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The social forming of professionals' adaptive performance: a sensemaking perspective

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ABSTRACT

Adaptive performance of professionals describes task achievement under conditions of novelty or uncertainty. Research shows that this type of performance can be trained, and that social interaction often plays an important role in it. This study sought to clarify that role, by posing the research question of how social interaction shapes professionals' sensemaking in adaptive performance. Our conceptual model integrates two concepts from organisational studies, sensedemanding and sensebreaking, with the Data/Frame Model of Sensemaking from cognitive psychology. To test this model empirically, we carried out an explorative, qualitative study. Data collection took place by means of interviews and field observation at an intensive care unit of a Dutch hospital. The analysis revealed that sensedemanding and sensebreaking facilitate sensemaking of professionals by, enabling 'switches' between sensemaking cycles crucial for adaptive performance. Based on our findings, we propose that the integration of sensedemanding and sensebreaking in the D/F Model of Sensemaking contributes to our understanding of socio-cognitive mechanisms shaping (the development of) professionals' adaptive performance.

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Introduction

Professionals develop occupational expertise through many years of practice in domain-relevant declarative and procedural knowledge and skills (Ericsson and Harwell 2019). Such 'routine-based' expert performance affords professionals with greater speed and accuracy in task achievement (Feltovich, Prietula, and Anders Ericsson 2006) which yields gains for organisations.

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Besides routine-based expert performance, scholars have identified another type of expertise which stems from 'conceptual' knowledge of professionals. It describes the ability to transfer previously acquired declarative and procedural knowledge in one domain for application in another domain (Hatano and Inagaki 1984). Conceptual knowledge enables professionals' adaptive performance (Baard, Rench, and Kozlowski 2014).

Adaptive performance relates to professionals' task achievement under conditions of novelty or uncertainty (Ward et al. 2018) which is highly sought-after in modern-day work (Baard, Rench, and Kozlowski 2014). For example, Small, Shacklock, and Marchant (2018) explicitly included adaptability of graduates in their definition of employability.

Professionals' sensemaking and the role of social interaction

Various studies in the field of expertise and organisational research have underlined the importance of sensemaking in professionals' adaptive performance (Klein et al. 2007, Hutton 2019; Schildt, Mantere, and Cornelissen 2020; Weick 2022). Studies using the sensemaking perspective stem from various disciplines, such as cognitive psychology, engineering, educational sciences, and organisational sciences (Baard, Rench, and Kozlowski 2014). These different research strands do not automatically build on each other. Nor do they provide an account for the role of the social context in sensemaking that underlies adaptive performance. This is problematic as it compromises consensus of how actors' sensemaking relevant for adaptive performance is understood in its dynamic, socially interactive context.

Prior studies have pointed out that adaptive performance does not occur or develop in isolation. A review found that often it stems from actors' collaborative efforts to solve non-routine, complex organisational tasks (Park and Park 2019; Pelgrim et al. 2022). Research has shown that expertise development of professionals is situational and relational (Guile and Unwin 2022). Hawse and Hawse and Wood's (2018) study on the development of professional judgement, for example, highlighted the role of participatory learning environments in workplace learning.

Bailey, Winchester, and Ellis (2023) studied complex task achievement and found it occurs as 'social activity that needs to be more clearly reflected in the design and assessment of the [.] curriculum. This would mean a pivot away from the current focus on the assessment of the individual to greater focus on collaboration and group learning' (18).

Despite the importance of social interactive dimensions in (development of) adaptive performance, the current literature does not provide sufficient insights into the micro-level processes by which social interaction shapes professionals' sensemaking relevant for adaptive performance (Schildt, Mantere, and Cornelissen 2020; Hutton 2020).

If we want to know how we can build professionals' adaptive performance, it is essential to increase our understanding of the role that social interaction plays in sensemaking used in such performance. This yields the following research question: *How does social interaction shape sensemaking used by professionals in adaptive performance?*

Professional expertise and adaptive performance

Extant work recognises that exceptional performance in fields such as computer programming, music, and sports results from years of deliberate practice in a domain's representative tasks, yielding routine-based expertise (Ericsson and Harwell 2019; Feltovich, Prietula, and Anders Ericsson 2006). Professionals' routine-based expertise builds on an actor's possession of domain-relevant declarative ('what') and procedural ('how') knowledge and skills. It is different from the so-called adaptive expertise.

Adaptive expertise describes professionals' conceptual knowledge (Hatano and Inagaki 1984). It goes beyond declarative and procedural knowledge and skills to encompass professionals' metacognitive and self-regulative skills which enable (organisational) task achievement under conditions of novelty and uncertainty. Adaptive expertise forms the base for adaptive performance of professionals. Adaptive performance refers to professionals' ability for organisational task achievement under conditions of novelty or uncertainty (Pelgrim et al. 2022; Ward et al. 2018), through modification of behavioural, cognitive, and affective responses to task or contextual demands (Baard, Rench, and Kozlowski 2014; Van Tartwijk et al. 2022).

Studies in the field of expertise research describe the cognitive dimension of adaptive performance as adaptive skill (Ward et al. 2018) or adaptive sensemaking (Cornelissen, Mantere, and Vaara 2014).

Sensemaking and adaptive performance

Sensemaking describes interpretative (mental) processes which enable individuals to understand issues or situations, particularly those that are novel, ambiguous, and confusing (Maitlis and Christianson 2014). Sensemaking provides an understanding of a situation, in terms of mental representation, model, story, a script, a map, or a plan (Klein et al. 2007).

Research in cognitive psychology describes sensemaking as an ongoing process of (re)connecting incoming data (sensory input) to cognitive frames (Ward et al. 2018). Cognitive frames provide descriptions, explanations, and/or justifications of entities as well as their respective relationships with other entities. By doing so, they enable our understandings, beliefs, and/or assumptions of how things fit together (Hill and Levenhagen 1995).

