FROM “PUBLISH OR PERISH” TO SOCIETAL IMPACT: FRAMING AND SERENDIPITY IN THE EMERGENCE OF A PLATFORM FOR RESPONSIBLE INNOVATION

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ABSTRACT

Why would an academic research project turn into a platform for responsible innovation despite incentives to focus on publishing research papers? To address this puzzle, we draw on the case of *Patient Innovation*, a non-profit medical platform, focusing on innovations by patients and caretakers to find affordable solutions for rare and chronic diseases by creating a ‘knowledge commons’. Initially set up as a ‘research platform’ aimed at generating scientific publications, it turned into a ‘help-society platform’ to create a wider social impact, despite not initially targeting such a goal. Using a framing lens, we explore the role of moral emotions and serendipitous inspiration in the creation of this medical platform. We examine how the reframing towards socially responsible innovation occurred despite strong institutional pressure to focus on publishing scientific research. In doing so, we develop a model illustrating how interactional framing in situations lead actors to shift towards responsible innovation. We explain how actors frame and reframe situations in which they interact and transcend their immediate self-interests in order to serve collective interests.

Keywords: Responsible innovation, frames, framing, grand challenges, serendipity, moral emotions, inspiration,

*Paper accepted at
Annual Conference of the Academy of Management in Vancouver, Canada, August, 2020*

*Never doubt that a small group of thoughtful, committed citizens can change the world.
Indeed, it's the only thing that ever has.*
Margaret Mead

Chance favours the prepared mind only.
Louis Pasteur

INTRODUCTION

Why would a research-driven project in academia that is geared towards scientific publications and research productivity shift towards becoming a non-profit platform for sharing and disseminating patient- and caregiver-led innovative and affordable solutions for rare diseases? And why would it do so despite not initially targeting such a goal and in the face of strong institutional and professional pressures to focus on academic research? This is the core puzzle driving this research.

Healthcare is a grand societal challenge (e.g., Ferraro, Etzion, and Gehman, 2015; George, Howard-Grenville, Joshi, and Tihanyi, 2016) and is one of the United Nation's (UN) key Sustainable Development Goals (SDGs). Although, on average, people are living healthier lives today, many still suffer from preventable diseases or die prematurely. One culprit is the so-called *demand-driven* focus of the pharma industry—that is, costly investments are made in drug development and equipment that are sold at premium prices, while commercially unattractive rare and ‘poor man’s’ diseases are neglected (UN, 2018). This amounts to a ‘market failure’ (von Hippel, 2017, Kucukkeles, Ben-Menahem, and von Krogh, 2019), whereby big pharma focuses on high-return innovations related to ‘rich men’s’ medical problems, including cosmetic ones (e.g., hair regrowth), rather than on affordable cures for life-threatening diseases (e.g., malaria) that continue to plague society (Austin and Dawkins, 2007; Inoue and Drori, 2006).

Market dynamics do not necessarily yield socially responsible innovations, and businesses need to contribute more to the global agenda of sustainable development (e.g., Bode et al., 2019; Doh et al., 2019). Responsible innovation includes three key dimensions: (1) innovation avoiding harm, (2) innovation to ‘do good’, and (3) responsible governance (e.g., Scherer and Palazzo, 2011; Voegtlin and Scherer, 2017). While many traditional profit-driven organisations fail to meet the criteria for conducting responsible

innovation, some engage in responsible business practices (Girschik, 2018), and social enterprises have emerged in an ‘age of responsabilization’ (Shamir, 2008). But how do players emerge unexpectedly in this space? How does an organisation that has not been set up for nor incentivised to conduct socially responsible innovation adopt a social purpose, even if this defies its self-interest? How does such an ‘innovation of responsibility’ (Voegtlin and Scherer, 2017, p. 233) occur?

To address these questions, we drew on the framing literature (e.g., Goffman, 1974), which explains how social reality is not only constructed but also re-signified or reframed (Snow et al., 2014). A framing lens provides insights into ‘major shifts in organizational or societal behavior’, particularly into the ‘processes that initiated the change and propelled its amplification’ (Purdy, Ansari, and Gray, 2017, p. 8). Studies have explained frame shifts in different contexts, such as global climate change (Ansari et al., 2013), humanitarian crisis (Reinecke and Ansari, 2015), and environmental change (Litrico and David, 2018). While these studies explain purposeful field-level shifts, fewer studies examine emergent frame shifts at the organisational level and how interactions and situational experiences may foment such changes (Cornelissen and Werner, 2014; Furnari, 2019; Girschik, 2018).

To understand such changes towards socially responsible innovation, we conducted an inductive, qualitative study of *Patient Innovation*, a medical non-profit organisation based on an initiative by academics and doctors which ‘aims to create a “knowledge commons” for patients and nonprofessional caregivers to share knowledge and develop innovative solutions to medical care-related problems through an online platform’ (Oliveira, et al., 2017, p. 301). Specifically, *Patient Innovation* addresses some of the market failures in the medical industry by providing a platform for the free diffusion of ‘homemade’ solutions, including equipment and instruments, in order to lower the costs of medical care for patients and ‘freely’ distribute innovative ideas.

Using a framing perspective, we shed light on how *Patient Innovation* emerged from an academic research project for generating scientific publications and was then used to provide solutions for rare diseases neglected by mainstream pharma. We illustrate how, through a frame *drift* – i.e., an increase in

the perceived misalignment between the situation at hand and the frame in use—actors reassess the situation and craft a new frame to realign. More specifically, we show how a predominantly research-focused frame shifted to a societal-impact frame. We argue that a frame shift towards responsible innovation may *not* necessarily occur through only a planned change. Rather, it can also be emergent, precipitated by moral emotions, serendipitous developments, and unanticipated contingencies along the way (Portes, 2000).

Our findings allow us to offer three contributions to the literature on responsible innovation and frames. First, we explain how an organisation that has been set up for a different purpose unexpectedly reframes its mission during interactions to pursue responsible innovation and meet all three of its dimensions (e.g., Khavul and Bruton, 2013; Voegtlin and Scherer, 2017) despite facing strong institutional pressure and professional incentives not to do so. While such reframing is often attributed to disruptive ‘frame breaks’ in interaction (Goffman, 1974; Gray et al., 2015), whereby a frame in use becomes untenable for the situation being experienced, we reveal a more emergent process of ‘frame drift’ – a growing misalignment between the situation at hand and the frame in use—which requires a new frame to fit the changing situation. Second, we provide a theoretical model depicting how framing and reframing occur in social interactions (Goffman, 1974; Gray, Purdy, and Ansari, 2015) to produce unanticipated frame shifts towards responsible innovation. We derive two interactional mechanisms that drive unexpected frame shifts in an organisation, inducing it to embrace a morally driven purpose. Specifically, we illuminate the role of moral emotions (e.g., Haidt, 2003, Wright et al., 2017) that reorient people from self-serving actions towards concern for the collective and ‘serendipitous inspiration’ that motivates them to espouse a morally uplifting cause. Third, we shed light on the power of users and their communities to produce and disseminate innovations in areas that are neglected by business due to a lack of commercial potential. The involvement of users in the innovation process (von Hippel, 2005) to democratise innovations is well established (Chesbrough and Bogers, 2014; von Hippel and von Krogh, 2003). We extend this idea to show how a community of highly motivated contributors can be harnessed

for sharing responsible innovation to collectively address a grand challenge through digital social platform-based organisation (Bode et al., 2019; Logue and Grimes, 2019; Yoo et al., 2012) that allows for widespread reach with limited resources.

THEORETICAL BACKGROUND

‘Grand challenges’—such as poverty, protracted wars, and climate change, which are often termed *wicked problems* (Rittel and Webber, 1973)—pose formidable challenges for mankind (see George et al., 2016). Organisations can contribute to addressing such challenges through not only innovation, i.e., ‘the generation, acceptance and implementation of new ideas, processes, products or services’ (Thompson, 1965, p. 2)—but more specifically ‘responsible’ innovation (e.g., Scherer and Palazzo, 2010; Voegtlin and Scherer, 2017) to make progress towards achieving UN’s SDGs (Voegtlin and Scherer, 2017). Both scholars and policy makers have urged businesses in particular to contribute more to this endeavour (Bansal, 2005; Khavul and Bruton, 2013; Stahl and Sully de Lue, 2014; Voegtlin, Patzer, and Scherer, 2012; Scherer, Palazzo, and Seidl, 2013). However, there is a chasm between the need to engage in responsible innovation and actual organisational behaviour. The growth in social enterprises and changes in business practices represent progress towards making innovation more responsible (Voegtlin and Scherer, 2017, Owen et al., 2013). But how does an organisation that is not geared towards responsible innovation adopt a model of innovation that benefits society at large?

