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Goto, Masashi

(Citation)
Journal of Professions and Organization,9(1):77-99

(Issue Date)
2022-02

(Resource Type)
journal article

(Version)
Version of Record

(URL)
https://hdl.handle.net/20.500.14094/90009117

Journal of Professions and Organization, 2022, 9, 77–99
https://doi.org/10.1093/jpo/joab022
Advance Access Publication Date: 3 January 2022
Scholarly Article

Accepting the future as ever-changing: professionals' sensemaking about artificial intelligence

Masashi Goto *

Research Institute for Economics and Business Administration, Kobe University, Nada, Kobe, Hyogo 657-8501, Japan
*Corresponding author. Email: gmasashi17@gmail.com
Submitted 23 June 2021; Revised 8 December 2021; revised version accepted 13 December 2021

ABSTRACT

This article examines how professionals leading the digitalization of professional service firms construct their views on new digital technologies such as artificial intelligence (AI) and the influence of such technologies on their future. This understudied question is important because such early-stage envisioning can significantly affect the later processes and outcomes of digitalization. A qualitative study was conducted, using interview and archival data, on a Big Four audit firm in Japan during the period 2017–9, when its taskforce considered applying AI to its core audit service. The contribution of this study is threefold. First, the findings expand our knowledge of prospective sensemaking by introducing a distinct mode of viewing the future that accepts the future as ever-changing as a means of coping with high uncertainty. Second, this study demonstrates the understudied link between institutions and sensemaking by showing how professionals' embeddedness in their professional institution sets the focus of their sensemaking on the elements that support the institution. Third, these insights add to our knowledge of digitalization and professions by suggesting the potential high variability of professionals' strategies regarding digitalization due to their continuous updating of their view of the future, as well as the inherent antinomy of digitalization for established professions due to their advantaged but constrained position regarding digitalization.

KEYWORDS: prospective sensemaking; occupations and professions; artificial intelligence; qualitative research

INTRODUCTION

The influence of digital technologies, such as artificial intelligence (AI),[1] on various professions and professional work has long been debated. As early as in the 1980s, Andrew Abbott predicted that as technology advanced, AI and algorithmic solutions could someday replace many human professional tasks, and professional jurisdictions might be significantly affected (Abbott 1988: 182–184). Indeed, coping with new technologies can be viewed as a critical issue for professional survival because 'sudden technological changes can result in a state of professional disruption, in which technological change disrupts the institutional arrangements of a profession' (Hasselbalch 2016: 63). As such, the manner in which professionals interpret and respond to digitalization and the rise of AI is of great importance for both practitioners and scholars (Hinings, Gegenhuber and Greenwood 2018). This interest has led to an emerging literature on digitalization and professions that has begun to reveal significant changes in key aspects of

professionals' work, professional service firms (PSFs), and the professional institution (Armour and Sako 2020; Kronblad 2020; Pemer 2021). However, these studies have remained silent on the way in which the professionals leading the change construct a shared perception of new technologies and future projections, which significantly affect the initiation and outcomes of these changes.

In the exploration of professionals' responses to digitalization, sensemaking (Weick 1995)—the process 'through which people work to understand issues or events that are novel, ambiguous, confusing, or in some other way violate expectations' (Maitlis and Christianson 2014: 57)—provides a useful theoretical lens. Furthermore, studying how professionals interpret AI addresses two blind spots in the literature on sensemaking. First, the issue of whether and how actors can reach the 'right' future projections in highly uncertain contexts has been increasingly problematized. Earlier studies highlighted the resolution of equivocality, which leads to tangible outputs in prospective sensemaking (Stigliani and Ravasi 2012; Kaplan and Orlikowski 2013). However, recent studies have indicated that equivocality in prospective sensemaking can actually increase in some highly uncertain contexts (Dwyer, Hardy and Maguire 2021) and that the true nature of future projections may be fictional rather than factual, providing motivations and a tool for actors to shape their future (Beckert 2013, 2016, 2021). Secondly, our understanding of how sensemaking is affected by socio-cognitive factors, such as institutions, remains limited despite calls for research (Weick, Sutcliffe and Obstfeld 2005; Weber and Glynn 2006; Glynn and Watkiss 2020). Previous studies have examined actors' contexts and their influences on sensemaking mainly at the individual and organizational levels (e.g. Gephart 1993; Weick 1995; Balogun and Johnson 2004; Maitlis 2005; Lockett et al. 2014). Studying sensemaking by professionals who are firmly embedded in the professional institution enables an exploration of how actors' embeddedness in their contexts affects sensemaking beyond these levels.

The objective of this study was to investigate this rarely examined phenomenon and develop a theory of the nature of prospective sensemaking by the professionals leading digitalization concerning rising digital technologies—such as AI—and the impact of such technologies on their future. Specifically, the study analyzed the content and process of sensemaking at one of the Big Four auditing firms in Japan by auditing professionals who participated in the firm's internal taskforce studying and developing AI solutions for its auditing work during the period 2017–9. This context was selected because auditing is an exemplary case of a highly professionalized occupation (Greenwood and Suddaby 2006) and a widespread concern that new technologies might replace the profession's core tasks triggered intensive sensemaking on the part of the professionals.

The analysis resulted in the development of a grounded theory model for the content and process of professionals' prospective sensemaking. In the content of sensemaking, institutional factors—regulations, societal expectations, and trends among other auditing firms—constructed what was socially acceptable, while technological factors determined what was technically possible. The surveyed professionals reflected on their future to discern the uniqueness of the human role in consideration of these factors. In the process of sensemaking, the auditors moved through a three-phase cycle: monitoring environmental changes, experimenting with new practices, and developing blueprints of the future. Through the cycle, they developed a sense that the future of their firm and profession would be ever-changing due to the complexity caused by changing and contradictory factors surrounding their professional institution.

With these findings, this study contributes to the literature in three ways. First, it contributes to the literature on prospective sensemaking by expanding our knowledge of the nature of views of the future that sensemakers can construct in highly uncertain contexts. Specifically, it demonstrates that actors can develop a sense that equivocality can increase at any time in the future; thus, views of the future can always be tentative and accepting the cycle of continuous updates can be a way to cope with high uncertainty. This resonates with the perspective of sociological fictionalism (Beckert 2013, 2016, 2021) in that future visions can be intentionally imagined futures, and such views of the future have instrumental value in motivating actors to continue taking actions under conditions of uncertainty. Second, this study contributes to the sensemaking literature by

providing empirical evidence of the ways in which institutions influence sensemaking. Specifically, this study shows that actors' embeddedness in an institution sets the focus of their sensemaking on the elements that support the institution rather than on radically disruptive new approaches. Finally, these findings add to the emerging literature on digitalization and professions by shedding light on the underexplored topic of professionals' technology interpretations and views of the future in the early phase of technology adoption. The findings imply a shift in the mode of future projections and strategy development in PSFs toward higher volatility in digitalization. The data also indicate the antinomy of digitalization for established professions; while they are more able to innovate professional tasks than most potential external disruptors are, they are also motivated and constrained to sustain the existing scheme. In consequence, digitalization poses the difficult problem for professionals of finding the right balance between innovating professional tasks and maintaining the professional institution.

This article proceeds as follows. First, prior work on digitalization and professions is discussed, followed by a review of the theoretical lenses of this study—prospective sensemaking and institutional perspectives in sensemaking. Next, the case context and research methods are explained. Then, findings and a grounded theory model are presented, with a concluding discussion on the contributions and implications of this study.

LITERATURE REVIEW

Digitalization and professions

The significance of the changes caused by the recent rise of digital technology for various professions and occupations has been a matter of debate (Susskind and Susskind 2015; Smets et al. 2017). The emerging literature on digitalization and professions/occupations has enriched our knowledge of this important topic with two foci.

First, many studies have highlighted how and in what respects digitalization transforms professional fields. These studies have revealed significant changes in various fundamental aspects of professions, such as business models (Armour and Sako 2020; Tavoletti et al. Forthcoming), professionals' tasks and organization (Armour and Sako 2020), job descriptions and required skills (Kruskopf et al. 2020), and collective role identity (Nelson and Irwin 2014; Goto 2021). Digitalization has even provided opportunities for new types of technology-based professional service providers that undermine the traditional features of PSFs: high knowledge intensity, low capital intensity, and professionalized workforces (Kronblad 2020).

Secondly, another stream of research has focused on the way these changes unfold in individual organizations (Thorén, Agerfalk and Rolandsson 2018; Bechky 2020). In particular, Pemer (2021) has revealed how the macro-level changes link with front-line professional service work. Her work found that individual professionals act with renewed professional identity when they enact the changes in their new digital service development, new service roles, and new interactions between humans and robots. The aggregation of such enactment in firms, often unfolding after firm-level decisions and strategic actions on digitalization, is important because it triggers and interacts with the field-level shift.

While these studies add much to our knowledge of the potential outcomes of digitalization at different levels, they remain silent on how the professionals leading the change perceive technologies when making decisions about their strategic moves in the first place. Technology interpretations in the early adoption phase are important because they set the foundation for decisions and actions that can significantly affect digitalization outcomes (Fleming 2019). As Weick (1990) suggested, the installation of new technology is one important trigger of sensemaking among organizational members, because technology is 'equivoque' and requires ongoing structuring, interpreting, and enacting. Thus, the sensemaking literature provides a suitable lens for understanding digitalization and professionals in order to address the gap. Indeed, technology is increasingly understood as being socially constructed, representing the duality of objective reality and a socially constructed product (Leonardi and Barley 2010).

Prospective sensemaking

Sensemaking is a 'process, prompted by violated expectations, that involves attending to and bracketing cues in the environment, creating intersubjective

meaning through cycles of interpretation and action' (Maitlis and Christianson 2014: 67). It is a process in which individuals invent possible explanations about themselves and their environment that reconcile the complexity, confusion, and uncertainty around them (Weick 1995). Sensemaking is dynamic and social in nature and is driven by action and coordination among a collective of individuals (Weick, Sutcliffe and Obstfeld 2005). It was originally studied in the context of an ongoing crisis and change (Maitlis and Sonenshein 2010). However, recent theoretical development has gradually identified sensemaking at different levels. In the primary practice world, such as occasions when an organization is facing a crisis, immanent sensemaking by individuals with practical sense aggregates to detached-deliberate collective sensemaking with conceptual sense, sometimes with involved-deliberate sensemaking at the intermediary level (Sandberg and Tsuokas 2020). These interact with the secondary practice world in which representational sensemaking unfolds (e.g. a post-incident public inquiry). It then feeds back into the primary practice world and causes post-inquiry sensemaking (e.g. the focal organization receiving recommendations) (Dwyer, Hardy and Maguire 2021).