The literature recognises the relevance of sensemaking processes, for young professionals as well as for their career choices. For example, narratives have helped scholars to examine how young professionals cope with career setbacks, to better understand how those setbacks shaped their emerging career self-concepts (Kutscher and Mayrhofer 2023). Sensemaking is crucial for professionals' adaptive performance because it enables professionals to recognise and/or construct a mental frame when they realise the inadequacy of their current mental frame in the light of novel and 'atypical' cues (Klein et al. 2007).

Data/Frame model of sensemaking

The Data/Frame (D/F) Model of Sensemaking describes professionals' sensemaking as data-frame (re)connections by means of which incoming data (sensory information) are (re)connected to cognitive frames (Klein et al. 2007). The model depicts three essential sensemaking 'cycles' used by professionals in adaptive performance, namely: 1) cycles of frame elaboration (or preservation), 2) cycles of frame questioning, 3) cycles of frame re-framing (Klein et al. 2007).

Frame elaboration cycle

A frame elaboration cycle relates to the process of fitting data to preserve and build on current frames (Klein et al. 2007). For example, by updating current situational (mental and external) frames with novel cues or by linking cues to existing frames (Ward et al. 2018, 40).

Frame questioning cycle

A frame questioning cycle refers to the mental state of facing discrepant or inconsistent data (Klein et al. 2007). It encompasses different cognitive aspects, namely the scanning of the environment for 'atypical' cues which enable the discovery of inadequacies or anomalies in data-frame connections (Ward et al. 2018).

Frame re-framing cycle

A cycle of frame re-framing describes the facing of inconsistencies and contrary evidence in data, re-assessment and re-interpretation of existing data, and re-definition of what counts as data (Klein et al. 2007; Ward et al. 2018). It also relates to the replacement of someone's initial account with an alternative account, as new insights emerged.

While the D/F Model of Sensemaking describes essential cognitive processes in adaptive performance, it does not address the role of the social context in sensemaking used by professionals in adaptive performance. However, adaptive performance does not occur in isolation. We know from various studies that professionals increasingly work in multidisciplinary teams to achieve

organisational problem-solving. For example, a literature review on adaptive performance found that social interaction plays an important role in enabling complex, non-routine problem-solving in organisations which characteristically requires 'coordinative action' among professionals (Pelgrim et al. 2022).

Professionals' sensemaking and social interaction: a socio-cultural perspective

Organisational science generally assumes that sensemaking involves the creation of (shared) understanding (Weick 1995; Cristofaro 2019). When professionals face conditions of novelty or uncertainty in task achievement, collective sensemaking is particularly relevant as it aids the development of shared understanding. We see this in Kruser et al. (2023) study on professionals' collaboration in a hospital, which describes collaborative task achievement as a shared cognitive process in which shared mental models enable team members to be 'on the same page'. Similarly, Compagni, Cappellaro, and Nigam (2023) coined 'collective engagement' to emphasise their finding of the role of social interaction affecting sensemaking in collaborative efforts between stakeholders in complex problem-solving during the COVID-19.

The influence of social interaction on sensemaking also prominently reflects in Sandberg and Tsoukas' (2020) typification of sensemaking. The authors showed that the type of sensemaking professionals used depended on the specific practice world that this sensemaking was situated in, concluding that social context plays an important role in sensemaking used by professionals. Importantly, Sandberg and Tsoukas (2020) drew attention to enacted sensemaking, by distinguishing between professionals' 'performative' and 'representational' language used in task achievement.

Sensedemanding and sensebreaking

In organisational studies, researchers have proposed two sensemaking-related concepts which capture the socially interactive and discursive dimensions professionals' sensemaking relevant for collaborative task achievement under conditions of novelty or complexity. These concepts are sensedemanding and sensebreaking. Sensedemanding describes the asking of questions and cross-checking one's an actor's intentional efforts in information search aimed at establishing 'a manageable level of uncertainty' (Vlaar, Van Fenema, and Tiwari 2008). Sensebreaking defines the rejection, invalidation, or disruption of an individual's current understandings by others (Pratt 2000; Schildt, Mantere, and Cornelissen 2020; Vlaar, Van Fenema, and Tiwari 2008). Both sensedemanding and sensebreaking

are important social cognitive dimensions of sensemaking (Bera 2021). In this study, we propose to integrate sensedemanding and sensebreaking in to the D/F Model of Sensemaking to conceptualise the way that social interaction affects sensemaking used in adaptive performance. We describe both concepts in turn.

Sensedemanding

Sensedemanding (SD) describes efforts by professionals in search for information to establish 'a manageable level of uncertainty', by asking questions, performing inquiries, and cross-checking one's own perceptions and interpretations with other individuals (Bera 2021; Vlaar, Van Fenema, and Tiwari 2008). For example, in a cross-cultural, comparative study of strategy policy formulation, Pavlova and Askerud (2023) studied differences in (habits of) asking questions outside one's own group and the role this can play in restructuring processes.

Sensedemanding requires a social context from which sense is 'demanded' – for example, one's family, friends, work colleagues, or other (in)formal networks; or simply by using artefacts such as books, podcasts, or a digital search engine like Google (Berglund and Glaser 2022). The cognitive ability of information search, to pick up on 'atypical' cues, is a crucial element in professional's adaptive performance of professionals (Ward et al. 2018) as it enables the signalling of inconsistencies or implausibility between data processes and current frames. For example, Radinsky and Tabak (2022) described scanning, in addition to looking closer and puzzling through, as key sensemaking-related practice of 'data engagement' which facilitated learners' sensemaking of COVID-related news.

Sensebreaking

Sensebreaking consists of three subprocesses: (1) Questioning which relates to refusal or rejection of (shared) meaning; (2) Redirecting which draws someone's attention to a different aspect of current understandings; (3) Reframing which describes the challenging of someone's existing assumptions and perspective (Pratt 2000; Kaffka Gabi et al. 2021; Vlaar, Van Fenema, and Tiwari 2008). We succinctly describe each of these subprocesses in turn.

Questioning. Questioning is defined as the interruption of undesirable courses of action that someone has taken or is currently taking by other parties (Maitlis and Lawrence 2007; Vlaar, Van Fenema, and Tiwari 2008). It relates to punctuated event of negative or critical feedback, stemming from the (undesirable) rejection by stakeholders, triggered by challenges from others (Bailey, Winchester, and Ellis 2023) or from 'startle and surprise' moments caused by others (Landman et al. 2017). It should be noted that the term as it is used here is different from the term frame questioning described previously.

