Computational Organizational Cognition

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Computational Organizational Cognition
A Study on Thinking and Action in Organizations

By

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INVESTOR IN PEOPLE

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List of Abbreviations

ABM — Agent-Based Modeling
ABMO — Agent-based models of organizational behavior
AOC — Agent-based computational organizational cognition
DA(C)M — Dynamic Adaptive (Cognitive) Mechanisms
EDEC — Embodied/Distributed/Extended Cognition
MOC — Managerial and Organizational Cognition
MOR — Management and Organization Research
OC — Organizational Cognition
R — Software for statistical computing
RECS — Radical Embodied Cognitive Science
SDC — Socially Distributed Cognition

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About the Author

Davide Secchi, PhD, is Associate Professor of Organizational Cognition at the Department of Language and Communication, Director of the Research Centre for Computational & Organisational Cognition, University of Southern Denmark, Slagelse. His research is organized around (a) rationality in distributed cognitive environments by using (b) empirical data and advanced computational simulation techniques, especially agent-based modeling. He has authored more than 80 among journal articles, book chapters, and books. He is founder and convenor of the Agent-Based Models of Organizational Behavior Workshop Series and has presented his work more than 100 times at major international conferences (2002–2020). He sits on the editorial board of *Kybernetes, Team Performance Management* and, since March 2020, he is Editor-in-Chief of the *International Journal of Organization Theory & Behavior* (Emerald).

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Preface

When I was invited by Flaminio Squazzoni at the University of Brescia in the North of Italy to give a lecture to his Master's students, I did not know what was going to happen. It was May 2018. The sun was shining, the futuristic look of the city provided a fantastic scenery, and the visit to the Ninth Century old San Faustino's convent in which the social science faculty is located simply blew my mind. "I miss this!," I thought, referring to what it means to breathe history daily, really unearthing sentiments of how much I miss Italy. And Brescia is not even *my* city! It just felt home. Anyway, I had the impression that the lecture "Implications of distributed cognition for leadership and team dynamics" did not go too well. I tried to do too much. I read the request from Flaminio for a lecture where I could present some of my research by connecting it to leadership, the topic of the course. In the first part, I talked about (bounded) rationality and cognition, and that did probably do the trick; students were engaged. The second part of the lecture was dedicated to a few of my agent-based simulations. I do not know why I decided to go on with such a review of my computational research. It probably was Flaminio, knowing who he is and what he does, the book he used in that course (it was Goldstein, Hazy, & Lichtenstein, 2010), or just my own ambition. That was probably too much for the poor students. But it meant the world to me. In an attempt to connect some of these simulations together, without purposefully planning it out, I outlined the very idea that is now this book.

There were a series of realizations (is "epiphanies" the right word here?) that made me understand what I was really aiming at as I was presenting my line of thoughts during the lecture. One was that 10 years had already passed from my book *Extendable Rationality*. That sounded like a long time. It felt a geological era, especially because many things had happened in my professional life. I was no more a young US scholar at the University of Wisconsin, with all the charm and vibrant force that such position brings. I was now back in the Old Continent, as I

first landed in England and then in Denmark, where I currently work. When I wrote the previous book (published in 2011), I never thought it was something to be continued. To some extent, I was right, the message of that book is that there is a possibility to extend the way in which bounded rationality is looked upon and theorized. This is exactly the point. I find myself more and more dissatisfied with discussions around and criticisms of bounded rationality because I believe it is no more a starting point for me. Of course, as it is clear to those who will read this book, I still consider myself a scholar of bounded rationality. But here is the first realization of my lecture Brescia: I had moved on!

By giving that lecture and discussing my research, I connected a series of models and studies that had been previously published in papers and chapters. The connections were very easy to make, even though I never thought about them before. Not in that way, at least. But it all made sense. All this time, and with the help of my co-authors, I have been looking at the theory presented in *Extendable Rationality* to verify its consistency, robustness, and developments. Here is the second realization: this research is all connected and follows a rather consistent thread.

