1. Introduction to the *Research Handbook on Complex Project Organizing*

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1.1 WHY COMPLEX PROJECT ORGANIZING?

Our society increasingly faces challenges when we look at the drastic climate change causing floods, migrant flows and displacements; massive fires; geopolitical struggles and wars; and our need for transiting to a net-zero economy to remain sustainable. Those grand challenges call for urgent transitions in our socio-technical regimes for energy, mobility and shelter (Geels, 2010). Indeed, the central spine of one framework for addressing global challenges (George et al., 2016, figure 2) can be read as mapping onto the project life-cycle through ‘articulating and participating in grand challenges’ (project shaping), ‘multilevel actions’ (project delivery) and ‘impacts and outcomes’ (benefits realization). On one estimate, achieving net zero alone will entail a 60 per cent increase in capital investment in the short and medium terms above our existing rate of capital investment, mainly in complex projects (McKinsey, 2022), but we face enormous challenges in delivering on these investments aimed at transitioning to zero carbon. For example, the Muskrat Falls megaproject in Canada turned from a promising hydroelectric sustainable energy facility into one of the most impressive and notorious megaproject failures (LeBlanc, 2020). Although project organizing is highly relevant for delivering the solutions (Kaufmann & Danner-Schröder, 2022) to grand challenges, it still seems overlooked or ignored (Winch, 2022).

The assertion that we now live in a volatile, uncertain, complex and ambiguous (VUCA) world is a familiar trope (Bennett & Lemoine, 2014). At the heart of this world, we suggest, is complexity, which has long been investigated within CPO (Geraldi & Söderlund, 2018). Recent research has addressed this theme through various lenses. These include systems engineering to improve project governance and performance (Gorod et al., 2018; Locatelli et al., 2014) and the specific setting of megaprojects (Davies & Mackenzie, 2014; Hu et al., 2015; Pitsis et al., 2018). Project leaders and stakeholders have to tackle complexity, depending on how they perceive it (Fisher et al., 2018; Mikkelsen, 2020), and to develop strategies accordingly (Floricel et al., 2016).

Despite abundant research on the topic, we felt that there was a missing thread behind these various contributions. Therefore, with this *Research Handbook on Complex Project Organizing*, we seek to develop a guiding path to help academics – both established and early career – and research students navigate through these important topics, and envision how to respond to the grand challenges we all face. Our aim with this Handbook is to provide a state-of-the-art review of the main studies conducted in complex project organizing (CPO) research, and to suggest fruitful avenues for future research. The editorial team is both interdisciplinary and geographically widespread, and we have sought contributions from leaders in project studies to address various facets of complexity. Before presenting the contents of this
In more detail, it will be useful to provide a brief history of CPO research to provide context for the following contributions.

1.2 RESEARCH ON COMPLEX PROJECT ORGANIZING: A BRIEF HISTORY

We now present briefly an intellectual history of research on CPO. This is not a history of CPO; rather, we sketch out three research perspectives on CPO research and trace their origin back to attempts to understand the organizational innovations associated with United States (US) weapons acquisition programmes in the 1950s (Johnson, 1997). While our field has its own urtext (Defoe, 1697), little was written in the ensuing 350 years outside professional and technical publications (Pinney, 2001) until scholars from US business schools began to take an interest in weapons acquisition. We can identify three distinct, but complementary, traditions of research over the last 60 years:

- In organization theory, early contributions addressed the challenges of organizational coordination under complexity around the concept of matrix organization, which evolved into the theory of temporary organizations in a projects-as-coordination perspective.
- In systems theory, early contributions heavily influenced by general systems theory evolved into concerns around complexity, system dynamics and complex adaptive systems in a projects-as-systems perspective.
- In commercial theory, early work from the perspective of institutional economics evolved into perspectives derived from transaction cost economics in a projects-as-contracts perspective.

The focus of this Handbook is on organizing, so we will not discuss the fourth stream of research that emerged during the 1950s in management science providing increasingly sophisticated tools for decision-making on projects, especially for schedule and risk. We call this the projects-as-planning perspective, also known as the optimization school (Söderlund, 2011; Turner et al., 2013).