The sensemaking cycle of frame questioning describes the cognitive process of hesitation and doubt. A frame questioning cycle relates to doubting (Klein, Moon & Hoffman, 2006; Klein et al. 2007) of undefined temporal duration having a variety of triggers (for example, introspection or observation), while sensebreaking-related questioning is defined in terms of a very short, negative event associated with startle and surprise. It describes the short process of direct opposition (rebuttal or refusal) by social interaction (Kaffka Gabi et al. 2021).

Redirecting. Redirecting describes the intersubjective process by which (relevant) others draw one's attention towards a different though known frame, which facilitates the update of the current mental and external frames or representations (Pratt 2000). Notably, Van Merrienboer et al. (2002) found that redirecting students' attention will improve training efficiency, i.e. positively affect the balance between cognitive load during training and transfer test performance.

Reframing. Reframing is an intersubjective trigger for frame re-framing cycles as it describes the challenging of currents assumptions (Pratt 2000). Notably, it is achieved by perspective-taking (Rein and Schön 1996) which entails reflective sensemaking, namely the contestation of meaning that can yield frame reflection and frame shifts (Van Hulst and Yanow 2016). Such changes stem from metacognitive development and contribute to developing 'conceptual knowledge' relevant for adaptive performance (Hatano and Inagaki 1984).

Integrating sensedemanding and sensebreaking with the D/F Model of Sensemaking

To analyse how social interaction shapes sensemaking relevant for adaptive performance, we introduce the concepts of sensedemanding and sensebreaking (in the form of questioning, redirecting, and reframing) to the Data/Frame Model of Sensemaking (Klein et al. 2007). The D/F Model of Sensemaking contains three sensemaking cycles of frame elaboration, frame questioning, and frame re-framing. These three sensemaking cycles cover essential dimensions of sensemaking used by actors during adaptive performance (Klein et al. 2007; Hutton 2020). Next, we succinctly present literature on how sensedemanding and sensebreaking as social interactive elements in sensemaking can shape the three sensemaking cycles.

Sensedemanding

The concept of sensedemanding closely aligns with the sensemaking cycle of frame questioning, and therefore can yield cycles of both frame

elaborating and frame re-framing. Both concepts – sensedemanding and cycle of frame questioning – share a focus on search activities, i.e. scanning and signalling. Laureiro-Martinez, Pablo Arrieta, and Brusoni (2023) associates these activities with knowledge acquisition. However, while frame questioning cycles also encompass mental processes related to personal doubt, introspection, or (critical) self-reflection, the concept of sensedemanding describes only the socially situated search for 'frames of others' and for 'others' cue-frame connections' (Ward et al. 2018).

Sensebreaking-related questioning

The concepts of questioning and the sensemaking cycle of frame questioning both share a focus on professional's realisation of discrepancies in the current data-frame connection. They also differ in important ways. Questioning is triggered externally, very negatively experienced because they cause what Kaffka Gabi et al. (2021) described as 'temporary cognitive breakdowns'. Invariably, these very short, cognitive breakdowns are succeeded by a cycle of frame questioning – from which either a cycle of frame elaborating or of frame re-framing emerges (Ward et al. 2018). Sensebreaking-related questioning lasts only momentarily. Meanwhile, a sensemaking cycle of frame questioning encompasses introspection and doubt and can vary in duration, depending on the professional's willingness and/or ability to engage in 'search for plausibility' regarding atypical cues (Hutton 2020).

Sensebreaking-related redirecting

The literature shows that sensebreaking-related redirecting closely relates to cycles of frame elaboration and/or frame preservation. Redirecting enables professionals' information processing activities involved in adding or discarding data, as well as fill missing data slots, which are associated with frame elaboration cycles described in the literature (Klein et al. 2007). An empirical study by Kaffka Gabi et al. (2021) showed that redirecting enables the acquisition and transfer of cues containing task-relevant declarative and/or procedural knowledge and skill.

Sensebreaking-related reframing

Reframing and frame re-framing cycles both relate to processes of conceptual reorganisation of explanatory reasoning which professionals use to account for discrepant or deviant cases or situations encountered (Spillane et al. 2002). But both concepts differ in an important way. Reframing understands that a socially situated source triggers the actor's reframing processes, while these in turn yield cycles of frame re-framing which also include an actor's mental, i.e. internal (interpretative) process.

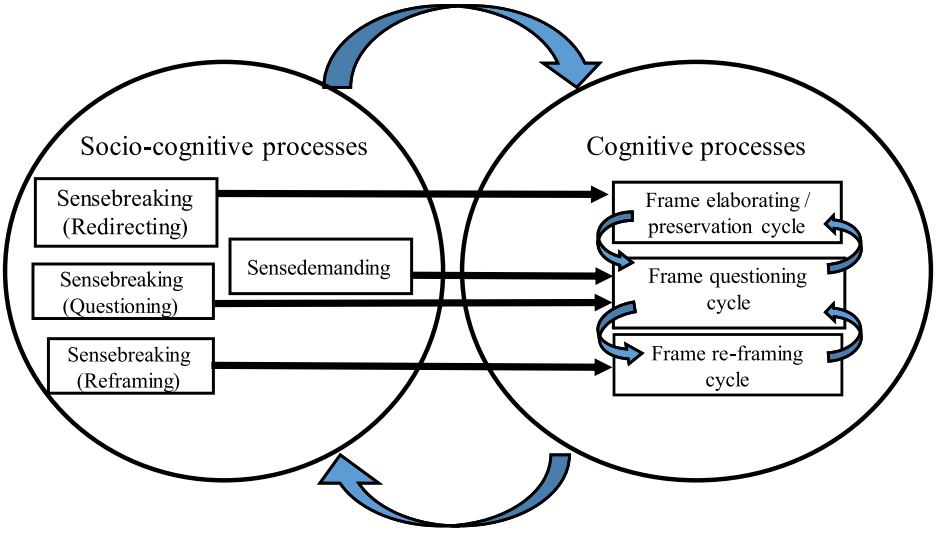

Figure 1. Conceptual model drawing on Klein et al. (2007)Data/Frame Model of Sensemaking and Kaffka and Krueger (2018).

