The Metacognition Underlying Radical Business Model Innovation: Four Case Studies of Individual Criticism

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Abstract

This chapter explores the role of individual cognitive abilities in the radical innovation of business models and their value proposition. The focus on a specific cognitive construct – metacognition – contributes to understanding the specificities of "criticism," an approach relevant to addressing the challenges of the radical innovation of value drivers. Based on empirical data, this exploratory research identifies the characteristic elements of criticism from a metacognition perspective, pinpointing the key moments and attitudes of innovators, i.e., cognition of own cognition. The analysis of the findings shows that successful innovators are able to leverage the perception and control of own cognition to more effectively develop and negotiate the radical innovation of the business model in their organization, going beyond the dichotomy between rational and affective mental states. This chapter concludes with a discussion and future research outlook.

Keywords: Radical innovation; value drivers; business model innovation; metacognition; criticism; case studies

In this chapter, we explore the role of individual cognitive abilities in the radical innovation of business models and their value proposition, taking a specific perspective on innovation enhanced by "criticism."

Applying an established construct from the cognitive sciences to the literature on the foundations and processes of the radical innovation of value drivers and the role of individual innovators, we contribute to knowledge on radical business model innovation. The research is explorative in nature, aiming to shed light on a promising intersection that has yet to be extensively studied and unveiling areas for further research and theory development (Handfield & Melnyk, 1998).

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Specifically, this chapter explores the role that individual metacognitive abilities play in the process of developing radical innovation. This research builds on a wide and growing body of literature on cognitive abilities and skills supporting innovation and business models. However, to the best of our knowledge, this is the first exploration of how metacognition might support the microfoundations of criticism in innovators and professionals. In fact, most studies at the intersection of cognition and innovation have thus far focused on ideation and creativity skills for (incremental) innovation and the ideation and problem-solving process (e.g., Ward, 2004), leaving criticism and judgment abilities rather underexplored. This is all the more surprising given the uncertain quality and reliability of information and sources on which managers can rely in their decision-making, the weight that cognitive biases and cognitive overload demonstrably have on thinking processes and decisions (Schwartz, 2004), the challenges that technologies pose, the ability to increase and access the number of potential ideas (Verganti, 2017), the growing obsolescence of skills, the relevance of learning strategies for individuals' lives in general, and for professional activities in particular (Autor, Levy, & Murnane, 2003).

This chapter is structured as follows: Section 1 describes the relevant literature from both sides of this interdisciplinary work. Section 2 illustrates our conceptual framework and introduces the key cognitive construct adopted, as well as the overall research methodology. Section 3 illustrates the key findings from the data. Section 4 discusses the results and managerial implications, while Section 5 concludes with the limitations and avenues for future research.

1. Value Creation, Value Capture, and the Key Role of Criticism

According to the comprehensive literature review of Zott, Amit, and Massa (2011), business model studies follow five value dimensions: value networking, value creation, value proposition, value delivery, and value appropriation. In this chapter, we assume a business model innovation and technology management perspective where the main efforts of entrepreneurs and executives engaged in new business model design and development concern *value creation* (Zott & Amit, 2010).

Furthermore, contributions to business model *innovation* have been traditionally limited to incremental innovation (i.e., new formulations of existing value drivers) enabled by strategy-making processes (Ghezzi, Cortimiglia, & Frank, 2015; Schneider & Spieth, 2013). In this respect, Ghezzi et al. (2015) show that business model innovation has become a relevant research field, even though no precise definition is provided. Business model innovation may refer to business model design (entrepreneurs/managers designing new business models from scratch) or business model adaptation (entrepreneurs/managers adapting existing business models with different levels of innovativeness). With reference to the models of Zott et al. (2011) and Osterwalder and Pigneur (2010), we focus particularly on the *value proposition* dimension and the underlying value drivers that best capture the source of innovation in the business model canvas.