* * * * *

This book is not just the story of the last 10 years of my work. In fact, I think of the book as a way to reflect on some of the concepts, models, theories, and approaches that usually accompany my enquiries. In order to be able to fully engage with this declaration of intents, the book is made of three parts: Part I to discuss advancements on distributed cognition, Part II to assess the theoretical elements in Part I through agent-based modeling, and Part III to summarize and discuss an alternative view of organizational cognition.

Before everything begins, I have decided to write an introduction (Chapter 1) that discusses the aim and scope of the book and summarizes its content, offering a roadmap to readers who want to jump directly to one chapter or the other. The first chapter in Part I (Chapter 2) serves as a connector to more traditional literature in organizational cognition. This is something I decided to add after a comment from one of the colleagues who reviewed the book proposal. The reviewer was concerned that those who did not read my other book and come from a more traditional background in organizational cognition studies would be left out. The reviewer was referring explicitly to scholars affiliated to the Managerial and Organizational Cognition (MOC) division from the US Academy of Management (AoM). I thought that was a good point. I never intended this book to be of sole interest

of MOC colleagues. My primary interest is the scientific community as a global project; of course, that includes colleagues from the AoM, but also those from all the other corners of the world and from other disciplinary perspectives.

* * * * *

As I did in the last monograph I wrote, a few words on what it means to write a book are probably warranted. Writing a book is one the most ancient ways in which scholars have communicated over the centuries. It is well engrained into the way European science has historically progressed. This means of communication is now entering a new phase, where its value, role, and effectiveness are questioned. Considering that a book should respond to the same criteria that apply to the evaluation of a journal article is one of the issues surrounding assessment of books as scientific outlets. Here are a few points, where I have tried to indicate how these two assessments differ (the list is not exhaustive):

- While journal articles have to strictly adhere to the literature that allows them to be published in the journal of choice, a book may select this literature more freely, since it is not bound to a specific outlet (i.e. the journal). In fact, the book is an outlet in itself.

- Journal articles have page/word limits that make them exercises in succinctness and conciseness; books do not abide to such constraints. A book is more valuable if it can be concise, but there are plenty of examples of excellent academic books that are all but concise.

- Journal articles cannot digress or explore sideline stories, if not sporadically; books can and should be actively taking those sideline stories and digressions, as far as they contribute to building a stronger argument. In other words, more than anything, in a book the argument is king.

- A book is an exercise in exploring a topic in full; an article targets one (sometimes, but rarely, two) specific aspect(s) of a topic.

- The audience of a given journal article is predictable – not always, but fairly accurately – while that of a book is much more unpredictable, because it presents itself free from the outlet's (i.e. the journal's) constraints.

- Using traditional or innovative constructs in an unorthodox way is almost unanimously banned from journal publications. It is

possible, sometimes necessary, to do that in a book, because one is more free to explore new horizons and has the time to explain why, how, and when.

If one agrees with the points listed above, then one shall also start reading this (and other) books with a slightly different mindset as of when one reads journal articles. In fact, even though it refers to several journal articles, this book is not a sum of possible papers, nor it is a simple sum of its chapters, considered individually.

With these considerations in mind, I hope you want to keep reading and I wish you a nice experience if you are going to.

Acknowledgments

The Italian academic environment is very formal or, at least, it was when I used to live in Italy (now almost 15 years ago). Some of the junior scholars used to refer to full professors by their titles, as in "Professor X," and use the formal third person form. In some environments, this behavior could have been more relaxed, depending on seniority. When I was (very) young, my mother used to take me with her to some of the classes she was teaching and, as a child, I have always had a fascination with the academic environment. At that time, the old building where the Faculty of Economics was located at the University of Cagliari had giant black and white pictures of notable scientists on the walls, and books, books everywhere. I never actually reflected upon the fact that my mother was "Mrs" (Signora), and not "Professor," to some of the junior faculty. She became full professor in Italy in a discipline and at a time where 95% of her colleagues were men. Some of these men had a difficulty accepting the fact that she was (still is!) a strong woman and better than them. Not just a better published scholar, but better cited, better with students, better in academic politics, better in attracting funds, and better in establishing partnerships with local enterprises. Not many colleagues had such a thriving and inspiring example at home. I consider myself extremely lucky having been able to look up to her. There are no words to express such an incredible intellectual debt. My work embeds this inspiring upbringing of mine. Thank you, mother, Professoressa Giudici![1]