The literature originally assumed sensemaking to be inherently retrospective (Weick 1995) but recent studies have increasingly accepted that sensemaking can explicitly involve direct consideration of the future (Wiebe 2010; Stigliani and Ravasi 2012; Kaplan and Orlikowski 2013; Ganzin, Islam and Suddaby 2020). In this article, I follow this research stream to explore the nature of prospective sensemaking—'the conscious and intentional consideration of the probable future impact of certain actions, and especially nonactions, on the meaning construction processes of themselves and others' (Gioia et al. 1994: 378). Prospective or future-oriented sensemaking consists of iterative cycles and the use of multiple temporalities: past, present, and future (Gephart, Topal and Zhang 2010; Kaplan and Orlikowski 2013). It can be a multi-level process involving individuals and groups (Stigliani and Ravasi 2012).

Most prospective sensemaking studies have highlighted that it leads to a tentative conclusion and results in a renewed interpretation with greater clarity about the world in general (Stigliani and Ravasi 2012; Kaplan and Orlikowski 2013). As Weick, Sutcliffe and Obstfeld (2005: 415) argued, sensemaking in the literature is a 'redrafting of an emerging story so that it becomes more comprehensive, incorporates more of the observed data, and is more resilient in the face of criticism'. Accordingly, prospective sensemaking has been credited as a precursor to and enabler of tangible organizational change, such as strategic actions, organizational learning, and innovation (Kaplan and Orlikowski 2013; cf. Maitlis and Christianson 2014). It has been primarily studied in the context of specific episodes with clear beginnings and endings, such as a strategic change project (Gioia et al. 1994) and innovation projects in technological change (Kaplan and Orlikowski 2013). In this view, prospective sensemaking leads to the resolution of equivocality by sensemakers obtaining certain outputs, such as go/no-go decisions for new businesses (Kaplan and Orlikowski 2013) and tangible design artefacts for clients (Stigliani and Ravasi 2012).

However, some of the emerging literature observes that this stream of research has not been clear about the nature of the views of the future that sensemakers can construct. Some scholars have long argued that the future is inherently unknowable due to the discontinuity between the present and the future, as well as humans' cognitive limitations (Dervin 1983). Particularly in highly complex and uncertain contexts, constructing a fixed and plausible view of the future is extremely difficult due to the novelty and variability of the situation (Beckert 2021). Indeed, some recent studies have reported that equivocality can actually be increased for organizational members via prospective sensemaking about the adoption of new technologies and tools (Dwyer, Hardy and Maguire 2021). Thus, in a highly uncertain context, such as that of increasing digitalization, the kinds of future that sensemakers can arrive at and how they do so—a clear-cut plausible view to resolve the equivocality or some completely different form of resolution—constitute an important but understudied issue.

To address this mystery, sociological fictionalism (Beckert 2013, 2016, 2021) provides important insights in two ways. First, it suggests potential

variation in the actors' mode of future projection. The literature introduces the concept of fictional expectations, a view that approaches future visions in an uncertain environment as creating fictions about what the future will look like, rather than as finding the right answer based on rationality (Beckert 2013). This view assumes that prospective sensemakers in highly uncertain situations cannot obtain the true answer because future projections with great uncertainty cannot be fully backed by knowable evidence. Thus, in certain situations, actors must confront the future in radically different ways from the pervasive rational approach. This implies that actors need different versions of vision of the future depending on the nature of the context they face. For example, Augustine et al. (2019: 1931) proposed a distant future—'a representation of a future state of the world that is fictional in the sense that it presents a discontinuity with present reality and is not grounded in present experience'—as a distinct mode of perception for developing an extremely far-in-the-future perspective in the case of geoengineering (planetary-scale technological interventions in climate change). Studies suggest that actors need to manage the different views of the future carefully, because different versions of the future, such as those of the near and distant future, can generate contradicting interests (Slawinski and Bansal 2015).

Secondly, sociological fictionalism highlights the functional role of such imaginary futures in order to actually shape the future (Beckert 2021). In reality, the future that will unfold can be very different from the projected future. Regardless of the accuracy of views of the future, actors can often construct an 'as if' sense that the imaginaries were plausible. This 'as if' sense motivates and legitimates a firm's decisions and strategic actions. In addition, firms push their fictional expectations on others, making the view of the future a source of power (Beckert 2021). Thus, firms' fictional expectations can proactively shape the future. Furthermore, at the macro level, those projected futures form a dynamic force undergirding social change (Mische 2009) and drive macroeconomic dynamics and the advancement of capitalism (Beckert 2016). This view hints at the neglected but important role of prospective sensemaking as an opportunity for organizations to shape their future context and manage uncertainty.

Sensemaking and institutions

The existing literature has reported that actors do not engage in sensemaking in a vacuum; the context matters. Past studies have examined how contextual factors surrounding actors influence the nature of their sensemaking, mainly at the individual and organizational levels. The types of contextual factors have included actors' social positions, histories and personal backgrounds (e.g. Gephart 1993; Lockett et al. 2014), as well as their group membership and patterns of social interaction (e.g. Balogun and Johnson 2004; Maitlis 2005). These contextual factors affect sensemaking by developing different schemata for individuals. Meanwhile, institutions are another contextual factor that is socially constructed beyond the individual and organizational levels, comprising 'regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life' (Scott 2014: 56). The literature has long noted the potential important role that institutions play when they affect sensemaking (Weick, Sutcliffe and Obstfeld 2005; Weber and Glynn 2006; Glynn and Watkiss 2020).

Indeed, the literature has implied that socio-cognitive factors surrounding sensemakers significantly affect the nature of sensemaking. For example, after studying a crime laboratory, Bechky (2020) reported that technology adoption in one occupational group affected the social evaluation in the field such that neighbouring occupational groups perceived the future need to adopt the technology to sustain their legitimacy. These 'evaluative spillovers' exemplify the cultural turn of sensemaking for which this study is calling. Building on early attempts to link sensemaking and institutions (Jennings and Greenwood 2003), Weber and Glynn (2006) suggested four ways in which the institutional context can affect the sensemaking process. The most basic is through traditionally assumed cognitive constraints; institutions internalize structures and cause particular roles to become embodied in actors, making 'some things unthinkable and un-sensible' (Weber and Glynn 2006: 1643). They also suggested priming (providing social cues to follow), editing (providing social feedback), and triggering (providing occasions for sensemaking) as potential paths.

The manner in which these specifically unfold in an empirical context has not been sufficiently studied, however (Glynn and Watkiss 2020). As Bechky (2020) put it, when seeking to understand the interplay of digital technologies with workers, 'it is crucial to examine how workers themselves interpret them within the framework of their occupational cultures, organizational structures, and institutional influences' (p. 638).

In summary, how professionals leading their firms interpret technology and construct their views of the future when adopting technology is a missing but important topic of inquiry in the study of digitalization and professions. The literature on prospective sensemaking provides a fruitful lens for analyzing the phenomenon. Moreover, studying views of the future in digitalization contributes to the recent debate on the nature of such views in a highly uncertain context. Furthermore, studying a highly professionalized context addresses the important inquiry into the influence of institutions on sensemaking. Thus, this study explores the nature of prospective sensemaking about new technology and their future by professionals leading their firm, using the case of auditing and AI on which the next section elaborates.

RESEARCH CONTEXT: AUDITING PROFESSION AND AI

Auditing professionals have considered the application of AI to their auditing service since the mid-20th century (Vasarhelyi 1989). Due to recent technological breakthroughs, this discussion has resurfaced (Issa, Sun and Vasarhelyi 2016) and publications featuring sensational future scenarios have triggered public disputes. The research has spread speculation about the deterioration of various occupations, including auditing (Frey and Osborne 2013). The application of AI to auditing has not seen an immediate shift, however, because it involves gradual steps in the form of solution development in dozens of auditing tasks (Abdolmohammadi 1999). Decisive solutions had not yet materialized by the mid-2010s, and the process was still in an exploratory stage, with multiple prototype solutions. On one hand, there were positive expectations for improved productivity, superior managerial insight (Kokina and Davenport 2017), and the prevention of accounting fraud, the last of which damaged trust in the capital market (cf. Mueller, Carter and Whittle 2015). On the other hand, critical perspectives highlighted an overemphasis on accountants' advertisements to win competitive bids and the limitations of the currently available technology (Murphy 2017). The content and comprehension of the impact of digitalization were still in the formative stage and were being negotiated globally.

The audit professionals in Japan perceived the global debate about AI potentially substituting humans as a significant threat to their professional legitimacy and survival. This was because during this century they had already seen deteriorating public trust in their profession and a decline in the number of the certified public accountant (CPA) examination applicants due to continuing serious accounting fraud (e.g. Kanebo in 2005, Olympus in 2011, and Toshiba in 2014). To set digitalization as an important agenda, the Japanese Institute of Certified Public Accountants (JICPA) published a report on the future prospects of the auditing profession in March 2016 (JICPA 2016), followed by an updated report published in January 2019 (JICPA 2019). After the initial report's publication, each of the local Big Four firms increased their activities related to the research and development of AI solutions for audit tasks by creating a new organizational unit to facilitate AI application to auditing, establishing research alliances with universities, announcing the installation of new solutions in press releases, and publishing service brochures and business magazine articles. This study explored the content and process of sensemaking, with regards to AI and the future of their firm and profession, of a group of auditing professionals involved in the taskforce organizational unit for AI adoption at their Tokyo headquarters at one of the Big Four firms in the 2017–9 period.

