

CORPORATE USES FOR CONCEPT MAPS

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Abstract. Corporate world is a complex environment. Large volumes of information from various sources must be addressed under a faster and faster pace in order to make decisions. Business competition, regulations, changing requirements, progressive integration and interdependency between departments and functions are some of the factors contributing to the increasing complexity of daily tasks inside corporations. In this setting, professionals are expected to find effective ways to deal with challenges, often resorting to creatively applying several tools to manage knowledge and solve problems. Concept mapping, due to its flexibility and features, is an appropriate tool for this scenario. Despite its origins in a different, educational setting, concept mapping has unveiled great capabilities for use in corporations. This paper discusses and illustrates some of those possible applications, based on practitioner experience and real world problems, intending to inspire innovative uses for concept mapping.

Keywords: corporate, concept map, application, use.

1 Introduction

During last decades, changes on information, economy and work relations have exponentially increased complexity in the corporate world. This reflects in corresponding increased complexity of contemporary professional tasks, as new abilities are required and several different areas of knowledge need to be correlated. To perform well in such a complex environment, professionals must resort to knowledge management techniques and innovative approaches.

In this context, the use of concept mapping has revealed itself highly suitable. Concept maps, as graphical tools for organizing and representing knowledge (Novak & Cañas, 2008), have emerged from the educational community in the 1970's and still today they seem to find their mainstream in there. However, in the 1990's concept mapping started spreading into the business world as an aid in solving problems in workplace, in a trend designated by Moon et al. (2011) as applied concept mapping.

There are a number of knowledge management methods that can be used to graphically represent knowledge (Buzan & Buzan, 1993; Novak & Cañas, 2008; Village, J. et al., 2013). But among those techniques, concept mapping presents some advantages over others, making it suitable for a variety of applications.

2 Methodology

The main objective of this paper is to illustrate expanded applications for concept mapping in the corporate world, providing examples based on real, daily professional problems. Hence, this work is mostly based on author's practitioner experience in logistics research, shipping process analysis and information system development. Some concept labels (names) have been changed or generalized in order to preserve classified information, yet enough attention has been paid not to turn them into purely theoretical examples. Motivation for this writing came out from the perception stated by Novak & Cañas (2010) that few corporate uses for concept maps have been reported (Dumestre, 2004; Fourie & Westhuizen, 2008; Freeman, 2004; Kyrö & Niskanen, 2008). Thus, this paper aims to fill this gap, in order to contribute to the concept mapping communities worldwide.

All provided concept maps were designed using CmapTools software (Novak & Cañas, 2008). Original styles were changed from colorful to greyscale in order to meet printing requirements.

3 Important Features in Concept Mapping

One of the most important features in a concept map is the focus question, once it keeps the mapping activity oriented towards a clear objective. Enunciating an appropriate focus question is a good starting point for

achieving representative, high quality concept maps. Thus, it is desirable that the focus question remains visible during the entire mapping process, preferably as a guideline in the header of the map, as shown in Figure 1.

Concepts used in the map must be clear, so that their meanings remain explicit and easy to understand. For this reason, Crandall (2006) discourages the use of colors to code meaning in concept maps. Even though, in some cases we see advantages in the use of different colors and styles to categorize or highlight concepts or groups of concepts, as it may help emphasizing hierarchy and keeping point of relevant concepts within the map. Colors and styles may also bring additional properties to concepts, such as variations of status in time, or temporality (as it will be shown ahead in Figure 3). Nevertheless, if any notation is used (be it of color or style), it must be properly captioned to ensure the related meaning is fully understandable and explicit, instead of becoming tacit. Notice an example of captioning for the styles on Figure 1, at the upper left corner. In addition, encompassing the captions within a nested node makes it possible collapsing the whole caption for additional clearance.

