring Disruptions in Service: *Insights from Employing a Systems Perspective*

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Services, and failures associated with it, are nestled in systemic contexts. It is important to understand how disruptions might ripple out in services, as well as how actors influence disruptions and possible failures through their participation, as this can impact value creation. This paper reports the results of an interview study supported by a card mapping tool. The main contribution of this work is its generative methodological approach when exploring service disruptions from a systems lens. Using this method, we classify eight forms of disruption: request, query, hiccup, delay, mistake, flaw, breakdown and the unexpected, and associated systemic activation patterns. We suggest a disruption-activation ripple model and identify five tensions in responding to disruptions: competing priorities, dealing with difficult others, mismatching expectations, shouldering responsibility, and reluctant assistance. We posit that this generative tool can be used to understand the nature and extent of disruptions in situated service contexts. This understanding can provide direction on how to handle and/or absorb variety emerging in different interactions by clarifying frequency and predictability of certain kinds of disruptions in investigated contexts. We also argue that viewing service disruptions through a systems lens requires the designing of social service infrastructures that support employee relationships.

Keywords – Design Methods, Disruptions, Ripple Model, Service Design, Service Failure, Systems.

Relevance to Design Practice – Service designers can draw on their repertoire to develop generative tools and methods that enhance embodied thought and action to study intangible phenomena such as service disruptions through a systems lens. Further, understanding the systemic disruption-activation patterns can aid the co-design of flexible responses to such disruptions.

Introduction

Failure in any human endeavor is inevitable and service is no exception (Pina e Cunha et al., 2009). When a customer experiences service failure, it is often frontline employees (FLEs), supported by organizational recovery procedures, who swoop in to save the day. Service encompasses multiple interaction processes among several actors (Holmlid & Björndal, 2016; Sampson, 2012) who contribute with their resources, competences, and capacities (Holmlid, 2012; Sangiorgi & Clark, 2004) to systemic value creation. Correspondingly, service research has shifted its focus from dyadic interactions to multi-actor perspectives, with designing and developing service systems being listed high on research priorities (Ostrom et al., 2015). However, extant service recovery literature has developed by distinctly focusing either on the FLEs or the organizational perspective (Van Vaerenbergh & Orsingher, 2016). Real-word service systems require a unified approach that cuts across system levels and addresses the accompanying complexities and interdependencies. It is important to understand how actors empower or disenfranchise themselves, and others, by acting with and through their (in)formal connections in systemic contexts. A reductionist view of service design that ignores systemic interdependencies and institutional arrangements governing such multi-actor systems can impact the realization of long-term change (Vink et al., 2020).

Against this backdrop, we argue that a systemic perspective can offer an alternative understanding by foregrounding feedback coordination, requisite variety, continuous adaptation, ordering, and boundary framing. In this context, there is a lot of potential in putting generative, material, and embodied design tools and methods to use when investigating human interactions and activity and rendering the intangible tangible. The purpose of this paper is to put forth a designerly approach to understand employees' responses to service disruptions through a systemic lens. Accordingly, the guiding research question is "What can we learn about how actors respond to service disruptions when applying a systems perspective?". For this paper, service failure is understood as a concept more oriented to the customer outcomes. Service disruption as a concept denotes a deviation or interruption in service that may or may not result in service failure. This exploratory qualitative study undertaken in a healthcare context utilizes an interview study complemented by a generative design activity (Sanders, 2000), to explore how service

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employees respond and tap into their connections when faced with disruptive situations that could potentially lead to service failure. The main contribution of this work lies in its methodological approach, i.e., use of generative cards as tools that support embodied thought and action (Clatworthy, 2011) when exploring service disruptions from a systemic perspective. This method helped identify and classify a list of disruptions as perceived by the service providers. Analysis through a systems lens revealed patterns of how certain forms of disruption led to actors activating their connections with others. We define this systemic activation as the degree of connections that the focal actor (in)directly initiates contact with to respond to a disruption. Studying these systemic activation patterns also allowed the exploration of tensions that occur when resolution or action requires a coordinated response. Based on this, we develop a disruption-activation ripple model that allows conceptual exploration of the focal service-providing actor's possibilities to coordinate a response through systemic activation during disruptions. This is a valuable contribution to service practice as the use of tangible tools such as card mapping can shed light on employees' mental models as well as perceived service infrastructures. Furthermore, we argue that viewing service disruptions through a systems lens requires the designing of social service infrastructures that support employee connections and relationships.

The remainder of this article is organized as follows. In the next section, the theoretical framing is introduced. Next, a description of the methodology used in this qualitative study is provided. After, the findings of the empirical study are contextualized, and the implications are discussed. The paper concludes by identifying limitations and highlighting avenues for future research.

Theoretical Background

This paper draws on literature related to systems and service recovery from service management as well as service design. The following sub-sections present a brief overview of the theoretical aspects underpinning this research.

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Stefan Holmlid, is a Professor in Design at Linköping University. Stefan's research resides in the meeting between design and service, as practices as well as research traditions. His contributions are founded in situated and distributed cognition, mediated action in complex adaptive systems, and contemporary developments in design theory. With the main empirical context being public sector design and policy, core issues include design and cocreation of values, design and enactments, and design and agency.

