

# Managing business model innovation uncertainties in 5G technology: a future-oriented sensemaking perspective

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**It is well-established that technology – and particularly the uncertainties caused by emerging disruptive technologies – has an impact on industrial dynamics, forcing organizations to reimagine their business models. The in-depth qualitative case study of a Nordic telecom organization shows that the uncertainties created by disruptive technologies initiate a process of sensemaking and business model innovation, while the new business model becomes manifested at the final phase of the process (i.e., enactment). The newly developed business model has three dimensions reflecting value-centric activities, internal changes, and attempts to capitalize on external opportunities. Investigating the way in which managers handle uncertainties related to 5G, this research argues that business model innovation emerges from a future-oriented sensemaking process. The process model developed in this study entails three distinct phases disaggregated into eight underlying dimensions. The present study contributes in two ways: first, it advances our understanding about managing future uncertainties regarding business model innovation by identifying future-oriented sensemaking as a mechanism to manage these uncertainties. Second, it sheds light on the process model underpinning future-oriented sensemaking for business model innovation.**

## 1. Introduction

Today's dynamic and highly uncertain business environment is loaded with complex and equivocal cues, which are likely to cause change and disruption (Wright, 2005; Teece and Leih, 2016). In particular, the fifth-generation technology (5G thereafter) wireless and mobile communications networks are expected to disrupt the telecom industry, reshape several other industries (e.g., healthcare and the Internet of Things (IoT)), and affect everyday

life (Mitra and Agrawal, 2015). As an intelligent technology, 5G networks offer higher data rate and lower-latency transmission, lower energy consumption, and more efficient and reliable communication at an affordable rate (Kaartemo and Nyström, 2021). The disruptive emergence of 5G is creating new dynamics, and uncertainties about the future of related industries, causing major challenges to existing business models (BMs) (Gattringer et al., 2021).

Coping with technological disruption (Adner, 2002) and leveraging emerging opportunities, organizations

seek to make sense of the change phenomenon (Weick, 1995; Teece and Leih, 2016). Then, they anticipate uncertain developments, while creating viable options for action through their BMs (McGrath, 2010; Kaartemo and Nyström, 2021). Such efforts to manage uncertainties and external pressures may result in opportunities for business model innovation (BMI) (Sabatier et al., 2012; Aagaard and Nielsen, 2021). Prior research has positioned BMI as a new way for BM contributors to create, distribute, and capture value (Chesbrough, 2007, 2010; Demil and Lecocq, 2010; Teece, 2010; Amit and Zott, 2012), which is strategically important for organizations. As BMI is essential for obtaining and sustaining a distinct competitive advantage in a new business environment (Casadesus-Masanell and Ricart, 2010; Chesbrough, 2010; Teece, 2010; Baden-Fuller and Haefliger, 2013). However, BMI is admittedly a difficult strategic task as the elevated level of uncertainty causes complexity in evaluating and deciding which new resources and competences are strategically pertinent and which elements are significant for building competitive advantage (Eisenhardt and Martin, 2000; Mezger, 2014; Kim and Min, 2015).

Although, BM and BMI literature have examined the mechanisms for addressing uncertainties for instance, by deploying different coping strategies (Schneckenberg et al., 2016) or learning and experimentation mechanisms (Andries and Debackere, 2013), we observe that it lacks in process and its underlying dimensions linked with managing and making sense of uncertainties during BMI. To address this gap, our study asks *how uncertainties are managed during the development of new business models?* Addressing this inquiry creates insight for managers engaging with BMI. We discovered a dynamic process through which an established telecom organization makes sense of the uncertainties associated with disruptive technologies and feed this information to BMI development. We identified that future-oriented sensemaking (Gephart et al., 2010; Tapinos and Pyper, 2018) is the catalyst for new BMs that are developed to address the uncertainties. In addition, we propose future-oriented sensemaking process and contribute to existing knowledge on this burgeoning topic (Stigliani and Ravasi, 2012).

In relation to BMI theories, our research adds new insights into the process of BMI as being initiated by external uncertainties and integrated with *identifying uncertainties, interpreting uncertainties, and enacting on uncertainties*. The outcomes of this research answer Schneckenberg et al.'s (2021) call on disentangling how organizations engage with technological uncertainties and their influence on new BMs alternatives. Moreover, it contributes to the knowledge of how organizations redesign and innovate

their BMs within the rising environmental volatility by emphasizing that future BMs should incorporate factors such as uncertainty in their design process (Aagaard and Nielsen, 2021). These findings thus address the research on antecedents influencing BMI (Spieth et al., 2016; Foss and Saebi, 2017). Building on previous research on BMI (Zott and Amit, 2010; Amit and Zott, 2012; Spieth et al., 2014; Massa et al., 2017; Schneckenberg et al., 2021) and sensemaking (Weick, 1995; Weick et al., 2005; Akgün et al., 2012; Maitlis and Christianson, 2014; Friesl et al., 2019), the present research explores the way in which uncertainties corresponding disruptive technologies trigger the sensemaking process and BMI (Chesbrough and Rosenbloom, 2002), while managers redefine and innovate the key elements of their existing BM. Based on this outset and research aim, this paper makes a narrative-based theory building contribution (Cornelissen, 2017; Wenzel and Koch, 2018; Cloutier and Langley, 2020) to BMI development literature (Zott, et al., 2011; Baden-Fuller and Haefliger, 2013; Ramdani et al., 2019).