With regard to value drivers, there is widespread recognition that the competitive environment in different industries (also due to technological advances) poses more and more challenges for managers to innovate the value drivers and achieve a sustainable competitive advantage through differentiation, decommoditization, and customization (Kano, Seraku, Takahashi, & Tsuji, 1984; Pine & Gilmore, 1999; Porter, 1980). With the aim of supporting businesses in pursuing this differentiation path and gaining a long-term competitive advantage, radical innovations that set new standards and paradigms are proven more effective than engaging in incremental innovations alone (O'Connor & Veryzer, 2001; Reid, Roberts, & Moore, 2015). Indeed, by introducing new standards, radical innovations protect against the commoditization of products and services, which might in part rely on technological advances, but are first and foremost a function of the innovation's ability to pull together the technology, the customer base, and the complementary assets (Schilling, 2017), hence a business model perspective on an organization's ability to create value.

We focus on the radical innovation of value drivers as a key element of gaining a sustainable competitive advantage, taking a design-driven innovation approach to envisioning radical innovations (Verganti, 2009, 2017). According to Schilling's (2017, p. 48) definition, radical innovation is "an innovation that is very new and different from prior solutions," whereas incremental innovation is "an innovation that makes a relatively minor change from (or adjustment to) existing practices." The design-driven approach distinguishes innovation of meanings and directions from innovation of solutions. The former is radical, the latter is often incremental. Examples of radical innovation and their respective business models and partner alliances in this sense include Starbucks, Nest, and Nintendo Wii (Dell'Era & Verganti, 2010; Pinto, Dell'Era, Verganti, & Bellini, 2017; Verganti, 2009). Working on meanings enables entrepreneurs and executives to identify new value drivers, since a radically innovative value proposition does not solve existing problems (*how*) but opens up new paths, offering people a more meaningful experience (*why*), satisfying basic aspirations, emerging values, those unexpressed and unarticulated. In this sense, the authors refer to meaningful innovation or innovation as a way of creating meaning. For example, in 2006, Nintendo released Wii and instead of powerful graphics provided a benefit that was not explicitly requested: the ability to play by moving; in the 1980s–1990s, Starbucks launched a new coffee retail experience in the United States: a sense of community in a third place between home and work; in 2012, Nest launched a learning thermostat not to control the temperature but to enjoy a warm home without the need for control.

Verganti (2017) shows that new meanings have value both for people and businesses, incorporating the value creation (value for people) and value capture (value for business) dimensions in a new business model. The radicality of the innovation driven by meanings often translates into a new product-service category or setting a new standard. In being radical, design-driven innovation is positioned within the research and literature streams to which the Blue Ocean Strategy (W. C. Kim & Mauborgne, 2014), Value Proposition Design (Osterwalder, Pigneur, Bernarda, Smith, & Papadakos, 2014), and Disruptive Innovation (Christensen, 1997) pertain.

From a managerial perspective, "envisioning" new value drivers (valuable to people) has become a key challenge. The abundance of available technologies, solutions, information, and the cognitive effort linked to selecting solutions and managing providers is considered relevant issues in the management literature (e.g., Schwartz, 2004; Verganti, 2017). However, ideation and creativity can only contribute to innovation up to a certain point. Moreover, organizations are now largely equipped with tools that enable their people to be more creative (e.g., design thinking). More and more, a critical attitude and judgment rather than the deferral of criticism and brainstorming are emphasized, the latter helping with the incremental innovation of solutions, but not supporting radical innovation.

Starting from Verganti (2009, 2017), we consider the key characteristics that set radical innovators apart from incremental creativity-driven teams:

- Output: visions vs ideas; proposals vs answers
- Process: depth vs speed; experimentation vs brainstorming
- Assets: knowledge vs methodologies; scholars vs newbies
- Key Performance Indicators (KPI): robustness of vision vs number and variety of ideas

These characteristics contribute to an innovation approach that is supported (but not limited) by criticism through taking critical stances in innovation discussions and processes:

> Criticism is the way to *challenge* our own cognitive frame; it's the way to question how we make sense of the environment. (…) Criticism indicates *the practice of going deeper* when interpreting things. (Verganti, 2017)

Despite widespread recognition that different cognitive models shape the ideation and creativity processes, little is known about the cognitive underpinnings of criticism that are relevant for the radical innovation of business models. Moreover, criticism helps in designing effective tools for the empirical inquiry of individual executives facing relevant experiences in designing the radical innovation of business models.