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Thinking and Working in Systems

Systems can be described as emergent or designed networks of interconnected functions that achieve an intended outcome (Jones, 2014). System performance depends on the interaction between its parts since the system is considered a whole that would lose essential properties if divided into independent parts (Ackoff, 1999). Recent design research also identifies service organizations as complex social systems "consisting of ongoing, iterated patterns of relationship between purposeful human beings" (van der Bijl-Brouwer, 2017, p. 187).

Service researchers have also attempted to define service systems. Service science scholars define service systems as "a configuration of people, technologies, and other resources that interact with other service systems to create mutual value" (Maglio et al., 2009, p. 395). Service management scholars define a service ecosystem as a "relatively self-contained, self-adjusting system of resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange" (Vargo & Akaka, 2012, p. 207). When applying a systems perspective to service disruption, certain principles become salient. These include but are not limited to idealization, boundary framing, requisite variety, feedback coordination, ordering, emergence, adaptation, and self-organzing. Table 1 presents an overview of shared principles between systems theory and design theory as synthesized by Jones (2014).

When viewing services through this systems lens, it becomes clear that service organizations cannot simply rely on individual employee actions. The focus needs to shift to their relationships and interactions with other employees. Therefore, management should pay attention to creating the right pre-conditions for optimal interactions between employees. Relationality or intersubjective relatedness between people becomes important to understand the fluidity of relations (FitzPatrick, Varey, Grönroos, & Davey, 2015). In discussing high quality connections (HQCs) in relation to organizational innovativeness, Akgün and colleagues (2016) highlighted the structural features of HQCs—emotional carrying capacity, tensility, and connectivity. Emotional carrying capacity denotes the extent to which connections comprise the range of emotions from positive to negative. Tensility refers to the extent to which the connection can survive under different circumstances and is also an indicator of the resilience of connections (Akgün & Keskin, 2014). Connectivity denotes the level of openness to novel ideas, possibilities for action, and creativity among people. Interactions in systemic contexts require consideration of actors' relationships and the characteristics of these relationships, which may be perceived differently by actors. Thus, factoring in the systemic perspective can shed light on the asymmetries in relationships when designing for service. Such asymmetries in relationships can potentially affect feedback coordination, responses to variety, and hamper adaptation, particularly in case of service failures.

Failing, Recovering, Improvising

Research on service failure and recovery spans more than three decades (e.g., Bell and Zemke (1987)). Much of the management literature on service recovery has focused either on

Table 1. Systems design principles adapted from Jones (2014)**.**

Principle	Description
Idealization	Idealization is the principle of identifying an ideal state or set of conditions that compels action toward a desirable outcome or signifies the value of a future system or practice.
Appreciating complexity	The principle of appreciating complexity acknowledges the dynamic complexity of multi-causal wicked problems and the cognitive factors involved in understanding the relationships that indicate problem complexity.
Purpose finding	The shared systemic design principle of purpose finding is not that a purpose is identified, but that purposes can be determined by agreement and therefore designed or redesigned.
Boundary frame	The aim of problem framing is to define the most effective fit between a concept and its target environment. And this "fit" requires an iterative process of selecting boundaries and reflectively considering the associated meanings entailed by the boundary frame.
Requisite variety	Requisite variety implies the capacity of a system to respond to changes in its environment, and implies that only variety can absorb variety. In system or service design, requisite variety is observed when the coordination of a system is managed by processes that can adapt to outputs and effects of the system in operation.
Feedback coordination	Negative (compensatory) and positive (reinforcing) feedback loops are distinguished in physical and control theory as functions that can be designed to guide the output performance of a system to conform to desired effects. Feedback processes are conceived as continuous or iterative loops, gathering information from a state, applying control signals to obtain a desired performance, and measuring the difference and coordinating this control to achieve a preferred state.
System ordering	Ordering defines the relationships of objects, system components, or abstract concepts to each other in a systematic way.
Generative emergence	Emergence is a quality of complex adaptive systems whereby a higher, coherent level of organization arises from the interaction of system components. Emergence properties in complex social systems are considered co-occurring with intentional, purposeful behaviours.
Continuous adaptation	Stakeholders in different design and monitoring roles consciously identify variations over time, signal the onset of emergent situations, and co-design adaptive responses. Continuous adaptation maintains the preferred system purpose and objectives throughout the lifecycle of adaptation, conformance to environmental demands, and related system changes.
Self-organizing	Social systems are self-organizing human interaction systems that develop (evolve) through learning and flexible responses to changing circumstances. When disturbed, a system seeks to stabilize an interrupted state by locating an equilibrium that accommodates the environment and the set of available states.