The framing literature that sheds light on major changes in societies, fields, and organisations (Cornelissen and Werner, 2014; Girschik, 2018; Purdy et al., 2018) can provide useful insights into how an organisation reorients its innovation activities to target social causes. To frame is to ‘select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation’ (Entman, 1993, p. 52). Framing processes operate recursively, both guiding the perception and representation of social reality and being generated during interactions to make sense of what is going on (Goffman, 1974; Gray et al., 2015).

One stream of the framing literature illustrates the use of cognitive and discursive strategies to explain frame shifts in individuals, organisations, and even fields (e.g., Bessant, Öberg, and Trifilova, 2014; Cornelissen et al., 2015; Litrico and David, 2018; Lee, Ramus, and Vaccaro, 2018). For example, in their study of the global climate crisis, Ansari et al. (2013) illustrate the use of discursive mechanisms, such as issue linkage, active learning, and collective theorisation, to trigger frame shifts that defy narrow self-interest and achieve consensus for a commons logic in climate change. Similarly, in their study of a cross-sector partnership to create a market for recycled phosphorus, Klitsie, Ansari, and Volberda (2018) illustrate the mechanisms of merging, pluralising, and importing frames to achieve collectively acceptable solutions among actors spanning the public, private, and civil society spheres.

Other studies point to the importance of leveraging emotional mechanisms to trigger frame shifts, such as invoking morally charged issues, as well as shocking images and narratives, to mobilise people (Jasper, 2011). Emotions – empathy, guilt, and righteous anger (Rao, 2008) - are purposefully invoked to create moral resonance, as deploying ‘moral shock’ can be more effective than logical arguments to spur support for a cause (Jasper, 2011; Scheff, 1997). For example, in their study of conflict minerals in Congo, Reinecke and Ansari (2016) illustrate how NGO activists roused emotional resonance for their cause to responsible business for a grand challenge by linking the minerals used to produce consumer products (mobile phones) to the sexual violence that arises during the production of these minerals. This eventually triggered a frame shift, as businesses eventually accepted responsibility for their role in armed conflict, despite initially trying to resist doing so. Thus, changes in frames may occur through the invocation of emotions (Jasper, 2011; Voronov and Vince, 2012; Voronov and Weber, 2016) that influence individual and group interactions (Hochschild, 1979; Zietsma and Toubiana, 2018) and may cause a shift towards attending to moral causes and promoting societal welfare as the morally ‘right’ or fair thing to do (Wendt, 2001). Emotions function as the ‘glue binding people together and generating cognitive commitments’ to change (Turner and Stets, 2005, p. 1), and emotional energy (Collins, 2004) can motivate people to begin shifting their efforts towards serving a bigger social cause.

In sum, both cognitive and emotional mechanisms can lead to frame shifts and induce people to pursue societally beneficial activities beyond their narrow self-interests. However, the literature has mostly focused on mechanisms as being purposeful, if not strategic, drivers of frame shifts. Although prior studies have shown how actors ‘reaffirm or challenge the frame repertoires available’ (Gray et al., 2015, p. 116) and change the frames in use in interaction (Lee, Ramus, and Vaccaro, 2018; Litrico and David, 2018), we know less about how unexpected frame shifts and ‘the dynamic enactment and shaping of meaning in ongoing interactions’ (Dewulf et al., 2009, p. 162) occur. Frame shifts may emerge in interactions (Hallett, 2003) through situational experiences (Furnari, 2019) that clash with existing frame repertoires (Cornelissen and Werner, 2014) and may appear “accidentally” or unanticipatedly (e.g., Austin, Devin, and Sullivan, 2011; De Rond and Morley, 2010; Garud et al., 2018).

Thus, while we understand the roles of cognitive and emotional mechanisms in frame shifts towards addressing moral issues, we still need to learn more about how unexpected frame shifts arise. There is, however, little theorisation about how actors unexpectedly change their frames despite incentives not to do so. Can this be attributed to pure luck and the fortuitous circumstances of being ‘in the right place at the right time’ (Tilly, 1996), or to a sense of preparedness and readiness to change that enable opportunity recognition or allow latent frames to surface? More specifically, we ask, how and why might an organisation reframe its core purpose to pursue responsible innovation for the benefit of the collective despite misaligned institutional and professional incentives and in defiance of its immediate self-interest?

RESEARCH CONTEXT

Case Selection and Research Site: *Patient Innovation*

We conducted an inductive, interpretive case study at *Patient Innovation*, a non-profit organisation whose aim is to share solutions and ideas for managing personal health issues related to rare diseases. Officially incorporated in 2014, *Patient Innovation* hosts an Internet-based sharing platform that is intended to promote ideas developed by patients and informal caregivers. *Patient Innovation* began as a research project whereby academics sought to study user innovation without the intention to create a platform, let

alone a non-profit organisation with a social mission. However, inspired by the results of their research on user innovation beginning in 2011, the academics scaled the project significantly in a short period. Within a short while of the project's commencement, patients, non-professional caregivers, and collaborators had submitted more than 850 solutions from over 60 countries (Internal Document 411). Today, *Patient Innovation* is a multilingual platform which encourages people from all over the world to post, share, discuss, and evaluate solutions, advice, and adaptations for improving the lives of people affected by rare diseases. It is supported by numerous distinguished individuals, such as Nobel laureate Sir Richard Roberts and Nobel Prize winner in chemistry Aaron Ciechanover, as well as renowned academics from the Massachusetts Institute of Technology, UC Berkeley, and NYU, who serve on the platform's Advisory Board. Medical conditions for which solutions are uploaded vary greatly, from genetic disorders, such as Angelman syndrome, to Marfan syndrome, malaria, and Alzheimer's disease. They also vary in terms of technological sophistication, from 'small' technological inventions to codes for the 3D printing of hands (see pictures in Appendix).

Over the years, *Patient Innovation* has received many awards and much recognition for its efforts to develop a sharing platform that addresses SDGs 3 and 9. Commendations include 'Non-Profit Startup of The Year' in 2016, in addition to being named one of five projects that serve as an example of 'Commitments to Collective Action' at the 'Summit on Science and Technology Enablement for the Sustainable Development Goals' and being recognised by UN Secretary-General Ban Ki-Moon. Despite the relatively young history of the organisation, the London Science Museum featured *Patient Innovation* as part of its exhibition, 'Beyond the Lab: The DIY Science Revolution', which was held in 29 European countries between 2016 and 2018 and showcased solutions such as the 3D-printed hand and external aortic root support, both innovated by patients themselves (Internal Document 330–340).

This organisation and its industry are a fertile setting for studying responsible innovation and the role of serendipity in this process. First, the medical and healthcare industry is strongly characterised by the need for adaptation and a strong impetus for profit generation. Second, *Patient Innovation* provides

the rare opportunity to access and observe the creation and development of an organisation from its very beginning. Its relatively small size and young age, in addition to the unplanned shifts it has experienced, enabled an in-depth study to be undertaken. Third, it provided a rare access in which non-profit actors deliver sustainable solutions to societal problems in an industry characterized by market and governance failures (Kucukkeles et al., 2019).

METHOD

Data Sources

We chose an inductive case-study design and relied on a broad range of data sources (see Table I), such as interviews, internal documents, and participant observations.

Semi-structured interviews. We conducted semi-structured interviews, which ranged from 45 to 180 minutes, with the founders of *Patient Innovation*, as well as 47 additional interviews with staff members, board members, caregivers, and patients, including both those who upload home inventions and active users of the platform. In total, we conducted 49 interviews, with an average length of 69 minutes, which amounted to more than 64 hours of audio data. Our questions were open in nature and pertained to the history, creation, and activities of *Patient Innovation*. Drawing on our industry knowledge derived from prior web research, we asked questions regarding the sharing platform, the establishment and management of the platform, risk and governance, challenges and opportunities, and plans pertaining to the future. All interviews were professionally transcribed verbatim. Our respondents also made available rich archival data to which they referred throughout the interviews.