The scale and complexity of US weapons acquisition programmes during the 1950s, complemented by the later success of the Apollo programme that applied the new organizational innovations, led to innovative contributions to the projects-as-coordination stream of enquiry. At the core of these contributions was the concept of the matrix organization which broke with the principle of the unity of command in organizations (Fayol, 1918) – a principle which fails to address the complex ‘tangled fabric’ (Gulick, 1937, p. 20) of organizations. The characterization of the project manager ‘in the middle’ (Gaddis, 1959) initiated this line of enquiry; supported by research on Boeing (Galbraith, 1970) and NASA (Sayles & Chandler, 1971), it became a standard element in the contingency theory of organizations (Chapter 6) and promised a strong research agenda (Ford & Randolph, 1992). Fundamentally, this line of enquiry addressed the advantages of matrix organization in addressing the core organizational problem of coordination (Mooney, 1937; Okhuysen & Bechky, 2009; Puranam, 2018), where the increasing complexity of business processes and products generated growing organizational differentiation and so a greater need for organizational coordination (Lawrence & Lorsch, 1967).
It is perhaps ironic that as the projectification (Midler, 1995) of manufacturing organizations gathered pace in the 1990s (Chapter 5), interest in matrix organization waned to be replaced by interest in projects as temporary organizations (Bakker, 2010; Bryman et al., 1987; Burke & Morley, 2016). In one way, this new focus provided an important clarification of the matrix organization concept because research had shown that project-oriented matrix organizations were the most effective (Ford & Randolph, 1992), and a rich body of research developed. However, it was not long before the issue of the relationship to the permanent organizations which supplied the temporary organization with resources arose (Bakker et al., 2016). This suggests to us that the theoretical concerns of the analysts of matrix organization remain relevant for the analysts of temporary organization – one example is in project leadership research (Merrow & Nandurdikar, 2018).

The projects-as-systems perspective draws on the application of general systems theory to organizations and their ‘project systems’ (Johnson et al., 1964) which was enthusiastically taken up in the seminal text of the field (Cleland & King, 1968). This combined systems concepts, investment appraisal techniques and Fayol’s life-cycle of strategic planning (prévoyance) > organization > coordination > control to provide a coherent, if partial, theory of CPO. Later editions expanded the systems perspective to include more formal life-cycle analysis (King & Cleland, 1983), matrix organization and stakeholder management (Cleland, 1986). This projects-as-systems perspective has been enormously influential, and still provides the conceptual foundations of basic education in the field (Kerzner, 2017). It is reflected in some of its multiple dimensions in Chapters 3, 7 and 14.

The projects-as-contracts perspective addresses the acquisition, or procurement, process. The sheer complexity of the new generation of weapons systems meant that owners in the form of the US Air Force and Navy had enormous problems of managing commercial relationships with their private-sector suppliers. Attempts by researchers to address these issues (Peck & Scherer, 1962; Williamson, 1967) drew on concepts from industrial economics to argue that it was a case of market failure under high levels of uncertainty. Theoretical developments in economics in the 1970s (Williamson, 1975) enabled the application of transaction cost economics (TCE) to the problem (Masten et al., 1991; Stinchcombe, 1985). However, this stream of enquiry remained largely separate from the other two for reasons that remain puzzling; after all, ‘projectizing’ (Peck & Scherer, 1962) was central to the acquisition process on the owner side. TCE has now become the main starting point for analysing commercial relations in CPO and more generally (Cuypers et al., 2021); these concerns are reflected in Chapters 8, 21 and 22.

More recently, there have been attempts to bring together these perspectives to provide a more integrative one. An elegant combination of the theory of temporary organization with the life-cycle aspects of the systems perspective (Lundin & Söderholm, 1995) has been very influential. The integration of commercial issues with a matrix theory of temporary organization (Winch, 2014) is more recent. Within both the coordination and system perspectives, there has been considerable evolution with the rethinking project management initiative (Winter et al., 2006) being identified as a point of inflection (Padalkar & Gopinath, 2016) from a hard to a soft paradigm (Pollack, 2007) and greater attention to the dynamic aspects of complexity (Cooke-Davies et al., 2007). This shift encouraged a focus on behavioural issues (the ‘nominalist’ quadrants of Figure II.1) in projects-as-coordination and a focus on complex adaptive systems (Chapter 14) in projects-as-systems. Recent developments in the projects-as-contracts perspective have moved beyond the focus on discrete transactions and articulated a broader
set of challenges around procuring complex performance (Caldwell & Howard, 2011) and inter-organizational coordination trajectories (Oliveira & Lumineau, 2017). However, the perspective still remains relatively isolated from mainstream CPO research (von Danwitz, 2018).