the micro-level employee and customer perspectives or on the actions to be taken at the organizational level (Van Vaerenbergh & Orsingher, 2016). Lacking in the current discussion is a more systems-informed approach that considers boundary framing, requisite variety, feedback coordination, ordering, emergence, adaptation, and self-organzing, which are not directly evident at the service interaction or organizational level. At the individual employee level, recovery performance has been linked to frontline employees (FLEs) perceptions of their own abilities and actions to resolve service failures (Babakus et al., 2003). Improvisation when dealing with failures is essential due to the variability that can occur in situations (Pina e Cunha et al., 2009). This ability to improvise is connected to requisite variety. In an extensive review on service recovery literature, Van Vaerenbergh and Orsingher (2016) identified antecedents to FLEs recovery performance as either job demands, job resources, personal resources, job burnout, or job engagement. However, none of these variables account for other employees' resources or actions as an antecedent to recovery performance. The focus on FLEs is logical as they are prominent actors in service encounters (Bitner, Booms, & Tetreault, 1990). Further, actors' capacity to respond to a situation is also affected by the perceived possibilities for action (Rodrigues et al., 2018). Bitner and colleagues (1990) analyzed 700 customer accounts of critical incidents and their impact on satisfaction. They categorized the critical incidents under broad groups related to core service

failures, customer needs and requests, and unprompted and unsolicited employee action. It also led to the identification of three specific types of employee behaviors - recovery, adaptability, and spontaneity as sources of (dis)satisfaction in service encounters (Gremler, 2004). Organizational approaches to recovery dwell on the structural dimensions such as accessibility, formality, decentralization, comprehensiveness, human intensity, system intensity, and influence (Smith et al., 2009). An employees' ability to perform can be facilitated or hindered by the organizations' structural policies and commitment of resources. This view too obscures the role other employees and/or external actors might play in tackling disruptive situations and do not sufficiently account for multi-actor systemic perspectives. Another perspective that moves away from a unidimensional perspective of improvisation is organizational improvisation (Cunha et al., 1999). The authors defined organizational improvisation as "the conception of action as it unfolds by an organization and/or its members, drawing on available material, cognitive, affective, and social resources" (p. 302). In developing this definition, the authors assumed that a) action is organizational if taken by one or more team members, an organization and/or a project and b) the pre-existence of a set of resources, which could be action plans, knowledge, or social structures, upon which variations can be built. This approach to organizational action and improvisation is more compatible with a systems view of disruption.

Understanding Variety through Design

When it comes to more everyday variety, an important perspective comes from design after design (Bjögvinsson et al., 2012). In service, this is a prominent perspective from the start, as the actual enacted service is done by competent actors in joint action with the resources provided (see e.g., Holmlid, 2012). Actors jointly enacting the service and integrating their resources are a source of variety and adaptability, echoing the principle of design after design. Some of the tools used in service design and development, such as the service blueprint or the customer journey map, can be problematic in terms of representing variety. In some usages, they focus on generalized knowledge that harbors variability without explicitly showing what and how. In other instances, they are displays of specific service instances without generalization. And in yet other usages, they highlight specific insights gained when investigating current service. In many ways, these uses treat the service processes as ideal, where variation in current services are viewed as deviations from an actual service (Halvorsrud et al., 2016), and where variation in possible future services are not made explicit at all (Følstad & Kvale, 2018). The systemic principle of idealization is exemplified through such tools. Service infrastructures, including tools like scripts, protocols, and blueprints, are in some ways used to influence and control service personnel behavior in service interactions, which can undermine their intrinsic motivation, expertise, and creativity (van der Bijl-Brouwer, 2017). Viewed from a systemic lens, service infrastructures have the potential to provide guidance related to the principles of systemic ordering, feedback coordination, boundary framing, continuous adaptation, and requisite variety. However, current uses of design methods and tools often do not sufficiently address these aspects in relation to failures.

Service design researchers have previously introduced mistakes, delays, and failures during prototyping to explore customer reactions and expectations for resolution (Blomkvist & Bode, 2012). This makes it possible to envision, through the knowledge and skills of the partners in prototyping, how variety can be made part of designing. It also supports reflection on how to train for different triggers. Such generative techniques allow different forms of expression and help access tacit and latent knowledge (Stappers & Sanders, 2003). Other researchers have also pointed out how design research might benefit from embodied cognition perspectives (Christensen, 2017; Lindgaard, & Wesselius, 2017) that can affect our ability to plan actions and coordinate activities in situated contexts. Prior research has also shown that use of generative cards as tools support embodied thought and action (Clatworthy, 2011). Systemic visualizations tend to emphasize nodes over relations between the nodes and are constrained by two-dimensional representations (Sevaldson, 2013). While nodes enjoy rich representation formats, relations are represented often statically in a schematic manner. Even though a relation is assumed to have some dynamics, the dynamics emerging from variations outside the normal does not follow automatically, neither does the inter-dynamic nature of relationships. Alternatives do exist to overcome these constraints. Within Systems Oriented Design, researchers have developed a

library of systemic relationships, with color codes specified for various kinds of relationships (Sevaldson, n.d.). Inspired by this color-coded library of relations (Sevaldson, n.d.), Aguirre-Ulloa and Paulsen (2017) further developed a three-dimensional multi-sensory systemic design tool to explore alternative means of representing and shaping complex, systemic relations. The authors claimed that the emphasis on the relations between nodes and use of tangible material such as string, cord, etc. allowed for more rich discussion amongst workshop participants around powered and reciprocal relations and led to the emergence of a novel relational language. Although still a static representation, such a tool can appeal to the tactile and visual senses to surface issues that impact value creation and capture the structure of high-quality connections. This presents an opportunity for both practitioners and researchers to develop generative, material, embodied service design tools, and methods that consider disruptions and variations as well as their effect on relations in service systems.