## 2. Theoretical background

### 2.1. Business models and business model innovation

BM and BMI have become an important top management priority due to increasing environmental volatility and market dynamics; the rapid pace of technological development, as well as merging industry boundaries (Chesbrough, 2007). BMs exist mainly to deliver offerings designed to reinvent value for customers (Kapoor and Teece, 2021; Massa and Tucci, 2021). It is also known that they are a subject of innovation, typically triggered by perceived environmental changes through problem sensing or creating new opportunities within the existing market and generating profits (Chesbrough, 2010; Amit and Zott, 2012; Foss and Saebi, 2017; Massa et al., 2017). BMI reflects new strategic distinction; lays the foundation for superior future value creation and long-term performance (Chesbrough and Rosenbloom, 2002; Casadesus-Masanell and Ricart, 2010; Egffjord and Sund, 2020). By providing a new and an effective model, BMI reveals a unique combination of resources that generate innovation, efficient transaction as well as a critical position for the organization within its value network of suppliers, partners, and customers (Morris et al., 2005). Characteristically, Chesbrough (2007, p. 12) argued that *'a better business model often will beat a better idea or technology.'*

BMI requires novel changes in multiple key elements of an organization's BM (Foss and Saebi, 2017;

Brenk et al., 2019). This can be achieved by adding new activities, linking activities in new ways, or changing the parties that carry out these activities (Zott and Amit, 2010; Amit and Zott, 2012). This conceptualization of BMI, in essence, incorporates the activity-based system and dynamic vision of BM components, alongside the value-centric nature of BMs and BMI (Chesbrough, 2010; Zott and Amit, 2010; Clauss, 2016; Massa et al., 2017; Massa and Tucci, 2021; Tykkyläinen and Ritala, 2021). It is widely recognized that the process of BMI changes the logic of value creation and the core activities themselves. In this way, it enables organizations to reconfigure their activities in unique and consistent ways around a logical model, developing their business and increasing operational effectiveness (Casadesus-Masanell and Ricart, 2010; Teece, 2010; Spieth et al., 2014, 2016; Laasch, 2019). Using an activity-based system perspective for the purposes of this study, we try to identify what kind of activities are emerged or introduced during the process of reconfiguring existing BMs in the face of disruptive technologies. It provides new insights into the way the logic of value-oriented activities changes by managing the uncertainties embodied in BMI and contributes to the dynamics of BMI emergence in organizations which is still not fully understood (Morris et al., 2005).

Innovation, in general, and BMI in particular, are materialized under conditions of considerable uncertainty (Khanagha et al., 2014; Massa and Hacklin, 2021). Uncertainty usually originates from lack of understanding about the potential value to be created by the technology, target markets, or customer preferences and acceptance (Casadesus-Masanell and Ricart, 2010; Kapoor and Teece, 2021). Uncertainties always exist in future-oriented contexts as decision-makers are dealing with something new that they do not understand well enough. Even when decision-makers perceive an emerging change, it is difficult to decide when to heavily invest in BM transformation; what would be the logic and mechanisms of this transformation (Khanagha et al., 2014) or to anticipate how well the new BM will actually work (Chesbrough, 2007). To unpick BM transformation, it is crucial to capture and make sense of such challenges and uncertainties and anticipate their potential consequences (Chesbrough and Rosenbloom, 2002).

## 2.2. Sensemaking in organizations

The concept of sensemaking dates back to work done by Karl Weick who conceived it as the process of constructing ‘*meaning and order in the face of environments that impose ill-defined contradictory demands*’ (Weick 1993, p. 635). Klein et al. (2007) defined sensemaking as the continuous intentional

endeavor to understand connections (e.g., among complex events) to anticipate their trajectories and subsequently act effectively. Sensemaking is crucial in dynamic and volatile environments where it begins with noticing and volatile environments where it begins with noticing surprising and inconsistent events or confronting with uncertainties (Maitlis, 2005; Weick et al., 2005). By engaging in a sensemaking process, individuals attempt to respond to circumstances that interrupted the routine and the expected flow of experience (Stigliani and Ravasi, 2012). Daft and Weick (1984) stated that organizations should be able to scan the environment to seek information relevant to their own survival, market, competitors, technological advances, and trends. Accordingly, sensemaking occurs through certain processes: *creation* (noticing and extracting cues from an interrupting event or situation), *interpretation* (establishing an initial sense and developing it into a narratively organized sense of the interrupted event or situation) and *enactment* (acting on the complete sense to reinstate the interrupted activity) (Weick, 1995; Sandberg and Tsoukas, 2014; Seidl and Werle, 2018). Maitlis and Christianson (2014) argued that the action-meaning cycles related to sensemaking happen recurrently while people establish provisional understandings that they continuously enact and modify.

Sensemaking has traditionally been considered a retrospective process (Weick, 1995), which makes sense of crises and failures, even with regard to the future (as ‘future perfect thinking’, see Pitsis et al. (2003)). Recent research (Gephart, et al., 2010; MacKay and Parks, 2013; Sandberg and Tsoukas, 2014; Gattringer et al., 2021) contends that organizations may tackle circumstances that are inherently unknowable and knowledge about the potential future is broadly non-existent and thus they necessarily have to develop novel understanding and involve in future-oriented sensemaking or prospective sensemaking. Tapinos and Pyper (2018) described future-oriented sensemaking as making sense of the future through a series of cognitive processes, triggered by current events, to foresee the future by understanding the forces that affect its emergence. Through future-oriented sensemaking actors intend to interpret uncertain developments; understand events as they unfold, intentionally consider the probable future impact of certain actions when developing a proper response (Gioia et al., 1994; Stigliani and Ravasi, 2012; Friesl et al., 2019). Managers depend on these interpretations when making decision and create a pathway toward an uncharted future (Friesl et al., 2019). In uncertain environments, interpretative frames play a significant role in making sense of equivocal signals from the environment (Kaplan and Orlikowski, 2013).

Gattringer et al. (2021) highlighted that future-oriented sensemaking fills the interpretive gap in understanding the far-reaching consequences of emerging technologies where the information about their developmental path is uncertain and their meanings for particular groups of users are not fully comprehended (Schneckenberg et al., 2016; Friesl et al., 2019). Consequently, understanding about new technologies is vitally important in perceiving and responding to environmental changes. Making sense of the future can either stimulate improved performance in the near future or help cope with surprising events and the uncertainties of long-term futures (MacKay and Parks, 2013). So far, future-oriented sensemaking has been studied in various contexts including strategy (Gioia et al., 1994; Kaplan and Orlikowski, 2013; Gattringer et al., 2021); the impact of material practices and artifacts (Stigliani and Ravasi, 2012); foresight and forward-looking analysis (Tapinos and Pyper, 2018); technological uncertainty in science incubation (Friesl et al., 2019) and scenario thinking (Wright, 2005); however, it has been remained relatively underexplored in BMI development. In the following section, we briefly review the current body of knowledge on this relationship.