Archival documents. Before entering the field, we collected publicly available data, such as website content, industry reports, press articles, medical articles about inventions, and a report on the organisation's history. We delved into relevant historical contexts, such as the market conditions and specialties associated with medical innovations and regulatory aspects, and the healthcare industry more broadly to sensitise us to the context. Furthermore, *Patient Innovation* generously allowed access to

confidential documents (e.g., regarding the development of the organisation, funding presentations, strategic activities and plans, and grant applications – see Table I).

Participant observation. Following our initial round of interviews, the first author conducted participant observations, attending meetings, talks by *Patient Innovation*, and discussions among caregivers and patients participating and sharing on the *Patient Innovation* platform. The first author was able to speak with participants in more informal settings and seek additional clarification about topics that emerged during the interviews or from internal documents.

Insert Table II about here

Data Analysis

We used an open-ended and inductive analytical approach (Corbin and Strauss, 2008), following a processual lens (Langley, 1999). First, we created a database to which we uploaded all of our gathered material from the different data sources and used the qualitative analysis software NVivo for further analysis. In particular, as the first step, we developed an event history database (Van de Ven and Poole, 2002), in which we developed a ‘visual map’, i.e., creating a timeline of important events and activities. In addition, we wrote a detailed narrative of *Patient Innovation*’s development by drawing on multiple data sources. The narrative entailed perceptions of *Patient Innovation*’s nature, strategic initiatives, motivations for change, and members’ reactions. As the second step, we relied on ‘temporal bracketing’ (Langley, 1999) to delineate different periods within the organisation’s history. Given the particular history of *Patient Innovation*, we also considered the time before its official establishment in 2014 as a non-profit organisation. We searched back to 2008, when important ground was laid for the organisation’s emergence. We considered different accounts to comply with the tenets of interpretive research (Lincoln and Guba, 1985; Scherer 2003). Following Langley (1999), we constructed a timeline of events to which we could relate our interpretations. In doing so, we relied on both archival and internal documents, to which we attached memos if further clarification was needed. This procedure helped us to prepare for the interviews and allowed us to approach the organisation with a rough understanding of its development.

We filled in the timeline iteratively while simultaneously working on the case narrative. In particular, we paid attention to the purpose and timing of different data sources in order to address potential issues regarding retrospective narratives (Wolfram-Cox and Hassard, 2007; Golden, 1992). More specifically, in order to minimize potential bias such as the presentation of a “socially desirable image” (Miller, Cardinal, and Glick: 1997: 189) and cultural background distortions (Bernard et al., 1984), we followed especially the guidelines by Huber and Power (1985) for retrospective data collection. We also employed “follow-up probes” (Huber and Power, 1985: 177) to ensure that the original interview questions were well understood, and asked for examples, and explanations of specific concepts and experiences. Initially we allowed a high level of complexity to avoid prematurely discarding aspects that might consistently reappear.

We noticed that perceptions of *Patient Innovation* as an organisation changed significantly over time and that members particularly highlighted the ‘serendipity’ dimension in both the archival data and the interviews. For example, from archival documents, we could see how in 2008 members applied for formal grants to engage in research on ‘user innovation in health industry’ (Internal Documents 234–244), while in interview and internal documents often highlighting aspects ‘of surprise’, ‘this wasn’t planned’, and ‘one thing came to the other’ when asked about previous events and the beginning of Patient Innovation. For example, we first noticed the importance of surprising ‘events’ occurring at different points in time, and how these surprises which were different in their nature triggered emotional reactions in the group. More specifically, we then paid close attention how group members described these events by expression, such as “spoke to my moral side” and “It was inspiring”. Consulting the existing literature, we noticed that few studies have considered the role of ‘moral emotions’ (Fan and Zietsma, 2017; Haidt, 2003), ‘serendipity’, and ‘surprising discovery’ (e.g., Busch, 2020; De Rond and Thietart, 2007), thus rendering it an interesting phenomenon to explore. Then we observed and investigated more systematically the different occurrences of what members described as “lucky coincidences” and “surprises”, but also how the members experienced such instances addressing the elicitation of what has

been described as “moral uplifting” and “motivational”. We also noticed how the understanding and foci of the group changed slowly over time, and narratives around the purpose of their activities as a group was questioned and changed.

As the next step, following an interpretive approach inspired by grounded theory, we followed well-established approaches to studying framing dynamics and frame shifts (e.g., Ansari et al., 2013). We started our analysis with open coding of the textual database, which included transcriptions of interviews and videos, internal archival documents, and field notes from participant observations. We used this textual database to explore and uncover common themes and engaged in a first round of in vivo coding by staying ‘true’ to the terms and phrases used by our informants (Locke, 2001). In particular, the frequent and explicit use of the terms ‘moral feelings’, ‘responsibility’, ‘luck’, and ‘chance’ facilitated the selection of passages in texts. We then categorised the in vivo codes into an initial set of categories, which served as the basis for subsequent comparative analysis (Glaser and Strauss, 1967; Locke, 2001). Next, we collapsed similar codes and created first-order categories (see Table II). This, in turn, enabled us to move from provisional to more advanced categories (Locke, 2001).

We engaged in axial coding at a later stage of our analysis to discover the relationships among the categories (Strauss and Corbin, 1998). This process was iterative in nature, as we probed back and forth between different sources and pieces of literature. Following common practices (e.g., Corbin and Strauss, 1990), we consistently compared our informants’ reports to discern differences across time and groups, and we iterated between the literature and our data to generate more theory-driven second-order categories. At this point, we also sought identify mechanisms underlying frame shifts. We draw on Weber’s (2006) notion of social mechanisms describing patterns at an analytical level above description and below universal laws (Gross, 2009; Hedstrom and Swedberg, 1998), which is similar to what Langley (1999) refers to as ‘process drivers’ (p. 904). More specially, we sought to identify mechanisms to understand how the different frame shifts occurred, such as through the interactions between different members, and how these interactions transformed the group as a collective. We then discussed, in various

iterations, alternative explanations for our findings. This process led to the final set of categories, frame shifts, and mechanisms for explaining the creation of a new frame. Finally, we organised our derived categories into a process model. We initially developed alternative models, which we ‘tested’ by returning to our data and, subsequently, synthesising the aspects that matched our observations most closely.

FINDINGS

From ‘Publish or Perish’ to Societal Impact

How are issues framed and reframed at different points in time as people who are engaged in responsible innovation interact in different situations? More specifically, we grappled with the question of how an academic project can become a non-profit organisation (without the prior intention or goal to become one) that aims to diffuse medical innovations and engage in responsible innovation for society. Our case illustrates an iterative process of how organisational actors frame and reframe the situations in which they interact to address the problems at hand and how moral emotions and serendipity plays a role in the emergence of a non-profit platform to create a ‘knowledge commons’ (von Hippel and von Krogh, 2003) for people in need. This frame shift can be divided into different temporal phases with respect to key events.

Initial Field Frame: Research and Publishing. At the start of 2011, a research group from MIT and Catholica Lisboa were awarded a relatively large research grant to study ‘user innovation in the healthcare sector’ (Internal Document 21), following up on their overall interest and previous successful publications and trajectory in the field of user innovation. The group members had already worked together, including doing research on user innovation in banking. Inspired by the positive outcome and his stint at MIT, Pedro, a young Portuguese scholar, applied for a prestigious grant to continue on this research trajectory and build his academic ‘tenure case’ through this project. With this goal in mind, the group also hired a PhD student to join the project and write his dissertation on the very topic. The goal of this project was clearly to produce research output that could lead to publications. Despite the group

members being at different stages of their academic careers and at different institutions, they were all part of the ‘publish or perish’ game (Interview 12), which refers to a popular alliterative aphorism in academia describing the pressure to publish academic work in order to succeed in an academic career (Case, 1928), or as one team member noted,

We all adhered to the publishing game. More papers published, more bonus, more recognition, more citations, less teaching, bigger research budgets, more TAs (...). Two more 4* to get to the next career step (...). Incentives are very clear in our system. (Interview 14)

However, this focus got backgrounded as the project evolved (Internal Documents 22–25).