To summarize, we present the dichotomy in service recovery literature revolving around individual or organizational perspectives, which does not fully account for the interconnected nature of these perspectives. We describe how a systems-informed approach to understanding service failures could make certain interconnected aspects, such as feedback coordination, responses to variation, and adaptation, more salient, thereby shifting the focus from individuals and organizations to relationships between actors. We also highlight how design tools and methods often prioritize idealization over exploration of variety and the role that generative, material, and embodied methods and tools might play in accessing tacit knowledge. With this background, we see potential in using design tools and methods to explore disruptions from a systemic lens that cuts across the individual-organization dichotomy. Actively working with failures during "design time" can allow organizations to access tacit and latent knowledge to proactively address their responses to failures and formulate preventive or adaptive measures.

Methodology

First-person accounts of unusual situations were collected from service-related actors across the Healthcare Organization through in-depth, semi-structured interviews. This study considered unusual situations to be (unintended) deviations from the service provider's expected path of events. The data collection approach drew on the Critical Incident Technique (CIT) (Flanagan, 1954) to derive guiding interview questions supplemented by a generative card mapping activity (Sanders, 2000; Sanders & Stappers, 2012). Critical Incident Technique (CIT) has been extensively used in service research to examine diverse service marketing and management issues (Gremler, 2004) including service failure and recovery. Chell (1998, p. 56) described the CIT method as follows: "The critical incident technique is a qualitative interview procedure which facilitates the investigation of significant occurrences (events, incidents, processes, or issues) identified by the respondent, the way they are managed, and the outcomes in terms of perceived effects." The CIT method allows data collection from the informant's perspective with storytelling

in their own words (Edvardsson, 2015). However, Edvardsson and Strandvik (2000) have questioned the 'criticality' of all incidents, suggesting that this may differ across time and between customers. Therefore, the term 'critical' was avoided so as not to elicit only severe disruptions at the outset. It was substituted by asking informants to describe an unusual situation, understood as deviations from the expected flow of work processes. By gathering data from employees, we were able to capture variety in disruptions and in employee responses to these disruptions from a service provider perspective. The interview protocol consisted of the following:

1. **Interviewee background**: description of the informant's role and day-to-day activities in the organization,

2. **Unusual situation**: description of an unusual or disruptive situation that they had faced during work (gathering narratives),

3. **Network perspective**: mapping of the actors involved in unusual situations and the role they played (creation of visualization/artefact using cards) while retelling their story,

4. **Organizational perspective**: the organizational view on the handling of the situation, and

5. **Closing**: wrapping up and giving the interviewee the opportunity to ask questions.

Different forms of data collection provide access to varying types of knowledge and experience. While established qualitative techniques such as interviews, observations, and focus groups help gather explicit knowledge about contexts, while generative techniques can uncover tacit knowledge (Visser, Stappers, van der Lugt, & Sanders, 2005). Generative techniques (Stappers & Sanders, 2003) direct informants to incrementally construct and express their knowledge and experiences leading to a better understanding of the same. The descriptions captured informants' stories, while the actor card mapping activity (see Figure 1) made the informants' relationships and connections (Clatworthy, 2011), and their tacit knowledge tangible, collectively resulting in rich and useful qualitative data. The interview protocol was first created in English and then translated to the native language. This translated version was then checked by a researcher who is a native speaker to ensure the meaning of the questions had been retained. In addition, ethnographic observations of service interactions were conducted at eight healthcare centers and the call center. All informants signed an informed consent document prior to starting the interview, which assured anonymity, confidentiality, and the right to withdraw from the study.

Data Collection and Sample

This research was conducted in collaboration with a private Healthcare Organization in a European country. At the time, the organization had close to 150 employees and 600 contracted doctors, paramedics, and healthcare professionals spread over 16 polyclinics, a centralized call center, and the head office. The sample included 10 persons, six females and four males, from different departments across the Healthcare Organization (see Table 2). The first author established contact with the informants directly or with the aid of the manager P9. Through initial discussions and collective charting of the user (i.e., patient) journey, we identified distinct roles and functions within the organization that could potentially impact service provision. In addition, at least one employee from every department at the Head Office was identified in early interviews, and was interviewed to gain multiple perspectives. Purposive sampling (Tongco, 2007) was used in order to have as much variation as possible, and employees across departments at different organizational levels with varying work tenures within the Healthcare Organization were included. 7 informants were frontline employees (FLEs), and two head office managers were in frequent contact with patients. The interviews were conducted in person at the Head Office, the call center, or on location at the clinical center. The interviews lasted between 35-70 minutes with an average length of 50 minutes. Data was collected over a period of three months until saturation was reached. All interviews were digitally audio-recorded, and the process of creating any form of visualizations was video-recorded.

Figure 1. Informant using the actor cards to explain a situation. Blank cards were provided for capturing unknown actors. The pictures illustrate the changing constellation of cards during an interview.

Table 2. Overview of informants.