During my early years, my mother was always taken by some academic project while my father was more relaxed in his work and philosophy of life. For many years my father used to receive phone calls from colleagues who asked about various aspects of their work. He worked

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[1]If you are wondering, of course, she read this book and provided feedback!

in the central administration office for the Italian Postal Services in Cagliari. These long conversations used to take him away from lunch or whatever he was up to. The calls did not stop after he retired. And he would still help! In fact, this service-driven mentality continues still today, after many years of retirement. He gives financial advice on how to navigate the intricacies of Italian tax law to those who need it and works as a volunteer for an association that is set to do just that. For many years, I failed to recognize how generous my father is and, probably, one of the reasons why I write about altruism is due to the example he set throughout his life. This is why there is another intellectual debt that I feel it is long overdue. Sometimes, actions speak louder than words and I believe this is a way typical of Sardinians to express themselves. Through his approach to life my father has taught me more than I have ever realized. Thank you, father.

As explained in the Preface, I owe this idea for a book to Flaminio Squazzoni and his invite to the University of Brescia for that seminar in the Spring of 2018. Thank you very much for serving as an inspiration.

I am extremely thankful to my colleague Stephen J. Cowley for our endless talks, seminars, workshops, papers, and conferences that made me realize the limits of my thinking and especially their potentials.

Dinuka B. Herath published his book *Organizational Plasticity. How disorganization can be leveraged for better organizational performance* with Emerald in 2019. He is the one who actually pushed me into writing this book. As a former PhD student of mine, I wish to thank him for the many things he has taught me. Daring to write another book is one of them.

All the colleagues with whom I discussed parts of what has gone into this book deserve a sound and wholehearted thank you. They are Billy Adamsen, Emanuele Bardone, Rasmus Gahrn-Andersen, Bruce Edmonds, Siavash Farahbakhsh, Nicole Gullekson, Dinuka B. Herath, Gayanga B. Herath, Fabian Homberg, Astrid Jensen, Martin Neumann, Laura Parolin, Raffaello Seri, and Yumei Yang.

The editor from Emerald, Niall Kennedy, believed in me since the beginning. Actually, since before I started to seriously think of this book. His nice emails and attempts to nudge me into a book project really worked as a motivation for me in that I would know that, once I had an idea, I could count on a publisher. His support has been exceptional, especially during the pandemic, when I could complete the work on my time as opposed to abiding to a strict deadline.

Last but definitely not least, an immense thank you goes to the love of my life, my wife Claudia. As we were all forced to work from home by the COVID-19 pandemic, she made sure I had some quiet time for myself so that I could write. I cannot fully express how fortunate I am to

have such a patient and caring person next to me. My now 11-month old
son Luca gave me the force to recharge my batteries very rapidly when I
was off my (too many) projects. His smile and daily developments have
been a blessing.

Davide Secchi
https://secchidavi.wixsite.com/dsweb

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Introduction

This book is a very ambitious attempt to set new grounds for the study of organizational cognition. More specifically, it shows why cognition in organizations should be studied with computational means of inquiry, how this can be achieved, and what are the theoretical implications of such a scientific enterprise.