Looking more broadly at innovation and not only at the development of new value drivers and business models, interdisciplinary contributions leveraging the cognitive sciences have largely focused on creativity and ideation (e.g., Dietrich, 2004; Weisberg, 2010), under the assumption that such processes are fundamental to spur innovativeness and proactivity within organizations (Kelley & Kelley, 2013).

Scholars have long referred to the cognitive sciences literature to inform and support managerial decision-making and innovation processes and practices. Starting from the first conceptualizations of bounded rationality and the cognitive limitations of rational actors (Simon, 1957), the impact of biases on decision-making and the exploration of different thinking systems (Gilovich, Griffin, & Kahneman, 2002; Kahneman, 2011), and risk-perception and loss aversion (Kahneman & Tversky, 1979), ample studies testify to the fecundity of

interdisciplinary work between the cognitive sciences and management/economics. Other contributions from the cognitive sciences have more specifically focused on business models as cognitive constructs per se (Doz & Kosonen, 2010) or schemas helping managers visualize and organize value linkages (Furnari, 2015). In general, however, key contributions at the intersection of the cognitive sciences and business model literature have focused on the schema itself, while embryonic research focuses on the antecedents of business model design, such as attention (Frankenberger & Sauer, 2018).

With this chapter, we aim to focus on the traits of radical innovators, using the cognitive sciences to provide an edge not inherent in other approaches. Thus, the key research question explored in the chapter is:

> How can cognitive constructs help better define and pinpoint the criticism attributes of radical business model innovators?

2. Conceptual Framework and Methodology

For this study, we reviewed existing literature at the intersection of cognitive sciences and management to narrow down the scope of potentially explanatory constructs to further investigate. We have also reviewed the adjacent cognitive sciences literature to explore constructs not yet embedded in the management and innovation disciplines to expand the horizon of potentially constructive interactions between the two disciplines and deepen understanding of the cognitive microfoundations of "criticism" for innovation.

Research on individual cognitive styles (De Visser & Faems, 2015) and team cognitive styles (Büschgens, Bausch, & Balkin, 2013; De Visser, Faems, Visscher, & De Weerd-Nederhof, 2014) shows important interdependencies between cognitive constructs and managerial/entrepreneurial performance and with regard to radical innovation. Another relevant and adjacent research stream related to criticism and the construction/processing of the innovation funnel derives from the dynamic capabilities and absorptive capacity literature (Berends, Smits, Reymen, & Podoynitsyna, 2016; Helfat & Martin, 2015), focusing on cognitive elements supporting flexible strategic thinking and the ability to effectively and speedily move between fast and slow thinking (Laureiro-Martínez & Brusoni, 2018; Wrona, Ladwig, & Gunnesch, 2013).

The concepts of learning and learning strategies are necessarily explored in relation to dynamic capabilities and absorptive capacity. However, much of the literature embeds such concepts in the "fail fast, learn fast" landscape, positioning the innovation of value drivers as an agile or prototyping-close activity.

While this is relevant for a series of successful innovations, radical innovation based on meanings and criticism does not start with speed and agility but with reflection. This prompted us to search for a construct and an understanding of learning that could encompass reflection more than action. To do so, we explored the relevant literature on education studies and psychology identifying "metacognition" as a promising construct to explore as a contributor to radical innovation processes.

While cognition refers to first-order thinking and intellectual enterprise, metacognition refers to second-order reflection – thinking about the thinking. We refer to the seminal work of Flavell (1976) and consider metacognition as the knowledge and cognition of cognitive experiences, both intellectual and affective. Metacognition is traditionally recognized as a function of two different abilities: monitoring and control (Perfect & Schwartz, 2002). Effective metacognition enables effectively controlling and steering one's own thinking, opinions, thinking strategies, and inferences.

Wide research on the metacognition concept has been undertaken largely on students, linked to learning abilities and strategies, but some research also considers the impact and role of metacognition on firms and managers (e.g., Haynie, Shepherd, & Patzelt, 2012; D. Kim & Lee, 2018; Rhodes, Lok, & Sadeghinejad, 2016), highlighting the interesting contribution of metacognition abilities to firm performance.