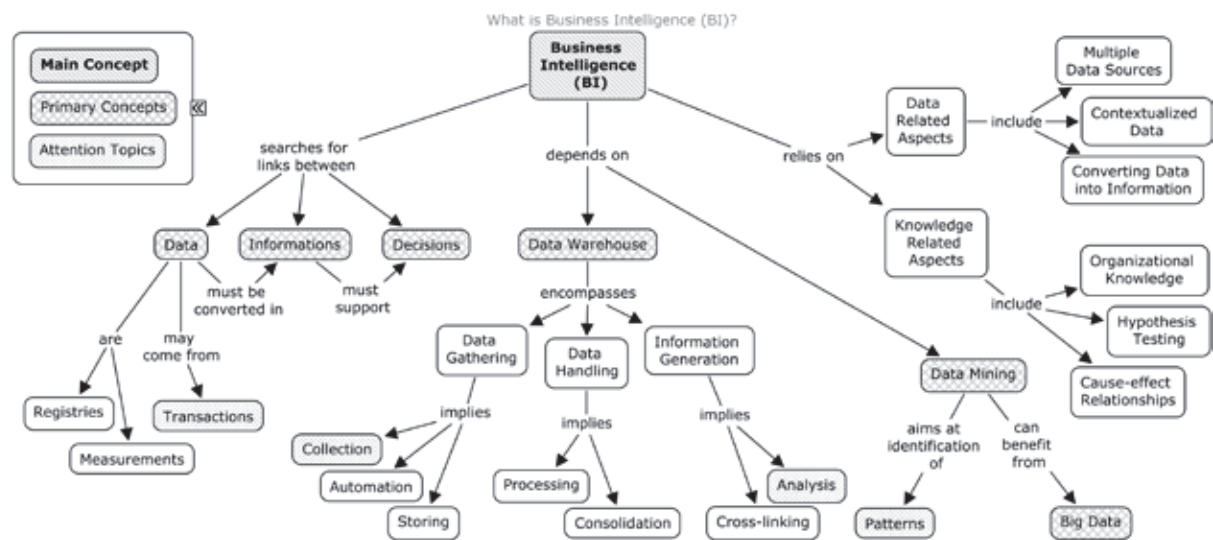


Figure 1. Additional meaning and information can be provided by styles and captions.

Despite the apparent simplicity of the concept map idea, the underlying constructivist theories (Ausubel, 1963; Novak & Cañas, 2008) demonstrate how solid the foundations of this technique are. In this way, a distinguishing principle of concept mapping is the use of linking words to form independent propositions. This structure reinforces meaningfulness, as it allows to clearly explaining relations between concepts. Choosing appropriate linking words while making a map usually allows maximizing the capture and understanding of meanings.

Furthermore, the availability of CmapTools as a software kit for handling and sharing concept maps constitutes a major advantage, granting flexibility in the mapping process.

4 Some Corporate Uses for Concept Maps

Due to their graphical nature and inherent flexibility, concept maps fit a diversity of applications regarding knowledge modeling and problem solving in complex, abstract and fuzzy settings. Some of those possible applications will be presented and illustrated as follows.

4.1 Risk Analysis

Concept maps have turned to be appropriate for risk analysis on complex decisions. The hierarchical structure of the maps allows to group risks under more general concepts (see for instance Figure 2, *Main Risk Areas* caption and respective concepts). Each risk group is related to a risk generating factor, providing explicitness for brainstorming individual risk possibilities associated to each factor. Identifying the individual risks is an important step prior to considering mitigation actions, as well as categorizing risks into a hierarchical structure is beneficial to a correct risk identification.

As risks are interrelated, some cross-links resulting from additional reflections may indicate which risks hold the most critical potentials, allowing better mitigation and contingency planning.

Once decisions or events happen, on the fly information may be logged to the risk map as well. For instance, see *Test Realization and Reporting* concept in Figure 2. Inside this nested node there are other concepts related to the realization, events and results happened during the upgrade pilot test. This is a way to keep track of the status of risks, to enable posterior analysis, to evaluate the quality of planning and to discuss learned lessons.

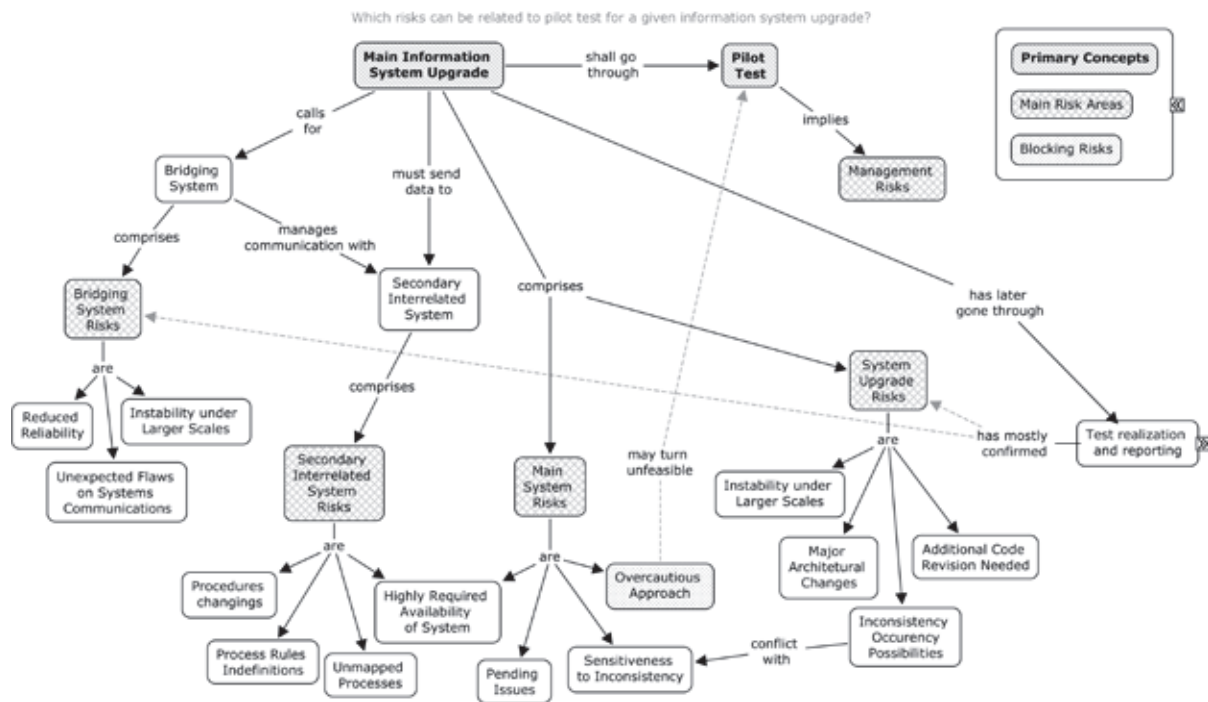


Figure 2. Map used for risk analysis of a system upgrade pilot test.