New Frame Creation: Three frame shifts occurred during the process of the ‘research’ frame becoming the ‘social impact’ frame, which was triggered by distinct mechanisms throughout the different phases. These frame shifts allowed for the overall construction of a new frame.

Phase I (t₀): ‘Surprising revelation’. After successfully acquiring the grant, the research team conducted studies on creating and adopting (new) health solutions for patients by drawing on previous research in user-based innovation. With this goal in mind, the group conducted a survey with over 500 patients and caregivers of rare or chronic diseases to explore what drives patients to develop and share new solutions with others, as well as the frequency and intensity of such efforts. Interestingly, 40 participants in the study, or 8% of the sample, reported engaging in innovations that were evaluated as novel. Two medical professionals examined these innovations to evaluate their novelty from a medical perspective (Internal Document 12).

In the beginning, the group was simultaneously ‘surprised’ and ‘intrigued’ about the potential of the project and ‘less certain what to expect’ (Interview 14); consequently, for different members of the group, the stakes, such as their ‘tenure package’ and even their dissertations associated with the research output of the grant proposal, were high. Despite this importance of the project for his research and successful dissertation, a PhD student supervised involved in the project at the time who was vital in the early days of *Patient Innovation*, states,

Looking at the data ... I mean it was like realising that whatever we could potentially do would probably have more impact than anything else I could do as a PhD student. This was very

powerful. The thought of empowering patients. The people who are already disadvantaged. (...) But, of course, this thought needed time to grow. (Interview 35)

Frame Shift 1: Realisation of immense potential (frame drift). The narrative around the 8% seemed to play a pivotal role, as members often referred to this percentage in making comments such as ‘Thinking of this consequence that actually 8% in our study are affected was fascinating’ and ‘we must talk about millions’ was a recurrent narrative. A group member recalls ‘extrapolating the 8% to a bigger population, thinking of all the groups of different patients affected by rare diseases worldwide, [it] had something very powerful and even inspiring’ (Interview 11). This awareness laid the seeds of a *frame drift* away from the dominant frame of simply ‘conducting research’ to one that had the potential to address the global challenge of helping people with rare or chronic diseases. As stated in an internal memo written in early 2012,

If anything like this fraction of innovators holds for the overall population of hundreds of millions of people worldwide estimated to be afflicted by rare diseases, patients and their caregivers may be a tremendous potential resource to improve management and care for many who are similarly afflicted. (Internal Document 110)

Phase II (t₁): Moment of inspiration. Inspired by the initial results of their studies on ‘user innovation in healthcare’, the team became motivated to further investigate the topic. Not only did the team discover the ‘surprisingly’ high percentage of patients innovating and its positive impact on their quality of life but also that only a tiny fraction of the patients who developed these novel solutions were actually sharing or diffusing their discoveries more widely. A relatively large percentage of innovators—that is, 89%—acknowledged that they had shared their solutions with other patients, whereas 37% stated that they had shared their ideas online, such as on websites, blogs, or social networks. However, surprisingly, only 5% of those patients were actively discussing their solutions with medical doctors or documenting their innovations for future use (Internal Document 739 - follow-up study).

These results also spoke to the emotional and human sides of the research group, which amplified the potential impact of the project and, hence, created emotional energy for the team members to pursue something that had not been initially intended. For example, one internal document illustrates the

struggle faced by Pedro, one of the academics involved from the first day of the project, who, at the time, was at a crossroads in his career and under pressure to conduct and publish research in the ‘publish or perish’ world of academia (Internal Document 590). As such, a student conducting his master thesis on *Patient Innovation* in 2013 states the following in his thesis:

A new academic semester has just started, and Pedro has a very important decision to make. He has been planning the next step of his career for a long time, and the coming academic year is supposed to be a decisive one: He is bound to advance from Assistant Professor to Associate Professor. He knows that to achieve such a goal, he needs to focus his energies on his research projects. But a new, promising opportunity is now making him hesitate: the possibility of launching an entrepreneurial project. *Patient Innovation* is actually much more than just a project to Pedro; it is a great chance to impact the world in a positive way and help thousands of people. At this end of a summer evening, Pedro is questioning what his next big step should be. (Internal Document 182)

External feedback and encounters with others also enabled further consideration of the project and continued the drift away from a research frame, contributing to the increased misalignment between the ‘research frame’ and the situation in which they interacted (Internal Document 474). This was revealed in a presentation given by Pedro very early on in the project. As he noted,

After I had a presentation, there was a guy. I had no idea who he was. So, he wanted to talk to me, and he said, ‘You made a very interesting presentation, but it is also very obvious you are not a medical doctor’... ‘But I could help, and I could probably contribute with some of the medical knowledge you don’t have, and I have some contacts. I could even invite some friends to help you’. And I was like, ‘Who the hell is this guy?’ Maybe I lost interest in the conversation, but then he finally told me, ‘You are not listening to me, but think about it later. If you think I could help you, send me an email. And, by the way, this is my email. I didn’t introduce myself, but my name is Richard Roberts, and I got the Nobel Prize for Medicine, and I was thinking that I could even bring along some of the other Nobel laureates. I mean, we call ourselves Nobel friends, and we could eventually help as well’. And, you know, suddenly I start paying attention. And, you know, yes, these guys were extremely important for what happened afterwards. (Interview 10)

Frame Shift 2: Reassessment of frame. Over time, the research team repeatedly pondered the significance of these findings to explain their results ‘from a different angle’ (Interview 02). More specifically, the team increasingly realised that its findings had significant implications for the medical and healthcare sectors. The European Organization for Rare Diseases estimated that as many as 5,000 to 7,000 distinct rare diseases exist and that as much as 6% to 8% of the population of the European Union is affected by at least one (European Organization for Rare Diseases, 2005). The awareness that this discovery had ‘gigantic’ implications was informed by the team’s own previous knowledge of the

healthcare sector, studies conducted in the past, unexpected positive external feedback, and experience of working in the medical industry. Big-pharma companies in particular engage in highly profitable R&D processes with ‘big profit margins, high demand and many people affected by a disease’ (Interview 12) and ‘have no or very little incentive to look at small batches such as rare diseases’ (Interview 22). In this vein, one team member described the situation as follows: ‘This finding of patients innovating but not sharing, where those invented solutions could potentially help thousands of people cope with their condition because the ideas remain hidden due to lack of diffusion, was mind-boggling to me and the team’ (Interview 10).

Phase III (t₂): Realisation of potential impact. In the following months, the team was thinking of a possible solution for its ‘dilemma’ and how to possibly address the problem identified in the data. A high number of patients develop novel solutions which improve their lives, but only a fraction engage in the diffusion of these solutions. The team began discussing the feasibility of a possible solution to the problem at hand and how such a solution could be envisioned in more practical terms. This process is illustrated by the experience of Helena, the Chief Medical Officer, and that of another team member who was essential to the founding of *Patient Innovation*:

We had these results, and it was very much about making sense of them. I spoke often to the others [medical doctors], and our conversations always concluded that these opportunities are potentially missing. There is something to be done about it. We all agreed on this. (Interview 07)

As one of the most immediate outcomes of the process of envisioning a possible solution to the dilemma, the team decided to investigate the willingness of patients to share their solutions on an online platform. This is illustrated in an interview:

Then, we started to do an experiment in 2014, and what we realised was that there are a lot of people interested in sharing. More specifically, we created a platform to share what they did. We advertised this with many patient associations internationally—everywhere from Australia to the US. (Interview 10)

An additional ‘accelerator’ was the highly influential scholars who offered their support early on. As stated by an involved PhD student,

We had Sir Richard Roberts visiting Portugal. He had asked me about my current PhD project, and I told him a little bit about it. I told him especially about a Portuguese mother who has a son, Goncalo, who was diagnosed with Angelman's syndrome, which was detected in the late development of his motor skills. Inspired by observations made by the mother at Goncalo's birthday party, where he reacted to helium balloons by attempting to grab them, she filled their home with balloons to encourage Goncalo to get up to grab the balloons. It was fascinating because Goncalo's interest in balloons was constant, and he would get up without his mother's or anybody's aid to grab them, which now enables him to walk without any help at home. I reported this to Sir Richard Roberts; I was surprised by how he genuinely seemed to be interested ... This positive feedback from a Nobel laureate who, in the same capacity, was also a person directly affected by a family member afflicted by a similar disease and who could, hence, relate to my findings. (Interview 35)

