Abstract

This dissertation uses an ecological framework to investigate the social practice of human error related to interaction in emergency medicine. The overarching motivation behind this project was nourished by an interest in how multiple dynamics of human decision-making in emergency medicine lead to human errors and successes. Having introduced the field of human errors, the dissertation sets out to answer three overall questions:

(i) **How do healthcare practitioners manage decision-making about patient diagnosis and treatment in a way that yields cognitive results?**

(ii) *How do healthcare practitioners anticipate and counter errors? How does an emergency medical team function to prevent errors in complex treatment situations? How do errors emerge and escalate in a (dysfunctional) social system?*

(iii) *What are the methodological innovations that can be extrapolated from an ecological perspective on human errors and an ecological approach to language and cognition?*

The dissertation concludes that, overall, an ecological approach is apt for explaining how events on multiple timescales affect local decision-making in complex organisations. Thus, by extending practitioners' decision-making to an eco-systemic activity, cognitive results are shaped by non-local dynamics and situational affordances for actions within the cognitive system. The dissertation's empirical findings are specific examples of what non-local dynamics and situational affordances for action look like in real-life diagnostic events (see below).

Chapter 2 reviews and contrasts conversation analytical approaches to social interaction with Hutchins' classic approach to the study of distributed cognition (DC), which are the two major approaches to the study of social interaction. It shows how DC favours embodied information processing within a distributed cognitive system with functional properties, while conversation analysis (CA) underlines the sequential organisation of social orderliness in a local negotiable situation. It concludes by claiming that both positions are inadequate in the exploration of the phenomenon in its ecological entirety, as, in each case, the enabling conditions for human decision-making are reduced to a single domain of either social orderliness or representational states.

Building on an ecological view, chapter 3 presents an alternative analytical framework for studying the ecology of human decision-making in complex organisations: the interactivity framework. This framework provides analytical models and theoretical perspectives to investigate

Comment [IS1]: This sound unusual because "social practice" is usually used about successful activities. You might say "human error in the (interactive?) social practice of emergency medicine".

Comment [IS2]: The use of "dynamics" here sounds off to me, I think because "multiple" connotes countable objects but "dynamics of human decision making" connotes the physical-temporal aspect of decision making in general. You could just say "the" instead of "multiple" and mention multi-scalarity elsewhere, maybe?

Comment [IS3]: Clarifying question: it this about positive cognitive results (vs. negative ones) or about cognitive results (vs. non-cognitive results)? If the former, putting in an adjective like "positive" or "beneficial" or something would make it more clear.

Comment [IS4]: This tends to specifically be about continuing trends. Maybe "derived"?

Comment [IS5]: Substitute something more specific, maybe? – this is just to set up the "both" two sentences later.

Comment [IS6]: "defined by"?

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Comment [IS7]: multiple uses of "framework" are slightly repetitive, but it can be dealt with in any number of ways.

the multiple time-scales in human decision-making. Specifically, the preliminary approach of Cognitive Event Analysis (CEA) is a pivotal method for framing cognitive events in local interaction.

Chapter 4 presents the project's research design. It uses cognitive ethnography to examine the real-time dynamics of medical decision-making at a ▮▮▮ Hospital (▮▮ Hospital). The primary data material consists of video-recordings of 17 real-life diagnostic and treatment situations in the hospital's emergency ward. From beginning to end, the case study was carried out by the author, as were the coding and general data processing. Based on the initial coding process, hypotheses and thematic events were outlined as organising principles for further investigation. Specifically, six themes were defined and investigated further in the analyses.

Six analytical chapters (chapter 5-10) treat these themes as aspects of the diagnostic encounter in the emergency ward. Using the interactivity framework, the analyses take their starting point in the enchronic timescale, using CEA to frame cognitive events. From there they move beyond the conversational scale of interactivity and embrace both the rapid pico-scales and the larger cultural scales of interactivity as explanatory resources in the investigation of how decisions are reached.