### 2.3. Business model innovation and sensemaking in business model development

BMs and BMI from cognitive/narrative perspective have been linked to sensemaking theories (Chesbrough and Rosenbloom, 2002; Sosna et al., 2010; Massa and Tucci, 2021) which generally reflect the idea that managers interpret the *images* of a real BM system shaped by their own cognitive frames when making decisions and they do not hold the real BM system itself (e.g., real value creating and capturing activities, potential outcomes, and organizational structure) (Massa et al., 2017). Accordingly, BMs can be seen as cognitive instruments that contains causal links between the customers and how value is delivered and captured (Baden-Fuller and Haefliger, 2013). Massa and Hacklin (2021) explained that the organizational cognition and interpretation are affected by various types of uncertainties rooted in events such as technology evolution, market dynamics, and regulation which are related to the future. Laasch (2019) suggested that the value logic of BMs encompasses cognitive structures, becomes visible through artifacts, and are enacted as activity system. From Doz and Kosonen's (2010) point of view, BMs are cognitive structures and representations of how to

create value and organize and govern internal structure. Likewise, Martins, et al. (2015) discussed BMI through the process of generative cognition (i.e., analogical reasoning and conceptual combination) and considered BMs as schemas that organize understanding about the design logic of value creation activities. Barr et al. (1992) pointed out that cognitive representations direct activities and influence the renewal of BM. Regarding the connection between cognition, action, and BMs, Tikkanen et al. (2005) notified that a BM is a cognitive mechanism designed to contextualize managerial action. The actualization of BMs, as tangible elements in an organizational strategy, emerges from the interaction between cognition and action. Hence, BMs can be both cognitive and externally articulated representations of the ways in which companies do business (Magretta, 2002; Zott et al., 2011). Reflecting on these discussions, sensemaking from process perspective and future-orientation has not yet received scholarly attention in BMI research.

## 3. Research method and design

The present study has adopted an explanatory single case study in narrative form (Yin, 2018), while also extracting structures from qualitative patterns, following the abductive approach (Alvesson and Sköldbberg, 2000).

### 3.1. Description of the case-study organization

Our case study is ComCo,<sup>1</sup> founded in 2001, a specialized supplier of power, communication, smart grids, and fiber, headquartered in Sweden, listed on Nasdaq Stockholm, and considered a leading player in the Nordic region, with annual sales exceeding 900 million euros in 2021 and more than 5000 employees and ten subsidiaries. The organization's services target network owners and operators (B2B and B2C) and are generally based on contractual agreements, ranging from a few months to many years, which allow the organization to create and maintain long-term and closer relationships with customers. 5G is expected to influence ComCo's entire business environment and consequently its BM, making it an interesting representative and relevant case.

### 3.2. Data-collection process

The empirical research material consists of data from three different sources (Figure 1): (i) publicly

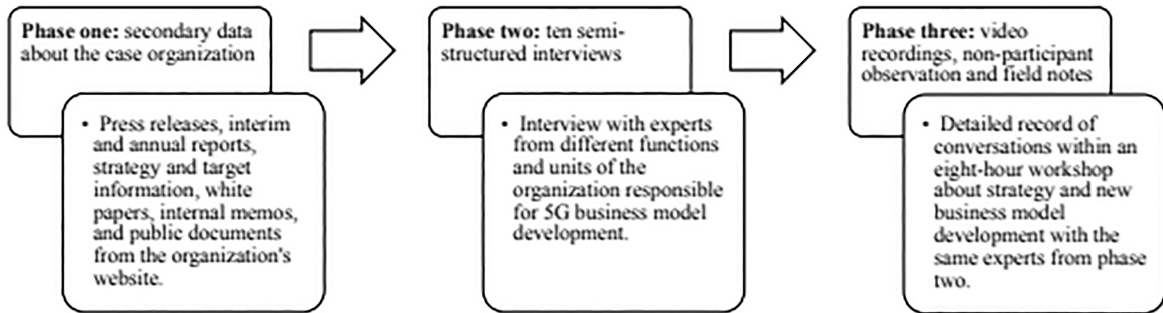


Figure 1. The data-collection process.

Table 1. Interview participants and their responsibilities within ComCo

Interview participants	Responsibilities
1. Head of digital transformation	1. Digital applications and project management
2. Product manager	2. Developing new business/product ideas
3. Mobile-communications engineer	3. Engineering development, consultancy, R&D
4. Solution manager	4. Training and user support, business development
5. Area business unit director	5. Directing mobile and fixed business units
6. Business-development director	6. Customer strategy development
7. Mergers and acquisitions manager	7. Business communication; strategy development
8. Electrical and telecommunications engineer	8. Engineering and operational activities
9. Marketing and sales manager	9. Marketing and sales strategy development
10. Radio-access network engineer	10. Measurement; network installation and planning

available data, (ii) 10 semi-structured expert interviews, and (iii) video recordings and non-participant observation, carried out by the first author. The background documentary material was collected prior to the interviews and workshop. These materials have helped us develop a good understanding of ComCo’s past direction, current strategies, and elements of its BM and helped prepare for the interviews and BMI observation. The informants had mixed (educational) backgrounds (i.e., business and technology) and expertise in business-management and engineering-based roles. The informants represented different functions, ensuring a diverse range of insight, and producing in-depth information and rich data related to the phenomenon under investigation (Parker and Northcott, 2016) including various interpretations of complex environmental change (Seidl and Werle, 2018).

Table 1 presents an overview of the participants and their responsibilities within the organization.

The participants were interviewed face-to-face, with the interviews lasting between 45 and 60 min. A semi-structured interview protocol involving handwritten notes (Saunders et al., 2016) was used. The protocol registered the key points and connected ideas; the interviews were also audio recorded. Both forms of record-keeping were used in the data analysis. The interviews explored how individuals and teams engaged with the uncertainties arising from

the introduction of 5G during the BM development process. In particular, the interviewees were asked how they applied their understanding of 5G when implementing BM changes. Additional interview questions involved the organization’s perspective on BMI and ComCo’s future-orientation.