Similarly, a different team member described it as 'an emotional power' coming from the project, drawing on an encounter with a close friend in Portugal. The friend's son suffers from a rare disease that he had not even heard of, let alone knew how to address:

It was because of my relationship with him. 'Cause I am a parent. So, of course, I help. Suddenly, we have a structure that is taking place. People wanting to help. So, we decided to do something about it. So, we started to work on the platform. We started to improve it. The platform in the beginning was not supposed to ... I mean, it was going to be an experiment. (Interview 06)

Similarly, the members become increasingly intrigued by the powerful stories of individuals they encountered throughout their continual engagement with the project. As a student assistant involved from early on in the project described:

All of a sudden, from everywhere, there were these stories, and we just kept on finding more and more. And even more surprisingly, people started coming to us without us really doing advertisement, fundraising, or any of this usual non-profit activities. (Interview 16)

A powerful story behind an unusual request once again illustrates the power of sharing solutions and the role of 'luck' in the process. Ivan, a propmaker from the US west coast and a passionate self-taught engineer, creates special effects with props and puppets and, in his free time, experiments with developing 'different things'. In his free time, Ivan recorded and posted on YouTube a video of himself wearing one of his giant mechanical prop hands. Soon thereafter, Ivan was contacted by Richard, who had seen the video. Richard, who lives in South Africa, is a master carpenter who suffered the loss of four fingers on his right hand due to a work accident. The most diffused solution available on the market—that is, a bio-mechanical prosthesis—was too expensive to be a feasible solution for Richard. However,

after watching the video posted by Ivan, Richard decided to ask him for help in designing a low-cost prosthetic hand. Hence, despite the 10,000-kilometre distance, the two soon started collaborating through Skype and email, and what seemed at the outset to be a crazy, impossible idea developed into ‘Robohand’—a 3D-printed, thermoplastic set of mechanical graphing fingers that open and close based on the motion of the wrist. To further develop Robohand, Ivan shared his solution on the internet to permit anyone to customise the design to his or her needs. Robohand costs around \$45 dollars for material, plus three hours of assembly after printing. To their knowledge, since Ivan posted his YouTube video, more than 3,000 robotic hands have been printed and assembled in over 45 countries worldwide.

This encounter was one of many stories around the globe which had a profound influence on the team. This ‘kinship’ between two total strangers that enabled thousands of people to get help at a minimal cost was a source of great inspiration for *Patient Innovation*. Today, it costs approximately 18 euros to produce a hand ‘that could make a kid very happy’. Supported by their research findings and the strong belief that ‘Although eight per cent sounds like a small percentage, even if it would just be half of it ... even if it’s just four per cent, we can have a tremendous impact’ (Interview 21), they continued to follow this trajectory.

Frame Shift 3: Re-framing of situation. After realising the significance of the findings, the research team acted upon its initial hunch regarding the impact of its studies of user innovation in healthcare. Ongoing and continued engagement with the topic and increasing realisation of its potential impact led to further shifts in how actors viewed their research. Various sources described the ‘strong implications’ of their findings as pivotal: ‘It made it difficult to just go back to run regressions again on the topic’ (Interview 10); ‘It was not a normal finding which you find out. There was something special about it’ (Interview 11); and ‘It was time to see the project with different eyes and act upon it’ (Interview 09).

Phase IV (t₃): Yes, we can: Development of collective movement. Based on their previous efforts to recruit patients and caregivers from diverse backgrounds and different countries, people started to participate rapidly and beyond the teams’ expectations in terms of scalability and enthusiasm of

strangers. However, in building the experimental design, the researcher had inadvertently not put a cap on the required number of participants, as is the usual practice in designing experiments. As the required number of participants was not determined, ‘several thousand started to participate and were all of a sudden sharing their experiences and solutions’ (Interview 09). As one member reflected in an interview,

What we wanted in a way in the beginning was just really doing an experiment, but we didn’t really know how to do a good experiment. And I guess that was a blessing in the end. We never really did the experiment how we wanted, but we created a platform in which, after a very short time, thousands of users were active and uploading and sharing their ideas. So, the project started growing, and people started to get interested, and because, you know, these several thousand users started to share. (Interview 10)

In this vein, another team member reflected on the ‘failed experiment’:

Having my researcher hat on, it was simply wrong of us that we didn’t put a limit on the number of participants on the platform. We did not take into consideration that we should administer the number of participants needed for an experiment. But exactly this lack of a cap or limit was one of the keystones of what *Patient Innovation* is today. (Interview 22)

As these illustrative quotes show, due to a ‘lucky’ coincidence (Portes, 2000), the expectations of the group were ‘far exceeded’, and the group members ‘were simply overwhelmed by the ideas and commitment that patients and caretakers actually have’ (Interview 16). They noted that as a result of the overwhelming response, which exceeded their expectations, ‘it was all of a sudden clear and simply not deniable anymore that we have to embark on this mission’ (Interview 10).

In the following months, the team started elaborating on how it could turn this ‘failed experiment’ into a full-blown sharing platform to serve patients and those in need. Partly inspired by their own research on open innovation, as well as their experience as medical doctors, the team members were confident about certain attributes of the platform—that is, that it was open to everybody and offered free access (Internal Document 98). However, there were also many obstacles to what such a sharing platform should look like and how it could be effectively governed. One team member reflected,

I was a PhD student and was supposed to write my thesis on these data. Well, I never did, but we created something so much bigger than my thesis. We all knew that to make this work, we all had to want this. (Interview 35)

When reflecting on how to build this platform, several aspects had to be considered. For example, several premises were important for the platform's future development—for example, the 'platform is international, multilingual, open, and free for use by patients and caregivers with any disease' (Internal Document 230). This premise emerged following long deliberations on what such a platform should look like. Along this line, the organisation also determined that a 'decision should be made about *who* could contribute content, *what types* of content could be contributed, and *which* contributed content would be displayed' (Oliveira et al., 2017, p. 318).

Current Frame: Societal-impact frame. The research team decided to shift its focus from solely producing knowledge and publishing its research findings (a traditional 'research frame') to focusing on creating a sharing platform to recognise and enhance the capacity of intrinsically motivated patients, caregivers, and collaborators to help people in need (societal-impact frame). With this motivation in mind, the team decided to professionally deploy and administer a sharing platform to provide infrastructure which 'aims to create a "knowledge commons"' to enable patients and non-professional caregivers to share and further develop their innovative solutions to medical care-related problems through an online platform. As stated by one team member,

There was a need to create an online platform that made the diffusion of these solutions possible. And against this backdrop, *Patient Innovation* was born. However, this was not such a straightforward story ... There was a lot of luck in the process, too. (Interview 15)

Through the establishment of *Patient Innovation*, a non-profit organisation based on a sharing platform emerged from a research-focused academic endeavour. The fledgling platform-based organisation had to craft rules and guidelines about its operations, as well as develop governance rules regarding its activities. Between March 2011 and November 2015, a new frame emerged via three frame shifts manifested in three different phases. These frame shifts were critical to shifting the frontiers of what could be accomplished with their 'surprising research findings'.