Conceptual model

Figure 1 contains our conceptual model. It depicts essential micro-level processes in professionals' sensemaking used in adaptive performance. The model is informed by insights of Klein et al. (2007) in the field of cognitive psychology, and organisational studies which provide an account for the enacted and discursive nature of sensemaking used under conditions and novelty and uncertainty (Kaffka and Krueger 2018). To validate our conceptual model and answer our initial research question, we undertook an empirical study. The next section presents the methods used for data collection and analysis.

Methods

The empirical study was designed as explorative, qualitative research. This was fitting for the purposes of our study as we sought to explore the applicability of our conceptual model for empirical data collection and analysis.

Sampling

Following Palmer et al. (2005) we operationalised expertise by means of three categories: novice professionals with 0–5 years of prior domain-related professional experience, intermediate experts, and senior experts (with 6–10 years, respectively, more than 11 years of prior professional experience).

Data collection

We carried out the main part of the data collection among professionals with varying amount of professional expertise, by means of interviews. Furthermore, we collected data from a field observation at an intensive care unit at a Dutch hospital.

Interviews

The interview sample included 20 professionals with varying degrees of reality-relevant expertise. Extant work has shown that adaptation can take 'varying degrees of change', 'from incremental adjustment to radical reorientation' (Jarzabkowski, 2004). In the context of this study, we focus on adaptive performance in terms of non-routine, complex problemsolving in organisations. We identified participants for the interviews via snowball sampling, i.e. the professional network of the principal investigator as well as the project team members. Educational backgrounds of professionals are in disciplines of health, engineering, educational studies, and business administration.

The interview questions consisted of a dozen structured, open-ended questions about the way they had experienced a recent, non-routine, complex problem and how they went about solving that problem. On average, an interviewee was 51 years old. Seventy per cent of our sample identified as male, while 30% identified as female.

Field observation

To collect real-time data on sensemaking of professionals during non-routine, complex task achievement, we carried out a field observation at an intensive care (IC) unit in an academic hospital in the Netherlands. The research team requested and was granted permission to collect data in this setting, and the principal investigator observed a shift at the hospital's IC ward, observing professionals in task achievement, with data collection occurring by means of hand-written field notes. After transcription of the field notes, these were given to two professionals who had been present at the field observation and who were asked independently to cross-check the observations. Both independently from each other confirmed the data's validity.

Data coding

Language plays a pivotal role in sensemaking of professionals (Logemann, Piekkari, and Cornelissen 2019), and the transcribed data formed the base for the analysis of sensemaking used by professionals during adaptive performance. A code book, shown in Table 1, contained (1) a description of the five key variables of our conceptual model: sense-demanding, sense-breaking, as well as cycles of frame elaboration, frame questioning, and frame re-framing; (2)

the operationalization of those variables into empirical indicators; (3) signal words, such as words, phrases, expressions, or verbal structures which reflect codifiable units of analysis.

In first-level coding, we identified sense-demanding and/or sense-breaking instances which correspond to a unit of analysis (Cohen et al., 2018) because it contains meaningful data for analysis. This was followed by second level coding in which previously identified units of analyses were coded to one (or several) of the cycles of, respectively, frame elaborating, frame questioning, and frame reframing (or a combination). During the coding process, researcher triangulation – coding of the data by different researchers ensured reliability of coding. In addition, we compared the outcomes of the data analysis from the interviews with those from the field observation. This enabled data triangulation to ensure the validity of our findings.

Results of the analysis

In this section, we present the analysis findings of the data collected during field observation. Annex 1 contains supportive analysis of the interview data representative quotes from the 20 interviews. The results presented below are structured as event analysis of data which was collected from the intensive care (IC) unit of a Dutch hospital.

Event analysis

There are three events, with each containing a description of the event and an analysis of professionals' sensemaking used during adaptive performance. The events occurred during hospitalisation of a baby patient of six months old. The baby patient was brought by ambulance after it had developed severe breathing difficulties on a Friday night. A rare genetic difference caused the baby to live with a potentially life-threatening yet stable physical health condition. To stabilise the baby's condition and to monitor it, the baby patient remained at the hospital's IC unit ward for observation throughout the weekend. By the beginning of the week, and following sufficient stabilisation, the breathing issues required a surgical procedure on the throat.

The surgery was urgent; however, the condition of the baby patient made it uncertain whether this could take place. In addition, in this situation the baby patient's initial health condition imposed an additional challenge to doctors and nurses involved, as this made the patient more vulnerable to complications during or after the surgical procedure. This setting provided the principal investigator with a setting which required adaptive performance of professionals involved.

Event 1

Just before the parents of the baby patient arrived at the IC unit on Monday morning, around 9.30 am, the senior female nurse (Nurse 1) and two junior female nurses (Nurse 2 and Nurse 3) had started their shift and were talking about the nursing for the baby patient. Nurse 1 explained to the other two nurses that she intended the following:

> Nurse 1 (to Nurse 2): 'I will discuss with [baby patient's parents] what they want to do, as parents, and to finetune how it works. I allow parents to participate in the care as much as possible. For example, when washing the baby. So, I am actively searching: what do they want? Changing a diaper, for example.'

In this quote, Nurse 1 mentions that she plans to inquire with the parents about their contribution to caring for the baby during hospitalisation. This illustrates her use of sensedemanding, by accounting for parental needs ('I am actively searching what do they want?'). In doing so, she shows that her sensemaking includes relevant stakeholders associated with her task – and from whom sense shall be demanded.

Shortly hereafter, Nurse 1 tells the two younger nurses (and principal investigator) about how she had initially developed the skills required for her work as head IC nurse:

> Nurse 1: 'You must dare to ask. And you should use examples to think about: What went well? What can be done better?'