The third source of data was a non-participant observation (Creswell and Creswell, 2018), obtained through a facilitated one-day workshop, run by external experts. The workshop was video recorded to enhance the quality of data and analysis (Smets et al., 2014). The workshop focused on new BM development in the context of environmental changes caused by the development of 5G. The purpose of the observation was to analyze and comprehend the way in which the participants made sense of 5G and its implications during strategic conversations while developing their BM. The observation materials captured technical and business-oriented conversations involving 5G mobile-communication networks, in which the participants actively engaged in discussing all potential BM activities. Following the advice of Stigliani and Ravasi (2012), the process included data collection through artifacts and visual material including PowerPoint presentations of the agenda and activities, flipchart notes, post-it notes, white-board and paper descriptions, participants’ discussions highlighting and summarizing the main points. These materials captured the outcomes of

all activities and interactive conversations and thus promoted new understanding as participants were engaged in sensemaking.

### 3.3. Data analysis approach

All collected and recorded materials were organized and transcribed by the first author. Interview transcriptions were emailed to the interviewees allowing edits (Saunders et al., 2016); albeit none was suggested. The data from all sources were coded following the approach developed by Gioia et al. (2013), which was used to structure the data and guide the content analysis (see Figures 2–4). The second author coded part of the data to ensure inter-code reliability (Miles and Huberman, 1994). The Gioia method was selected, as a systematic approach to structure the data, in the form of data-driven coding steps, providing convincing evidence to support our conclusions (Gioia et al., 2022) as well as developing concepts and theorizing<sup>2</sup> (Herley and Cornelissen, 2020). In addition, it is a method that improves trustworthiness when researching unexplored concepts (Van Burg et al., 2022).

Following the principles of this process (Gioia et al., 2013), ‘first-order concepts’ (or informant-based codes depicting their experience in their own terms) (Gioia et al., 2022) were identified using open coding. Similar concepts were merged with thematically related knowledge, grouped into fewer categories (Klos and Spieth, 2021). This stage interpreted and explained the first-level findings, first by unpacking the meaning of relevant concepts and then by linking them to theoretical concepts grounded in organizational sensemaking theory. The codes were grouped and regrouped in multiple rounds to identify themes that explained the empirical data (Guiette and Vandembemt, 2013). Coding process was done manually without using any software. Next, we identified the relationships within the first-order themes and gathered them together within the second-order themes (or researcher-based themes providing a theoretical view) (Gioia et al., 2022) (see Figures 2–4 ‘second-order themes’ column). In other words, we developed a deeper structure of content and connections to reveal sensemaking concepts. This stage was iterative and abductive, navigating between the empirical data and sensemaking theory in the broad sense. After reaching theoretical saturation (Glaser and Strauss, 1967), we developed aggregated theoretical dimensions by assimilating the second-order themes to build a detailed sensemaking concept (see the ‘aggregate dimensions’ column in Figures 2–4) (Gioia et al., 2013).

## 4. Analysis and findings

By observing BMI development in the workshop and interviewing ComCo managers, we reveal that the uncertainties caused by 5G created fundamental changes. As a disruptive technology, 5G presents a range of threats and challenges, including ‘*uncertainties about long-term growth, governmental regulations, market potential, positioning within the value network, technology feasibility, technology investment (e.g., in network security), advanced and highly efficient operation*’ (area business unit director), as well as opportunities, such as ‘*a wide variety of services for a wide variety of customers and market segments. Thus, the key opportunity is to get closer to the end customer*’ (business-development director). Based on these threats and opportunities, ComCo redefined its target customers, moving away from an exclusive focus on MNOs (mobile network operators) and opening up its products and services to a wider public (e.g., universities, shopping malls, hospitals, arenas). ‘*Concerning the new 5G technology, the emerging small-operator business field (i.e., operators who own 5G networks) requires simpler solutions that last without maintenance*’ (mobile communications engineer).

In response to the research focus, three distinct phases disaggregated into eight underlying dimensions emerged from the qualitative analysis constructing the future-oriented sensemaking process: (i) *identifying uncertainties* which is aggregated into two dimensions including identifying and bridging the gap; gaining insight and situation awareness, (ii) *interpreting uncertainties* which is aggregated into three dimensions including structuring and connecting, organizing through communication; reducing uncertainties and (iii) *enacting on uncertainties* which is aggregated into three dimensions including value creation, value proposition, value capture; expanding products and services as well as creating internal changes. This phase manifests the new BM. Overall, a total of 27 codes were identified in the interview and observation transcripts.

### 4.1. Identifying uncertainties

In ComCo, it was evident that the emergence of 5G had created a new landscape for the industry; 5G was considered the most influential force shaping the organization’s external environment and required to explore if and how it should change its BM. ComCo’s managers singled-out 5G as a key ongoing event, involving multiple unknown factors. Figure 2 depicts the scheme for coding ‘identifying uncertainties’.

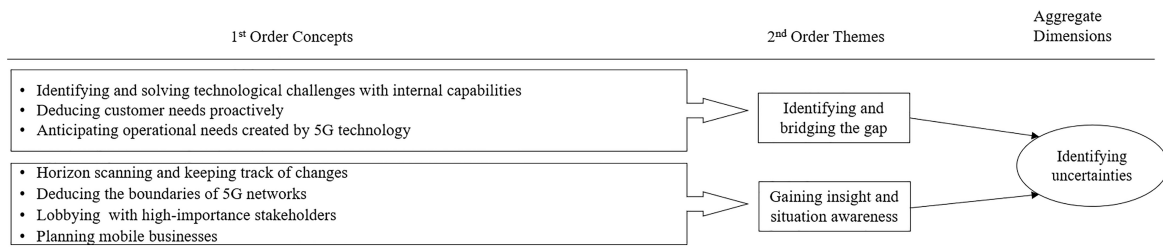


Figure 2. Identifying uncertainties.