This new frame entailed new norms, such as the 'do no harm' principle, which is considered a minimum standard by humanitarians and doctors when treating patients and avoiding *inadvertent* harm,

was of particular importance in determining which solutions and devices to include and share on their platform (Internal Document 753). Many sharing platforms do not provide any screening, let alone reliable medical reviews to the submitted proposals. One team member stated in an interview,

The worst nightmare is that we could potentially share a solution which causes harm to others. Due to this reason, we deliberate and consider for a long time how to ensure the safety and accuracy of the ideas posted on our platform. This was the moment when we were sure we needed a review process, as the safety of patients is of utmost importance and stands above all.
(Interview 27)

Hence, the organisation put in place a comprehensive medical review process for assessing submitted solutions before they could be posted on the platform (Internal Document 168). Each solution had to be evaluated by a team of medical experts in the field in order to verify that it was safe for use by other patients. As a result of this process and the further development of the platform, the team decided to craft and define ‘terms and services’ pertaining to *who* they are as an organisation and *what* can be posted on the platform (Internal Document 340). However, the development of such terms and services was fraught with challenges:

We defined terms and services that we deal with, like medical devices and solutions. But we don’t deal with things that you can eat, drink, or put on your skin, because at this point, we cannot access their quality and validity. It is just very hard to test those solutions. We have people saying and sending us ideas, such as ‘Hey, I used this tea’, but this is just very difficult to test. We don’t have the capability to test it. (Interview 10)

To provide a ‘sustainable knowledge commons’, the organisation was aware that this goal could be achieved ‘based on our fundamental commitment to openness and free peer-to-peer sharing’ only (Interview 11). Hence, the organisation decided to structure itself as a non-profit by ‘only taking small portions [of money] from many’ (Interview 09). One respondent noted, ‘To stay independent, we never really take a lot of money from one institution’ (Interview 15). The organization maintained their independence by relying on public and private funding grants, such as research grants and donations (Internal Document 95), and by ‘keep[ing] the commons governance free from conflicts of interest’ and ‘vested interests’ (Internal Document 89).

Patient Innovation represents an example of responsible innovation that does not per se need to include the most radical or game-changing breakthrough innovations (e.g., Abernathy and Clark, 1985). At times, ‘simple’ and ‘easy’ innovation can change lives and enhance people’s quality of life. An example is the ‘shower shirt’ featured on the platform: This water-resistant garment is designed to keep post-surgical drains from getting wet, allowing patients to shower after a mastectomy instead of being forced to use trash bags or plastic wraps to prevent the suture area from getting wet. Ivan, who invented the Robohand, but who was neither a patient nor a caretaker but, rather, was strongly affected by someone close to him, stated,

If two people on opposite sides of the planet, from their garages, can use this technology [the Robohand] as a vehicle to create and share an idea, which then blossoms into a small community that works to find ways to create a large positive impact, imagine the possibilities as more and more people become involved and begin exploring what this technology can do. It can serve as a new tool with which we can reach out and help our neighbour. And our neighbour can now be someone who lives thousands of miles away.

Patient Innovation highlights the importance of creating a ‘knowledge commons’ to address a grand societal challenge (Inoue and Drori, 2006). As the European Commissioner, Carlos Moedas, stated in regard to the positive impact of *Patient Innovation*,

I think what you’ve achieved is nothing less than astonishing! The simplest innovations are the game-changers. And a game-changing innovation doesn’t always come easily to a sacred profession like medicine. Not many people are willing to put in the effort it takes to prove something can be done differently. Particularly, when the world around you seems to think that ‘the way it’s always been done’ is probably good enough. So I congratulate you—I respect you immensely—for being the pro-wrestlers of change! The heavy-weights of *Patient Innovation*! I can’t wait to see what the future has in store for this project and its impacts on citizens! (Internal Document 302)

A CONCEPTUAL MODEL OF FRAMING AND REFRAMING SITUATIONS

Looking across our observations, we developed a conceptual model of how actors frame and reframe the situations in which they interact (Goffman, 1974) and how doing so can lead to a shift in their frame towards responsible innovation. We explain how a new responsible innovation frame of a ‘knowledge commons’ emerges through a series of frame shifts. Figure 1 presents our theoretical model.

----- Insert Figure 1 here -----

Our observations suggest how frame discrepancies lead to a (1) frame drift, which induces actors to engage in (2) frame reassessment, which, in turn, triggers a (3) reframing of the situation, thereby prompting the creation and use of a new frame (see Figure 1). This new frame allows actors to be realigned with the situations they experience. We identify three different shifts driving the creation of a new frame and derive two underlying mechanisms.

Theorising Frame Shifts

(1) *Frame drift* refers to the increasing misalignment between the frame in use at the time to make sense of the situation at hand and new situations and ‘surprises’, in which this frame no longer fits. In such a predicament, actors become unsure about how to frame the new situation or which frame to draw on to make sense of it. Studies have shown that frame shifts represent a change from one frame to another and have identified underlying mechanisms that tend to be leveraged strategically (e.g., Reinecke and Ansari, 2016). However, fewer studies have considered the less strategic and *emergent* aspects of these shifts (De Wulf et al., 2009; Gray et al., 2015). A frame drift implies that such frame shifts is not be strategic and preordained but can also be emergent, precipitated by a turn of events and unanticipated contingencies along the way (Portes, 2000). We call such as an emergent and gradual shift a ‘frame drift’, rather than a disruptive ‘frame break’, as participants slowly move away from their initial framing. Such a frame drift occurs when actors recognise a growing misalignment. However, context matters, as, for example, academics who are engaged in research that is distant from human and ecological suffering may be less likely to experience a frame drift towards serving collective interests than those who are regularly exposed to heart-wrenching stories and first-hand experiences of human predicament.

(2) *Frame (re)assessment*. Actors have an initial reading or framing of the situation in which they interact based on their shared background (e.g., Cornelissen and Werner, 2011), and the extant frame repertoires both functions as the ‘background structure of shared reality on the one hand, and as tools for strategic and creative behavior on the other’ (Diehl and McFarland, 2010, p. 1719). However, due to changes in the situation, such as new and especially discrepant information about the nature of their

activities, they begin to problematise the initial framing of their situation and experience dissonance arising from misalignment. This is not a sudden ‘frame break’ (Goffman, 1974) as such, whereby the prevailing norms of the interaction are disrupted and the interactants must respond on the spot (Gray et al., 2015). Rather, this problematisation of the viability of the extant frame occurs gradually over time, instead of being provoked by a particular situational cue that makes an extant frame untenable for making sense of the situation.

This also leads to ‘rekeying’—that is, ‘the set of conventions by which a given activity, one already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by participants to be something quite else’ (Goffman, 1974, pp. 43–44). In a keying situation, the activity itself does not change, but its interpretation does, thereby motivating a different set of behaviours, e.g., from viewing vegetarianism as preventing animal cruelty to being good for one’s health (Lee et al., 2018). While actors might perceive a frame misalignment, they may still not reassess the situation. For example, oil and gas industry executives might see a frame misalignment in the context of their industry’s strong link with climate change, but they might still not be sufficiently moved to reassess their dominant industry frame.

(3) *Reframing situation* refers to an activity in which actors allow themselves to understand the situation at hand from a different perspective, which potentially entails less misalignment between the situation and the previous frame in use. Theoretically, we refer to this process as reframing the situation—that is, the crafting of a new narrative. *Reframing* is based on the actors’ perception that the organisation possesses the capabilities necessary for successfully changing a frame. Academics and scientists benefit from ‘academic freedom’, which provides greater latitude for frame shifts than is granted to people in organisations with stronger hierarchies and power structures. For example, organisations such as the military enforce frames with a tight set of procedures and protocols that offer little leeway for reframing and following through on serendipitous discoveries. Additionally, reframing a situation in favour of responsible innovation requires a focus on serving a collective benefit, such as improving lives or the

planet's health. Such type of reframing needs actors to recognise and accept responsibility for an issue (e.g., obesity) based on both direct and indirect social connections between actors, activities, and consequences (Schrempf, 2006; Young, 2006) and to understand societal issues as systematic and as part of both the problem and the solution. Such a realisation contributes to a shift from an egocentric focus to an allocentric focus on serving a bigger cause, such as finding cures for rare diseases.

(4) *New frame creation* refers to an activity in which a new frame is established and created, as actors slowly move away from their initial framing (frame drift), reassess the extant frame, and seek a new way to make sense of the situation. This can eventually lead to a new frame emerging to make sense of the situation—a 'frame shift' (Ansari et al., 2013). The process is not based on pure strategic calculation but, rather, on serendipity, as the new frame begins to take hold and the same innovative activity begins to be framed differently, i.e., not in line with the background and professional interests of the participants (in this case, academics).