Based on the identification of this construct, we put forward an exploratory study. Fig. 1 summarizes the conceptual framework that guided our research, inspired by Sund, Galavan, and Brusoni (2018) in its three levels.

The analysis explores the cognitive elements by referring to three different levels of cognitive processes: the individual, team, and organizational level. In each case, the unit of analysis is the innovator's thinking and particularly his/her criticism.

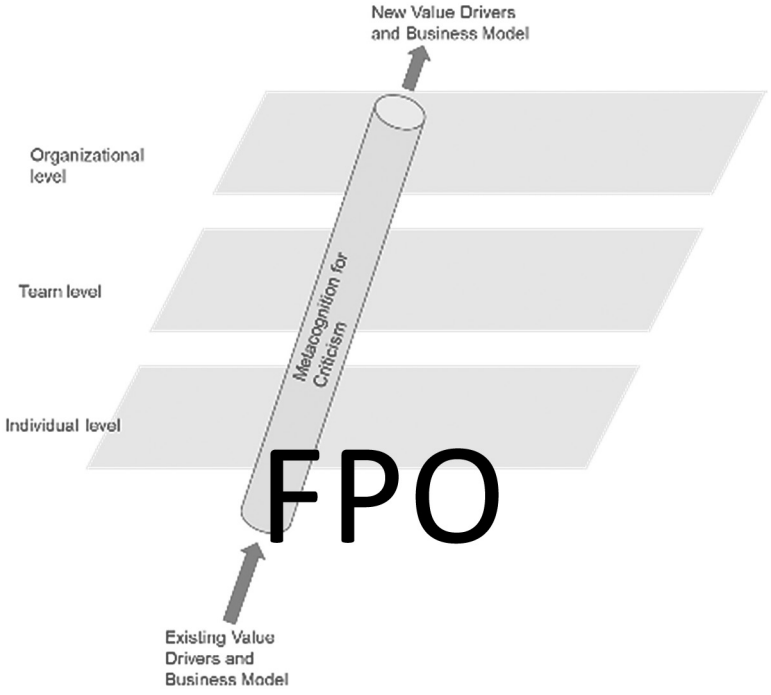


Fig. 1. The Conceptual Framework.

To this end, we conducted an explorative study aimed at understanding the possible boundaries and characteristics of criticism in the radical innovation process and the role of a specific cognitive construct in understanding its use.

In particular, we investigated four cases of radical innovation of value drivers (Company Alpha in the semi-conductor industry, Company Beta in the luxury-fashion industry, Company Gamma in the banking industry, and Company Delta in the grocery industry), together with the individual lead innovator's story. The case study methodology enables shedding light on scarcely explored areas for a first investigation of the criticism phenomenon (Handfield & Melnyk, 1998). For each case, we reviewed secondary sources on innovation and execution and the involvement of key informants in the business model innovation itself. Moreover, we conducted interviews with the four leading innovators (semi-structured, followed by content analysis; Atteslander, 2006) to explore the role of metacognition in their processes. We selected the cases based on the innovators' successful implementation of radical changes in the value drivers and value proposition of their business model.

3. Results from the Case Studies

This section provides an overview of the four cases and describes the findings from the innovators' interviews.

Case	Industry	New Value Proposition	Innovator
1. Case Alpha	Semi-conductors	The sensor as a value platform for new products and services for business customers and end users	Alpha (CxO for R&D)
2. Case Beta	Banking	Fully digital private banking services as an independent value platform for financial services providers and investors	Beta (Founder)
3. Case Gamma	Luxury fashion	The omnichannel retail service as new value platform for brands, store team, and customers	Gamma (Head of Digital Innovation)
4. Case Delta	Grocery	The grocery store as new value platform for collaborative services and new relationships between farmers, food companies, and end users	Delta (Head of Digital Innovation)

We operationalized the three modes of criticism at the individual, team, organizational level by asking the interviewees to reflect on their radical innovations and identify key moments according to the three types: individual moments of reflection on the innovation; moments of reflection and discussion with their team; and moments of discussion or reflection with organizational stakeholders,

both internal (other departments) and external (customers, partners, suppliers). The scope of the innovation on which they were asked to reflect encompasses both the value creation (definition of new value drivers) and the value capture dimensions (design and execution of the new innovative business model).