This quote does not only illustrate Nurse 1 using critical self-reflection but also sensedemanding to facilitate her information acquisition ('You must dare to ask'). This quote reflects Nurse 1's engagement in a frame questioning cycle ('think about, what can be done better'). It also conveys her learning orientation, namely asking questions is important in performance improvement.

Event 2

In the second event, the Nurse 1 and the father of the baby patient were engaged in changing the baby patient's diapers. The father was standing on the right side of the baby, while Nurse 1 operated from the left side. During this task, they collaborated to lift the baby patient's body delicately while handing each other diaper or bandages, carefully changing those together on the baby patient. Meanwhile, the following conversation ensued:

> Father of baby patient (in the direction of Nurse 1 who stands on the other side of the bed): 'She gets [pain medication] of more than 400. Above 100–200 it's normal dosage for an adult.' Nurse 1 (looking down at the baby-patient, concentrated on the diaper change): 'Oh - I didn't know that. Normally that is . . . ' Without finishing her sentence, she abruptly raises her head and looks up towards the father for a short moment,

> before quickly returning her eyes towards the baby patient and says; 'Well, well. . .'. She continues to focus on finishing up the bandaging and diapering of the baby patient and says (in the direction of the father): 'It is good that we can do this together. You two are so important for her. We are passers-by, but you stay.' Turning her head towards Nurse 2, Nurse 1 says (to Nurse 2): |Anna, can you get the things, the cannulas, for the transport?". Turning her head back and looking towards the baby patient's parents, she says: 'You are going to eat lunch now, I assume?' In response to this question about lunch, the father made simple nod with his head, and both parents proceeded to take their coats from by-standing chairs and walked towards the exit door of the IC unit.

In this conversation between the baby patient's father and Nurse 1, we observed the use of sensedemanding and sensebreaking in the sensemaking of the nurse. We see that the patient's father remark of the high dosage of medication triggers Nurse 1's use of sensebreaking-questioning, followed by a cognitive breakdown, which is illustrated by her surprise at his words ('Oh – I didn't know that'). Nurse 1's verbally expressed connection of the novel information ('cue') to her existing frames ('Normally that is.') and her pausing illustrate how she is trying to make sense of the received ('signalled') information from the patient's father regarding the (undesired) medical condition of the baby patient.

We see that she engages in a frame questioning cycle, illustrated by the fact that she interrupts herself, does not finish the sentence, but instead slows the conversational flow ('well, well. . .'). Subsequently, Nurse 1 modifies her performance. While keeping busy with the baby, she addresses patient's father's concerns raised. She does so by use of redirecting, namely drawing his attention to the task at hand ('It is good that we can do this together'), which yields a sensemaking cycle of frame elaboration ('You are so important for her. We are passers-by, but you stay'). Her utterances of positive valence regarding his identity as caregiver redirect the father's attention to the task at hand, steering it away from parental worries about medical dosage. Nurse 1 proceeds to use sensedemanding to trigger reframing on the part of the father, illustrated by her abrupt asking about the patient's parents' planned lunchtime at the hospital ('You're going to go eat now, right?').

By posing the question about lunch (sense-demanding), Nurse 1 achieves to signal a different perspective to the baby patient's father: the consumption of food by himself instead of focusing on medication for the baby, illustrating that she engages the father in frame shifting. Namely, taking his attention off his daughter and instead on physical needs as caregiver of his daughter. The father's reaction to this causes a very short cognitive breakdown – illustrated by his surprise look at this question – followed by a cycle of questioning – illustrated by his glance towards his watch –. It then yields a cycle of frame reframing, namely, his realisation of a novel perspective on the situation – his own physical needs for food, observed in the father's nodding and acceptance of the situation, as he together with the mother of the baby left the ward to grab some lunch.

In this event, Nurse 1 applies procedural knowledge to achieve the complex, non-routine task at hand (namely, the changing of the baby patient's diapers and bandages). We then observed that Nurse 1 cues an atypical signal – namely, the baby patient's father's anxiety and adapts her performance accordingly. Nurse 1 proceeds to pose an off-topical question regarding lunch which engages the baby patient's father in a sensemaking cycle of reframing. By doing so, Nurse 1 modifies the conversational topic and achieves to take his mind off his worries, demonstrated in his immediate leaving for lunch.

Event 3

In this situation, three female doctors – designated as, respectively, Doctors 1, 2, and 3 – come down the ward and walk up to the baby patient's bed where parents, where Nurse 1, and two novice female nurses (Nurses 2 and 3) are already present. Doctors 1, 2, and 3, together with Nurses 1, 2, and 3, begin detaching various monitoring tubes from the monitoring device located at the right-hand side of the IC bed of the baby patient. This process takes place in a pressed way but structured and concentrated. During this process, Nurse 1 and Doctor 2 are the only ones speaking.

> Doctor 1 (in the general direction of the baby's parents and Nurse 1): 'Here we are…' (focusing her attention on Nurse 1): 'What we already talked about: In first instance, we'll only have a look at it. To see what it looks like now.' Nurse 1 (pointing to one tube attached in the baby patient's arm that connects monitoring system): 'Do you want to leave it in or.?' Doctor 1 gazing at the baby patient and the monitoring system): 'Something is still stuck…' (to Nurse 1) 'How did you…?' Nurse 1 says to Doctor 1 (pointing to a tube which is still attached on the baby patient's body): 'The salt, do you guys want to keep that attached or.? And are there any other things you would like to know.?' Doctor 1 says (to Nurse 1, while detaching the tube Nurse 1had pointed out): 'I want cannulas of [name of medication] to take along - oh, and a spare of this?' (Doctor 1 points with a finger in the direction of a small package). Then Nurse 1 hands the package to Doctor 1 who, together with Doctor 2 and 3, proceeds to push the baby patient in the IC bed delicately from the IC unit down the corridor and towards the surgical unit.

