

Research article

Using narrative in ergonomics research and practice

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Background: For the discipline of ergonomics, taking an external focus is thought to be necessary to make a shift from ergonomics research to practice. This outward focus can be sustained through a series of conversations - a form of narrative - with partner organisations. An inwards focus on the role of narrative in current research and practice will help prepare ergonomists for these conversations. **Aims:** This paper examines the way narrative is currently used in ergonomics and relates this to the potential for narrative to support interdisciplinary and collaborative activities involving ergonomics. **Method:** Titles and abstracts from three peer-reviewed ergonomics journals were scanned to establish an understanding of the use of narrative in ergonomics. Seven ergonomists were then interviewed and the transcripts analysed to identify narrative approaches to ergonomics which are believed to build the capacity for interdisciplinary work. **Results:** Themes identified included the formal and informal use of narrative as a tool for defining problems in the field, as a way of describing approaches to professional practice, as a means of working with abstract or complex concepts and as a way to build trust and new knowledge with others. The latter use of narrative positions it as a 'boundary object', something which acts as an intermediary between different communities of practice allowing flexibility, the coordination of activities and knowledge creation. **Conclusions:** There is evidence that experienced ergonomists find a narrative approach important for effective practice in the field. Narrative may act as a boundary object, as a way of improving problem definition, of building trust, relationships and knowledge. This paper supports the strategic use of narrative methodologies to help ergonomists engage with stakeholders and practitioners from other disciplines and to understand and deal with complex problems.

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Background

From time to time, human factors and ergonomics (HFE) literature focusses on ways to improve outcomes. Shifting towards an external focus, one that includes other stakeholders, is thought to be important in order to translate research into practice [1]. Humans are born story tellers and arguably social creatures. It makes sense then to take a look at the role of narrative in ergonomics in both performing the work of ergonomics and in forming and sustaining partnerships in ergonomics. The definition of narrative used in this paper is 'a coherent representation of a story which happens in conversation, is composed of discourse, appears in a sequence, and is interpreted retrospectively' [2].

In addition to its textual, auditory and verbal forms, this research situates narrative being not only just linguistic in nature but as having visual, kinaesthetic, tactile and, even gustatory forms [3] and existing in multiple modes. Narrative is considered to be a type of cognitive structure imposed by the mind to give coherence to the world and things in it and which occurs in a communicative context [4].

Knowledge arising from narrative - narrative knowledge - can be used to uncover and give context to other types of knowledge, for example practical, discursive and scientific knowledge [2]. Narrative is flexible in its form and this flexibility should increase the accessibility of ideas and information for others involved in ergonomics work.

Narrative is important as a way for people to communicate and to interpret aspects of their environment. There is a long standing argument that ergonomics is less effective than it aims to be [5-8]. This study suggests seeks evidence of the use of narrative in the way ergonomists go about their business. This research therefore aims to look for the application of different forms of narrative in ergonomics research and practice and considers how a narrative perspective in HFE might enhance the effectiveness of ergonomics.

Method

The approach taken in this research was to look for evidence of the current use of narrative in HFE from two sources, firstly ergonomics journals with high impact factors [9] and secondly, expert interviews. In the initial phase, the titles and abstracts of papers in the last three years' issues of the three journals - *Ergonomics*, *Human Factors* and *Applied Ergonomics* - were scanned for evidence of the use of a narrative approach to ergonomics. Reference was made to the methods section as required. In the second phase, verbal permission was sought from seven ergonomists to participate in semi-structured interviews. Four of the ergonomists had extensive international experience, all except one were Certified Practicing Ergonomists and four were senior academics. All interviews were conducted by the researcher. Interviewees were sent an email with the definition of narrative used for this paper and a description of the aim of the interviews. The

duration of interviews was between 20 and 35 minutes. A scan of HFE literature was used to develop questions that would explore the interviewee's knowledge of the use of narrative in a range of ergonomics research and practice. Other themes covered were participatory ergonomics, design and how the interviewee's themselves approached ergonomics projects in the field. The recordings were transcribed and hand coded to establish key themes.

Results

Scanning of titles and abstracts of journal papers

As expected, scanning the titles and abstracts of papers in HFE journals provided only a basic, but useful, sense of the degree to which narrative methods were actively used in discipline specific literature. The process was sufficient to be able to establish that in these journals at least, the term was seldom used explicitly. There was, however, evidence of narrative as defined in this paper occurring in three ways. Firstly, the most obvious use of narrative was in the very form of the papers themselves – text as a literature review, discussions and conclusions. One theme relevant to this paper was the relationship between ergonomics research and ergonomics practice [10-12].