By observing the process of framing and reframing, we identified the role of serendipity in the process of framing. More specifically, we differentiate serendipity from luck (Liu and De Rond, 2016; Portes, 2000), drawing on Louis Pasteur's frequently cited quip that serendipity is not pure luck but, rather, favours the 'prepared mind'. Clearly, the academics were engaged in a worthwhile research endeavour for which the latent frame of its wider societal impact would seem plausible if not inevitable. Thus, it was not due to pure luck that they began to see the 'bigger picture'. On the contrary, they only gradually began to realise that 'they were on to something much bigger' than they had initially imagined. This growing realisation set off a fortuitous chain of events and collective action involving users around the world, which eventually led to the emergence of a sharing platform based on a 'knowledge commons' for responsible innovation. The construction of a new frame involves three different steps, which enable a frame shift. We identified two mechanisms driving these frame shifts.

Mechanisms Underlying Framing and Reframing

The frame shifts shifted the organisation's focus from producing research and publishing journal articles to establishing a non-profit innovation platform for a larger societal purpose. Our analysis revealed serendipitous inspiration and the emotions induced by the 'surprising' and hugely significant findings they encountered, which required them to craft a new frame.

Mechanism 1: Serendipitous inspiration. Inspiration is defined as a 'trigger to refer to the stimulus object that evokes inspiration (e.g., a person or idea) and target to refer to the object toward which the resulting motivation is directed (e.g., a possible self, personal goal, or creative product)' (Thrash and Elliot, 2003, p. 871) and which can affect important life outcomes (Kaufman, 2011). However, inspiration is not be achieved through pure luck nor careful planning but, rather, through serendipitous events that precede inspiration and an 'openness to experience' (Thrash and Elliot, 2003). Serendipity is the 'distinct capability, namely that of recombining any number of observations as to deduce "matching pairs", or sets of observations, that appear to be meaningfully related' (Liu and De Rond, 2016, p. 434) and stressing the importance of past experience, previous skills, and what is referred to as the 'prepared mind' (Pasteur, 1854). Serendipitous inspiration played a central role as a mechanism enabling frame shifts at different points in time. At the outset of the study in phase one, the actors had no intention to create a non-profit organisation. Yet, they had exposure to the non-profit sector that would increase the potential for opportunity recognition. Hence, without the recognition that the '8%' represents something novel and worth pursuing, *Patient Innovation* would not exist today, and the research findings would more likely be confined to academic journals with limited readership, rather than benefiting the community at large.

However, while opportune moments and serendipitous inspiration are part and parcel of the innovation process (Austin et al., 2011; Gehman, Garud, and Kumaraswamy, 2011), they may not necessarily motivate actors to switch to responsible innovation without a moral awakening of new possibilities to transcend self-serving interests and devote themselves to serving a bigger cause.

Mechanism 2: Moral emotions. A second mechanism that played a key role in allowing frame shifts is moral emotions, which amplified the potential impact of the project and generated emotional energy

(Collins, 2004) for team members to pursue something that was neither initially intended nor self-serving. Moral emotions are ‘emotions that are linked to the interests or welfare either of a society as a whole or at least of a person other than the judge or agent’ (Haidt, 2003, p. 853) with regard to what is right and wrong or good and bad (Fan and Zietsma, 2017; Kroll and Egan, 2004). They are ‘feelings of approval and disapproval based on moral intuitions and principles ... the satisfactions we feel when we do and feel the right (or wrong) thing, such as compassion for the unfortunate or indignation over injustice’ (Jasper, 2011, p. 287). Accordingly, what actors perceived as ‘hard to ignore’, created strong ethical and moral considerations to act and not just let it be and to engage in an ‘adventure which we usually wouldn’t embark on’ (Interview 12). Our analysis indicates how actors were particularly intrigued by moral emotions, such as compassion, empathy, and consideration of ‘what is right to do?’ (Fan and Zietsma, 2018; Wright et al., 2017), produced in interactions which enabled the frame shifts to materialise.

Together, serendipitous inspiration and moral emotions generated in interaction prompt frame shifts towards responsible innovation.

Broader Implications

Our framework suggests that frame shifts are less purposeful than has been previously suggested (Cornelissen and Werner, 2014). The stark influence of serendipitous inspiration and moral emotions are especially relevant to instances in which individuals, groups, organisations, and fields are subject to strong institutional pressures and rules about how to act and what to prioritise. While our ‘organisation’ was an academic research project team, the insights from our case have relevance to other types of organisations that are not oriented towards addressing grand challenges, such as professional and scientific institutes and research incubators.

Our model has implications for businesses with commercial incentives. Responsible innovation is dear to the hearts of some business leaders, who advocate combining profits with SDGs to be part of something meaningful; however, many businesses innovate in ways that are distant from responsible innovation and even be irresponsible. Our mechanism provides insights into how behaviours switch.

While many organisations, such as 3M and BMW, foster a culture that nurtures the ‘entrepreneurial spirit’ by allowing employees to informally develop individual projects (Garud et al., 2018) based on individual concerns about issues dear to their hearts (Bansal and Roth, 2000; Schrempf, 2006) and moral emotions, such initiatives could potentially shift to responsible innovation projects by drawing on the wider social connections of the innovations at hand (Young, 2006). However, business innovation are still be constrained by the need for profit generation, even if profit-making can be compatible with responsible innovation. In addition, large organisations may have less flexibility to switch their core purpose than smaller organisations or project teams of the type we examined. At the same time, larger organizations have greater resource endowments to allocate towards responsible innovation. The relationship between flexibility and resource endowment may influence organisational transitions towards attending to social causes and innovating responsibly.

Additionally, we do not suggest that serendipity is always required for frame shifts to materialise in favour of responsible innovation, nor are we neglecting the role of meticulous and deliberate planning in organisations. Overall, serendipitous inspiration might be a unique phenomenon rather than a daily occurrence in organisational life. Indeed, very few organisational scholars have addressed the role of serendipity (De Rond, 2014; Garud et al., 2018), and managers might be reluctant to speak openly about ‘coincidence’, preferring to attribute a positive outcome to their own skills and abilities than to pure chance or ‘luck’. Nonetheless, this mechanism deserves more attention, as it occurs frequently in innovation processes (Pasteur, 1854; Roberts, 1989), as in the example of Post-it Notes and the HP Inkjet printer. It is also not uncommon in the medical and pharma industries (Liu and De Rond, 2018, p. 435). For instance, Pfizer’s drug sildenafil citrate was meant to address hypertension but ended up as a key ingredient in its erectile dysfunction drug, Viagra, which became a ‘best seller’. Yet, these serendipitous innovations may not necessarily meet the criteria for responsible innovation, which requires not only the fostering of preparedness to seize opportunities but also the motivation to make innovations socially beneficial.

DISCUSSION AND CONCLUSION

Our case of *Patient Innovation* represents how a ‘serendipitous’ discovery and a ‘hunch’ that ‘there has to be more’ can encourage a group of academics to shift from the ‘publish or perish’ imperative to embark on a mission to contribute ‘something to society at large’. We drew on a framing perspective to illuminate the process through which the framing and reframing of a situation might occur and identified the underlying mechanisms towards the emergence of responsible innovation.

We make three interrelated contributions to the literature on responsible innovation and framing. First, we explain how an organization can be repurposed to pursue responsible innovation (e.g., Khavul and Bruton, 2013; Voegtlin and Scherer, 2017) despite facing adverse institutional pressures and professional incentives. By relying on an inductive case study of how an academic endeavour without ‘any’ ambition to impact the real world was transformed into a medical, non-profit, platform-based organisation for sharing innovative solutions among patients, we explain how all three dimensions of responsibility are interrelated and implicated in this process. Through the rigorous medical screening of solutions offered by medical professionals—that is, regulations that allow only certain products and solutions to be uploaded and shared in the community—*Patient Innovation* ensures that it has suitable governance mechanisms in place to meet the criterion of ‘doing no harm’. At the same time, the organisation strongly pursues the ‘free dissemination and open sharing’ (Internal Document 429) of solutions across the world by carefully scrutinising and accepting only small donations so that it can remain independent, operate in multiple languages for broader reach and dissemination, and maintain its focus on the goal of serving ‘humanity’, ‘alleviating human suffering’, and improving human lives (Internal Document 430).