The mission of the taskforce organization was to research the potential of adopting AI for auditing tasks and to develop and implement specific software solutions if necessary. The unit involved three types of member: a few core team members (led by Partners 1, 2, and 3) who planned, facilitated, and organized various initiatives; a larger number of part-time members who developed solutions in subteams composed of three to five members (typically one Manager and several Associates); and internal

and external advisors who provided expert knowledge. Each sub-team explored how their focal tasks could be improved through AI and related solutions. The core team helped the sub-teams gather information, search for AI vendors and negotiate upon request. This core team also held weekly meetings for all project members to share their progress updates, placed periodical information exchange calls with overseas member firms, and reported the progress to the local Partners. By the end of 2019, the firm had developed several tools and made them available to local audit teams.

METHODS

Research design and data sources

I conducted a qualitative study based on archival and interview data (Strauss and Corbin 1998), which is a suitable research design for theory development of a rarely studied phenomenon (Edmondson and McManus 2007). I chose the case firm because it was named as a firm that advanced in its AI adoption in the preparation discussions explained below.

I collected the data in three steps. First, I reviewed publicly available literature on AI and auditing firms, which amounted to approximately 1,300 pages of A4-sized documents in the Japanese and English languages. Second, I engaged in one-hour preparation discussions in June 2017 with two Partner-class auditors who were involved with AI adoption initiatives at two of the Big Four firms in Tokyo. I used these unstructured discussions for the research design and interview questionnaire development. Third, I conducted 22 interviews with 16 members of the case firm (one of the firms with which I conducted the preparation discussions) at three different points in time: 2017, 2018, and 2019–20 (see Table 1). These interviews covered key auditors who led their firm's AI adoption initiative and were directly involved in the sensemaking: all the key decision makers (Partners 1, 2, and 3), the key staff who worked at the project management office (e.g. Senior Manager 1, Associate 1), key advisors (e.g. Director 2), and most of the sub-team leaders (e.g. Director 1). They were homogeneous in their backgrounds except for one management consultant of their group firm (Interviewee #7); they joined the profession directly from university or in their early careers through the same CPA examination and training, worked with the same auditing protocols and IT infrastructure of the firm without particular prior experiences in AI; and they proactively joined the taskforce team because they were interested in and willing to contribute to AI adoption. The interviews did not cover junior staff in the sub-teams because the degree of their involvement varied and generally was limited. Other auditors outside the taskforce unit did not have access to the confidential AI adoption project and the sensemaking process. Thus, this study focused on a deep understanding of the initial collective sensemaking by pioneering professionals who led firm-wide initiatives as a team, rather than on exploring the potential diversity in sensemaking that followed in the firm as a whole. Each interview lasted between 1 and 1.5 h, with an average length of 1.3 h (i.e. 28.5 h in total). Through the interviews, additional data were collected from the sample weekly taskforce meeting minutes in 2017. Except for four interviews in which I wrote extensive memos during the interviews and typed up within 24 h, all interviews were audio-recorded and transcribed.

Data analysis

I adopted a grounded theory approach to discover the key characteristics of the focal phenomenon (Strauss and Corbin 1998). I utilized a two-step coding approach because it is an effective way to balance the researcher's creativity and analytical rigor by distinguishing the meanings addressed by informants and the implications distilled by the researcher on the basis of the initial coding results (Gioia, Corley and Hamilton 2013).

The analysis was conducted in the following iterative steps. First, I developed a case history of the case firm's AI initiative, using the interview data as the main information source, supplemented by the archival data. Different data sources demonstrated consistency in the shared case history. Second, I coded the key concepts that emerged in the source data and grouped them into categories. In accordance with the research question, I focused on the taskforce members' perceptions in relation to the kind of sensemaking they performed, the factors they considered and how those factors were associated with one other. This '*in-vivo* coding' aimed to

Table 1. List of interviewees

No.	Date	Duration (hour)	Interviewee	Role
1[a]	June 2017	1	Partner 1 (P1)	Task force (TF) sub-leader
2[a]	July 2017	1	P1 (second)	TF sub-leader
3	August 2017	1.5	Senior Manager 1 (SM1)	TF member (PMO[b])
4	August 2017	1.5	Associate 1 (A1)	TF member (PMO)
5	August 2017	1.5	Manager 1 (M1)	TF member, temporal transfer to JICPA
6	August 2017	1.5	Partner 2 (P2)	TF leader
7	August 2017	1.5	Consulting Senior Associate (SA1)	TF member (PMO)
8	September 2017	1.5	Director 1 (D1)	TF member (sub-team leader)
9	September 2017	1.5	Manager 2 (M2)	TF member (sub-team leader)
10	September 2017	1.5	Senior Manager 2 (SM2)	TF member (sub-team leader)
11	September 2017	1.5	Senior Manager 3 (SM3)	TF member (sub-team leader)
12	September 2017	1.5	Director 2 (D2)	Advisor to TF
13	September 2017	1.5	Director 3 (D3)	Advisor to TF
14	September 2017	1.5	P1 (third)	TF sub-leader
15	September 2017	1	Audit Representative Partner (P3)	Executive in charge of TF
16	August 2018	1.5	P1 (fourth), SM1 (second)	TF leader, TF member (PMO)
17[a]	October 2019	1	P1 (fifth), SM1 (third)	TF leader, TF member (PMO)
18	December 2019	1	SM1 (fourth)	TF member (PMO)
19	December 2019	1	Manager 3 (M3)	TF member (sub-team leader)
20	December 2019	1	Senior Associate 2 (SA2)	TF member
21	December 2019	1	Manager 4 (M4)	TF member (sub-team leader)
22[a]	January 2020	1	SM1 (fifth), M4 (second), SA2 (second)	TF member (PMO), TF member (sub-team leader), TF member

[a]Interviews were not audio-recorded.
[b]Project management office.

capture the original meaning that the informer attempted to convey. The interview data showed highly consistent perceptions across individuals. The only major difference was their perceived priority of task areas to which they thought they should apply AI. This led to the choice of the task area for each sub-team in which they engaged in experiments with the new technology. Third, I analyzed the characteristics of relationships among the first-order concepts, with a particular focus on their common characteristics and ability to explain the phenomenon of interest. The aim of this step, which is similar to axial coding (Strauss and Corbin 1998), was to highlight emerging concepts from the researcher's perspective. Finally, I developed the data structure (Gioia, Corley and Hamilton 2013) shown in Figure 1, which clarified the link between the original data and the extracted higher-order themes (Gioia et al. 2010). I shared the analysis results with the representative interviewees and found no significant discrepancies from their self-perceptions.

FINDINGS

The analysis revealed that the auditing professionals' sensemaking involved three themes: monitoring environmental changes, experimenting with new practices, and developing blueprints of the future. In the

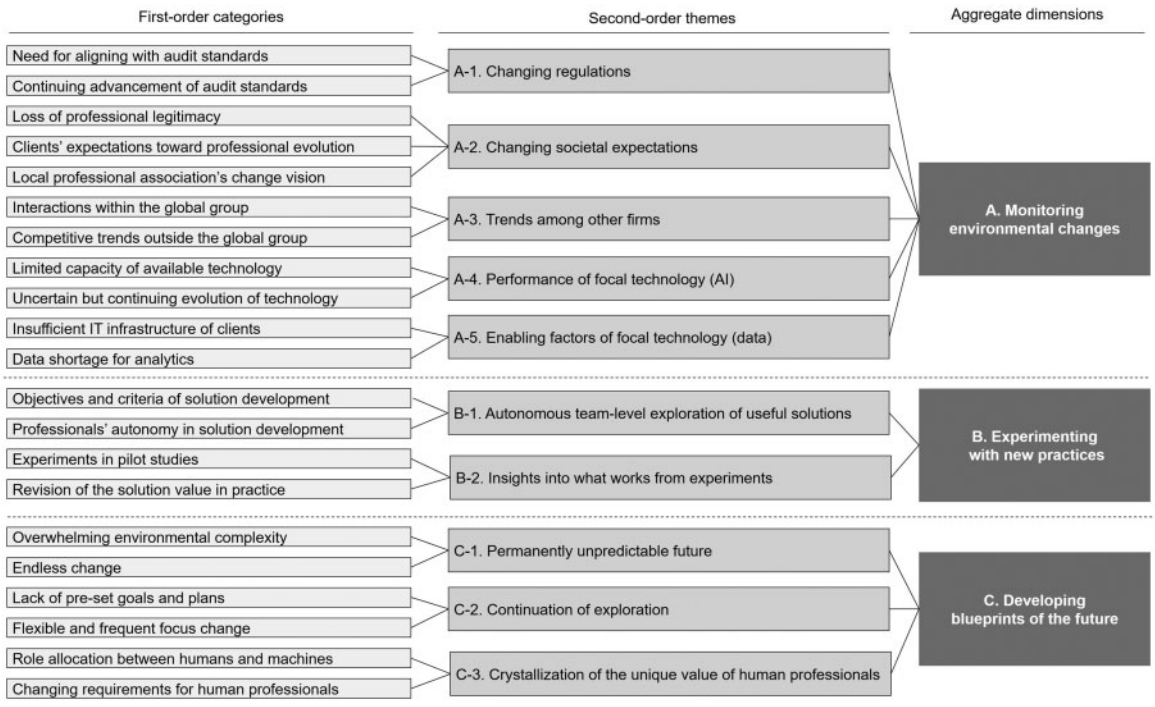

Figure 1. Data structure

data, these themes were consistently observed throughout the observation period. These researcher-induced themes served as the basis for the development of a model of the content and process of the sensemaking, which will be discussed after each theme is reviewed.

Theme A: Monitoring environmental changes

Throughout the sensemaking process, the auditors continuously monitored what they perceived as requirements from external stakeholders—particularly in terms of regulations, societal expectations, and trends among other firms—and what was possible with the new technology—technology performance and its enabling factors.

A-1: Changing regulations

The auditors perceived that the current auditing standards could hinder AI use, especially in judgement tasks. Consequently, they continually monitored those constraints and the potential regulatory change of international audit standards in the global professional associations (i.e. the International Auditing and Assurance Standards Boards in the International Federation of Accountants).