A. Individual Reflection

All interviewees recalled moments of individual innovation thinking where they elaborated and advanced key ideas. The individual moments, often devoid of organizational constraints or structure, frequently related to deep reflection, clarifying the idea or argumentation, critical review, and *synthesis*. These are reportedly not moments to scout new ideas or inspiration but moments to reflect on the large amount of information either available in the world or provided by their teams, and on which they needed to make decisions as managers or decision-makers. The word "synthesis" was frequently recalled to describe the activity:

> […] moments of synthesis, and of focus, of what you already have … (Alpha)
> […] trying to create some mental order … (Alpha)
> […] It's been a process of long synthesis and cleaning of all that which we represent for customers and affiliates … (Delta)
> […] There have been different, subsequent integrations … It was not like Paul on his way to Damascus (*to arrive at the new model*), there have been different pieces which have grown over time. I decided to take my time and my curiosity … I realized that I did not like the world of finance anymore, I wanted to take the conflict of interest out of it … I then had different moments with someone who was helping me to focus, to give more to a construct … (Beta)

In these individual moments, managers did not reflect on single problem-solving instances, but were asked to identify moments relevant for the radical innovation they were working on. In Case 4, particular attention was given in the innovation process to the organization's core activities and resources to allow deep "cleansing" of a (back then) very unclear and crowded value proposition.

Such synthesis involves the ability to understand the value and correctness of the information and idea available to oneself, distinguished from unclear thinking processes and potential fallacies:

> […] one knows what one knows … (Alpha)
> […] I have entered a loop-circle several times, at the individual level, between cause and effect, means and ends … (Delta)
> […] Today that there is such an excess of information, I mean … I do not save all emails, I try to remember through a double step, I fix in my mind the content, the person that has shared the information … (Alpha)

> […] It's an immediate thing. Usually, I do not immediately understand or appreciate the stimulus, I do not understand it completely, I asked to tell me again, and I realized that there was something interesting in there. It's not exactly a strategy, it's hidden, it's more something that comes up automatically when there is something that makes me change my way of thinking … I had taken for granted that I needed to choose between a dilemma, and then I felt that there was (*in what someone was saying*) something that was changing the rules of the game, more than a strategy, it's an external stimulus because it tickles me, it seems counterintuitive, and I see some space to work on it. (Gamma)

Moreover, deeper moments of reflection are linked to the meaningfulness of the innovation undertaken, as one interviewee described:

> […] you are pushed into thinking a bit, and if you are really taken by the project – and a project takes me if I am really changing something meaningful, then in that moment I really think in depth about that thing … I see something and reconnect it to the project I am doing … This thing only happens I think if you are very much deeply involved … I start to think about everything in a different way … (Gamma)

Managers develop their own strategies to support them in innovation thinking, for instance, avoiding being subject to the argumentation of others and critically reflecting on their own thinking position – an ability that requires the support of the two key metacognitive *monitoring* and *control* functions:

> […] I think that if you know the whole iceberg then you are automatically influenced, you follow the argumentation of the other, but if you know only the tip of the iceberg you connect the dots in a different way … (Alpha)

Such awareness allows taking actions and prevents being subjected to own confirmation biases or those of others by critically thinking about different sources and the informants they might involve to double-check their position:

> […] It's a little demonstration via negation, I need to find something that is against my own thinking … (Alpha)

Metacognitive abilities, such as recognizing own fallacies in thinking, also support communication and sharing with the rest of the team:

> […] I then recheck the whole mental process I went through in my mind, with variations so that I can adjust the direction. Obviously,

> at that point I need to convince, to explain to those who work with me why I had doubts, why I changed my mind, and then I bring some explanations, and from the discussion a shared understanding usually arises … (Gamma)

B. Interactions with the Team

In situations where managers take the lead in decision-making while working with their teams, without the constraints of other stakeholders, meetings often take the form of "challenging" and development sessions:

> […] your thinking divides into two parts … on the one hand, you are following the discussion and the different inputs that you receive, on the other hand, you keep on thinking on your idea or on that emerging from the discussion, and I notice this thing because it happens often in these discussions, if there is something very different (*that emerges from the team meeting*) then I need concentration, I need to stop everyone and say you all stop, I didn't get it, explain it to me again because I was thinking as if it was an individual phase but with input continuously arriving … It's not the usual meeting where you listen to others and are concentrated on how you reply, on how to defend your opinion, in these meetings there is still a creative process ongoing … (Gamma)

This again requires being able to monitor and *differentiate* (Semerari et al., 2012) one's own mental state by recognizing that own beliefs and mental states might be subject to personal lenses and fallible, subjective interpretation – both their own and those of others with whom the innovators engage:

> […] My role in these meetings has been double … (*the second one*) being a bit of a disruptor, when I see them too convinced I challenge them, and if their ideas still hold true then good. I rarely enter a meeting and follow the rational flow that they have prepared, because I assume that theirs is correct. If by following another flow the result is the same, good, if not then it means there was a bug … (Alpha)

In this case, the innovator's role is again to maintain the direction and promptly identify possible fallacies or mistakes in the proposals of others and stimulate them into going deeper.

With his/her own team, the innovator is often aware of the different thinking styles and cognitive preferences of colleagues:

> […] but it's ok (*that we have different approaches and disagree*). He then moved on and became a teacher, it was his natural dimension. Less stressful. Fewer decisions between head and gut … (Alpha)

This ability assumes the manager's capacity to distinguish between the "proof" and the team's argumentations, and his/her own role to challenge and prompt them to go further, while not forgetting the dual value creation and value capture dimensions:

> […] My role was steering toward a conclusion … it's not that we have this meeting, then we have another one, and so on … there are no more. Trust your gut, use your cognition to the best (*to make a decision*), one week more or one week less will not change your life … (Alpha)

C. Interactions with Stakeholders (Internal and External)

The particularity of interactions with internal or external stakeholders necessary to embody a new value proposition and new business model is that, more often than not, there are rare discussion occasions. The pressure on the innovator to persuade others of the value of his/her proposal is high, time is short, and the complexity to be managed is usually considerable. In the interviews, we explored the ability to act and react (*monitor* and *control*, going back to the two key metacognition functions) during the meeting rather than individual preparation strategies.

The interviewees highlighted the need for the dual ability to perform successfully in meetings where authorization or a green light needs to be given – be it with customers, new partners, or new suppliers. The first is the ability to focus on understanding and interpreting the other person or persons:

> […] No, I am not focused on my idea, I am focused on the other person … (Alpha)
>
> […] I am constantly listening to who is in front of me, and somehow I am able to anticipate changes, the fact that dissent can be explicitly expressed, and so I adjust the direction, not to change the destination, but to change the way to get there, I still need to get there … (Delta)
>
> […] You need to be very concentrated … as soon as I realized that it was not a topic they wanted to discuss at that moment I immediately slightly changed the subject … I had a very versatile presentation … (Gamma)

In meetings with a high level of technical complexity, this ability to focus is supported by technical preparation, which allows the innovator to concentrate on the meeting and not on what is being said:

> […] In my case, technical preparation allows me to jump to solutions which have not yet been validated … (Alpha)

The second ability interviewees described, enabled by focusing (on the other person), relates to thinking what the other person is thinking and understanding

the best way to follow their flow of thoughts and reformulate the message in a way that is coherent with the starting mental states of the other person, thus reinforcing and not confusing them:

> […] I think what he is thinking. I try to think what he is thinking, and I try to adapt my message so that I can reinforce his thinking. It's not emotional, it's rational. I try to understand where he is going … (Delta)
>
> […] I was thinking about what he might have been thinking … no, not my idea … his perception of my idea … but this is what happens when you need to convince someone to give you money for an investment. When I was in the meeting for the investment (*in the technology behind the new business model*) and there was the then-CEO, and he had understood something different from what I meant. And then when you weigh the options, you risk losing time by correcting what he understood – so you assume that what he thinks is true and slowly bring him back to where you want. It's a rational thing. The mistake that people with a technical background make is that they say 'no it's not like that', and especially if the person covers an important role in the organization, then it becomes difficult for the other person … (Alpha)