In this event, which lasted around one and a half minute, the only communicative interaction observed was that of Nurse 1 and Doctor 1. Both engaged in a normal routine, yet complicated task, namely the decoupling of life-saving tubes from a patient in order to transport the patient (in the patient's bed) from the IC ward to the surgical ward. Doctor 1 and Nurse 1 achieved the task while adapting to task novelty and complexity stemming from the baby patient's fragile health condition in combination with its rare abnormality). We observe that Doctor 1 expresses hesitation ('first, we will have a look'), illustrating her engagement in a frame questioning cycle as well as her use of sensedemanding

('to see what it looks like, now') when addressing the task at hand in her search for which tube was still attached on the baby patient's body. We also observe that Nurse 1 used sensebreaking (redirecting) to signal the 'atypical' cue to Doctor 1, enabling both professionals to adapt their performance during task achievement. By pointing first to the task at hand ('The [. . .], you guys want to keep that attached or. . .?') she proceeds to elaborate on the task in a more general way ('And are there any other things you would like to know?').

In this event, Nurse 1's use of sensedemanding facilitates a 'switch' in actors' sensemaking processes, in this case from frame questioning cycle to a frame elaboration cycles. Nurse 1 did this by means of using sensedemanding and sensebreaking aimed at achievement of shared understanding of this situation – and, in turn, successful performance of the novel and non-routine, complex task at hand.

Findings from the interviews

Analysis of the interview data validated findings from the field observation. It revealed that sensedemanding and sensebreaking are used for 1) acquisition and transfer of task-relevant knowledge (switching to frame elaboration cycles); 2) seeking of and identifying atypical signals (in frame questioning cycles); 3) re-connecting data to novel frames (in the course of frame re-framing cycles).

Discussion

This study set out to examine how social interaction associates with sensemaking relevant for adaptive performance. Our empirical analysis reveals that sensedemanding and sensebreaking fulfil important functions in aiding professionals in their sensemaking. Specifically, we found that professionals use sensedemanding and sensebreaking for 1) the detection of atypical cues and 2) the creation of opportunities for novel sensemaking by means of intentional 'switch' to questioning and specifically to frame re-framing cycles essential for novel sensemaking.

Table 2 contains a summary of the definition and description of the variables used in our conceptual model. It also contains supportive quotes from the interviewees which illustrate our analytical findings and validate our conceptual model.

Our findings yield two contributions to the literature. For one, we contribute a social ontology of sensemaking processes relevant in adaptive performance of professionals. Second, we contribute to the literature on agency in professional learning.

Table 1. Codebook with key concepts, their definition, description, and empirical indicators.

Concept	Definition	Description	Indicators (signal words or linguistic tools)
• Frame elaboration/ preservation cycle	• Updating the current situational (mental) representation based on new data (or data-frame relationships) (adding detail, accounting for more information available about the situation, and suggesting additional aspects of the situation based on the current frame), or discarding of data	• Elaboration of the action plan • Diagnosing problems • Increasing commitment • Adding resources	• Disseminating of visions • Using rhetoric, narratives, and artefacts • Offering explanations and/or justification of choices by story building • Dismissal of contradictory information/downplay of it
• Frame re-framing cycle	• Search for further data, the re-assessment, re-interpretation of old data, as well as redefinition of what counts as data (guided by inconsistencies and contrary evidence)	• Seeking a new frame • Comparing frames • Reframing the priorities	• Change of priorities • Redescribing the goals • Reprioritizing the goals • Adding new goals
• Frame questioning cycle	• Supports discovery of inadequacies in the initial account which allows a person to challenge the current assessment of a situation	• Tracking or detecting inconsistencies • Gauging data quality	• Noticing anomalies • Judging plausibility • Recognising goal conflicts • Questioning goals
• Sense-demanding	• Cross-checking one's own perceptions and interpretations with those of other individuals or organisations	• Searching for new information • Seeking advice/ help/support	• Asking questions • Listening to someone • Performing inquiries
• Sense-breaking	• Reframing: changes in someone's existing beliefs, values, identity, way of looking at things (goal-related or motivational changes) • Redirecting: changes in parts of a plan, trying out techniques, methods, instruments • Questioning: negative feedback that interrupts existing brings 'stream of conscious, rational and logical chain of thoughts to a halt or interrupts it	• Problematises existing information, understandings, and beliefs • Challenges current assumptions, i.e. cognitive frames	• Negative feedback/startle/ surprise • Rejection • Disapproval • Discontentment/ dissatisfaction • Annoyance

Social ontology of sensemaking

Our findings validate and extend prior research on relevant micro-level mechanisms which affect someone's power for idea diffusion (O'Mahoney and Sturdy 2016) and which are associated with changes in cognitive frames or models (Kaffka Gabi et al. 2021; Krueger 2007) enabling so-called 'adaptive

Table 2. Theoretical summary.

Concept	Description	Indicators	Example quotes from the interview data
Frame elaboration cycle	Updating the current situational (mental) representation (adding detail, accounting for more information available about the situation, and suggesting additional aspects of the situation based on the current frame)	• Diagnosis of problem(s) • Elaboration of planning • Adding resources • Increasing commitment	**Diagnosis of problem** • TM (Teacher): *If you talk to colleagues who experience the same thing, it gives you a feeling: I am not alone, he is doing it there too.* **Elaboration of planning/Increasing commitment** • DV (Teacher): *I have, well,– I have once again learned that this lesson plan, which I use more often, well, actually a kind of confirmation: it works. It works to allow students to engage in conversation in a structured manner. According to a fixed schedule. What they have learned, or what was confirmed, was that it works. If you give them a targeted assignment, have a targeted conversation about a limited topic, that works, students can ultimately do that."*
Frame questioning cycle	Allows a person to challenge the current assessment and supports discovery of inadequacies in the initial account	• Noticing anomalies • Questioning the goals • Judging plausibility • Recognising goal conflicts	**Noticing anomalies** • RR (Entrepreneur): *Until at a certain point the new manager stepped in with full power of attorney. And it started with the first comment: Yes, everyone wants to do business with us. There I already had the idea: Well – everyone wants to do business with us? Like 'So I am so popular, so I decide and I can choose who I work with because everyone wants to do business with me?'* **Judging plausibility** • GG (Entrepreneur): *And every time that – that there was reaction on the facts analysis, I had to push it back and explain why the reaction wasn't correct but that the facts analysis indeed was correct . . . Actually, I appreciated that.* **Questioning the goals/Recognizing goal conflicts** • TM (Teacher): *And if one colleague says: yes, I always throw him out, then yes, that is not of much use to me. Because that is not actually policy here at school. And I actually think that's a good thing too. Because those students are going to mess around in corridors, they are going to mess around, that is not the solution either.* • DV (Teacher): *I cannot say with certainty that it would never happen – that is not possible. But I would like to say – I'm not sure, I'm not sure if this is a solution to the problem, but I did contribute to preventing young people from having such a reaction. But what I said: I have no illusion that because of my action, things like this will never happen again.*

(*Continued*)

Table 2. (Continued).