Organizational cognition is not a new expression, nor the area of interest and research is recent. In fact, it is almost 30 years that management and organization research (MOR) scholars have been concerned with it (Ilgen, Major, & Spencer, 1994; Walsh, 1995). Since its beginnings, the area has produced an increasing number of papers and other publications (Secchi & Adamsen, 2017; see also Chapter 2) and has recently started to diversify its perspectives (Hodgkinson, 2015). While the expression "managerial and organizational cognition" (MOC) is used to define one of the divisions of the American Academy of Management, there is no academic journal that is specifically dedicated to it. As Hodgkinson and Healey (2008a) showed in their review of the literature, this area of study was well alive and thriving a decade ago, and it keeps moving forward about a decade later (Healey, Hodgkinson, & Massaro, 2018).

With all that has been written on cognition in organizations, why this book then? Why should you read this book instead of one of the latest articles presenting a thorough review of the literature?

There are multiple reasons I can offer, not all of them equally appealing to all readers. Besides presenting a computational approach to the study of cognition, this book also represents a personal journey. It elaborates on the last 10 years of my research on cognition, what drove

it, how connected, and where it is headed. Through this process, the
book tells the story of a theory as well as of a methodology.

1.1   A Theoretical Line

The book elaborates on the idea that people are *docile*, that is, they
lean on information, advice, suggestions, recommendations coming from
social channels and use them to make decisions (Simon, 1993). More
than that, the book intends to show how any attempt to take cognition
seriously as it manifests in organizations needs a re-definition of the way
we think of cognition in general. A perspective that takes us close to
this re-definition is the use of embodied/distributed/extended (EDEC)
cognitive paradigms. But that is not enough. It is insufficient because
these paradigms treat the *social* elements at their surface. Most of
them do not fully elaborate on what, how, why, and when a structured
social environment (such as an organization) affects cognition. I am
generalizing here and, just like any generalization, I am partially at fault.
There are instances in which the EDEC perspectives have referred to
the role of the social (especially parts of Hutchins, 1995a). What I am
referring to is that (a) this has not been taken as a constitutive element
and as a starting point to understand, frame, identify, determine, and
analyze cognition, hence (b) we do not have a proper theory of cognition
in organizations. We do have adaptations of theories to fit organizations,
attempts at matching cognition with organizational features, and wider
approaches to cognition. However, there are no specific theories that
start from what it means to cognize in an organizational environment.

   This is a big miss. It is because human life and work are organized
around and within organizations. These social institutions shape our
behavior, expectations, aims, motivations, the extent to which we expe-
rience satisfaction, as well as our knowledge, learning and, broadly, our
thinking. In other words, much of what and who we *are* is inextricably
tied to organized life and work. This is obvious and it has been within
the realm of management knowledge for almost a century. Yet, and not
surprisingly, it has not touched the way in which cognitive science has
evolved and is conducted today. In line with this, and perhaps surpris-
ingly this time, the implications of this simple truism – i.e. organizations
shape human lives – have not been reflected upon by MOC scholars.
As shown in this book, these researchers have been more concerned
with applying (what they thought was) knowledge from cognitive sci-
ence to various aspects of organizational research. As far as my knowl-
edge is concerned, this approach has not produced theories of cognition
in organizations, just applications of theories exogenous to the field.
The fact that the theories of cognition used in organizational contexts
were mainly generated by considering individuals (with the illusion that

they were) working in isolation has not triggered much reflection. As if the cultural, interactive, normative, value-based, resource rich, and socially-bound organizational environment was, at best, an add-on feature of the individual brain. Maybe it is just like that, maybe one could juxtapose traditional cognition to a complex organizational context and gain some useful knowledge. After all, there have been advances in MOC over the past decades.

My reaction to this last consideration follows two threads. One is that advancements in a field that did not exist 30 years ago are typically large, if one considers that the starting point was a very limited knowledge base. The other is that these advancements have started to hit a wall (better, a ceiling). This is the same obstacle that has been hit by cognitive science decades ago, when many have started to question the brain-centered and the brain-only approach (e.g., Varela, Thompson, & Rosch, 1991). And this limit has started to surface among MOC scholars as well recently (Hodgkinson, 2015; Healey et al., 2018).