Another function that innovators enacted in these meetings is the ability to change their strategy according to the feedback they receive from the environment, being able to rapidly adapt as needed:

> […] Before the meeting I would tell myself, these are the three things that you need to discuss and bring "home." I would keep presentations very, very light to be able to adapt based on how the meeting was going, both from a time management and from a mood perspective. There have been a couple of times where I immediately realized that I was not going to obtain anything, and so I left the things I wanted to ask for the following meeting. I really had to live the meeting, beyond the presentation, and be careful about the dynamics among people, and how these dynamics were forming … Over time, I for sure have learnt to listen more, and understand where the thing that the other person says is coming from. I have learnt whether I need to explain something in another way, if I have to get there through another route, if I have understood that the path I have taken will not work … (Gamma)

The criticism involved in radical innovation projects is not devoid of affective elements and the awareness and impact thereof:

> […] If I see that there is no great interest in the topic I am bringing, then I get a little sad, and I realize already during the meeting that

> I am not going to be as effective as I wanted because getting sad is impacting my way of presenting (*and this awareness*) unnerves me even more so that the situation gets even worse … (Gamma)

4. Discussion of Findings

The key research question of this chapter relates to how cognitive constructs can help better define and pinpoint the attributes of criticism adopted by radical business model innovators able to envision new radical ways to create and capture value.

The findings from the cases show that the mental processes recalled by radical innovators in their key innovation moments refer more to the ability to strengthen the robustness of the vision and proposal, rather than adding to the number of possible solution or ideas. Indeed, they referred to *synthesis*, to *order*, to *challenging* and *cleansing*, to uncovering *bugs* and not being subject to own *biases* and *fallacies* (Section 3.A). The approach of these innovators seeks to ground the proposal in the awareness of possible constraints around them, rather than in the ignorance of their existence, and are open to discussing possible fallacies and constraints with their teams (Section 3.B). This is coherent with the fact that radical proposals need higher buy-in compared to incremental innovations, and thus from innovators the ability to create a shared vision among different stakeholders, both internal and external (Verganti, 2017). This shared vision (and the investments in it) often relies on the innovator's ability to manage meetings and objections by co-thinking with stakeholders and adapting to their mental state (Section 3.C).

Driven by the amount of available information and technologies, and the increasing risk of fake news and algorithm-reinforced biases, radical innovators are aware that they pursue a real quest (and love) for truth in their activities and proposals. Radical innovators have the ability to be aware of their own "quality" of thinking, together with the ability to modify their assumptions and strategies when they deem these ineffective.

These first findings show that the use of the metacognition construct and its sub-elements allows characterizing the criticism in which radical innovators engage in a deeper and more precise way in the whole value proposition design and execution cycle. Moreover, the metacognition construct enables identifying key moments in which the innovator's thinking and concentration are at their highest. Different moments of the innovation and business model construction require different criticism levels and slightly different connotations.

Based on our exploratory research, we put forward a more detailed characterization of criticism that encompasses both radical innovation thinking dimensions:

- The first is the quest for truth on the object of value creation innovation (innovation of value drivers).
- The second is the quest for a shared proposal that will allow the innovation to be executed, thus creating value for all partners involved in the business model.

Both activities are supported by metacognition in that they require the ability to effectively reflect on their own and others' mental states (*monitoring*), and the ability to change and take action, interpreting the feedback from their own and others' reactions, expressions, and argumentations (*control*).

This approach and thinking differ greatly from other cases where the mantra is "fail fast, learn fast," as the core radical innovation and implications for the business model in the four cases would have been very difficult to test in a prototype. The innovators' proposals were all-or-nothing new value drivers: bringing significant changes to the relationships among the stakeholders (Case 1), a potentially new meaning in the banking industry (Case 2), in a totally new system in the distribution channels (Case 3), and in a thorough rethinking of the organizational purpose and proposals for the community (Case 4). All innovators needed strong commitment and partnerships to be able to advance in the first place. In this respect, the solidity and "synthesis" of the proposal is something that resembles more the *cold brewing* process than a *capsule coffee*, which the innovators approached with strong mental commitment in different situations.