Concept	Description	Indicators	Example quotes from the interview data
Frame re-framing cycle	Search for further data, the re-assessment and re-interpretation of old data, and the redefinition of what counts as data (guided by inconsistencies and contrary evidence)	• Comparing frames • Seeking a new frame • Reframing the priorities • Changing priorities • Redescribe the goals • Reprioritise the goals • Add new goals	**Comparing frames** • RR (Entrepreneur): *'And the remarkable thing is what I discovered: the difference in switching, from speed of organization from a 24, 50-person organization to an organization with 120 employees. This step is unprecedented in terms of being able to act effectively and quickly.'* **Re-framing goal and priorities** • JOB (Engineer): *We have an agenda, which we adapt, during regular 'lessons learned' sessions, and when necessary.* • AA (Teacher): *I lost my faith, so I used* [a very structured approach to teaching difficult students]. *And they loved it. I saw that they got to work, but that they had lacked structure. That was an eye-opener, this overly structured and pre-cooked… it's nice, nothing negative, right, but we really don't need that here. But with these students, we'll just do the structure and order.*
Sense-demanding	• Actively seeking out information • Cross-checking one's own perceptions and interpretations with those of others	• Seeking feed-back • Performing inquiries • Testing, measuring for assessment, testing, and/or critical analysis • Reading, study or discussion	**Seeking feedback/Testing** • GG (Entrepreneur): *What is needed is that the facts report is confirmed.* **Performing inquiries** • JG (Medical doctor): *We looked into whether it would be better to transfer her to another hospital.* • TM (Teacher): *We asked German colleagues to call the hospital because they could call, they spoke German.* **Discussion** • DH (Teacher): *So, I started my lesson with: who has heard of the murdered teacher in France?*

(*Continued*)

Table 2. (Continued).

Concept	Description	Indicators	Example quotes from the interview data
Sense-breaking	• Questioning (refusal) • Redirecting (new ideas/products/solutions, insights, methods, processes, markets etc.) • Reframing of existing perspective or understanding	• Negative feedback • Change of direction or activity • Novel beliefs or ways of looking at things	**Negative feedback/refusal** • MX (Entrepreneur): *So yes, and that criticism was often also about communication, that we would not communicate to someone quickly enough. But when it comes to individual counters, yes, there was always some delay, because we simply had far too many people to reach. And because everyone had their own emotions. . . so yes, if you have a* [salesperson] *on the phone and he doesn't like [the Corona regulations] at all, and he says that the regulations don't matter, then we had to say sorry but we're not going to do that.* **Change of direction/activity** • RR (Entrepreneur): *And that is something that I may have difficulty with, that for the first time I let it go, and let someone else take control.* **Novel beliefs or ways of looking at things** • MS (Teacher): *Learned a lot from it, the cultural aspect. That you can never, from our. from my perspective, that you can never understand the other person's perspective, but you can respect it.*

sensemaking' used by professionals for task achievement under conditions of novelty or uncertainty (Leroy, Schmidt, and Madjar 2020; Schildt, Mantere, and Cornelissen 2020).

The results showed that nurses and doctors, when faced with a highly complex and (for most) novel and collaborative task, make use of sensedemanding and sensebreaking. We observed how professionals achieved their task at hand by gauging, questioning, and reframing of cues. Such cues came in the form of distressed parents, the rare condition of the baby patient, as well as planning of a difficult surgery. Specifically, we saw how sensedemanding helped nurses to identify relevant information, while sensebreaking was used to distract the father of the baby patient as well as possible. Based on our findings, we propose a conceptual integration of sensedemanding and sensebreaking with the D/F Model of Sensemaking (Klein et al. 2007), clarifying how social interaction shapes sensemaking relevant for during adaptive performance (see Figure 2). It identifies the social dimension of the so-called 'adaptive sensemaking', i.e. sensemaking which professionals use when they face conditions of novelty and uncertainty in their work (Cornelissen, Mantere, and Vaara 2014).

We argue that sensedemanding and sensebreaking help clarify the social ontology of professionals' sensemaking relevant for adaptive performance. Specifically, their ability to know why and when to successfully communicate and collaborate during adaptive performance. Our study contributes to the literature by extending our understanding of socio-cognitive mechanisms relevant in acquisition and transfer of knowledge – as well as co-creation of novel meaning, and ultimately professionals 'adaptive performance.

Adaptive performance and social learning at the workplace

Francisco and Boud (2023) analysed practices used in collegial interactions and learnings and concluded '*that the social and relational aspects were critical in the development of a communicative learning space relevant to the activities of the workplace*' (2019, 923). And Derrick (2020) showed that innovation and workplace learning, i.e. social learning, require trust-building, boundary-crossing, and effective communication. These studies recognise the importance of socio-cognitive aspects of social learning at the workplace, characteristically socially situated, and requiring professionals' communicative efforts. We propose that our findings help explain how social learning takes place on the micro-level in organisations.