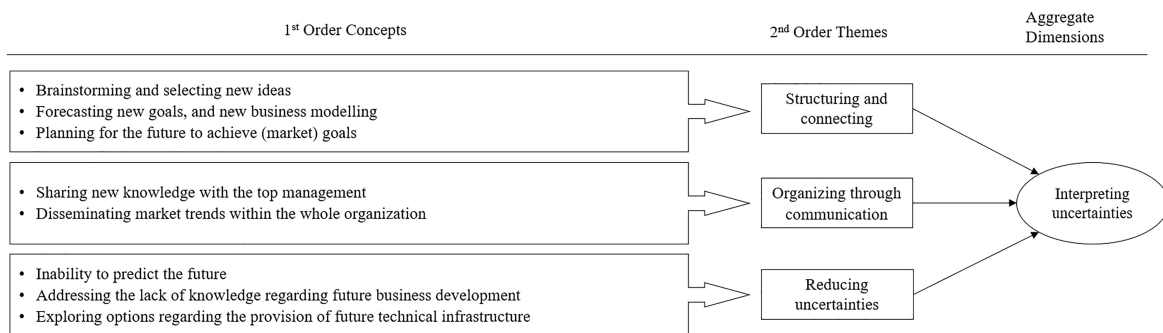


Figure 3. Interpreting uncertainties.

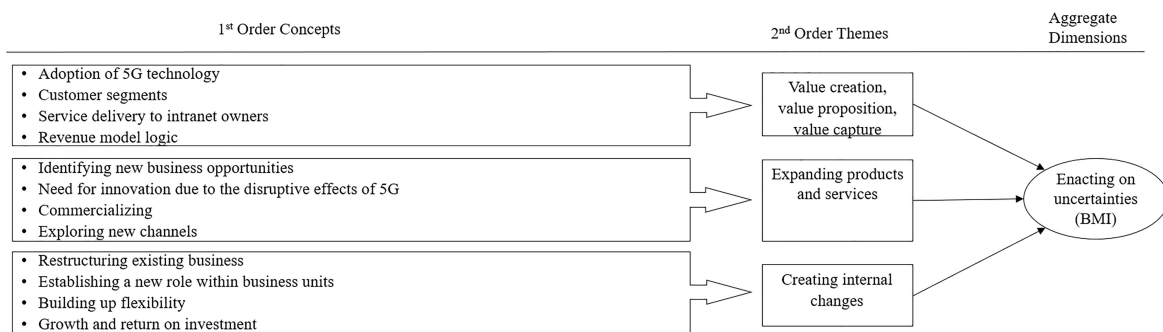


Figure 4. Enacting on uncertainties: The dimensions of business model innovation from the organization's perspective.

4.1.1. Identifying and bridging the gap

ComCo's managers perceived the transition to 5G as a trigger to sensemaking the new technology and how to take advantage of its potential opportunities. They viewed this process as *bridging the gap*. As one business development director commented, '[a]s market is changing through customer demand, the traditional model we are doing business with or getting our revenues from is drastically changing. Thus, we have to find opportunities outside of traditional telco operators.' To identify and bridge the gap, the managers held many discussions on identifying and solving technological challenges with internal capabilities. As a radio-access network engineer explained, 'there is a need for installation for all customers who have 5G networks. [...] We are able to find new interventions to respond to the situation. Therefore, we need to take

the lead to get to the next level.' This discussion led ComCo to *deducing customer needs proactively*. A product manager noted that, 'we try to be proactive in identifying new customer needs, e.g., indoor connectivity. In the 5G era, we have to serve much wider customer segments who are different from current MNO customers.' At the same time, there was a sense of realism in ComCo's future plans. All potential new products and services were filtered by *anticipating operational needs created by 5G*. An electrical and telecom engineer said, emphatically, 'we know that the hardware and antenna will change, and the technologies will be combined (e.g., cloud computing, edge computing, network softwarization, network slicing)' and that some anticipated changes and trends had to be considered.

#### 4.1.2. Gaining insights and situational awareness

As a consequence of future uncertainties and the impact of 5G, ComCo's managers needed insights to comprehend the situation better. The head of digital transformation explained that ComCo engaged in *horizon scanning and keeping track of changes*. '[...] we try to get as much information as possible from the environment and keep track of changes, scan the market and customers, and capture the best model to reflect the market.' A mobile-communications engineer suggested that managers found themselves discussing the ways to *deduce the boundaries of 5G networks*. One electrical and telecommunications engineer explained that *'5G spectrum allocation or usage is going to be shared rather than fixed and there will be IoT and different system integrations for service offerings.'* The discussions led to a proposal to consider *lobbying with high-importance stakeholders*, as *'operators are [characteristically] leading the discussion with ministries and related governmental decision-makers regarding regulation and broadband policy'* (mergers and acquisitions manager). At the same time, an area business unit director explained, *'[W]e are discussing and sharing thoughts mainly about mobile business, which is part of indoor business, and we are focusing on the mobile-access area to update the strategy on that specific area of strategic operations, since the market is different in each country.'* The strategy was concerned with *planning mobile businesses*.

## 4.2. Interpreting uncertainties

The *interpretation of uncertainties* is an aggregated dimension derived from three second-order themes. The themes in this dimension show how participants explored the uncertainty-caused disruption identified in the previous stage. Figure 3 presents the scheme for coding 'interpreting uncertainties.'

#### 4.2.1. Structuring and connecting

To make sense of the future and project ComCo's position within a 5G future, managers had to structure their knowledge of 5G technology and determine the interrelationships between their existing infrastructure and operations and a range of factors affecting their business. According to a product manager, this involved a lot of *brainstorming and selecting new ideas*. The brainstorming sessions were supported by background research, customer feedback, and expectations and *forecasting new goals and new business modeling*. As a business development director commented, *'We look for different business models or operating models – see earlier alliance models. Then, we must offer some new*

*models, calculations, and business cases for decision makers on how to approach the new mark.'* Ultimately, the interviews clarified that structuring and connection would lead to *planning for the future to achieve (market) goals*. A solution manager highlighted the planning needed to take advantage of emerging growth opportunities: *'We must figure out where we are now and know the steps to achieve the goals and targets (i.e., how we would utilize our assets) within the next 5 years. There is a huge and rapidly growing potential for indoor 5G connectivity during the next couple of years, where we can act as a strong player.'*

#### 4.2.2. Organizing through communication

During the interviews and workshop, ComCo managers clearly tried to make sense of the 5G disruption by developing a better understanding about environmental dynamism. In a characteristic quote, an area business unit director said, *'top managers get support from us (i.e., middle-managers); we have to collect information [...], as well as communicating our knowledge and learning to top managers and making sure they understand our views about where the market is going and where we would like to be, so that they can develop their ideas or strategies better.'* From such comments, this study has deduced the importance of *sharing new knowledge with the top management*. By the same token, a marketing and sales managers referred to *disseminating market trends within the whole organization*, explaining that *'we follow market trends and give organization updates regarding market changes. This provides inputs for people on the sales team to provide new sales models.'* This process ensures that the new direction is well-comprehended by everyone in the organization.