Informant ID	Role	Time employed	Location
P1	Mid-level Manager	1 yr 8 months	Healthcare Centre (FLE (frontline employee))
P2	Mid-level Manager	3 yrs 6 months	Call centre (FLE)
P3	Employee	2 yrs	Healthcare Centre (FLE)
P4	Employee	1.5 months	Healthcare Centre (FLE)
P5	Employee	4 months	Healthcare Centre (FLE)
P6	Employee	10 months	Head Office
P7	Manager	3 yrs 6 months	Head Office
P8	Manager	2 yrs 6 months	Head Office
P9	Manager	1 yr 6 months	Head Office
P10	Employee	1 month	Healthcare Centre (FLE)

Data Analysis

Six interviews were conducted in the native language of the interviewees with a translator, while the rest were conducted in English by the first author. Each of the interviews was transcribed verbatim and interviews conducted in the native language were transcribed and translated to English, resulting in 144 pages of single-spaced text. Narrative analysis (Creswell & Poth, 2018) was used to understand individual actions and responses. Nvivo 12 for Mac software was used to organize the data. This is also in line with the application recommendations for Critical Incident Technique (CIT) in utilizing narrative approaches for interpreting informants' experiences to gain insight (Gremler, 2004). Each of the transcripts was read and reread to gain an understanding of the informant's narratives. The researcher wrote reflection memos for each of the transcripts. Next, the incidents were identified by coding text segments that provided specific description of the issue or problem and the corresponding action (response) that impacted service interaction or provision in anyway. The situations were inductively sorted into categories based on their similarities without sacrificing comprehension. Next, the researcher identified recurrent themes that were relevant to the research question of understanding actors' responses when viewed from a systems lens. The researcher moved iteratively between the individual transcripts to the whole continuously revising interpretation. Five underlying tensions related to coordinated and/or collaborative responses were identified. These were critically evaluated by the co-authors resulting in slight adaptation of the wording.

Results

The following section presents the results of the empirical analysis of informant data.

Disruptions and Activation Patterns

Grounded in the emergent codes, supporting visual data, and comparisons with extant literature, the authors inferred a typology of disruptions that reflects informants' conceptualisations of deviations from the service they are expected to provide. As indicated in Table 3, eight forms of service disruptions were identified based on the recurring themes and subsequent classification of informants' narratives, and included request, query, hiccup, delay, mistake, flaw, breakdown, and the unexpected. The identified forms were differentiated based on the nature and magnitude of the disruption. The descriptions were modelled after the dictionary meanings as found in the Online Merriam Webster Dictionary. Table 3 lists the systemic activation for a particular instance of disruption. Systemic activation refers to the degree of connections that the focal actor (in)directly initiates contact with to respond to a disruption. This occurs in waves where each wave represents a degree of activation of one or more system actors over time. Figure 2 shows a visual representation of the disruption ripple model, wherein, depending on the disruption, it could be resolved at the service interaction level requiring no activation or the activation of the focal actors' connection(s). As visualised in Figure 2, the data suggests that the type of disruptions necessitate a minimum level of systemic activation. For instance, a delay is most likely to require at least one degree of activation.

Often front-line informants described problems or unusual situations encountered during the service encounter (Bitner et al., 1990) which were settled between the focal actors in the situation. The nucleus in the disruption ripple model (Figure 2) denotes the action space for the focal actors. Here, the service providing side actor draws on existing resources to address the situation. Queries, requests, and service hiccups are typically solved at the nuclear level. In such cases, the individual often resorted to primarily relational responses. As the nature and magnitude of the disruptions increased, procedural actions requiring more than one person for resolution were undertaken. Technical flaws and breakdowns most often utilized a mix of parallel relational, procedural, and technical responses from multiple actors.

P4 described their predicament in trying to attend to two issues at the same time, when a new gynecologist asked for their assistance while they were attending to a patient. In this situation, P4, the gynecologist, Patient 1, and Patient 2 were in

Table 3. Identified forms of disruption.