Sensedemanding and sensebreaking advance our understanding of the social nature of workplace learning while addressing the role of agency in such learning. Ma, Zhu, and Jain (2023) found that agency and initiative of employees have a positive function in organisational life as it enables intentional engagement in feedback at the workplace. Scholarly work long since recognised that newcomers need to acquire setting-specific interpretive schemes facilitating 'more adequate

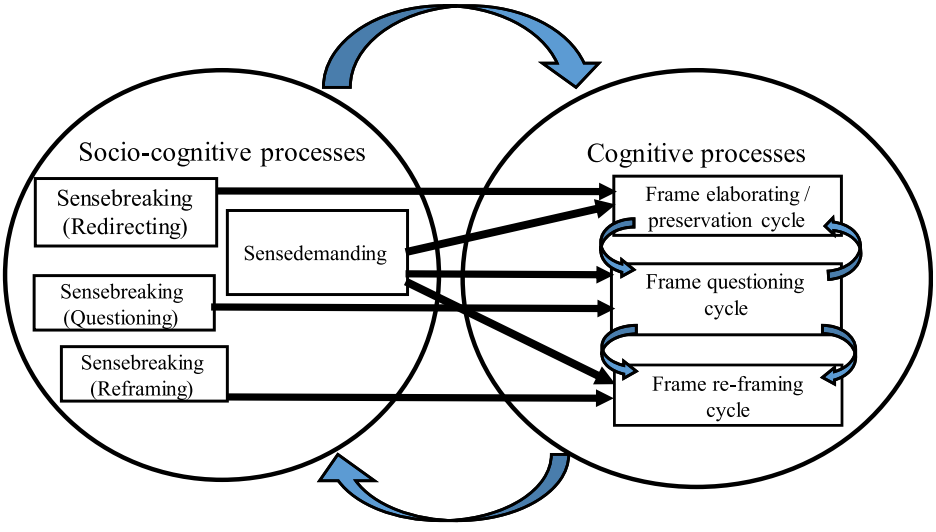

Figure 2. Integrated data-frame Model of sensemaking.

long-term self-sufficient functioning' in organisations (Louis, 1980). More recently, Feltrin, Newton, and Willetts (2019) suggested that adaptive performance relates to professionals' ability to acquire and transfer meaning in accordance with the organisation-specific norms and routines.

Our study extends insights from previous studies on the role of agency in professionals' adaptive performance. It does so by clarifying how two socio-cognitive mechanisms – sensedemanding and sensebreaking – help explain how professionals can exercise agency as they facilitate communication and boundary-crossing. Sensedemanding and sensebreaking enable professionals to acquire, transfer, and most importantly co-create (novel) meaning in the context of complex, non-routine problem-solving. This contributes to the literature on social learning and the role of agency of professionals in organisational complex, non-routine problem-solving.

Implications

Conceptual implications of our study lie in the deepening of the concept of adaptive performance. Assessment of speed, direction, and frequency of learners' use of sensedemanding and sensebreaking in sensemaking could tell us more about learners' ability for information search and identification of atypical signals which is crucial for adaptive performance of professionals (Hutton 2020), but also more generally for social learning (Derrick 2020).

Engagement with negative feedback, which generally can be seen as a form of sensebreaking, ultimately benefits professionals' development – whether voluntarily or not. For example, Kutscher and Mayrhofer (2023) studied how young professionals deal with career setbacks. Their findings revealed that

deliberate sensemaking facilitated young professionals' remaining aware of their aspirations and pursue them more consciously. And Modestino, Sugiyama, and Ladge (2019) examined enacted sensemaking of young professionals, i.e. how they developed a career narrative by means of narrative storytelling. Our results suggest that sensedemanding and sensebreaking can facilitate students and (young) professionals' engagement with (negative) feedback.

Both sensedemanding and sensebreaking operationalise into empirical, distinctive, and robust indicators. We suggest that inclusion of sensedemanding and sensebreaking in educational (research) design and assessment can help educational practice in feedback engagement design as they provide evidence-based empirical indicators for assessment of feedback engagement during task performance.

Practical implications of our study lie in the need in vocational and higher education in developing skills among students relevant for adaptive performance development (Maitlis and Lawrence 2007; Sanderse 2024). Development of communicative, discursive skills is paramount for professionals engaged in interprofessional work. Teamwork and networking skills, for example, have become increasingly important in higher education (Van der Beemt, Van der Watering, and Bots 2023). We argue that the development of these skills can be achieved by exercising sensedemanding and sensebreaking. Prior research recognises innovative educational approaches, like challenge-based learning (CBL), as catalysing skill development relevant for adaptive performance (Van der Beemt, Van de Watering, and Bolts 2023). CBL entails seeking of information by students, providing students with opportunities for sensedemanding and to seek engagement with critical feedback from relevant stakeholders, for example challenge-owners (Martin, Rivale, and Diller 2007) which facilitates 'switching' between sensemaking cycles. This can offer students with opportunities to exercise sensebreaking, i.e. skills relevant for dealing with critical feedback. We propose that exercise in and intentional use of sensebreaking and sensedemanding provides students with practice in (critical) feedback engagement, beneficial for the development of adaptive performance of (young) professionals.

On a related note, implications lie in start-up counselling, training should focus on providing opportunities for training discursive and narrative sensemaking skills (Modestino, Sugiyama, and Ladge 2019). To this, we add that such counselling could raise awareness for pro-active and intentional use of sensedemanding and sensebreaking in feedback engagement. As Nardon and Hari (2022) pointed out, sensemaking voiced by professionals in narratives helps the '*inclusion of multiple (even if contradictory) voices and points of view* [which] *may aid in breaking down barriers of who gets to be "one of us"*' (Nardon and Hari 2022, 96).

We suggest that future research can focus into which, when, how, and why such workplace or environmental affordances enable or constrain professionals

in sensedemanding or sensebreaking. Extant work shows that professionals and students alike employ (workplace or environmental) affordances, in interaction with other stakeholders to achieve sensemaking of professionals (Bailey, Winchester, and Ellis 2023; Rowe, Jackson, and Fleming 2023). Prior research shows that artefacts play an important role in (development of) adaptive performance (Hatano and Oura 2023) and therefore merit closer scholarly attention.

Conclusion

The results of our study offer an account of the social ontology of sensemaking used by professionals in adaptive performance. This contributes to our understanding of how social interaction associates with sensemaking processes relevant for (developing) adaptive performance among learners. This has important implications for training of (young) professionals. Guile and Unwin (2022) described expertise development as instilling a capacity for action; our findings suggest that the capacity for *interaction* might be equally important for the development of professionals' adaptive performance.

Disclosure statement

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