#### 4.2.3. Reducing uncertainties

Reducing uncertainties is essential when interpreting unfolding events. It was initially evident, particularly during workshop conversations that the participants were aware of their *inability to predict the future*. The solution manager articulated this view: *'There are so many uncertainties, we do not know what is really going to happen. We have to narrow our vision.'* On another occasion, the product manager said, *'it is hard to build a business case. We don't know how the license is going to be split for 5G networks e.g., 3.5 GHz will be probably used for commercial operators.'* Such statements clearly *addressed the lack of knowledge regarding future business development*. The business development director added the following comment, *'we need to learn from other technologies – do alliances with integrators and vendors and invest in network services,'* in reference to *exploring options regarding the provision of future technical infrastructure*.



### 4.3. Enacting on uncertainties

During the workshop, as the participants were reviewing their BM, they focused on the value proposition mechanism to accommodate the new planned business activities. It is worth noting that the new value proposition and proposed value creation and capture activities called for changes to the organization's internal configuration. Figure 4 presents the 'enacting on uncertainties' coding scheme which is materialized through BMI underlying dimensions.

#### 4.3.1. Value creation, value proposition, value capture (value-centric activity system)

The creation of a new value proposition centered around opportunities arising from the adoption of 5G technology. According to an electrical and telecommunications engineer, these opportunities can be in 'building network infrastructure and managing the quality and safety of network around the clock.' As 5G generates potential customers, the ComCo BM had to redefine its customer segments. According to the head of digital transformation, 'as the market is changing, our approach to finding new customers should be changed too.' In particular, there was much discussion about service delivery to intranet owners as the business development director explained, 'there is a need for small operators to provide infrastructure services for all operators.' Finally, the new value proposition took into consideration revenue model logic. The solution manager noted that 'market changes reduce the revenue from our current activities. So, what should we do to patch that up and also achieve some growth at the same time?'

#### 4.3.2. Expanding products and services

Efforts to innovate and expand the activities of the current BM are an essential aspect of BMI. To achieve this, ComCo managers engaged in conversations to identify new business opportunities. As the area business unit director explained, 'We are looking for new opportunities and activities, capturing new services within existing contracts and grabbing different things on the side'. These conversations identified the need for innovation due to the disruptive effects of 5G. The product manager emphasized the innovative qualities of the new BM: 'we are currently stepping out of our regular box. 5G is really changing the playing field for us and you cannot always just copy and paste'. The innovative ideas discussed by the solution manager included the following: 'becoming a small operator ourselves; generating content; providing a network, platform, and data as a service; selling our knowledge in the field'. Thus, they created new value propositions, which altered

the BM and required new plans for commercializing the value propositions. To provide network-as-a-service indoors, for example, it was necessary to have a sustainable financial model. The discussion about ways to commercialize the new value propositions within ComCo put pressure on the organization to explore new channels of distribution in order to reach customers. As the marketing and sales manager acknowledged, 'we are trying to find new channels at the national and Nordic level'.

#### 4.3.3. Creating internal changes

To support all the innovations introduced when value propositions are renewed, BMI necessitates internal changes. The internal changes took the form of restructuring existing business and establishing a new role within business units. According to the head of digital transformation, 'we have gone through quite a lot of big changes recently. We mixed mobile and fixed business units, and introduced a new role called "solution management" in the business communication unit, which helps to create strategies that are detailed enough to be easily followed.' The interviewees were conclusive about the need to build up flexibility within the infrastructure of the new BM to ensure that all the changes would help to achieve growth and return on investment. According to the mergers and acquisitions manager, 'we are trying to build up flexibility in the organization so that we have the most critical parts of the operations inside, can react to volume changes rapidly, and achieve internal growth effectively and profitably. We are growing in the "power" segment currently.'

## 5. Discussion and conclusion

In this article, we have analyzed how an established telecom organization confronted with uncertainties developed a new BM. In particular, we investigated how disruption associated with emerging technologies caused uncertainties and triggered BMI. Sensemaking theory argues that it is future-oriented type of sensemaking that plays a role in BMI. By making sense of uncertainties inherent in disruptive forces and an unknown future, organizations can break away from narrow innovation (Webb, 2020).

As our analysis showed, ComCo focused on and addressed the impact of 5G. The interviews revealed members of the management team realized that 5G (as an uncertainty) would disrupt ComCo's industrial and market environment. The interviews conveyed participants' perceptions and uncertainties about 5G. These were shared in the workshop to develop a collective understanding, in order to identify

opportunities and threats. The need to explore what the future might hold for their industry became a creative force and enabled necessary changes to ComCo's BM. Three distinct phases of managing uncertainties were unveiled, which indicate the future-oriented sensemaking process. Initially, the triggering issue (5G technology) was noticed and singled out (Weick et al., 2005) from among various uncertainties, as its impact was imminent and hard to readily interpret. Then, bracketed (Chia, 2000) by reflecting on the changes in the organizational environment. The bracketing was forward-looking, answering the 'now what?' – question (Weick et al., 2005).