| Disruption	Description	Practical example	Illustrative quote	Activation pattern (for the specified example)
Request	To ask for something pertaining to the specific service (interaction).	Modifying the type of visit that matches insurance categories.	"Then, in the end, explaining to me, that we needed to get in contact with the insurance and talk to them, we were able to find a solution, modify the type of visit." (P5)	1st degree
Query	To ask questions when authoritative or quick information is desired.	Giving information about an alternative course of action.	"He had a bruised, probably broken rib. And he said, oh, how can I leave like this? And I was like, OK, if you feel pain, you should go to a hospital. [...] Also, because the first available visit would be Monday or Tuesday." (P10)	None
Hiccup	A usually minor and short-lived interruption, disruption, or irregularity.	When a user does not know how to use a computer.	"And this patient told me, that he didn't know how to use a computer and therefore couldn't send an email. So, I did not know what to do and so I gave him a sheet of paper and a pen and he wrote the request by hand." (P8)	None
Delay	To postpone or cause something to occur more slowly than normal.	When a doctor is late for their appointment.	"And the doctor was 15 minutes late on his appointment, so it's on his schedule. So, I called the doctor to ask him how... I mean if he was at a good point or if he was fine... he was coming out to call the patient." (P10)	1st degree
Mistake	A wrong or forgotten action proceeding from faulty judgement, inadequate knowledge, or inattention.	An employee forgetting to note down a change in schedule.	"Or a problem with the communication between the physiotherapist that notifies us, that the next Tuesday he won't be there. Or someone forgot to write it down or he's convinced, that he told you, but he didn't." (P3)	1st degree
Flaw	A defect primarily stemming from physical or digital infrastructure.	A problem with linked software tools not functioning properly.	"For example, the systems of the insurances quite often don't sync correctly on our system, SAP." (P1)	1st degree
Breakdown	The non-performance of assigned or expected action in the service, particularly due to stoppage of technical functions.	Laser not functioning due to unstable room temperature.	"When we use the laser, it produces a lot of warm air. And if the temperature goes above 23-24 degrees inside the room the laser stops to work." (P6)	2nd degree
Unexpected	Something that is unforeseen, that the person is unprepared for and is completely caught off guard.	Reception employee encountering an emotionally distressed patient.	"The patient had to do a biopsy, because they found something suspicious during the mammography, for me it was an unusual situation, because I didn't expect something like that, it was the first time. And I ended up with this patient in front of me, who started to cry while we were booking the appointment for the biopsy, it was a little destabilizing." (P5)	None
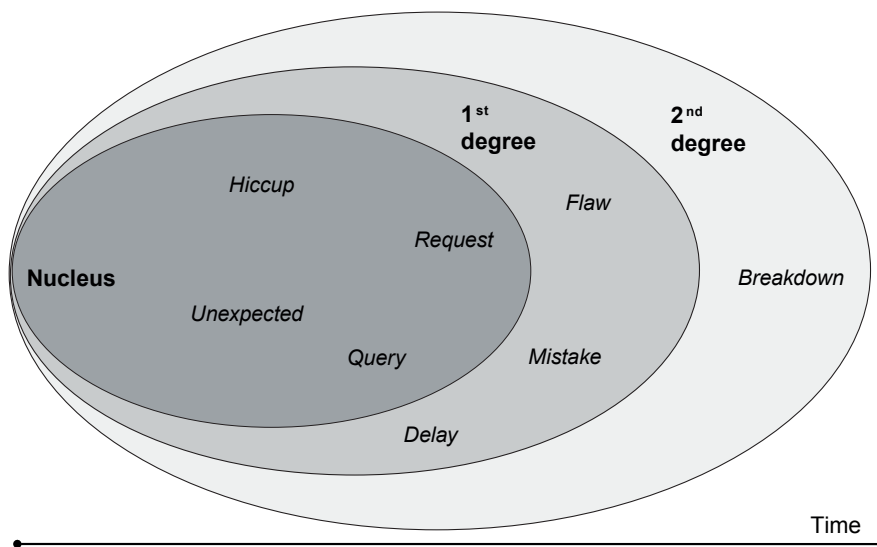
Figure 2. Activation patterns corresponding to disruptions identified in the study superimposed on the disruption ripple model.

the nucleus of the situation. From P4's perspective, they had to first settle their direct interaction with Patient 1 who was at the desk. This situation can be classified as a hiccup. Next, P4 acted on the gynecologist's request for a spiral contraceptive. This situation though reflected a mistake on the part of the nurse. P4 explained that they later informed the nurse who had missed proper preparation for the ambulatory patient. This represents the first wave of systemic activation after the occurrence to inform an actor whose timely intervention could have prevented the situation. However, not all disruptions are resolved in the nucleus and may require the focal actor to activate first degree connections to seek help or advice.

In their telling of the story, P4 was also acutely aware of how this small disruption could impact the experience of both patients, highlighting the tensions in the situation (see Figure 3):

> So, this patient felt like I was rushing through his service. And in my opinion, this [other] patient felt like the doctor was being late, ... was like her visit was being delayed or lengthened in time and if she had another plan for right after the visit because we have certain slot of times. So, I don't know. This visit would have taken 10 minutes instead he was taking 15. So here (pointing at Patient 2) her visit was delayed and here (pointing at Patient 1) his experience was rushed so maybe he felt kind of not… not wanted, but yeah not properly served maybe… I took action and then I informed Hey (supervisor), this, this and this happened. And she went, ok, good. You did the right things. (P4)

Here P4 also made note of informing the Head of the center, pointing at the second wave of activation. This contact did not demand any intervention but rather served to apprise their supervisor of the situation. Depending on the context and situation, multiple degrees of activation may occur over time to formulate a fitting response to the disruptions. Each wave comprises of one or several actors within the service system who intervene, inform, or need to be updated of the situation contingent on how they contribute to the settlement of the situation.

Identifying Tensions in Systemic Relationships

After systematically analyzing the disruptive situations, the authors encountered contradictions that were synthesized into five underlying tensions when responding to disruptions: competing priorities, dealing with difficult others, mismatching expectations, shouldering responsibility, and reluctant assistance. These tensions are underscored by the fundamental need to better serve the patients that clashes with other issues.

Competing Priorities

One of the most prominent tensions that surfaced was that of competing priorities, which reflects the conflict that actors face in prioritizing whom to serve, the need to maintain relationships, and staying on top of service situations. Several FLEs pointed out the difficulty in trying to manage simultaneous interactions with patients, doctors, and other colleagues vying for their attention. Those at the managerial level also reflected on the challenges with trying to resolve patient issues while managing organizational growth-driven pressures. Some argued this also affected their capability to provide timely intervention or proper service.