The main reaction, however, is of a more substantial philosophical nature. Do we truly believe that the instances of performing a task in isolation[1] or within the frame of an organization are the same? Let me rephrase: Is it fair to assume that the processes that inform human cognition are the same when performing a task independent of the context? And if they are not the same then, is the difference enough to warrant a different theory? This book is an attempt to answer these questions. An attempt to answer the first two negatively, and the latter affirmatively: no, it is not fair to assume that the processes are the same and yes, we need a theory.

The chapters included under Part I are dedicated to outline the backbone of *socially distributed cognition*, a general theoretical approach to cognition, that is tested through computational experiments in Part II and that informs what is called *theory of social organizing* in Part III.

1.2 Computational Revival

There is also a methodological story line that features in the title of this book and it is as central as the theory it outlines. The history of cognitive

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[1]A quick note here to comment on the meaning of "performing in isolation." In its absolute interpretation, that is the independence of an individual from any environmental perturbation, isolation cannot be observed. As I am writing this footnote, I am supposedly doing it in isolation. Writing is a solitary exercise. And yet, it is not. Actually, writing is a social exercise because it is directed to a readership, to someone who will read and hopefully understand the content of the text. This implies that, while writing, one projects the activity to imagine how someone else (a potential reader) could receive the meaning. For example, every time I write "MOC scholars" in this book, I hope that the one MOC reader I will have will not be too disappointed by my findings and comments. In the end, one may argue, it is still me writing, although far from isolation.

science is intertwined with that of artificial intelligence and especially to that of the first computers (e.g., Chomsky, 1980; Fodor, 1987; Newell & Simon, 1972). After all, the computer metaphor of the brain was one of the most widely used perspectives on cognition (as explained in Varela et al., 1991) and, to some extent, it still is (Gigerenzer & Goldstein, 1996; Hodgkinson, 2015; Patokorpi, 2008). This view postulates that the way in which the brain and the computer operate are very similar, and it is the signature metaphor of the cognitivist approach. Much has been written on the limitations of this view and of cognitivism (e.g., Patokorpi, 2008; Varela et al., 1991; Ibáñez & Cosmelli, 2008) and this book has not been written to counter that view. We are, philosophically, theoretically, and empirically far away from cognitivism today. This is why producing a counter to cognitivism is futile because irrelevant. Put differently, this book does not use computation as a way to describe the brain nor as a way to define artificial intelligence processes that mimic the brain. If not this way, how is computation used in this book?

Before I can answer this question, I think it is necessary to reflect on cognition in organizations, on what it is and then offer some thoughts on how it can be studied.

1.2.1 Organizations as Complex Systems

Imagine you are coming from the Anarchic World, a society à la Proudhomme where property does not exist, hence organizations take a form that is different than the ones we have in this world. If you are tasked with describing organizations, the first consideration would probably be that they are constituted by a bundle of interconnected parts that stand against each other in mutual dependence. Some of these relations can be formally defined (e.g., power structure, titles, positions, functions) while others are more informal and reflect behavior, common practices, habits, in other words tacit knowledge. The synthesis of these aspects of an organization's life defines differences and distinguishes one organization from another. Of course, you may notice, there are also more standard factors such as size, type of production, market and competition that characterize organizations. Most of all, when observations are repeated over a period of time, you may notice that change is probably the constant feature of any organization. Not only they adopt different practices, hire/fire personnel, direct their attention to different customers and markets, develop new products, procedures, routines, they also adjust, sometimes abruptly sometimes more softly, to a mix of internal and external pressures. Given the above, would you, as a visitor from

the Anarchic World, be able to predict an organization's state s_1 at time T given its state s_0 at time t?