Two associated factors were observed in relation to this interest. First, alignment with regulatory standards was a prerequisite for their profession. The auditing standards required specific interventions and confirmation processes conducted by the certified auditing professionals. This intervention by professionals with sufficient expertise legitimated their professional auditing. The auditors perceived that replacing human work with AI could hinder the effects of this intervention, as one Senior Associate commented:

> We're trying to use some work-in-progress AI tools as pilot studies, but we are not allowed to base our auditing on them. So, while we test those in our auditing process, we provide auditing with outputs based on the traditional 'questioning mind' of human experts, apart from the tests (Senior Associate 2).

The professionals were particularly concerned about highly judgemental tasks that required sophisticated

skills and would therefore be considered highly controversial if AI were employed:

> The first level is simple automation, then the next is judgement support. . .. The third level [the complete substitution of human judgements] is actually difficult. It could depend on the content of the judgement, but it is not realistic to have conclusions without human professionals' judgements. At least the current auditing standards do not permit it, because the audit judgements require such unique expertise (Partner 1).

Secondly, the auditors expected revisions of auditing standards in the future because they accepted frequent regulatory revisions driven by environmental changes as an integral part of their professional lives. For example, a Senior Manager shared their sense of 'revisions as usual':

> Auditing standards change every year, and public needs for accounting evolve. . .. For example, if clients shift to IFRS [the International Financial Reporting Standards], we need to respond to it, but while we struggle with the adjustment, a new requirement emerges. In such a rat race, we can't be sure how AI will be treated (Senior Manager 3).

Although the auditors were unsure about the content and timeline of new regulatory revisions related to AI adoption, they were 'waiting for the global trend to be set' (Senior Manager 1) in anticipation of the potential trickle-down influence of the international auditing standards on their local regulations.

A-2: Changing societal expectations

The auditors revealed their careful consideration of the public sentiment about their professional state in the age of AI. On one hand, sceptical public views regarding the legitimacy and sustainability of their profession posed a significant threat. On the other hand, some of their clients had expressed positive expectations for the use of AI in auditing, and the professional association had published visionary reports delineating full utilization of it. These factors pressured the auditors to pursue technology adoption.

The interviewees unanimously agreed that they were concerned about media articles describing an arguably pessimistic future for the auditing profession. The frequently associated narrative was that 'some new technological product would become able to conduct audits, and then clients would not have to rely on the Big Four' (Senior Associate 1). When this technology became readily available, auditing could be provided by fundamentally new competitors, such as 'start-up firms or IT big houses' (Partner 1), or even 'the tax office or the national government' (Senior Manager 1).

The auditors also perceived positive expectations for the potential value the technology could add. As a Senior Manager commented, some audit clients were 'interest[ed] in discussing the progress and contents of AI audit. Sometimes they actually [asked that] such solutions [be used] for them' (Senior Manager 2). These requests pressured the professionals to advance alongside the new technology, as one Director commented:

> We could call it a societal change that we are receiving diverse questions from our clients about the topic, in the recent boom of AI. As a result of such AI discussions, clients might say 'there is no need for accountants anymore' if we don't have counter arguments. This made us conscious of the need to proactively work on the issue (Director 2).

Answering the societal call for action, the JICPA served as a facilitating unit to develop a shared vision in the national professional field. The 'Future of Audit' team of the JICPA's IT committee published its research in March 2016; it highlighted three aspects of significant future change for the profession. First, it suggested that digital technology would revolutionize and expand the scope of audit data, enhance analytical rigor beyond human cognitive capabilities and increase audit frequency. Second, the report implied that these auditing process changes would significantly influence the social perceptions of how auditors add value to their clients and what the profession practically represents. Third, it predicted a future transformation of auditors' work style, proposing drastic changes to the nature of the profession regarding its value for

clients and the required professional skills (JICPA 2016).

The interviewees were all aware of the publication and they unanimously agreed with the stated agendas for urgent change. They perceived the vision of the report as 'the natural course of events' (Senior Manager 2) and described its publication as 'ringing a warning bell' (Manager 1).

A-3: Trends among other firms

In order to find references, the auditors continuously searched for technological trends among other firms. One source of information was other member firms in the same global group. The taskforce members used their personal networks to exchange information about progress, trends, and available technology. For example, one Senior Manager commented on his ad hoc referencing: 'I ask my IT expert colleagues to connect me with knowledgeable people in other member firms or I ask expats from the other global member firms in my office about who is doing what in other offices, and then contact them' (Senior Manager 2). As a result, in several task areas they 'adopted other member firms' tools, as long as they [could] be used in different languages' (Senior Associate 1).

Technology vendors were another source of information, especially about the latest technology available in the market. The core team 'continued to interview many technology vendors, and arranged meetings with vendors for [sub-teams] when they found a fit with the topic' (Manager 2).

The other Big Four auditing firms were the other source of inspiration. The auditors were interested in new initiatives undertaken by their competitors because 'the first and most advanced auditing firm in AI and the broader technology transformation could take the market initiative' (Associate). Even though they had limited access to their competitors' confidential activities and therefore could not copy their competitors' solutions, they continued to study them. For them, the 'other Big Four firms were the key players to monitor' (Senior Manager 1), especially in relation to their marketing activities and solution focus.

A-4: Performance of focal technology (AI)

The auditors also continued to investigate the capacity and limitations of the latest technological solutions. Two topics emerged from the data. First, they perceived that this technology still experienced functional limitations in many task areas. As one Partner suggested, 'through the study of various technologies, [they] learned that there weren't many options immediately available' (Partner 1). Natural language processing is one example of an underdeveloped technological area. Automatic linguistic data processing could significantly reduce the auditing workload when dealing with audit client contracts and remarks in journal ledgers. However, the auditors found that the local language was 'extremely difficult to search and match technologically' (Director 2). As one Manager pointed out, the challenge was associated with the characteristics of the language: 'It's easier for machines to recognise English, but it's actually difficult to make the automatic recognition and processing in Japanese because of the frequent use of implicit nuances. There really seems to be a technological bottleneck' (Manager 2). Another limitation of the available algorithmic solutions was that they were not readily understandable in terms of why they processed data in a certain way. As one Partner explained: 'The process is more important than conclusions in auditing. [Auditors] have to keep records of the kinds of judgements they made, and what accumulation of information led to the conclusion' (Partner 1). He asserted that unless the technology could make the underlying logic explicit and understandable for humans, they 'could hardly imagine fully installing AI in judgemental tasks' (Partner 1).

The second topic was the uncertain but continuing advances in AI technology. The auditors all assumed that technological advances would continue with increasing speed. However, as many interviewees pointed out, 'there [was] no way to see whether the next AI innovation would come soon or take much longer' (Senior Manager 2) and there were 'too many unknown factors to affirm something' (Director 1). In light of the limited capabilities of current technology solutions, the professionals recognized the need to continue the monitoring of the latest solutions to ensure that they did not miss out on the expansions of technology capacity.

A-5: Enabling factors of focal technology (data)

In their studying AI, the auditors realized the significance of the enabling factor for algorithmic solutions—namely, data. Two themes emerged as important issues. First, the auditors perceived that their clients' insufficient electronic data formatting created a significant bottleneck. Some audit clients still had limited integration of their Enterprise Resources Planning systems, and some lagged behind even in digitizing paper data. One Senior Manager highlighted the problem:

> Ultimately, most audit evidence is composed of paper documents. They are sheets of paper, manually written or typed and printed by PC. . .. Those papers are stored in cardboard boxes in our clients' warehouses. . .. Without their conversion to electronic data, the audit cannot be automated. (Senior Manager 2)

The auditors found that they could not use 'solutions that needed the high quality of client data formatting, at least in the short term' (Senior Manager 1). Due to their dependence on client data, they needed to continue monitoring the development of their clients' IT infrastructure in considering what would be technologically possible.

Secondly, the auditors observed a problem relating to the limited amount of teacher data needed to ensure reliable analytical outputs. They perceived two associated factors grounded in the very nature of auditing. One was the confidentiality of the client data, which could prevent the data use for analyses involving external parties and cross-client leverage. One Partner acknowledged this hurdle: 'Our client data should be protected as confidential, [but] then we have an issue of how much of the data we can share with external vendors in AI solution development' (Partner 3). Another factor was the rarity of critical events in auditing. One Director elaborated on an example of accounting fraud that was one of the most important events they had to detect:

> Do we really have sufficient data to have statistically significant insights? There is a constraint. For example, accounting fraud has been so rare that we don't have thousands or millions of teacher data. . .. I think there is data constraint in our field (Director 2).

In dealing with such a data shortage for analytics, the surveyed professionals anticipated continuing efforts to accumulate and develop their database.

Theme B: Experimenting with new practices

The surveyed professionals conducted experimental studies in the context of actual auditing projects to test solutions for individual audit task areas in sub-teams. These pilot studies aimed to improve the productivity and quality of their traditional auditing. The sub-teams autonomously explored new solutions under the loose control of the management. Their insights into the pros and cons of individual solutions were used to update the taskforce's perspective on the future application of AI to auditing.

B-1: Autonomous team-level exploration of useful solutions

The taskforce members set the priorities regarding the audit task areas to address in each sub-team in light of the expected technical returns. In their pilot studies in the prioritized task areas, each sub-team was allowed highly autonomous exploration.

The data revealed the auditors' strong interest in how AI could improve the productivity and quality of their existing audit tasks. They problematized the current chronic overwork because they 'always [had] to work for extremely long hours during the busy season to meet the deadline' (Director 1). They perceived that a major cause was the fact that the current audit tasks were 'fairly labour-intensive, handled mainly by manual work' (Partner 3). AI and the related new automation tools were perceived as game changers in this regard. In addition, they shared the expectation that AI would also 'enhance the quality improvement of the audit' (Senior Manager 2). They perceived that algorithms could outperform human judgements in certain tasks, such as estimating future asset values.

Driven by this interest, sub-teams proactively engaged in exploration. They had a controlling stake in deciding the content of their solutions, as well as the process and timelines for their sub-team work. At the beginning, the initial sub-teams were formed

according to team members' 'brainstorming about what task areas to tackle and how they wanted to use AI' (Senior Manager 3).