> Sometimes the solutions, especially the more industrious ones, are taking a little too long in the sense that solving the problem before would save us from other problems following. (P1)

> There are many doctors now and they're really different, it's difficult to keep up a relationship with all of them, also there are many patients and even the clinical offer is constantly growing. (P8)

Dealing with Difficult Others

The second tension that arose was dealing with difficult others, which included managing interactions with non-cooperative colleagues or those that did not show consideration for their efforts. Participants reflected on how this could hamper their ability or create delays in resolving a disruption.
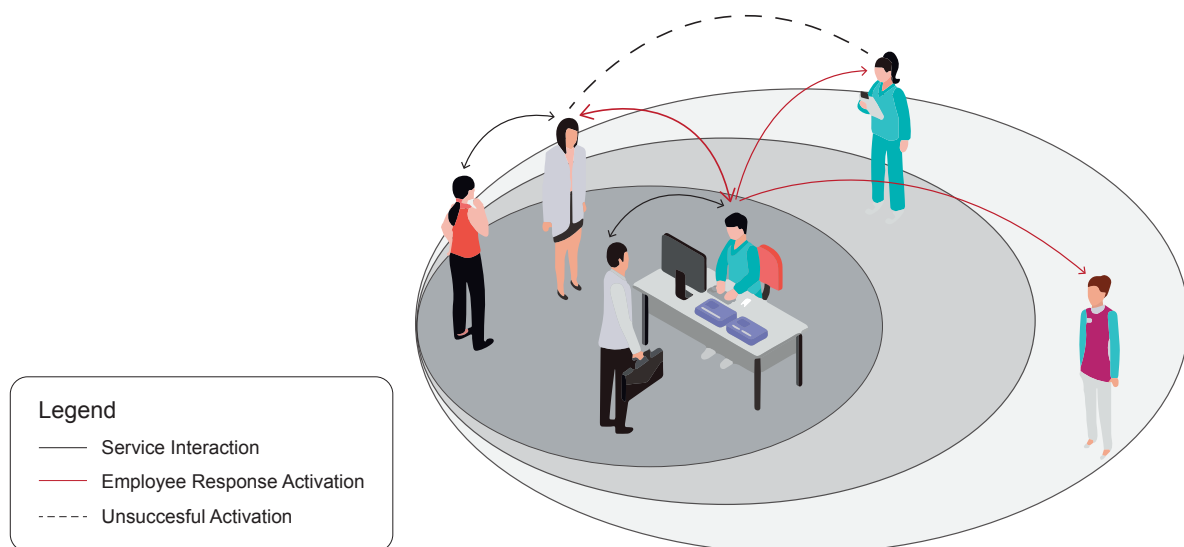

Figure 3. Visualization of the ripple effect in P4's narrative.

Legend
—— Service Interaction
—— Employee Response Activation
----- Unsuccesful Activation

But there are also the ones who are less collaborative, that create some problems, maybe because they don't want to be delayed with their schedule and they refuse to see the patient. (P1)

And he came and said the printer is not working, the computer is not working. If it continues like this in September, I will leave you guys. (P10)

Mismatching Expectations

Another frequently mentioned tension was mismatching expectations, which pertains to the discrepancy in how individual actors perceive their colleagues' roles and responsibilities and their subsequent readiness to respond. For example, P6 mentioned how the FLEs did not want to use a newly developed manual for tackling maintenance issues. They expressed that they faced some resistance since people thought they were trying to pass on their own responsibility, whereas P6's intention was only to speed up resolution.

Because you're asking me - I'm the health coach to do your job. But the idea is to of course be faster in a way to resolve the problem, band aid the problem. (P6)

Other participants expressed frustration at the value of their work not being understood even though the steps taken improved the customer experience.

But they still do not perceive the value of the things that is done because they don't pass their own time close to the patients. They don't understand... they work for the patient, but they don't understand because they... it's not requested of them so it's not their job. (P9)

Shouldering Responsibility

The fourth tension was shouldering responsibility, which relates to actors' tendency to assume responsibility for other's shortcomings in order to better serve or satisfy the customer. Some expressed frustration at having to deal with issues that did not directly originate at their workplace, while others simply resigned themselves to the notion that it needed to be done to keep the customer happy.

[B]ut we, here in (location), we felt like we had to tackle something that wasn't our responsibility, and we had a patient that wasn't properly served. (P4)

Even if actually it's the insurance, but we put ourselves as responsible, we try to make the patient as happy as possible. (P1)

Reluctant Assistance

The fifth and final tension of reluctant assistance points to an actors' disinclination to help but feeling forced to do it. This is influenced by reciprocal negative behavior.

I tried to help him, but it was not like I really needed to do it. I didn't feel like ok I really want to call the doctor and ask. It was just they were there standing, and they were asking. So, I kind of felt forced to do it. (P10)

Discussion

As mentioned in the introduction, prior research has often focused on the role FLEs play when faced with disruptive situations. This research investigates service provider response to disruptive situations from a systems perspective. In-depth, semi-structured interviews augmented with a generative design technique, helped gather rich narratives of disruptive situations that actors face and the veiled tensions amongst actors when responding to these situations. The generative card mapping made tangible the changing relationship dynamics and the ripple effect of disruptions. Several informants commented on the novelty and ease of the method, its affordance to explore the connections beyond the situation and gain a fuller picture of a situation as it unfolded (Čaić et al., 2019). Some narratives gained sharpness as informants included actors they had forgotten to mention in the first telling of their story. The tool served as an effective method in gathering vivid narratives. The use of generative actor cards also responds to calls for service design to utilize tangible artefacts when designing for intangible service systems (Clatworthy, 2011) and a shift towards "situated, embodied material practices" Kimbell (2011, p. 300). We posit that the tool can be used to understand the nature and extent of variation in situated service contexts. By clarifying the frequency and predictability of certain kinds of disruptions in investigated contexts, it can provide direction on required variety in formulating responses to situational variations. This calls for a combination of designed structures on which to base action and local autonomy to respond to disruptions and absorb variety at the frontlines.