Second, we contribute to the literature on framing by providing a theoretical model to explain how issues are framed and reframed in interaction (Giorgi, 2018; Gray et al., 2015; Lee et al., 2018) without necessarily being planned in advance. While prior research has portrayed frame breaks as disruptive events, whereby a frame in use becomes untenable for the situation, we unpack a more gradual and

emergent process of frame shifts by illustrating how actors experience a frame drift. This refers to a growing misalignment between the situation at hand and the frame in use. By using a framing perspective, we illustrated how, over the course of time, actors not only review and reassess the frame in use but also reframe the situation, which, in turn, triggers the crafting of a new frame and allows subsequent realignment with the changing situation at hand.

We explicate two different mechanisms that enable frame shifts towards responsible innovation: serendipitous inspiration and moral emotions. We illustrate how frame shifts occur through situational contingencies and serendipitous developments (Furnari, 2019). Frame shifts tend to be structured into neat, means–ends, and rational narratives about how things got ‘from here to there’. This ignores the multiple turn of events and contingencies encountered in the process (Portes, 2000). Many innovative processes involve serendipity and numerous departures from the intended course (e.g., Austin, et al., 2011; Busch, 2020; Garud et al., 2018; Gehman et al., 2011), but the role of serendipitous inspiration for *responsible* innovation remains under-specified. In other words, “[...] the process of serendipity is often a *prolonged journey* rather than an isolated moment, and we need to have sufficient motivation and *inspiration* to stay focused to make it happen. (Busch, 2020: 97, emphasis added). We show a rare case in which prepared team members had to frame and reframe the situation at hand to grasp the potential and wider societal implications of their work (providing widespread access to novel solutions for rare diseases). We also illustrated how the process is fraught with moral emotions (Haidt, 2003; Scherer and Palazzo, 2011) that motivate actors’ commitment to ‘engage in projective agency that focuses on taking collective action in anticipation of a potentially better future’ (Fan and Zietsma, 2017 p. 2323). Moral emotions produced in interaction enable actors to move from egocentric to allocentric perspectives—in our case, a ‘research’ frame focused on self-serving scientific publications to a collective ‘help-society frame’ for wider social impact.

Third, we add to the responsible-innovation literature by shedding light on the power of users and contributors (patients and caretakers) and their ability to produce and disseminate innovations in areas

that are neglected by mainstream business (pharma industry) for lack of commercial incentives. While the extant literature has focused primarily on involving users and the community in the innovation process (von Hippel, 2005) to democratise innovations (Chesbrough and Bogers, 2014; Kucukkeles et al., 2019; von Hippel and von Krogh, 2003), we show the power of a community of highly motivated contributors to collectively address a grand societal challenge (Scherer and Palazzo, 2011; Scherer and Voegtlin, 2018) through digital platform-based organisation (Bode et al., 2019; Markman et al., 2016; Yoo et al., 2012). By doing so, we follow the call by Austin et al., (2011: 1216), to study the ‘accidental and serendipitous nature of innovations that are becoming more pronounced during the era of pervasive digital technologies’. Specifically, in platforms for a social cause, for which profit seeking is not the key motive (Logue and Grimes, 2019), users may be even more driven to contribute and share solutions that benefit a collective. As businesses tend to be intellectual fortresses that control knowledge and the products and services that their users adopt, it may inhibit wider knowledge sharing to produce and disseminate the kinds of innovation needed to improve societal wellbeing. Platform organisation to harness the collective power of users with privileged access to the need-related knowledge of social communities is one potent means to engender such responsible innovation.

LIMITATIONS, BOUNDARY CONDITIONS, AND FUTURE RESEARCH AVENUES

This study has limitations and boundary conditions which also provide avenues for future research. First, a research frame that is focused on generating scientific publications may not be antithetical to a social-impact frame. Given the criticism that research and impact are decoupled (Bromley and Powell, 2012), academic institutions have faced increasing pressure to conduct socially relevant research and showcase its societal impact (Doh et al., 2019). Thus, while in our case, academics did not face such pressure regarding the research project they initiated, a social-impact frame may co-exist and overlap with a research frame. Future studies can examine how the two frames may co-exist, clash or harmonize in research-driven organisations. Second, while in our case, the shift in frames had a positive outcome overall, a ‘success’ case is, of course, not inevitable. Chance events can also derail an endeavour. Future

studies can focus on ‘failures’ and derailments, as well as aspects of trial and error in such a process, whereby even highly promising innovation endeavours may end up being neglected or overlooked. Third, as we draw upon a single case study, our objective is not to subsume particular instances into general laws but to promote analytical generalisation (Siggelkow, 2007; Tsoukas, 2009), i.e., to construct theoretical relationships and categories by accounting for the specificity of a particular case and refining what is currently known (Tsoukas, 2009). Fourth, people may be so heavily entrenched and incentivised in their extant frames that they find it difficult if not impossible to shift to a new frame. Consider the slow diffusion of open-access (OA) publishing to create a ‘knowledge commons’ of scientific knowledge (Suber, 2007), despite strong pressure from policy makers and the wider societal benefits that such a ‘knowledge commons’ can unleash. Professional pressure to publish in high-status toll-access journals; the time needed by academics to educate themselves about the OA publishing system; and the funding, reward, and research assessment regimes geared towards closed or toll-access publishing have impeded a ‘knowledge commons’ such as Wikipedia from emerging. Thus, frame shifts are far from inevitable, and it would be productive to examine why some frames may be more resilient and amenable to change than others. Fourth, the emergence of this platform must be seen alongside the rise of information and communication technologies and pervasive digitalisation in social life. Without these enabling digital technologies, it would have been impossible to create a platform that could rapidly link globally dispersed users and allow them to freely and quickly share knowledge of innovative solutions to medical challenges without massive investments in physical infrastructure. It would, thus, be productive to study the dynamics we explored in non-digitised environments. Finally, the organisation we studied comprised academics whose motivations and drive to pursue responsible innovation may differ from business actors in terms of intent and possibilities to deviate from intended paths. It would be productive to study unexpected shifts in other settings, such as business and professional bodies, and to identify other mechanisms at play.

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Table I. Overview of Data Sources

Data type	Details
Interviews (49)	<ul style="list-style-type: none"> • 49 Interviews with 49 informants from all hierarchical levels, and different level of involvement and responsibility with the project: (2) founders, (3) managers, (14) team members, (3) board members, (2) platform managers, (2) technical support staff, (5) interns, (7) supporters, (4) Patient Innovation-Award recipients, (3) patient sharing solutions, and (4) former employees. • All interviews were audio-recorded and professionally transcribed verbatim.
Participant observations (30,5h)	<ul style="list-style-type: none"> • Observations of strategy meetings, which were recorded in detailed field notes (14h) • Observations of presentations given at public talks, and panel discussions, which were recorded in detailed field notes (11h) • Observations of informal gathering among group members discussing daily business, which were recorded in detailed field notes (5,5h)
Pictures (329)	<ul style="list-style-type: none"> • Pictures taken from innovations uploaded in the platform (182) with time stamps of upload • Pictures obtained from different Patient Innovation Ceremonies (110) • Pictures covering Patient Innovation at presentations and talks, and other events (37)
Documents (1023)	<ul style="list-style-type: none"> • Full internal documentation, including final reports, management summaries, interim reports and grant descriptions, and email excerpts (119) • PowerPoint presentation to various entities at different points in time and different target audience (e.g., for publish and private funding bodies; academic presentations) (37) • Full internal reports on findings of the various studies that have been conducted within the scope of Patient Innovation (313) • Full access to all blog entries and newsletters (87) • Access to previous grant applications (both successful and unsuccessful) to private and public funding bodies (including details on purpose, target, and financial plans (129). • Internal documents on patient innovations' strategic projects for the future (e.g., establishment of Patient Innovation Awards; Patient innovation Entrepreneurship Bootcamp) (54) • Extensive statistics of platform usage, and search terms used, and performance evaluation reports (117) • Communication to stakeholders, and anniversary handbook (88) • Access to internal commune on various issues pertaining to patient innovation and critical topics such as legal issues to be considered (e.g., on reliability issues) (32) • Miscellaneous organizational documents on legal agreements and reports on health care industry, and issues pertaining patient information and data security (47)
Videos (17h)	<ul style="list-style-type: none"> • Recorded presentations given to different funding bodies or other occasions (6h) • Recorded presentations of internal events (4h) • Recorded events such as Patient Innovation Award Ceremony (7h)

Table II: Coding Tree

Picture 1: Robohand – ‘First time grabbing a bottle’