According to one Senior Manager, the work style of the sub-teams was also perceived as being highly flexible: 'We simply get together to talk when we prefer. . .. Of course, we have some basic schedules about the tasks [to do and] by when, but we're doing this project very flexibly' (Senior Manager 2). Individual members explored specific solutions that leveraged their personal expertise to solve problems they identified in their day-to-day audit work. For example, one Manager commented that their professional expertise in their client segment guided their sub-team's focus:

> I have audited clients in [a sector] in my career. . .. I have thought that a part of audit tasks in this sector could be properly systematized without significant barriers, so I proposed my plan for the sector and launched my sub-team to pursue the idea (Manager 2).

B-2: Insights into what works from experiments

The sub-teams tested their solutions in ongoing audit projects with their close contacts or in their own engagements. One taskforce member commented on their intent:

> The tool might be applicable for some clients but not for others, because the structures of data and information systems vary by client. The model should be finalized after pilot studies in several firms, and then will be applied to all audit projects (Senior Manager 2).

The professionals recognized that learning from these experiments provided essential inputs for understanding AI's potential uses for auditing. One Senior Manager commented on the value of this knowledge accumulation in the case of a new key solution using machine learning:

> In the past, human auditors analyzed [a particular type of data]. . .. The way of condition settings and outcome evaluations varied by individual CPAs to some extent. Now we have machine analysis; it is in the pilot-testing phase. . .. We get feedback from audit teams in the front line, and use the feedback to continue the machine learning, so we can further improve the accuracy of outputs (Senior Manager 1).

While learning from pilot studies did not necessarily lead to a successfully developed solution, it sometimes provided discoveries of fundamental bottlenecks, resulting in refocusing and/or cancellation of certain sub-team projects. Learning from the experiments clarified what new practices were emerging with AI in each task area, and thus provided inputs for updating the blueprints of what their profession would do and be.

Theme C: Developing blueprints of the future

The auditors continuously developed and updated their views on the future of their firm and profession. Three particular features characterized their thinking. First, their future vision was accepted as an inherently incomplete picture rather than a fixed description with tangible timelines. Second, the professionals demonstrated their intention to continue exploring ways to deal with continuing change. Third, the underlying consistent theme of their enquiry was the crystallization of the unique value of human professionals against the rise of algorithmic solutions.

C-1: Permanently unpredictable future

One evident motif of the auditors' sensemaking was the overwhelming environmental complexity and continuing change. For example, one Associate acknowledged the turmoil: 'Honestly, we cannot see the big picture because things could completely change in one or two years depending on the trends in the world' (Manager 1). In a similar vein, one Manager commented that they '[could] not forecast anything [and were] just searching for how [they could] get closer to the goal' (Manager 2). This lack of a clear and fixed vision was perceived as the inevitable outcome of an inability to know the future; as one Director commented:

> What are our mid-term goals for this AI project? What will we think about the ten years from now? Nobody knows—or at least, I don't

> know. Still, we must deal with the problem that some part of our work may disappear, or significantly change if not disappear. So, we continue thinking, although vaguely (Director 3).

Of course, as the auditors' sensemaking continued, they developed certain blueprints of the future that grew more detailed and formal. At first, it was only shared thoughts without written outputs. They developed their views into written visions in the following year. Then, they continued revising their visions, parts of which were used for their firm's transparency reports and other publications. They continued gradually updating their tentative future perspectives in those publications.

Indeed, with the unpredictable nature of the future, the auditors understood that AI auditing would be an endless and fluctuating project without specific timelines. In this respect, they considered ongoing sensemaking to be an unavoidable and steady state, as one Senior Manager described in a metaphor: 'We must continue riding the wave' (Senior Manager 2). A Partner aptly summarized their acceptance of the never-ending exploration of new meanings and solutions to adapt to the changing environment:

> I think there is no ending—it doesn't end because audit procedures. . .and clients' contexts change. There are no end points or specific year in which to finish, but we will continue improving and releasing tools that will be customized to the context. . .. It never ends (Partner 1).

C-2: Continuation of exploration

The auditors intentionally designed the project to be a continuous exploration through two features. First, they set no specific deadlines or goals for the sub-teams, as evidenced by another Senior Manager's comment: 'There were no specific objectives for the kind of outputs or deadlines. . .. We only have schedules for the coming month or two for each sub-team' (Senior Manager 1). According to one Partner, the project had 'no specific pre-set official goals' (Partner 3). Another Partner explained their intention:

> We have not set particular KPIs. . ..It would be ideal to set KPIs in relation to the solution tools to be used and in how many audit projects, or by how much costs would be cut, and the like. It is still not possible, however (Partner 2).

No KPIs were set, because 'nobody knows [what KPIs to set]' (Partner 1).

Secondly, they shifted their team structure and focus frequently. As the Senior Manager who served as the acting project manager of the core team acknowledged, they adopted this structure so that they could 'continue looking for. . .useful tools and the place to apply them' (Senior Manager 1). This evolving nature of the blueprints of the future assumed that exploration activities would continue to be rearranged so that their detailed solution designs and auditing practice revisions would keep pace with the changing future of the technology and stakeholder expectations. For example, one Partner described their frequently discovering unexpected shortcomings in individual solutions, which led to the abandonment of several sub-teams:

> As a result of our discussions with AI experts, we often encounter hurdles. . .. What we want to achieve is not possible with the current technology, or there are no practical benefits even if it is technologically possible. We confront such hurdles in a variety of ways (Partner 2).

C-3: Crystallization of the unique value of human professionals

Consistent with the JICPA's vision, the auditors gradually constructed their view that, regardless of how AI advanced, 'the audit without human intervention [would] be impossible, and the job of auditors [would] continue to exist' (Senior Manager 3). Meanwhile, they agreed that AI would be a substitute for some part of their work: 'We will not have to spend time on tasks that do not necessarily need professional accountants' (Senior Manager 3). The logic supporting the continued relevance of their profession was that human accountants would be necessary to 'educate AI' (Senior Manager 3) or

'communicate with clients' (Partner 3), and thus they expected that 'human accountants [would] continue to be required for the very survival of AI solutions' (Senior Manager 3). This view of human-AI collaboration was aptly summarized by the representative Partner:

> We expect that humans and AI will conduct audits together. We want an audit of much higher value than today. We want to spend much more time thinking and communicating. [For that purpose] we want AI or computers to deal with tasks as much as possible (Partner 3).

The question of the unique value of human professionals was associated with the changing requirements for human professionals to coexist with AI. The professionals agreed that future auditing with more advanced technology would require new skills outside their traditional professional training. One Director shared their expectations of the skill change:

> We must change our assumption of our human resources centred on people with accounting or financial backgrounds. Since data usage will be more important, we'll need more people with science backgrounds. . .with the increasing significance of sophisticated judgements, it is said that future auditing firms might need more experts in psychology and behavioural science (Director 2).

Making sense of the future of auditing

On the basis of the findings, a grounded theory model was developed on the content and process in the auditors' sensemaking (Figure 2).

First, professionals continually monitor environmental changes (Theme A: 'Monitoring environmental changes'). This focuses on institutional factors and technological factors. The former involves regulations, societal expectations, and trends in other firms. The latter highlights the performance of the focal technology and the availability of its enablers—in this case, AI and data. The institutional factors define what is socially acceptable in technology use, and technological factors determine what is technically possible. This provides an overall picture with which auditors should align their practices, as well as insights into available technologies and templates.

Secondly, professionals continue learning through experiments (Theme B: 'Experimenting with new practices'). On the basis of the information about available technologies from their monitoring and the priority agreed upon among the professionals, they design and implement small experiments in frontline practices—in this case, pilot studies of new technological solutions for individual audit tasks. This provides insights into what works in practice, as well as feedback for their further monitoring of the specific issues to focus on next.

Thirdly, professionals continue developing and revising their tentative future visions (Theme C: 'Developing blueprints of the future'). Using new inputs about the environment from their monitoring and insights into what works in practice from their experimentation, professionals construct their shared perspectives of the future of their firm and profession. With regard to the content, they focus on what remains legitimate to sustain their profession with the changing institutional factors and what remains functionally irreplaceable in the role of humans as it relates to the advancing technology. This updated vision provides renewed focus on further monitoring and experimentation that will lead to new inputs for continuing adjustment to the blueprints of the future.

In this case, the cycle of these three themes encouraged the construction of exploratory activities within the taskforce. Through this sensemaking, the auditors developed and enacted a sense that AI may not substitute for the core audit tasks in the short term. However, they perceived that they would continue this cycle without a specific ending to adapt to the environment because the complex and ever-changing nature of the environment would continue to provide changing views of the future.

The case of a journal entry fraud detection algorithm

This section demonstrates how the grounded theory model works, using the case of one representative

