

## A Sensemaking Interface for Doctors' Learning at Work: A Co-Design Study Using a Paper Prototype

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**Abstract.** In the process of everyday work, medical doctors usually have no time for reflecting, organizing and making sense of information that reflects valuable informal learning experiences. In this paper we propose a prototype that supports retrieval from episodic memory of informal experiences and sensemaking in semantic memory. A paper prototype was used in several co-design sessions with healthcare professionals to validate the idea.

**Keywords:** Workplace Learning, Sensemaking, Health Care

### 1 Introduction

While the importance of learning at the workplace and the significance of informal learning in this process have been stressed by many, there exists a dilemma. Because of the ever increasing economic and time pressures that today's workforce is subjected to, there is less and less time to reflect and learn about experiences that have been made in the workplace. For example, as economic pressures on the Health Care System have proliferated, the workload of general practitioners (GP) in the UK has dramatically increased over the past years. Nowadays a doctor sees more than 30 patients (for 10 minute consultations) on a typical day as well as undertaking home visits. In addition, she is dealing with administrative issues, and has therefore only limited opportunity to reflect on and learn from the experiences encountered during the day.

On the other hand, there is a wealth of informal learning opportunity in this working day, such as experiencing "Patient Unmet Needs" that then lead to "Doctor's Educational Needs", or performing reviews of significant events. Significant amounts of informal discussions with colleagues about individual cases can also be observed. GPs can submit a record of their informal learning experience in the appraisal process, which is required for their re-validation. However, due to the aforementioned time pressures, there is a risk that a lot of the valuable experiences get lost, if they are not remembered or reflected upon.

We created a sensemaking interface to support retrieval from episodic memory of informal experiences and sensemaking in semantic memory. A paper prototype was created in an early design stage to test our assumptions with healthcare professionals.

## 2 Supporting Sensemaking in Informal Learning

We see the task of remembering and making use of informal learning experiences as a memory retrieval and sensemaking task. Informal learning is episodic in nature, meaning that episodes of learning experiences are distributed over working time, and stored in episodic memory. Making sense of these experiences then involves a process of mental categorization and connecting it to other experiences which happens in semantic memory [17].

Tools to support this task usually cover two main phases: *foraging* (information seeking, finding, and collecting), and *sensemaking* (building representations and interpreting information) [1]. In Healthcare, tools now emerge that help GPs during information foraging by keeping track of their informal experiences to facilitate showing evidence of learning for their appraisal process, such as Osmosis<sup>1</sup>. However, available tools lack the support for sensemaking. Sensemaking support, on the other hand, can be found in systems for information collecting and categorizing [2,3,4], systems for visual information seeking [5,6,7], information visualization [8,9,10], making sense of large networks [11,12,13], and collaborative sensemaking [14,15,16]. However, these do not focus on retrieving experiences from episodic memory.

## 3 A Design for Supporting Memory Retrieval and Sensemaking

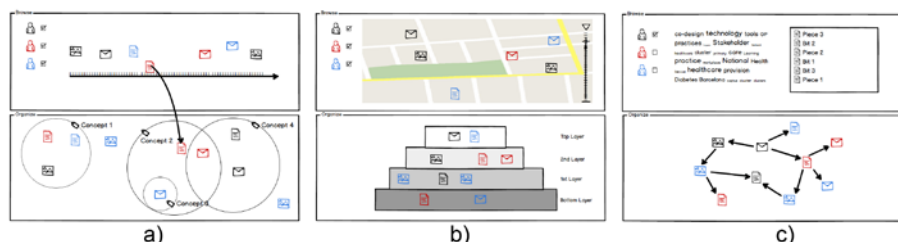
To effectively support both foraging from individual experience and sensemaking, the main support mechanisms in the two memory systems, episodic and semantic, need to be considered. First, to access past episodes from memory, a retrieval process uses cues, such as the time or location of the episode. Hence, these contextual cues need to be represented in the interface. Second, categorization and enrichment then happen in semantic memory in which the episodes are connected to meaningful categories and other episodes. A support for this sensemaking process needs to provide flexible ways to group, categorize and enrich the episodes.

In Fig. 1, a general architecture of the design is presented. The system consists of two main canvases arranged vertically. The upper canvas is intended for representing collected informal experiences. These are represented by icons that symbolize information that was collected in a learning episode, such as a picture that was taken, a URL that was discovered, a textual or audio note that was taken or a conversation that was held with a colleague. The collected information does not capture the entire learning experience but rather provides cues that allow the person to retrieve the episode from episodic memory to make sense of it at a later stage.

The lower canvas is intended to support semantic memory, by means of sensemaking and organization of resources in some meaningful way. Icons can be dragged and dropped between both canvases, however a main moving direction is top-down. The lower part then gives different ways to physically manipulate the icons by sorting, organizing or grouping.

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<sup>1</sup> <http://osmosis.me>



**Fig. 1.** The Browse (top) and Organize (bottom) canvas and alternative representations (a-c)

Both upper and lower canvases work as containers, which can be flexibly switched between different ways of visualizations (a-c in Fig. 1). The upper canvas (Browse) shows alternative cues that are important in memory retrieval, such as time, location, topic or person. In (a), users browse resources by the time when they were collected by shifting a timeline (*time*). In (b), users browse resources in a map that is arranged by the places where they were collected (*location*). Finally, (c) allows for accessing resources by using tags as filters (*topic*). Moreover, *persons* are included in each view by means of a checkboxes that allow the user to filter resources shared by other users.

In the lower canvas (Organize), users can arrange icons using round areas that represent specific categories (a). Placing a resource into a ring assigns a tag to this resource. By intersecting and placing rings inside each other, complex data structures can be built. In (b) a layered model is presented, which allows arranging resources according to different levels of abstraction. In the last example (c), information is organized into a concept map.

#### 4 Participatory Co-design Using a Paper Prototype

Following a design research strategy, previously we have collected evidence through ethnographic studies, the use of personas etc. Here we particularly focus on testing assumptions on the general architecture of the design. Because physical manipulation is a key feature of the design, we employed a paper prototype (as shown in Fig 1) in which paper icons that represent collected information during learning episodes can be manipulated (moved, categorized etc.).

A series of co-design meetings have been held with clinical staff from two medical practices: 2 GPs and 2 Diabetic Specialist Nurses (DSN) and 2 Health Care Assistants (HCA). Participants were given an introduction to the tools and using the paper prototype, could then explore the idea imagining their own collected experiences within this interface. This allowed us to explore potential usage scenarios and questions regarding the users' perception and motivation to use the tools, perceived gaps and desirable additional functionality.

The paper prototype has been used in a series of co-design meetings over several months in order to generate and validate initial ideas and discuss their suitability for the professional's working context as well as obtaining user input into the ongoing designs and use cases.