The second use was as a research methodology that produced narrative in a non-textual form. Examples of this included a kinaesthetic form of narrative where a physiometer to track the body's movement over a whole day [13]. An example of a visual form of narrative was the use of eye tracking technology [14]. An auditory form was suggested in the output from sonification [15], for example alarms in an operating theatre or control room. Cognitive activities which might be interpreted as narrative included research aimed at describing a team process for problem solving [16] were also noted. More abstract examples might combine several of these types of narratives to represent the concept of work style [17].

The third use of narrative as specific research methodologies generating oral and written forms of text. These included interviews, verbal protocols, case studies and focus groups. The literature scanning process suggested questions for the interviews. The intent was for the questions to identify methods producing different types of narrative, to explore the application of narrative to ergonomics practice and to consider the potential results of a narrative approach.

Expert interviews

Four major themes were identified in the interviews. These were:

1. the use of narrative in informal and formal modes as a tool for defining problems in the field;
2. as a way of describing approaches to professional practice;
3. as a means of working with abstract or complex concepts; and
4. as a way of building trust in and new knowledge in interdisciplinary partnerships.

Theme 1: Formal and informal use of narrative in problem definition

There were many examples in the interviews showing that that the informal use of narrative was common in ergonomics practice. These included informal interviews, meetings, discussions and conversations with clients. In addition to confirming the definition used in this paper, interviewees each clarified what narrative meant for them, for example one interviewee stated that:

If by narratives you mean anything which isn't numbers then I use injury narratives a fair bit, so I'll use descriptions of events where people have been injured as a way of highlighting the things that they need to be concerned about.

When the comparison between informal and formal use of narrative was raised, one interviewee, who has a social science background, gave the following rather insightful comment:

I suppose my view of narrative is that it is a less formal structured process and a less formal research style or way of presenting your material. Therefore, I sort of get a sense that it might be less accepted for validity and reliability and it doesn't always follow set structures. I suppose my narrative is more about telling the story in terms of the background, all the complexities of the organisation. In manufacturing, you have all sorts of things like ageing workforce and literacy problems and ethnic backgrounds and people with different skill sets. You have to try and present that in the terms of the general overview to fit the right 'this is the culture' or 'this is the safety behavior' or 'is it a proactive, positive, safety-conscious environment that we're working within?' I think narrative is the best way to express some of that, it's not emotion, but it's just that whole time and feeling of the business you're working within.

In addition to the examples given of the informal use of narrative in its linguistic form, there were also many examples of the formal use of narrative. While all interviewees knew of someone who used this approach in research, few gave detailed accounts of the regular use of formal narrative enquiry in their own practice. Examples given were verbal protocol analysis, the success case method [18] and transcribed interviews with coding using software such as NVivo [19]. A common example narrative or dialogue in design is the formal documentation of a design in the format of a brief [20]. One interviewee reported the use of sonification in operating theatres, and there is evidence in the literature of sonification for presenting complex data [15]. Another reported using a video recorder with dual channels. The first audio recording on channel one was used in the initial video, the second channel was used to record the subject of the video's commentary on reviewing the footage. Two interviewees were confident that either copious notes including verbatim quotes, and data analysis on the fly were effective. There was no mention of powerful tools for text

analytics in any of the interviews, for example Leximancer [21], however there was more evidence of awareness of tools to assist with coding of interview and focus group data. Overall, while there was a clear agreement that narrative methods were used by ergonomists, there was also a sense that these were limited in use because they were considered 'unscientific' and the most appropriate application was therefore as a supporting methodology, not as the core of a research process.

Theme 2 : Narrative as a means of describing approaches to practice

The idea of the practice of ergonomics as having its own 'narrative' came out subtly in several of the interviews. One interviewee saw that in her work, it was essential to practice in a way that was centred on the worker. This interviewee reported the problem was to get managers and other stakeholders to shift their views and become more aware of this worker centric model. Another interviewee saw the difficulty ergonomists have in being effective as being due to ergonomists behaving as if they had 'agency', that is the ergonomists were the change agents, as opposed to having to work through others.

Even the concept of participatory ergonomics, arguably the most well-known approach to ergonomics that is based on narrative, had the potential to fail, as one interviewee put it, because participation meant different things to different people. A 'failure' narrative, amusingly called the Easter Monday phenomenon was also noted by another interviewee:

.....'it can't be done because'..... they're very quick to think up some situation and what you're suggesting won't work.

He later stated that:

... it's very useful there to have places where everyone can sit around and agree yes, this did work. And people can bring up narratives in their own background where things have been changed and did work.