This is notoriously very difficult. What I have described above as a generic path for an undefined "organization" fits the design of a complex system very well. This is a system where its constituent parts are interconnected and, at the same time, maintain a certain degree of autonomy such that the exact way in which they interact can be difficult to determine. This leads to indicate that a complex system such as an organization is, generally speaking, *unpredictable* because any state s_1 at time T cannot be fully derived by its state s_0 at time t. Well, it probably could ex post, almost never ex ante. This is because the functions that determine s_1 are only partially known. Moreover, the organizational system has only a loose dependence on the initial conditions s_0 at time t. This generates processes that lead the organization to define ways of action that *emerge* from the interaction between its social, material and immaterial components.

I understand the above is a rather abstract definition of an organization and its description as a complex system. A quick example may help understand what some of the concepts above mean in practice. Consider a small brewpub[2] – a company that has a micro production of beer and, at the same time, it has a restaurant – that employs about 15 people, with a simple structure made of one owner and CEO, an administrative person, one brewmaster with an aid, one chef, one sous-chef, three more employees in the kitchen, one maitre de salle, one barista, and four waiters. The company also sells their beer in bottles. There are processes in place that reflect the roles as briefly described. At the same time, unexpected situations may materialize and bring, for example, one of the waiters to pour beer from the tap or, even more wildly, make the admin person do that. The flexibility in covering each other's role may be done with ease or with a grumpy attitude, depending on what is "normal" for someone working in that organization. Early in 2020 the company faced a significant struggle, followed by the lockdown due to the COVID-19 pandemic. As a result of those circumstances and to stay alive, some positions were suspended but, with the closing of the restaurant, activity was also threatening the existence of the company. After a quick round of consultations, and without the restaurant, the owner realized that sales of bottles would not make the company survive. This led to the decision to sell mainly from the internet, offering take-home meals and, obviously, beer. The database of customers built over more than 10 years of business was used to send the message out. After a series of initial difficulties, business remained active, mainly because

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[2]This anecdote is based on *Il Birrificio di Cagliari*, one of Italy's most internationally awarded companies in the craft-brewery business.

of loyal customers and special deals the company was able to offer (e.g., special containers that would bring the beer home as fresh as if it was drafted seconds before).

The pandemic took everyone off guard. If we consider s_0 for this company a time t placed somewhere in January 2020, there is nothing that could have predicted the lockdown and a move to turn temporarily off the restaurant, if we take late March 2020 to be our time T and state s_1. However, one may argue, this is a so-called shock and, by definition, these are unpredictable events that do not necessarily pertain to one single organization, they are market phenomena. Correct, this is something one cannot attribute to the single organization. Still, the way in which this particular organization re-structured to face the shock was unpredictable; many other organizations took a different path, with varying degrees of success. Suspending positions (who, when, how), how is take-home organized, which online platform, who is going to deliver, how is that management expertise built so quickly, and which parts of the menu can be transferred to a take-home business without losing the image customers have of the company? Moreover, interactions between members of the various teams – brewery, kitchen, restaurant – change significantly, being that the nature of business has changed. In the least affected part of the business, the brewery, for example, the decision was to suspend the brewmaster's aid, to freeze the production plan until the stock of beer could be sold. The lack of a restaurant made predictions on when the stock would be depleted very hard. So, the schedule had to change to something very flexible. The owner decided to step in and help the brewmaster. The production driver was now different, and making the beer became also different, with the brewmaster who needed to justify some of the choices in detail, now that the owner was stepping in. As a result, norms, practices, routines, as well as behavior, culture, forms of pressure, and roles in the organization emerged as the new configuration changed.

If we take the above to be a fair description of the way in which the typical organization behaves, then we can describe it as a complex (adaptive) social system.

1.2.2   Is Cognition Complex?

What about cognition? The question is more on what is the role of cognition and cognitive processes in an organization that is described as a complex system. There are some risks in a question such as this one that it is better to clarify.

One line would be to argue that, given the organization is complex, all of its constitutive elements are complex. This would be a logical

fallacy called *composition and division* (Gabbay & Woods, 2009; Secchi, 2011), that of attributing the characteristics of the system to one of its components. Moreover, cognition has not been described (so far, at least) as a constituent part for organizations. So, let me take one step at a time.