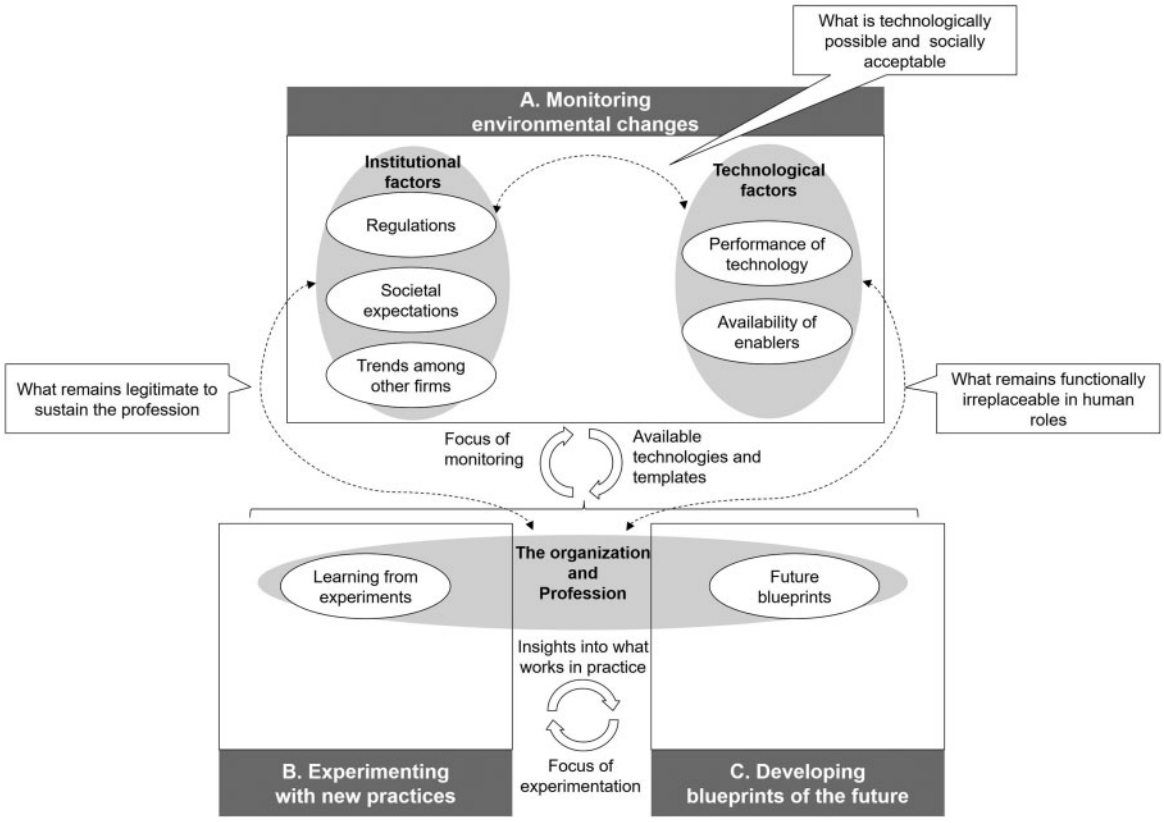

Figure 2. Grounded theory model of auditor sensemaking

solution area: a journal entry fraud detection algorithm. This case example is a reflection of the experience of one of the sub-teams; it was experienced by the sub-team members (e.g. SM2 in Table 1) and the project management office (PMO) staff who coordinated and were involved in the process (e.g. SM1 and A1 in Table 1). Those experiences were shared and discussed across sub-teams within the taskforce through knowledge-sharing opportunities, such as weekly meetings. It was a shared understanding among the taskforce members about the technology in this specific task area assigned to the sub-team. Those insights into individual task areas aggregated into evolving blueprints of the future.

The journal ledger is one of the most important datasets in audit risk confirmation because all transactions are recorded in its entries; its unusual patterns provide important clues to detecting accounting fraud. Traditionally, experienced auditors identified the patterns of entries that needed to be deeply investigated for particular kinds of clients on the basis of their expert intuition developed through their handling of a large amount of raw data as junior auditors. This task area is regarded as the very core of auditing professional expertise.

Monitoring environmental changes

The surveyed auditors perceived that *institutional factors* problematized complete substitution of humans in this task area. It was true that the *societal expectation* was positive; the profession's stakeholders—clients, investors, and the professional association—favoured the use of technology to improve the effectiveness of fraud detection. However, current *regulations* (auditing standards) required accountability for the underlying judgemental logic and compliance with due audit processes by certified human auditors. For this reason, auditors could not complete audits

by simply using algorithmic conclusions as audit evidence. *Trends among other firms* also suggested that AI adoption in this area attracted the attention of large audit firms, though the use cases seemed to be limited and only supplemental to human auditing tasks.

In terms of *technological factors*, it was possible to extract certain irregular journal entries using an algorithm trained with machine learning. However, in terms of the *performance of technology*, it was not known how accurate and useful the outputs of such software could be. Moreover, in terms of the *availability of enablers* (data), it was not clear what audit data formats would be required for effective and efficient algorithmic analyses. Thus, the auditors perceived both opportunities and potential limitations arising from *what is technologically possible and socially acceptable* in this task area. These insights informed the taskforce of the high priority of and key issues in this task, as well as the knowledge regarding anomaly detection by machine learning as one of key *available technologies and templates*.

Experimenting with new practices

The task area was acknowledged by the taskforce team as a *focus of experimentation* and a sub-team engaged in development and experimentation with a solution in this task area. The team developed a new tool using machine learning and the auditors learned the performance and practical limitations of the new tool through pilot tests in selected audit projects.

Although the new tool performed well in certain contexts, the team identified several practical limitations. The algorithm could sort the journal entry data according to the degree of anomalies from past data patterns, but it could not provide the reasons for the emergence of the anomalies and therefore could not determine which category of entries the auditors should use their limited time to investigate further. The auditors also perceived that the algorithm could not identify acceptable variations of specific accounting customs in each client firm. Furthermore, only a limited number of clients were equipped with an adequate data infrastructure to facilitate the auditors' smooth execution of causal verification on the system once the anomaly was detected. Data usage across clients was also limited due to confidentiality issues. One Partner's comment exemplified the professionals' disappointment related to the solution performance:

> Throughout the study with technology experts, we learned a lot. Originally, what we wanted was a solution that could automatically detect potential accounting frauds when we simply input data. Actually, the teacher data was insufficient, compared with our ambition, so we had to change our approach (Partner 2).

These *insights into what works in practice* were shared amongst the auditors. In addition, those identified issues, such as technological solutions for the algorithms' transparency and data format limitations, were reflected in their next *focus of monitoring* of the environment.

Developing blueprints of the future

Having inputs from the environment study and experiments, the auditors perceived that the role of human professionals could be sustained in this important task area. In terms of *what remains legitimate to sustain the profession*, they observed that human intervention in judgements and evidence confirmation would continue to be the sources of the trust inherent in auditing due to the current audit standards, which emphasized human auditors' expertise and responsibility. Moreover, in terms of *what remains functionally irreplaceable in human roles*, algorithmic solutions could provide only a limited degree of insight with the current technological capacity and client data availability. These perceptions were reflected in the taskforce's integrated view of the future of their profession, which denied immediate substitution of human auditors in the near future.

However, the taskforce also recognized that the *future blueprints* could be revised at any time, depending on the changes in auditing standards, technology advancements, and improved data availability. As such, they suspended the use of their journal entry anomaly detection tool as a pilot tool while its development continued, only making it available upon request to their auditing projects in the firm. This updated view of the future focused attention on further monitoring of this technology area and related regulatory trends, as well as on further experimentation in associated new task areas.

DISCUSSION

This study explored the nature of prospective sensemaking by auditing professionals in a large auditing firm in relation to their profession and organization vis-à-vis the rise of AI. The data analysis revealed the content and process of this detached-deliberate sensemaking (Sandberg and Tsuokas 2020). Specifically, the grounded theory model showed a cycle of monitoring environmental changes, experimenting with new practices and developing blueprints of the future. The auditors perceived that this cycle would persist so that they could continue to adapt to the complex, changing, and uncertain environment.

On one hand, this model fleshes out our knowledge from past studies on how sensemaking progresses. First, the model highlights professionals' 'monitoring environmental changes' to identify available technologies and templates. This substantiates the traditional view that sensemaking revolves around noticing and extracting cues in the environment (Weick 1995: 49–55). Secondly, the model suggests 'experimenting with new practices' as an important step. Experimentation with different ideas has been reported as valuable in prospective sensemaking to cope with uncertainty (Kaplan and Orlikowski 2013). As Augustine et al. (2019) noted, future imaginaries can develop through the exploration of multiple possibilities of an imaginary and an antithetical imaginary. Thirdly, the model identifies that insights from other steps aggregate to future imaginaries in 'developing blueprints of the future', providing a focus for further monitoring and experimentation in a continuing cycle. As such, concurrent with past studies, this study demonstrates how actors consider an interplay of a wide variety of factors in a long and iterative process in their collective prospective sensemaking (Stigliani and Ravasi 2012; Kaplan and Orlikowski 2013).

On the other hand, the findings renew our knowledge and make theoretical contributions, particularly in three areas: prospective sensemaking, sensemaking and institutions, and digitalization and professions. The rest of this section elaborates on each.

Prospective sensemaking

This study contributes to the literature on prospective sensemaking by significantly expanding our knowledge in three ways regarding the nature of views of the future in a highly uncertain context. First, the findings extend our knowledge about the variation in actors' modes of future projections in sensemaking. It has been accentuated that actors obtain a certain view with more cues and plausible explanations about the future environment through sensemaking (Maitlis and Christianson 2014; see also Brown 2000; Maitlis 2005; Weick, Sutcliffe and Obstfeld 2005; Stigliani and Ravasi 2012). Sensemaking creates various types of 'sense'—a certain conclusion about the nature of the sensemaking subject, from which the actors can choose and with which they can develop their interpretations and trigger actions (Weick 1995). The findings suggest, however, that views of the future can be incomplete without final conclusions in a cycle of exploration, and actors can perceive and embrace the continuous evolution of their vision without a specific ending. In other words, actors can construct a sense that equivocality can increase at any time in the future. Thus, their view of the future can always be explicitly tentative in their minds. This adjusts the assumption of past studies; actors do not necessarily achieve equivocality resolution with a conclusion in prospective sensemaking, but can explicitly accept the future as ever-changing. In highly uncertain contexts, the view of the future in sensemakers' minds can be only a tentative imaginary, not a decisive prediction. This resonates with the perspective of 'sociological fictionalism' (Beckert 2013, 2016, 2021), which highlights the way in which actors create and act on 'fictional expectations' when coping with an uncertain future.

Second, this study substantiates the instrumental value of such tentative views of the future that motivate actors to continue taking actions. As Beckert (2013: 219) noted, 'actors are motivated in their actions by the imagined future and organize their activities based on these mental representations'. In this case, the auditors continued their cycle of exploration to keep updating their views of the future, through which they developed prototype AI solutions. This suggests that when actors perceive the inherently unforeseeable nature of the future, they appreciate the value of continuing exploration, as opposed to taking no action, because such exploratory activities can help them collect more cues to update their view of the future, advance preparations for a

wider range of possible futures and thus better cope with continuing change. Even in the absence of a fixed view of the future, the auditors believed in the value of exploration, which in the end could shape their future through their solution development and legitimation work. This implies that facilitating collective sensemaking about the future can be an important opportunity for organizations, enabling participants to flexibly and continuously adjust their worldviews when dealing with a highly uncertain environment.