The main findings are based on an analysis of how interaction in a medical team links agents, artefacts and expertise. This analysis seeks balance between (potential) medical error cycles and a more general understanding of how practitioners undertake treatment as a team-based problem-solving activity. Each chapter focuses on a thematic aspect related to the function of decision-making: (a) medical visual systems; (b) interruptions; (c) diagnostic procedures; (d) medical cultural dynamics; (e) sense-making in teams and (f) writing the clinical record. The analysis demonstrates how team members enact expertise-in-action, and also how lack of coordination and communication can lead to human errors. In particular, it shows that non-routine events are crucial to what goes on in the emergency ward: anomalous events function as affordances, signal errors and trigger feedback mechanisms which prompt team members to anticipate possible changes of plans. For instance, it can be demonstrated that interruptions are handled differently depending on the interlocutors' level of expertise, team constellation and situational and material circumstances. In conducting numerous empirical analyses of how practitioners manage cognitive events, it becomes evident how the concept of multiple timescales is crucial to understand the enabling conditions of human decision-making. Thus, from the chapters' particular analyses of the function of a) how visual systems are extended in space-time, b) how procedures and interruptions constrain practitioners in balancing multiple moral values as part of decision-making, c) how cultural patterns

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shape local role-hierarchies that are shaped by the very same dynamics of local interaction, d) how team members co-act and make decisions by relying on the team's sense-making capacities, and finally e) how rich embodiments increase the chances for flexible adaptive behaviour in human-artefact interaction, the overall conclusion of particular case-examples unveils a general aspect of the eco-systemic enabling conditions for medical decision-making. When practitioners are unable to balance the non-local and local constraints within that system, they fixate on one thing that increases the chances for the emergence of error cycles.

In chapter 11, a synthesis of the empirical results forms the basis for a description of their practical implications. These implications are discussed in relation to challenges in everyday medical practice. On these grounds three initiatives are suggested: a) the implementation of a new model of language and cognition in the field, b) changing the basic assumptions of what is relevant content in training programmes. Hypotheses of necessary initiatives should be based on empirical evidence rather than subjective experiences and c) to deal with (the design of) material artefacts as flexible artefact environments.

Chapter 12 concludes by summarising how the project's empirical findings illuminate and respond to the research questions posed in the beginning. Overall, depending on how skilled healthcare practitioners are and what the environment offers, local flexibility varies, which affects cognitive outcomes. The more flexibility there is in a cognitive system, the better chance it has to anticipate what comes next. To enhance practice and manipulate the affordances within the environment requires a) a cultural change that relates to an understanding of language and cognition as distributed and ecological, b) an educational strategy that takes advantages of the learning potential within flexible systems, and c) a focus on the materiality of the environment and how the environment affects behavioural coordination.

The dissertation makes clear that it does *not* provide a complete account of the entire ecology of human decision-making, rather, it gives an ecological account of pivotal elements in functional and dysfunctional decision-making. Thus, a cross-section of the ecology is investigated to demonstrate the complexity, spatial extension and multi-temporality of human decision-making in complex organisations. By showing what is gained by extending the object of study from local interaction to interactivity, the activity of boundary constructions of eco-systems can explain the dynamic and bounded possibilities individuals have for producing cognitive results. This insight connects to the third research question, the one concerning which methodological innovations that can be derived from an ecological perspective. Crucial to the ecological perspective on human errors, language,

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and cognition is the fact that local coordination is understood to be sense-saturated. Selections are shaped by sense-saturated coordination rather than being local instantiations of individual logical choices. In this, the interactivity framework contrasts sharply with other approaches to human interaction, and for this reason it provides the best option if the aim is to study dynamics in the ecology of human life, including human decision-making.

Finally, a broad, long-term ambition of this project is to contribute to an ecological turn within the humanities and the cognitive sciences. By showing the results of embedding natural studies of human interactivity in an ecological framework, the project illuminates the benefits of treating language and cognition as ecological, distributed and intertwined in interactivity. In so doing, it challenges traditional approaches in linguistics and cognitive science to adapt their methods in accord with these foundational assumptions.