The first phase involved identifying uncertainties (Weick, 1995; Maitlis and Lawrence, 2007) associated with 5G. During this phase, managers identified uncertainties by detecting signals in their environment at both general macro and industry levels, and gained understanding by collecting information about the market and customer needs (i.e., *identifying and solving technological challenges with internal capabilities; anticipating operational needs created by 5G*) and then they developed representations of the collected information which constituted explanations that enabled understanding of complex issues. Through interactive talks (Barr et al., 1992; Klein, et al., 2007), these representations were utilized to bridge the gap in knowledge which in turn enabled the managers to gain insights; be aware of the uncertain situations (i.e., *deduce the boundaries of 5G networks*) and anticipate specific actions in response (i.e., *lobbying with high-importance stakeholders; planning mobile businesses*). Interactive talks can enhance understanding and create a medium for common knowledge creation, application, and establishment within an organization in a shared and collective way (Patriotta, 2003). All dimensions in this phase are concerned with an anticipation of the future.

The second phase wove together and interpreted the dimensions of uncertainty along with existing knowledge and experience into emerging discussions. This phase corresponds to Stigliani and Ravasi's (2012) articulation stage; as in this phase, there were structuring and connecting efforts with the aim of understanding and finding connections among entities and putting a frame around uncertain issues (Klein et al., 2007) (i.e., *brainstorming and selecting new idea; planning for the future to achieve (market) goals*). The interplay between examining and understanding the future regarding 5G uncertainties concludes when *'the initial cue is interpreted and the differences between the expected and the employed frame are reduce'* (Gattringer et al., 2021, p. 655).

This allowed managers to reduce the obscurity surrounding necessary decisions and thus act more effectively by making informed choices (Kaplan and Orlikowski, 2013). Organizing through communication, on the other hand, was an ongoing task and a core component of the sensemaking process. Communication occurred through interactive talks, using language to formulate and exchange representations of particular circumstances (i.e., *sharing new knowledge with the top management; disseminating market trends within the whole organization*) and created the basis for action. This suggests that patterns of organizing can be discovered from conversations and actions (Weick et al., 2005).

In general, uncertainties signify lack of knowledge and understanding about the future or the outcomes of an action i.e., an individual is not aware of any explanations (Weick, 1995) (i.e., *lack of knowledge and inability to predict the future*). Uncertainties make rational decision-making challenging and to ameliorate this problem more information is required. Managers, in our case study, constructed the required information through face-to-face interaction and sharing perceptions. They progressively created meanings by means of discussion and joint interpretation (Weick, 1995). As meanings and images were constructed to cope with these uncertain issues, the managers could overcome the constraints on their ability to prepare for an unknown future and were able to seize opportunities overlooked by others. Arguably, this process can lead to valuable organizational outcomes, such as innovation (Neill et al., 2007). These dimensions (i.e., *identifying and bridging the gap; gaining insight and situation awareness; structuring and connecting, organizing through communication, and reducing uncertainties*) emerged as the interrelated cycles of cognitive work. They naturally occur and mutually reinforce each other, making it possible to analyze and interpret contexts characterized by disruptions and uncertainties and lead to transforming existing BMs' schemas. Like the previous phase, all the dimensions of this phase were future-oriented as there was forward-looking anticipation of uncertainties and none was involved in looking back or retrospection.

By making sense of uncertainties and identifying a course of action to prepare and provide a direction for anticipated changes in the external environment, ComCo was able to move to the third phase which was labeled as enacting on uncertainties (Maitlis and Christianson, 2014), comparable to Stigliani and Ravasi's (2012) elaboration stage. This phase involved the development of a new BM and future BM activities i.e., *new value-based business activities, expanding products, and services, and creating*

internal changes in response to anticipated changes. ComCo's conceptualization of BMI aligned well with the dominate view in scholarly literature (Casadesus-Masanell and Ricart, 2010; Teece, 2010; Zott and Amit, 2010; Amit and Zott, 2012; Clauss, 2016; Tykkyläinen and Ritala, 2021). In other words, managers at ComCo perceived BMI as a new way of organizing BM activities, entailing a different logic of value creation (through technologies and equipment i.e., *adoption of 5G technology*), value proposition (through offerings, customer segments/markets i.e., *service delivery to intranet owners*), and value capture (through *revenue model logics*). This value architecture delineates how an organization senses, generates, distributes, and captures value. The core activities involved developing new products and services (by *identifying new business opportunities*; addressing *the need for innovation due to the disruptive effects of 5G*); monetizing the value (by *commercialization*) as well as preparing the infrastructure for production and distribution (by *exploring new channels*). These building blocks and dimensions are closely and dynamically interrelated (Li, 2020). ComCo's new BM activities also necessitated internal changes (Sosna et al., 2010; Khanagha et al., 2014) in procedures, practices, structures, and processes (e.g., by *restructuring existing business; establishing a new role within business units; building up flexibility*) and required organizational alignment to generate value (Basile and Faraci, 2015). The internal changes occurring in response to developing a new BM would enact and support the implementation of the new BM and enable the organization to remain actionable in the market (i.e., *gain growth and return on investment*) (Schneckenberg et al., 2016; Laasch, 2019).

In conclusion, as shown in Figure 5, the three phases together display how BMI emerges from the future-oriented sensemaking process (Gioia et al., 1994; Gephart et al., 2010; Stigliani and Ravasi, 2012) while managing the uncertainties caused by technological disruption (Gattringer et al., 2021). It also illustrates the dimensional dynamics underlying future-oriented sensemaking mechanism (George and Bock, 2011) where BMI begins to form.

### 5.1. Contribution to scholarship

Previous research argued that organizations encountering with exogenous shocks used BMI as a response to cope with volatility and uncertainty (Schneider, 2019). In this paper, we extended and deepened the understanding on how the anticipated

technological disruption induces managers to manage the uncertainties during the development of new BMs. This resulted in identifying future-oriented sensemaking mechanism and its cognitive constitutive dimensions that underlie BMI activities. On that account, we generated a 'new intellectual insight' (Sandberg and Alvesson, 2021, p. 491) about BMI and its underlying system and the 'hows and whys of the phenomenon' (Gioia et al., 2022, p. 234). This extends the BMI literature by demonstrating that BMI is specifically engaged with future-oriented type of sensemaking (process) rather than just acknowledging the sensemaking concept as a capability (e.g., Akgün et al., 2012) or as an interpretive view of cognition in relation to BMI research (e.g., Schneckenberg et al., 2021). Furthermore, we not only attempted to extend BMI theories on antecedents and facilitators of BMI (Foss and Saebi, 2017) but also contributed to a few empirical studies on future-oriented sensemaking by developing a grounded framework that illustrates the specific composition and order (Sandberg and Alvesson, 2021) of this less inspected and undertheorized form of sensemaking in BMI research, enhancing our understanding of BMI multifaceted and complex nature.