Third, this perspective also addresses and adds knowledge to the interest in whether or when sensemaking starts and stops (Maitlis and Christianson 2014: 97). The findings suggest that sensemakers can have a metacognition of never-ending sensemaking. In fact, such a sense of continuing confrontation between professionals and technology has been imagined. In discussing the implications of the rise of AI, Abbott (1988) emphasized the inherent and endless nature of professionals' attempts to keep pace with technological advancement: 'On the one hand, professional work is replaced by machine work. On the other, the machines enable new forms of professional work and new expectations for professional services. Essentially, the race is between two forms of creativity' (p. 184). This view reflects a neglected but important aspect of professionals' lives, as shadowboxing against the phantom menace of technology substitution, which could become more relevant in the digital age.

Sensemaking and institutions

This study contributes to the literature on sensemaking by demonstrating the specific way in which institutions influence sensemaking, a topic for which further empirical studies have been called (Weber and Glynn 2006; Glynn and Watkiss 2020). The findings show that the professional institution is one of the prevailing institutions that play a central role in sensemaking. Specifically, in the current case, the auditors' sensemaking about their future under digitalization centred around the factors constituting their professional institution, besides the focal technology. That is, the auditors significantly considered how society would perceive the profession and its legitimacy with the emerging technology, beyond simple evaluation of the technology's technical capacity (cf. Bechky 2020). Such considerations were important for the auditors because what was technologically possible was sometimes socially unacceptable for their established profession, as the example of the journal entry fraud detection algorithm indicated. In calling for sensemaking research, Weber and Glynn (2006) identified the need to consider 'what types of institutions become prominent or salient in sensemaking processes' (p. 1655). Beyond the 'stock market' and 'family' institutions that they used as examples, this study demonstrates that the context of professions provides a fruitful space for our understanding of the way in which institutions interplay with sensemaking.

Furthermore, the findings reveal how institutions impose cognitive constraints for actors to narrow the focus of their sensemaking. Specifically, in the study, the auditors' sensemaking was strongly anchored to the factors constituting their existing professional institution, inclined toward 'support[ing] specific fictions' (Beckert 2013: 234) rather than fundamentally new approaches. In other words, the auditors did not seriously consider extreme approaches for technology-driven auditing as advocated by some potential disruptors, of which they were aware. For example, Freee (https://corp.freee.co.jp/en/), a start-up firm providing free accounting software to small firms as software as a service, published a press release on its intention to expand automatic AI auditing functions for its users in May 2018. The idea was that the free software would automatically collect big data ready for use for algorithms to automatically detect and alert anomalies in users' journal entries and financial statements. The auditors' sensemaking, however, focused on the possible improvement of the current auditing tasks in the existing scheme, reflecting their priority on the continuation of the audit profession. This corroborates the theoretical claims that institutions affect views of the future by excluding radical alternatives from actors' serious consideration (Beckert 2013), and 'the "content" of sensemaking largely mirrors the "content" of institutions' (Weber and Glynn 2006: 1643).

Digitalization and professions

This study also contributes to the emerging literature on digitalization and professions by shedding new light on the under-examined area of how

professionals leading digitalization perceive new technologies and construct future projections. This knowledge is important because such early-stage visioning can significantly affect later processes and outcomes of digitalization, which is the current focus of this literature (Armour and Sako 2020; Kronblad 2020; Pemer 2021). The findings show that because of uncertainty and complexity, professionals can accept the future of AI and their profession as always tentative and ever-changing. As a logical consequence, this suggests that PSFs' digitalization strategies can continue to shift according to their leaders' continuous reinterpretations of and adjustments to further environmental and technological changes. In other words, PSFs' strategy in the digital age may become highly volatile, just as business corporations increasingly engage in frequent pivots to sustain flexibility in their strategy development and implementation (Kirtley and O'Mahony, Forthcoming). Thus, this study implies that one of the fundamental changes that digitalization is posing for professions is a shift in how professionals perceive, plan for, and act on the future.

Furthermore, the findings reveal that the highly regulated context of an established profession can be a source of both constraints and resources for professionals in sustaining flexibility in a digitally volatile and uncertain environment. On one hand, the established professional jurisdiction provides professionals with advantageous resources, in particular deep and exclusive knowledge about their professional tasks, as well as financial resources through monopolized profitable services. These enable professionals' active research investments and experiments in applying new technology to professional tasks. On the other hand, as this case showed, professionals' embeddedness in their professional institution can lead to their prioritizing of sustaining the elements that make up the current institution. Due to this embeddedness, future visioning for professionals in the digital age is not simply dreaming of a desirable tomorrow. Instead, it centres on the right balance between the maintenance and innovation of their professional institution; professionals are in an advantageous position to innovate their professional tasks with new technology to avoid being disrupted; however, their own innovation should not disrupt the professional institution at the same time. Thus, this study demonstrates the antinomy of digitalization for established professions, which may become increasingly relevant for professionals under conditions of advancing digitalization.

In addition, one practical implication of this study is that strategic coping with uncertainty can be the central agenda for professionals. As a basic implication, this study suggests that today's professionals need to embrace continuous updates of their future visions as the new normal, accepting the future as ever-changing. As an extension of this perspective, it should also be noted that one's imagined futures can influence the expectations of other stakeholders, which affect their decisions and future outcomes as a result (Beckert 2016). Thus, involving other actors in the cycle of sensemaking can be critical in shaping the future. Indeed, the sensemaking literature has stressed the significance of sensegiving, a 'process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality' (Gioia and Chittipeddi 1991: 442). The cycle of sensegiving and sensemaking forms the process of the social construction of reality (Maitlis and Christianson 2014). This implies that effective sensegiving can be another key area for professionals beyond sensemaking in coping with uncertainty. For example, it would be important for professionals to involve influential stakeholders, such as the regulatory agency and resourceful IT powerhouses, by sharing their views of the future in lobbying and alliances, to materialize a favoured future. Besides, a fine-grained discursive strategy is critically important in such sensegiving (Rouleau 2005). That is, strategic issues in communicating and materializing future visions, such as whom to involve or how to communicate, can be an important agenda for professionals in digitalization.

CONCLUSION

New technologies have affected how professionals work, collaborate, and organize. In particular, the way professionals leading their firms interpret new technology and project the future can form a crucial input for determining their actions, through which the real future will be materialized. In exploring such prospective sensemaking by professionals, this study introduced the distinct mode of views of the future

that accepts the future as ever-changing and highly uncertain, following a cycle involving monitoring environmental changes, experimenting with new practices, and developing blueprints of the future. It also demonstrated how professionals' embeddedness in their professional institution influences their sensemaking about their future. These insights add to the emerging literature on digitalization and professions, particularly by implying the potential high variability of professionals' digitalization strategy, as well as the inherent antinomy of digitalization for established professions.

The study has several limitations. The data coverage was limited to the early phase of technology adoption and to a group of professionals who led their firm-wide technology adoption initiatives. In addition, the study focused on shared perceptions in collective sensemaking based on interviews. Thus, other in-depth analytical approaches focusing on individuals could clarify subtle diversity of perceptions at the individual level.

For future research, the current study's focus on the early technology adoption phase raises an important question: Do professionals' technology perceptions and ways of viewing the future evolve in advancing digitalization, and if so, how? AI and other technologies will be further diffused to front-line professionals and may mature to become commoditized. Longitudinal observations will address this inquiry toward the day when digitalization of professional work is advanced further and almost taken for granted. In addition, this study focused on leading professionals of a resourceful large firm in a well-established profession. The context could have favoured proactive acceptance of AI and other advanced technologies that were viable for those large firms and that would work as a competitive advantage. Thus, another fruitful area of future study would be comparative studies on how diverse professions and professionals of different status and resource constraints perceive and act on digitalization.

ACKNOWLEDGEMENTS

This work was supported by JSPS (the Japan Society for the Promotion of Science) KAKENHI Grant Number JP 20K13585. The author thanks the editor and the anonymous reviewers for their helpful comments and guidance.

ENDNOTE

1. In this study, AI is defined as computer systems that perform 'cognitive functions that are usually associated with human minds, such as learning, interacting, and problem solving' (Raisch and Krakowski 2021: 192). AI is distinct from traditional automation technology, which is 'deterministic and does not include any learning processes' (Glikson and Woolley 2020: 629). AI exhibits a growing capacity to automate knowledge-based work (Armour and Sako 2020).

REFERENCES

Abbott, A. D. (1988) *The System of Professions: An Essay on the Division of Expert Labor*. Chicago: University of Chicago Press.

Abdolmohammadi, M. J. (1999) 'A Comprehensive Taxonomy of Audit Task Structure, Professional Rank and Decision Aids for Behavioural Research', *Behavioral Research in Accounting*, 11: 51–92

Armour, J., and Sako, M. (2020) 'AI-Enabled Business Models in Legal Services: From Traditional Law Firms to Next-Generation Law Companies?', *Journal of Professions and Organization*, 7/1: 27–46

Augustine, G., Soderstrom, S., Milner, D. et al. (2019) 'Constructing a Distant Future: Imaginaries in Geoengineering', *Academy of Management Journal*, 62/6: 1930–60

Balogun, J., and Johnson, G. (2004) 'Organizational Restructuring and Middle Manager Sensemaking', *Academy of Management Journal*, 47/4: 523–49

Bechky, B. A. (2020) 'Evaluative Spillovers from Technological Change: The Effects of 'DNA Envy' on Occupational Practices in Forensic Science', *Administrative Science Quarterly*, 65/3: 606–43

Beckert, J. (2013) 'Imagined Futures: Fictional Expectations in the Economy', *Theory and Society*, 42/3: 219–40

—— (2016) *Imagined Futures: Fictional Expectations and Capitalist Dynamics*. Cambridge: Harvard University Press.

—— (2021) 'The Firm as an Engine of Imagination: Organizational Prospection and the Making of Economic Futures', *Organization Theory*, 2/2: 263178772110057

Brown, A. D. (2000) 'Making Sense of Inquiry Sensemaking', *Journal of Management Studies*, 37/1: 45–75

Dervin, B. (1983) 'An Overview of Sense-making Research: Concepts, Methods, and Results to Date', in *International Communication Association Annual Meeting*, Dallas, TX, USA (May 1983).

