

Introduction

- ❖ Information management is a challenge for organizational teams across industries, and we are interested in how the cognition of individuals can be leveraged in a team for the best team performance outcomes.
- ❖ The need for novel strategies to accelerate learning is of concern in organizations as the senior experts' retirement comes closer (Hoffman et. al., 2014).
- ❖ We propose a method of information representation that may be suitable for accelerating training.
- ❖ The common elements theory of the transfer of learning proposes, minimizing the transfer distance between the skill already known and skill currently unknown to increase the learning efficiency (Hoffman et. al., 2014).
- ❖ Concept mapping is an ideal tool for eliciting knowledge, creating context for the knowledge, and showing the relationship between nodes of knowledge (Crandall, Klein, & Hoffman, 2007).
- ❖ We propose maintaining teams' knowledge on a concept map and using it for training purposes, which helps connect explicit and implicit information.

Challenges in Current Employee Training

- ❖ Employees get relatively comprehensive training at the beginning of their duration of the job. This may include more information than they need to do the immediate job, which results in slow and inefficient training that is too dependent on trainees' memory.
- ❖ Often, feedback in current on-the-job training relies on new hires' ability to comprehend and retain a massive amount of information and the ability to ask the right questions to generate the context of the information. Current training leaves it up to new hires to integrate newly-learned information with existing knowledge. These qualities may vary across trainees.
- ❖ Knowledge is as useful as its availability when needed. This gets tricky as the experts responsible for generating and refining knowledge retire, and there is no record of the knowledge derived from experience.
- ❖ Some types of knowledge, acquired by experts over decades, such as developing heuristics, are not easily captured in existing training or knowledge-management systems. For example, wiki pages do not often describe links between concepts.

What is Concept Mapping?

- ❖ Gowin and Novak developed concept mapping for academic purposes in 1984.
- ❖ Concepts are represented on a visual diagram using nodes, which are then linked together using arrows (Thordsen, 1991).
- ❖ Concept maps allow subject matter experts (SMEs) to share and discuss concepts for a specific task on the job, which facilitates having similar understanding of the information.
- ❖ Concept maps can be performed in various formats, ranging from paper and pen to digital concept mapping tools, such as the online tool for mind mapping: Mindomo.
- ❖ A list of definitions often is generated along with the concept map, because concepts across multiple concept maps could be similar, but differences exist (Gutzwiller, 2016).
- ❖ Good concept maps result in better retention of knowledge by new hires, enabling them to apply knowledge in novel situations that require both knowing and manipulating the knowledge learned (Crandall et. al., 2007).

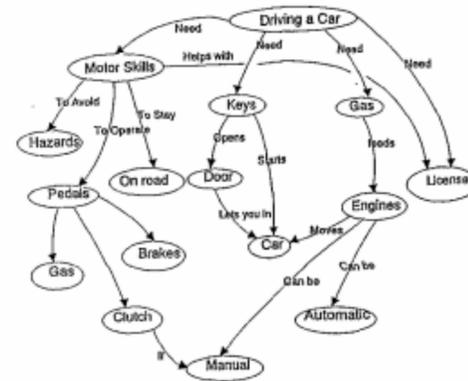


Figure 1: Sample concept map by Thordsen (1991)

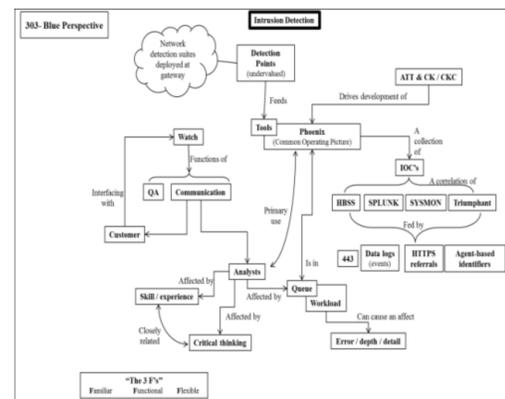


Figure 2: Sample concept map by Gutzwiller (2016)

Method and Research Goals

- ❖ Nodes represent information known or unknown to the trainee and that are connected with transferable skills, which respective nodes have in common.
- ❖ This representation would enable the trainee to locate both known and unknown information on the map and be able to find the shortest path on the map to learn the new information as efficiently as possible.
- ❖ Once the trainee locates one such path, the trainee would be able to visually relate known to unknown information.
- ❖ The concept map is also valuable for representing knowledge that was implicit to the experts. For example, experts may turn self-developed heuristics into explicit knowledge through the process of creating a concept map.

Discussion & Recommendations

- ❖ Implementation of concept maps may need to be done at the team level, as it relies on senior experts' knowledge, and their availability.
- ❖ A comprehensive concept map would take time to build and maintain.
- ❖ In addition, current employees and new employees will be required to be trained in how to make and maintain concept maps.
- ❖ We need to explore currently used information management tools with an aim to reduce challenges in implementing our proposed method.
- ❖ As part of our ongoing research, we are evaluating current technologies used to record, manage, and share concept maps.

Disclaimer

- ❖ This poster is based upon work supported by the National Science Foundation under Grant No. 1553018. Any opinions, findings, and conclusions or recommendations expressed in this poster are those of the authors and do not necessarily reflect the views of the National Science Foundation.

References

- ❖ Crandall B., Klein G., Hoffman R. R. (2007). *Working minds: A practitioner's guide to cognitive task analysis*. Cambridge MA: MIT Press.
- ❖ Hoffman, R., Ward, P., Feltoich, P., DeBello, L., Fiore, S., & Andrews, D. (2013). *Accelerated expertise: Training for high proficiency in a complex world*. New York: Psychology Press.
- ❖ Thordsen, M. L. (1991). A comparison of two tools for cognitive task analysis: concept mapping and the critical decision method. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 35(5), 283-285. doi:10.1177/154193129103500509.
- ❖ Gutzwiller, R. S., Hunt, S. M., & Lange, D. S. (2016). A task analysis toward characterizing cyber-cognitive situation awareness (CCSA) in cyber defense analysts. *2016 IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA)*. doi:10.1109/cogsim.2016.7497780