In the innovation literature, research on thinking has thus far related more to the technical elements of an innovation, more focused on the object or the *problem* to be solved in itself (e.g., progressing through the traditional innovation funnel, with its gates, or ideating several options for its early stage). The use of the metacognition construct allows envisioning a new research perspective. This perspective is not driven by the innovation itself but by the innovator and his/her own mental state – so that the quality of criticism during the course of a meeting with partners receives priority in the innovator's attention (and can be a deal-breaker), as much as the other stages of the innovation process – decoupled from the traditional innovation funnel gates. Put differently, the use of metacognition broadens our understanding of criticism and thinking in innovation in that the object of thinking is *not external to the innovator* (the technology, the problem, the user) *but becomes own thinking itself*, own mental cognitive and affective states, own ability to investigate those of the others involved in the innovation, and ultimately the individual's contribution.

Metacognition also helps shed light on the nature of criticism in radical innovation by not polarizing on only the logical, System 2-type elements. Rather, it enriches criticism with the awareness that the rational and affective elements are not opposed or extremized but included in a second-order reflection in which both become relevant "red flags" to pay attention to. The innovators interviewed all described the interplay of the "feeling" of not understanding something, feeling too certain of something or understanding that it is the right moment for a gut decision, feeling that the other person was lost in the argumentation, their own more or less emotional reaction, observing themselves reacting in a more or less effective way, and being affected by this awareness. The metacognition construct does not exclude emotional or affective elements from the analysis but rather adds to criticism a way of considering the obvious and frequent feelings and reactions that individuals have and their way of managing them. In this respect, the object of the criticism is not external to the innovator but becomes own thinking, and in the end, the own *self* with its different states.

Based on the research conducted, we put forward the definition of radical innovators as *inclusive discussants*. They are discussants in their almost scientific ability to dissect what makes sense from what does not, paying attention to the method, to the information, to the "tricks" of their own mind. They are inclusive in realizing that the new business model proposal will only be successful if they are able to include and have onboard all relevant stakeholders. They are able to successfully propose and facilitate radical business model innovation due to their ability – in given moments – to be very aware of their own situation and thinking, both on the technical side and in the organizational challenge of finding partners and allies.

5. Limitations and Research Outlook

As all research, this study has some limitations that we acknowledge. First, the concept of metacognition is adjacent to a series of other cognitive constructs that might also shed light on the criticism concept. By selecting metacognition as the key concept to characterize criticism, we ignore other potential constructs that could reflect and support the idea of criticism: an aspect to be further explored in future research.

Second, the exploration of metacognitive elements in the criticism of innovators via interviews and semi-structured questionnaire has some limitations and ambiguity, the first being the task of recalling and reflecting on mental processes that interviewees previously experienced while innovating the business model. Hence, the distance in time between the mental process and the recollection of the mental process might have biased some of the results. However, interviews remain a key tool in all cognitive sciences and psychiatric research exploring metacognition. Other tools, for instance, thinking-aloud protocols, which hypothetically might have been an alternative tool, have other limitations and require contemporary observation of the innovation process, which was not possible in our case. A second difficulty for interviewees is recalling exactly what was occurring in their minds, trying to rationalize *ex post* as little as possible. Some bias might thus have ensued.

Finally, the number of cases is limited, albeit deemed appropriate for exploratory research. Considering that access to top innovators and managers is key to this type of research, having four cases of radical innovators is a significant result considering the constraints in the availability of this elite group.

This first exploratory study on the cognitive foundations of criticism, enlightened by the metacognition concept, gives rise to a series of interesting and relevant research questions to be further explored. The role that metacognitive abilities can and do play in the activities of managers and innovators would seem potentially very important. Metacognition supports, and is involved in, many of the key situations managers face both internally and externally. Research on business model innovation can profoundly benefit from a deeper look at the foundations of criticism and innovation processes, for instance, identifying factors supporting the development of metacognitive abilities in managers and organizations from socio-educational factors to organizational practices, and possibly specific training and tools.

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