An important concern of any research field is the balance between fragmentation and specialization (Söderlund, 2011). While the kind of pluralism displayed, particularly in Parts II and III, is the sign of a healthy, self-renewing field of research, it can lead to a perception of fragmentation when viewed from the perspective of other fields of research which are then not sure what it specifically contributes to the development of management research overall. During the 1960s, this contribution was clear; it was how (US) society created novel complex systems to meet the urgent challenges of the day (the Cold War arms race). As such, it became part of the mainstream of management research. Few contemporary researchers would be happy with such a narrow research domain and the projectification process (Chapter 5) shows that concepts generated in that original body of research have a wide, if problematic, applicability. Yet, the field has become marginal in the wider development of research in management (Jacobsson & Söderholm, 2020). We suggest that this is partly because it is not presently seen to be addressing contemporary urgent societal challenges in the way it was in the 1960s. For instance, CPO is not seen as part of the research agenda for the sustainability transitions that are essential to meet the challenges of achieving net zero (Köhler et al., 2019), nor does it feature strongly in other research debates around meeting the challenges of the fourth industrial revolution (Winch, 2022).

1.3 THE FUTURE CHALLENGES FOR COMPLEX PROJECT ORGANIZING

Despite substantial developments during the past decades, CPO delivery remains plagued by diverse, long-standing performance problems (Flyvbjerg et al., 2003; Merrow, 2011) and by several emerging new threats (Whitmore et al., 2020; Winch, 2022). Among the most prominent of these are the increasing uncertainty and complexity of project delivery environments. Since the turn of the millennium, exploding technological progress compounded by dramatic ecological disasters, geopolitical conflicts and economic turbulence have disrupted our economic and social life with unprecedented pace and scale. It is becoming ever more difficult for project managers to make informed decisions and effectively manage project scope, schedule and resources based on fixed plans throughout a project life-cycle (Levitt, 2011). With the arrival of the COVID-19 pandemic as a ‘Black Swan’ event in the VUCA world, for example, we have witnessed the impending needs to develop emergency field hospitals with unprecedented agility and to deliver the ‘Operation Warp Speed’ vaccine development programme at an unprecedented pace (Winch et al., 2021). The increasing volatility, uncertainty, complexity and ambiguity of project delivery environments derived from these disruptions – and also the return of war to Europe – prompt us to rethink the effectiveness of current CPO practices, which we characterize as centralized planning, formalized controlling and fixed-price contracting, to manage complex projects in this new era.

The United Nations climate agreements have committed to transforming the worldwide development trajectories towards sustainability through achieving global net-zero carbon emissions by 2050 and projects will play a critical role in the transformation. This is not only due to the distinctive energy-extensive nature of many project-based sectors – for example,
construction alone contributes about 23 per cent of the total carbon dioxide emissions produced by global economic activity (Huang et al., 2018) – but also because of their centrality for the sustainability transitions of non-project-based sectors such as energy. As such, the net-zero transition requirements have a great potential to reshape the landscape of CPO through changing the practices of both ‘sustainability of the project’ and ‘sustainability by the project’ (Huemann & Silvius, 2017). This includes the addition of sustainability criteria to traditional business-as-usual projects, the mitigation projects that are required to build resilience against the effects of climate change and the advance of energy development projects and technology research projects that promise new ways of energy generation and consumption (Winch, 2022).

The development of CPO is also challenged by the strengthened public concerns for human-centred issues such as equality, mental health and wellbeing in the new era. Despite the increasing projectification tendency in diversified industries (Schoper et al., 2018), project activities in many industries are still organized in distinctive labour-intensive manners with relatively harsh working environments. For example, among the 53.67 million employees in the project-based Chinese construction sector in 2020, about 97.38 per cent are rural migrant workers and about 26.40 per cent of these migrant workers are above the age of 50 (National Bureau of Statistics of China, 2021). With the strengthened public concerns for these human-centred issues, the success of CPO should no longer be measured simply as meeting arbitrary objectives on project delivery cost and schedule but needs to include the value brought to the people that deliver the projects (Whitmore et al., 2020).

At the heart of the fourth industrial revolution is the rapid development of emerging digital technologies, including internet of things and artificial intelligence, which hold the promise to enable an almost real-time and intelligent connection between physical and digital systems (Schwab, 2016). While these digital innovations have a great potential to reshape CPO through transforming project life-cycle information processes towards a more integrated, intelligent and real-time capability, they will not act as a ‘panacea’ to address the grand challenges automatically. They may also generate new sustainability or human-centrality problems such as excessive automation, expanded energy consumption and privacy disclosure. The integration of emerging digital technologies within CPO could result in a range of organisational adjustments, such as the redistribution of benefits and risks at the inter-organisational level, the integration of multiproject resources at the organisational level and the governance of resistance behaviours at the individual level (Cao et al., 2022; Oraee et al., 2019; Whyte, 2019). Collectively shaped by the enabling digital technologies and the inhibiting disruptions in the new era, project organising practices hold a great potential to evolve into the Project Organising 4.0 paradigm (in analogy to Industry 4.0) that is more capable of agility, sustainability and human centrality. We hope this Handbook contributes to a deepened understanding of this wave of paradigm evolution as well as potential future research directions in this area.