This same interviewee also saw that as HFE involved humans 'not rats', it was reasonable to include the insights of people who were the subjects of ergonomics work in research and practice that centered on their health and well-being. While not named as such, this would be, like the worker centric model of practice, an argument for a user centered approach.

Several interviewees noted the importance of understanding the larger environment in which ergonomics products were being delivered. The combination of a user centred focus and an emphasis on the operating environment suggests one narrative for practice is the constant shifting between a micro and a macro view of a situation. This can be thought of as ergonomics being practiced as a 'context sensitive' discipline. Another concept was around the importance of the overall length of the narrative which was being considered. This applied in particular to working partnerships with clients. Longitudinal case studies would be example of a more formal, extended narrative. There was also a sense that the practitioner, informally through their experience, also picked up lots of little

examples or stories and that it was this length and sequence of experience over time which allowed them to practice effectively in some complex areas where others had failed.

Theme 3: Narrative as a means of working with abstract or complex concepts

While interviewees quickly agreed that narrative could actively be used to deal with complex situations, such as getting a message across in a keynote or to a board of directors, examples were rarely given. One engaging description of occupational health and safety (OHS) practice was as a sidecar to a motor bike – a part of the process, but not one in which the OHS practitioners were in a position of control. The interviewee stated that this idea had become a very powerful way of trying to reframe the role of OHS as part of the business case, as a co-driver and not as merely a passenger. Another interviewee saw the value of narrative as useful in conveying abstract concepts in a teaching situation. A third saw injury data as a type of narrative which could be used to drive investment in the preventative aspects of design.

Another concept was that highly abstract or refined narrative was thought of as losing some of its value. One interviewee told a story where the format of a meta-analysis of narrative had moved so far away from the original that it became barely recognisable to the original narrators of the incident. This finding prompted the designers to collaborate with workers to preserve more of the sense of the original in data capture. Another interviewee saw the risk that narrative might be used:

...like a drunk uses a lamp-post

that is, for support, not illumination. There is, therefore, some evidence that narrative can be misused or mishandled.

Theme 4: Narrative as a way to build trust and new knowledge

There was a clear sense that narrative, as conversation, was essential to effective practice. The implications of this were two fold. Firstly, there was a need for resources to build and sustain narrative over the life of a project. One interviewee recalled a very successful consultancy project where she had been given an extensive:

...package that was all around the management engagement side.

Early on in the interview, the interviewee had stated that:

If you don't ask the right questions, you don't get the right outcome. You have a period of relationship building to accurately define that and the scope of the project.

This demonstrates a relationship between narrative, trust and effective outcomes. It also suggests both a financial and personal investment. A second implication of this was that it is the conversations with stakeholders where trust levels were high that allowed the subject under discussion to remain fluid, and that because of this trust, the barriers often erected around contentious issues could be avoided. This could be seen to be the mechanism for participatory ergonomics as an approach to problem finding and problem solving.

Discussion and conclusion

There is evidence in the literature and expert interviews, that the use of narrative as a term to frame ergonomics work is somewhat forced. It is possible that the level of evidence for the use of narrative is greater in specific domains, such as human computer interaction. At least two of the interviewees had a strong social science background. These interviewees spoke with ease about the role of narrative in their research and practice. While, in general, interviewees did not appear to see their formal work as being accomplished through narrative, it was clear that all were comfortable with the informal use of narrative as conversation to define and to solve problems. There was strong evidence that narrative acts as a boundary object [22] - an interface between one or more areas of practice. Brohberg's [22] work on boundary objects relates well to the practice of participatory ergonomics, as described by one interviewee. The potential role of narrative as a boundary object in ergonomics practice is worthy of further investigation.

Despite the extensive use of narrative in the professional practice of highly experienced ergonomists, they did not appear to have much insight about the potential use of narrative as a formal tool in ergonomics research. Narrative is a very powerful means of reflection about research and working as a professional [23]. The more deliberate use of narrative as a rigorous tool may also be a way of linking ergonomics research with practice. Supporting ergonomists as a group to be more aware about how they use narrative may be an effective means of improving outcomes.

Narrative has been shown to be a useful tool in understanding complex situations and can be used in both for both quantitative as well as qualitative analysis [24]. The potential of narrative to communicate complex messages, for example in the format of metaphors and stories, is common practice in presentations and other professional practice.

David Caple, recent president of the International Ergonomics Association, has called for a greater focus on external stakeholders [1]. This research provides evidence that the more deliberate use of narrative has a significant role to play in establishing more effective partnerships between ergonomists and other stakeholders and as a means of helping ergonomists work more effectively with complex issues in research and practice.

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