Applying process-narrative (Cloutier and Langley, 2020) as a 'general sequence of events' (Cornelissen, 2017, p.10) for theorizing makes two main contributions: it reveals the way in which future-oriented sensemaking takes place (i.e., what constitutes the process of identifying uncertainties, interpreting uncertainties, and enacting on uncertainties), while also contributing to the BM literature by describing how BMI emerges under conditions of uncertainty and how it is systematically facilitated through future-oriented sensemaking process as an explanatory mechanism (Maitlis and Christianson, 2014). In addition, it was deduced that BMI, driven by technological disruption, is likely to require processual changes in order to cope with the uncertain future. Regarding R&D management research, our study confirms that technological uncertainties and engaging in external environment is strategically critical to R&D management because it provides the setting for developing new products, services, and BMs. Our framework contributes to R&D management by explicating how to inform technological uncertainties and effectively build futures-oriented sensemaking process into innovation and hence it improves the environmental performance of products. This also addresses the need for methods/frameworks for effective R&D management (e.g., Enkel et al., 2009).

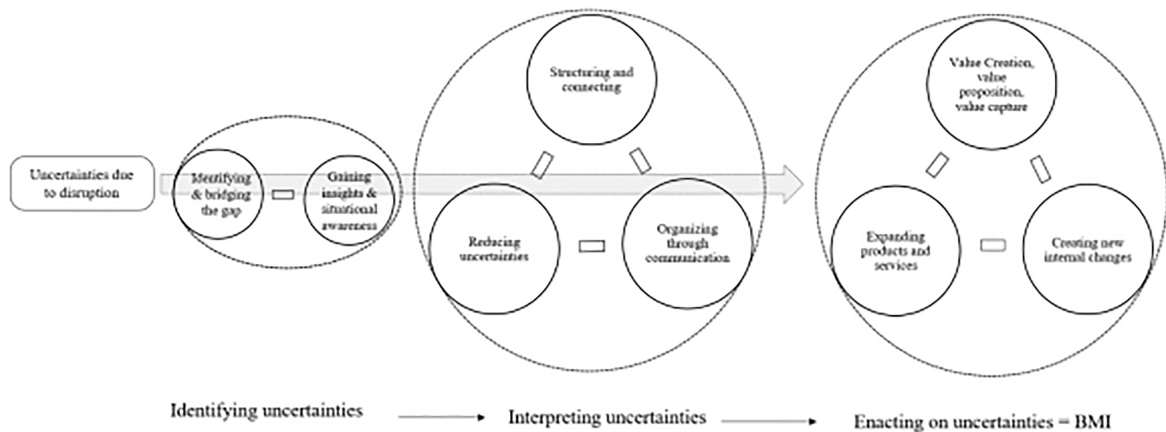


Figure 5. Business model innovation (BMI) emergence from the future-oriented sensemaking process.

### 5.2. Contribution to practice

Our findings include specific recommendations for strategy and R&D managers, particularly those updating their BMs or confronting disruptions in their industries. By showing how to identify uncertainties, how to interpret uncertainties, and how to enact on uncertainties, managers can systematically handle technological uncertainties and construct an understanding of emerging changes. Our framework enhances managers’ capacity to proactively act on those uncertainties by defining a new market landscape through their BM. As a result, they can have a leading role in creating their future (based on a shared understanding) and sustain their performance in fast-changing environments.

In addition, through this framework we disclosed that BMI and evidently R&D management processes start with encountering environmental uncertainties and identified the vital importance of identifying and bridging the gap in knowledge; gaining insight and situation awareness; structuring and connecting information as well as communication and information-sharing across the organization for making sense of and managing uncertainties. Accordingly, we would like to encourage managers to embrace uncertainties and respond to them systematically, instead of avoiding them. Our research shows that the nature of disruptive changes requires collective action with regards to BMI, in order for the uncertainties to be investigated and understood. Managers have to realize that this shared understanding will help them identify the opportunities and threats from the future which have to be addressed as part of BMI, deducing what products and services have to be developed and what positioning has to be adopted. Using our framework as a guideline for making sense of future uncertainties, organizations can make more

informed decisions on when and how to engage with BMI and direct their R&D activities. In this way, an organization can grasp the manifold and often incompatible aspects of the environment and begin to move forward while developing adaptive responses.

### 5.3. Limitation and future direction

Using an in-depth qualitative case study of a Nordic telecom organization facing the disruption of 5G, we investigated BMI uncertainties and how to manage that. The findings shed light on the overlooked links between future-oriented sensemaking and BMI in the context of technological disruption. Although, focusing on a single in-depth case study made it possible to observe and analyze the responses of managers confronted with 5G disruption, it clearly cannot ensure complete generalizability. Similarly, the contextual characteristics of this case including large organization, telecom sector, and dealing with 5G may have affected the findings. It is anticipated that BMI in smaller organizations with less resources available may not involve such collaborative interventions. Moreover, other technological disruptions, like VR, may take longer to unravel than 5G, which could affect how BMI is developed. Therefore, we call for research in this field particularly, different types of organizations, exposed to different uncertainties to verify, extend, or refute the findings of this study. Also, we call for longitudinal investigations to examine the impact of uncertainties on BMI, at both individual and organizational levels. We believe this effort will result in providing additional vivid aspects of future-oriented sensemaking around BMI development. Ultimately, we invite BMI and R&D management scholars and practitioners to seek new approaches and apply novel methods (e.g., scenario

planning) for managing the uncertainties of innovation processes.

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## Conflict of interest

None.

## Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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## Notes

<sup>1</sup>ComCo is a pseudonym.

<sup>2</sup>Considering the choice between different qualitative analyses: Eisenhardt et al. (2016), Langley’s (1999), and Gioia et al. (2013) methods, we selected the latter as it allows to explore the structure of the concepts and their interrelationships (Gehman et al., 2018) which fitted with the research question of this study.

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