Can organizations exist without cognition? This depends on what one means with the word "cognition." Inspired by the embodied, distributed and extended paradigms, in this book *human cognition is a way in which we use contextual embeddedness to make sense of the surroundings and inform action.* The expression "make sense" is vague and it is used here to refer to processes that involve conscious interaction with other human beings, material (e.g, computers, notebooks, buildings) and immaterial (e.g., ideas, concepts, models) artifacts. This process is embodied and embedded as well as dependent on the configuration of the environment, i.e. both the "contextual" and the "surroundings" in the sentence above. This points at a systemic or ecological perspective on cognition, that cannot happen in a vacuum. Finally, "action" refers to any activity that includes but it is not limited to behavior, at least, not in a narrow sense. Speaking, for example, is an action, probably not something one could refer to as behavior.

Hence, the question again: Can an organization exist without the use of contextual embeddedness to make sense of the surroundings and inform action? The answer is clearly negative. Or, one may argue using a hyperbole that an organization that does not use this feature is destined to nonexistence very soon (if it ever can exist in the first place).

But, if cognition is a feature of any organization – probably not exclusive to organizations but still a major feature – the following question would be that of asking whether organizations are cognitive systems then. This requires a more subtle reasoning. An organization may be part of a cognitive system, in the sense that it may become part of cognition as it happens within its boundaries. Organizational tools, resources, employees, as well as immaterial knowledge elements enable (or disable) and are functional (or dysfunctional, at times) to cognitive activities. However, even though it is clear that there is no organization without cognition, we cannot extend this feature as something describing the organization as a whole, the same way it would be difficult to argue that an organization is human because it cannot be without humans. It is the same logical fallacy mentioned above in its reverse capacity.

While organizations are complex systems by definition, cognition can be simple or complex depending on a multitude of elements. For example, when cognition involves repeated actions, such as the interpretation of the n-th invoice from a supplier, the convergence of stratified (long term) meanings and current numbers make it rather simple. On

the contrary, interacting with multiple colleagues during a meeting to discuss the strategic positioning of the company with effects for the next five years to come make it complex. The two examples may be classified based on unpredictability of the consequences stemming from the action taken (processing the invoice vs speaking to colleagues), structural constraints (rules of interpretation vs rules of appropriate speech in a meeting, company history, meeting history), local constraints (the invoice vs colleagues, room, shared ideas, norms, etc.), personal connections (knowing the suppliers vs colleagues, allies/enemies, political games, etc.). From this perspective, not only the second instance is more complex than the first, but it is – I claim – more interesting from a scientific point of view.

By considering the complex nested sets of interactions that individuals find themselves in organizations it is possible to provide an additional layer in the understanding of organizational complexity and, at the same time, it is possible to further our understanding of cognition as essentially social.

The answer to the question in the heading of the subsection on whether cognition is complex is varied. It can be complex and, when considered within organizations, the most scientifically salient manifestations of cognition are those of a complex phenomenon.

1.2.3   How to Study Organizational Cognition

If organizations are complex systems that would benefit from the study of cognition, we are then in need of instruments that allow this agenda to come to life.

Tools for the study of complexity are not very popular among MOR and MOC. In spite of the many statements that substantiate organizations as complex systems, very few have followed up these conceptual declarations. There is no point to analyze the reasons why this is the case and how we got there. However, I can certainly mention the fact that I came to work on computational models because of the dissatisfaction with current methods.

Among circles of computer scientists and, more recently, computational social scientists, agent-based computational simulation modeling (ABM) has been developed and used to study complex systems (Edmonds & Meyer, 2017b). These models allow to replicate or create features of complex systems and are among the most suited to study organizations (Fioretti, 2013; Secchi, 2015). The tool is flexible enough such that it can take into account interactions, unpredictability as well as emergent properties of the system.