Using a systems perspective, shifts the focus on interactions between employees rather than individual actions when disruptions occur and assumes a coordinated response. A better understanding of interpersonal relationships is required to support employees' creativity, drive and motivation. We argue that relationships are central materials of service design when designing to absorb variety. Rather than focusing on the designing of touchpoints (Zomerdijk & Voss, 2010) or service interactions, our findings support the exploration of relationships as design materials. For example, when dealing with difficult others, having to shoulder responsibility, or providing reluctant assistance, informants indicate that they respond with the aim of primarily serving the patient. Therefore, employees may be persuaded to maintain tenuous relations for improved value outcomes. However, this requires a better understanding of the current tensility of relationships. Conflicts can impact the tensility and connectivity (Akgün et al., 2016) of systemic relationships and affect their perceived possibilities for action (Rodrigues et al., 2018) and improvisation (Pina e Cunha et al., 2009). This highlights the situated nature of improvisation and adaptation in systemic service contexts. Thus, while organizations might empower employees to spontaneously exercise discretion, they need to consider how these discretionary actions work in tandem with those of other systemic actors. For this purpose, relating roles and functions within networks and hierarchies can be viewed as a designing activity of management (Jones, 2014). The systems principle of ordering can be employed to create compositional unity.

During service interactions, individuals draw on material, cognitive, affective, and social resources to improvise. These correspond to external, tangible infrastructures, mental models, emotional states, and social structures including formal relationships and informal interactions, respectively (Cunha et al. 1999). Our findings related to the disruption-activation ripple model corroborate this. Mapping disruptions through the ripple model makes actors' mental models tangible. These externalized mental models provide a subjective overview of relationships and connections that can impact the coordination of responses and corresponding feedback loops. Positive and negative feedback loops are considered designable functions to guide performance and apply control signals to achieve desired states. The ripple model of understanding disruptive situations and systemic activation would allow not only feedback coordination but also system and organizational management coordination. Our findings also show how systemic activation occurs in waves. This might be understood as iterative boundary setting and reframing by the focal actor. Depending on their own systemic position and the magnitude and nature of a disruption, the focal actor may initiate more contact within the system to coordinate the most fitting response. However, tensions arising within these relationships may affect the quality of the response. Organizations therefore need to reorient their strategies to designing appropriate tangible and social infrastructures.

Service design research can also benefit from the identified forms of disruption. Prior research has reported on the insertion of mistakes, delays, and failures to explore customer reactions and expectations for resolution (Blomkvist & Bode, 2012). This typology provides a more diverse set of disruptions to investigate during design time to gather knowledge on which disruptions might occur frequently as well as distinguish those that stem from systemic infrastructural issues. Experimenting with disruptions would deliberately enhance variety and help build a more informed and balanced response repertoire. Incorporating a systemic perspective of disruptions also cuts across the false dichotomy of individual versus organizational responses and performance. The knowledge gained could help service designers contextualize design decisions relating to feedback coordination that spans across several dimensions and levels of the service system. Moreover, actively working with disruptions could be a way of identifying 'failure demand' - demand caused by a failure to do something or do something right for the customer (Seddon & Brand, 2008).

Although this study offers a designerly approach to understanding responses to service disruptions and tensions surrounding effective resolution from a systems perspective, it is not without limitations. First, the informant responses may be flawed by recall bias (Michel 2001) and salience bias, although the generative card activity mitigated this to some extent. Second, although the data enabled explorations of the actors' narratives, the sample is small and limited to insights from the service provider perspective. However, the systematic production of this instrumental case contributes to service design theory by providing falsifiable results (Flyvbjerg, 2006). Future research should include users to gain a finer-grained understanding of how the typology of

disruptions impacts the user and their experience of the service. Third, this research was conducted in the healthcare context wherein relationships may be more emphasized than other contexts. More research is required to better understand if and how relational characteristics vary in other settings and cultural contexts.

Conclusion

This study started out with the research question "What can we learn about how actors respond to service disruptions when applying a systems perspective?". We used a designerly approach with a generative card mapping activity to understand the effect of and response to service disruptions through a systems lens. Through this approach we were able to identify forms of disruptions, systemic activation patterns and subsequent tensions arising among actors. Design, with its tangible tools and methods, poses immense potential when investigating human interactions and activity. Material tools such as the cards used in this study can support embodied thought and action leading to better understanding of emerging situations. There is a need for understanding the heuristics of responding to disruptions both during the design process and in service interactions. Evolving activation patterns in response to disruptions in situated contexts can be further studied and developed to inform heuristics. Although FLEs are important while responding to disruptions in service encounters, relationships between service system actors can significantly impact the possibilities for action as well as the quality of their individual or collective response. Therefore, responding effectively to disruptions requires the designing of social service infrastructures that support employee relationships. We hope that this work also initiates discussion and further research around addressing service disruptions and failure. Material and embodied approaches to exploring disruptions can contribute to a greater understanding of adaptive behaviour, creating better conditions for improvisation and anticipating unintended consequences.

Acknowledgments

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