1.4 THE STRUCTURE OF THE BOOK

We opened this introductory chapter with an assessment of the scale of the challenges we face, and how much more we need to do to ensure that the investments that will provide solutions to those challenges actually deliver. How does the content of this Handbook start to address these questions? In Part I, we identify four core concepts of CPO that, we suggest, provide
the conceptual foundations of research on CPO. Two of these are familiar – uncertainty and complexity – but often misunderstood, while the other two are implicit in CPO but rarely articulated explicitly. There is an emerging body of research on temporality in project organizing, but less attention has been paid to projectivity. This is surprising given that fundamentally projects are about how we achieve desired future states defined as outputs that realize outcomes for the investors in the project. Reading these four chapters together, we suggest that, in interaction (Figure I.1), they constitute a distinctive configuration for CPO research as the only management research discipline that fully integrates the four concepts with the exception of strategy. In comparison to strategy, though, CPO has a much longer time horizon than most strategy research, which, we suggest, makes it particularly appropriate for researching the achievement of grand challenges.

Theory is central to high-quality research in any management discipline, including CPO. Theory allows both the clear positioning of the contribution of any particular study and showing the broader implications of the empirical analysis for both practice and further theory development. In Part II, therefore, we offer 11 chapters that each present a different theoretical perspective that is relevant for CPO research (Figure II.1). Some of the perspectives were developed initially during the original heyday of CPO research in the 1960s, yet remain fully relevant today. A second group reflects the range of going perspectives that have evolved since the paradigm shift in the mid-2000s identified above and can now be considered collectively as the nominalist ‘mainstream’ in contemporary CPO research. Finally, a smaller group of theoretical perspectives is discussed which are less established but, we believe, offer new approaches to CPO research with considerable promise. There is a richness of theory across these chapters – and indeed across other perspectives that we were not able to include in this Handbook – which is a sign of a vibrant research community. However, one downside of this diversity could be that researchers outside the field do not see it as having a distinctive contribution to make as it ‘borrows’ theoretical perspectives from other fields and ‘applies’ them to CPO. If CPO is to escape the ‘straightjacket’, then it surely needs to be developing distinctive theoretical framings that can be applied more broadly in management research?

Part III gets to the heart of empirical research in CPO, and by addressing the various areas of enquiry our empirical knowledge will grow that allows distinctive theoretical framings to develop. We therefore offer a set of 15 chapters on a diverse range of topics, all of which have attracted considerable research attention in recent years. We focus on four overarching themes to address challenges of CPO research: organizational structures, inter-organizational relationships, stakeholders and project value creation. While each topic gathers several chapters which may address distinctive facets of complexity, they are presented in a continuum from more static system complexity (organizational structures), through socio-political complexity (inter-organizational relationships and stakeholders), to finish with more subjective complexity (project value creation as a state of mind).

Finally, we turn to the prospects for CPO research in the context of the fourth industrial revolution (Figure IV.1) in Part IV and suggest that we are now moving towards Project Organizing 4.0 (Figure IV.2). Myriad new technologies are now on offer to enhance the performance of complex projects. At the very least, they offer multiple lines of enquiry within the projects-as-planning perspective, particularly for the development of project controls. However, they also have important implications for the other perspectives: blockchain has the potential to change significantly the governance of the commercial interface for the projects-as-contracts perspective; and model-based definition offers considerable oppor-
tunities for projects-as-coordination. Perhaps most significantly, the projects-as-systems perspective can be renewed through the much enhanced information-processing capabilities of complex project organizations. All these fourth industrial revolution technologies will transform CPO over the coming years and deserve much greater research attention from an organizational perspective than they have received to date from researchers in the field.

1.5 INVITATION TO COMPLEX PROJECT ORGANIZING RESEARCH

We hope you find our Handbook helpful in developing your own research in CPO. We have been able to entice many of the most able scholars in the research field to contribute to this Handbook; not only established names but also rising stars. Some scholars were unable to contribute due to their personal diary pressures, and publishers set limits on the length of books they will publish. Were we to start again on this collaborative editorial enterprise, we would likely have included a chapter on value in Part I (but see Chapter 28), socio-materiality in Part II (but see Chapter 15) to support research on the technologies covered in Part IV and leadership in Part II (but see Chapters 25 and 27). Nevertheless, we hope that this Handbook can further stimulate the debate about the distinctive nature of CPO; how CPO can contribute theoretically to the development of management research and teaching more generally; and, most importantly, how CPO can contribute to addressing the grand challenges we all face across the globe and the sustainability transitions that are going to enable us to reach our collective aspirations for a sustainable planet.

Enjoy!

REFERENCES