Dwyer, G., Hardy, C., and Maguire, S. (2021) 'Post-Inquiry Sensemaking: The Case of the 'Black Saturday' Bushfires', *Organization Studies*, 42/4: 637–61

Edmondson, A. C., and McManus, S. E. (2007) 'Methodological Fit in Management Field Research', *Academy of Management Review*, 32/4: 1246–79

Fleming, P. (2019) 'Robots and Organization Studies: Why Robots Might Not Want to Steal Your Job', *Organization Studies*, 40/1: 23–37

Frey, C. B., and Osborne, M. A. (2013) 'The Future of Employment: How Susceptible Are Jobs to Computerisation?', Working paper, Oxford Martin Programme on Technology and Employment, University of Oxford (17 September 2013).

Ganzin, M., Islam, G., and Suddaby, R. (2020) 'Spirituality and Entrepreneurship: The Role of Magical Thinking in Future-Oriented Sensemaking', *Organization Studies*, 41/1: 77–102

Gephart, R. P. (1993) 'The Textual Approach: Risk and Blame in Disaster Sensemaking', *Academy of Management Journal*, 36/6: 1465–514

——, Topal, C., and Zhang, Z. (2010) 'Future-Oriented Sensemaking: Temporalities and Institutional Legitimation', in Hernes T., Maitlis S. (eds) *Process, Sensemaking, and Organizing*, pp. 275–312. Oxford: Oxford University Press.

Glikson, E., and Woolley, A. W. (2020) 'Human Trust in Artificial Intelligence: Review of Empirical Research', *Academy of Management Annals*, 14/2: 627–60

Gioia, D. A., and Chittipeddi, K. (1991) 'Sensemaking and Sensegiving in Strategic Change Initiation', *Strategic Management Journal*, 12/6: 433–48

——, Corley, K. G., and Hamilton, A. L. (2013) 'Seeking Qualitative Rigor in Inductive Research', *Organizational Research Methods*, 16/1: 15–31

Gioia, D. A., Thomas, J. B., Clark, S. M., et al. (1994) 'Symbolism and Strategic Change in Academia: The Dynamics of Sensemaking and Influence', *Organization Science*, 5/3: 363–83

Gioia, D. A., Price, K. N., Hamilton, A. L., et al. (2010) 'Forging an Identity: An Insider-Outsider Study of Processes Involved in the Formation of Organizational Identity', *Administrative Science Quarterly*, 55/1: 1–46

Glynn, M. A., and Watkiss, L. (2020) 'Of Organizing and Sensemaking: From Action to Meaning and Back Again in a Half-Century of Weick's Theorizing', *Journal of Management Studies*, 57/7: 1331–54.

Goto, M. (2021) 'Collective Professional Role Identity in the Age of Artificial Intelligence', *Journal of Professions and Organization*, 8/1: 86–107.

Greenwood, R., and Suddaby, R. (2006) 'Institutional Entrepreneurship in Mature Fields: The Big Five Accounting Firms', *Academy of Management Journal*, 49/1: 27–48.

Hasselbalch, J. (2016) 'Professional Disruption in Health Regulation: Electronic Cigarettes in the European Union', *Journal of Professions and Organization*, 3/1: 62–85.

Hinings, B., Gegenhuber, T., and Greenwood, R. (2018) 'Digital Innovation and Transformation: An Institutional Perspective', *Information and Organization*, 28/1: 52–61.

Issa, H., Sun, T., and Vasarhelyi, M. A. (2016) 'Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation', *Journal of Emerging Technologies in Accounting*, 13/2: 1–20.

Jennings, P. D., and Greenwood, R. (2003) 'Constructing the Iron Cage: Institutional Theory and Enactment', in Westwood R. I., Clegg S. (eds) *Debating Organization: Point-Counterpoint in Organization Studies*, pp. 195–207. Malden: Blackwell Publishing.

JICPA (2016) *IT wo riyo shita kansa no tenbo: Mirai no kansa eno apurohchi* (in Japanese) <https://jicpa.or.jp/specialized_field/files/2-10-48-2-20160328.pdf> (accessed 30 November 2021)

—— (2019) *Jisedai no kansa eno tenbo to taio* (in Japanese) <https://jicpa.or.jp/specialized_field/files/2-10-52-2-20190131.pdf> (accessed 30 November 2021)

Kaplan, S., and Orlikowski, W. J. (2013) 'Temporal Work in Strategy Making', *Organization Science*, 24/4: 965–95

Kirtley, J., and O'Mahony, S. (Forthcoming) 'What is a Pivot? Explaining When and How Entrepreneurial Firms Decide to Make Strategic Change and Pivot', *Strategic Management Journal*. doi: 10.1002/smj.3131

Kokina, J., and Davenport, T. H. (2017) 'The Emergence of Artificial Intelligence: How Automation is Changing Auditing', *Journal of Emerging Technologies in Accounting*, 14/1: 115–22

Kronblad, C. (2020) 'How Digitalization Changes Our Understanding of Professional Service Firms', *Academy of Management Discoveries*, 6/3: 436–54

Kruskopf, S., Lobbas, C., Meinander, H., et al. (2020) 'Digital Accounting and the Human Factor: Theory and Practice', *ACRN Journal of Finance and Risk Perspectives*, 9/1: 78–89

Leonardi, P. M., and Barley, S. R. (2010) 'What's under Construction Here? Social Action, Materiality, and Power in Constructivist Studies of Technology and Organizing', *Academy of Management Annals*, 4/1: 1–51

Lockett, A., Currie, G., Finn, R., et al. (2014) 'The Influence of Social Position on Sensemaking about Organizational Change', *Academy of Management Journal*, 57/4: 1102–29

Maitlis, S. (2005) 'The Social Processes of Organizational Sensemaking', *Academy of Management Journal*, 48/1: 21–49

——, and Christianson, M. (2014) 'Sensemaking in Organizations: Taking Stock and Moving Forward', *Academy of Management Annals*, 8/1: 57–125

——, and Sonenshein, S. (2010) 'Sensemaking in Crisis and Change: Inspiration and Insights from Weick', *Journal of Management Studies*, 47/3: 551–80

Mische, A. (2009) 'Projects and Possibilities: Researching Futures in Action', *Sociological Forum*, 24/3: 694–704

Mueller, F., Carter, C., and Whittle, A. (2015) 'Can Audit (Still) Be Trusted?', *Organization Studies*, 36/9: 1171–203

Murphy, H. (2017) 'Auditing to Be Less of a Burden as Accountants Embrace AI', *Financial Times* (18 September 2017).

Nelson, A. J., and Irwin, J. (2014) 'Defining What We Do-All over Again: Occupational Identity, Technological Change, and the Librarian/Internet-Search Relationship', *Academy of Management Journal*, 57/3: 892–928

Pemer, F. (2021) 'Enacting Professional Service Work in Times of Digitalization and Potential Disruption', *Journal of Service Research*, 24/2: 249–68.

Raisch, S., and Krakowski, S. (2021) 'Artificial Intelligence and Management: The Automation-Augmentation Paradox', *Academy of Management Review*, 46/1: 192–210.

Rouleau, L. (2005) 'Micro-Practices of Strategic Sensemaking and Sensegiving: How Middle Managers Interpret and Sell Change Every Day', *Journal of Management Studies*, 42/7: 1413–41

Sandberg, J., and Tsuokas, H. (2020) 'Sensemaking Reconsidered: Towards a Broader Understanding through Phenomenology', *Organization Theory*, 1/1: 263178771987993

Scott, W. R. (2014) *Institutions and Organizations: Ideas, Interests, and Identities*, 4th edn. Thousand Oaks, CA: Sage.

Slawinski, N., and Bansal, P. (2015) 'Short on Time: Intertemporal Tensions in Business Sustainability', *Organization Science*, 26/2: 531–49

Smets, M., Morris, T., von Nordenflycht A., et al. (2017) '25 Years since 'P-2': Taking Stock and Charting the Future of Professional Firms', *Journal of Professions and Organization*, 4/2: 91–111

Stigliani, I., and Ravasi, D. (2012) 'Organizing Thoughts and Connecting Brains: Material Practices and the Transition from Individual to Group-Level Prospective Sensemaking', *Academy of Management Journal*, 55/5: 1232–59

Strauss, A. L., and Corbin, J. M. (1998) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd edn. Thousand Oaks, CA: Sage.

Susskind, R., and Susskind, D. (2015) *The Future of the Professions: How Technology Will Transform the Work of Human Experts*, New York: Oxford University Press.

Tavoletti, E., Kazemargi, N., Cerruti, C., et al. (Forthcoming) 'Business Model Innovation and Digital Transformation in Global Management Consulting Firms', *European Journal of Innovation Management*. doi: 10.1108/EJIM-11-2020-0443

Thorén, C., Ågerfalk, P. J., and Rolandsson, B. (2018) 'Voicing the Puppet: Accommodating Unresolved Institutional Tensions in Digital Open Practices', *Organization Studies*, 39/7: 923–45

Vasarhelyi, M. A. (1989) *Artificial Intelligence in Accounting and Auditing: The Use of Expert Systems*. New York: Markus Wiener Publishers.

Weber, K., and Glynn, M. A. (2006) 'Making Sense with Institutions: Context, Thought and Action in Karl Weick's Theory', *Organization Studies*, 27/11: 1639–60

Weick, K. E. (1990) 'Technology as Equivoque: Sensemaking in New Technologies', in Goodman P. S., and Sproull L. S. (eds) *Technology and Organizations*, pp. 1–44. San Francisco, CA: Jossey-Bass.

—— (1995) *Sensemaking in Organizations*. Thousand Oaks, CA: Sage.

——, Sutcliffe, K. M., and Obstfeld, D. (2005) 'Organizing and the Process of Sensemaking', *Organization Science*, 16/4: 409–21

Wiebe, E. (2010) 'Temporal Sensemaking: Managers' Use of Time to Frame Organizational Change', in Hernes T., and Maitlis S. (eds) *Process, Sensemaking, and Organizing*, pp. 213–41. Oxford: Oxford University Press.