4.2 Action Planning

In a similar fashion than in previous item (4.1 - Risk Analysis), the capabilities of concept maps to group and categorize information into a hierarchical structure may aid well in action planning. As illustrated in Figure 3, a concept map was used to brainstorm, discuss and analyze each related aspect in an initiative to upgrade an information system. Given that the upgrade implied deep architectural changes in the system, a detailed action plan was needed prior to performing the referred upgrade.

An additional, desirable feature in this case is temporality, or the indication of change/progress through time, which is not an usual characteristic of concept maps. Once the planning effort was considered satisfactory and the upgrade process was initiated, the progress of upgrade actions could be indicated in the map by using different styles in association with captions (see captions at upper left corner of Figure 3, where each style indicates a different status). Then, as planned actions took place, the concept map was updated by changing the styles of the concepts. This approach has expanded functionality of the concept map, as it has allowed checking and monitoring process execution.

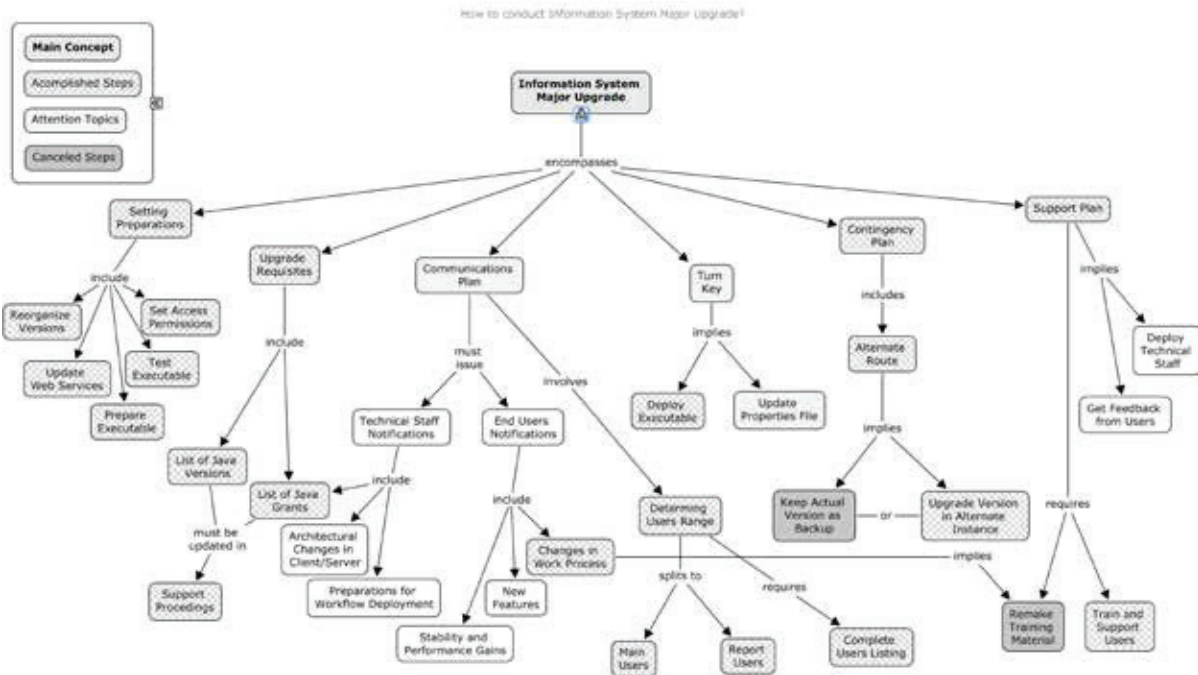


Figure 3. Action plan map, including temporality.

4.3 Training

In regard to training, concept maps may be used in two different ways. One of them is planning the training course, much similar to an action plan encompassing everything that needs to be provided in order to make the training happens. In this case, styles can indicate the status of each step required to organize the event and make it feasible (see Figure 4). The training content itself can be assembled in the same map. In the example in Figure 4, it is hidden under the *Content* node, which derives from the *Guide* concept.

Another way of using the same concept map is to turn it into the own course “book”, presenting and discussing contents aided by the concept map on screen. Considering the hiperlinking capabilities to other media, complementary material can be exposed from the map, while supporting the discussion on main topics. In this situation, a positive side effect is the interest that the concept map itself can draw.

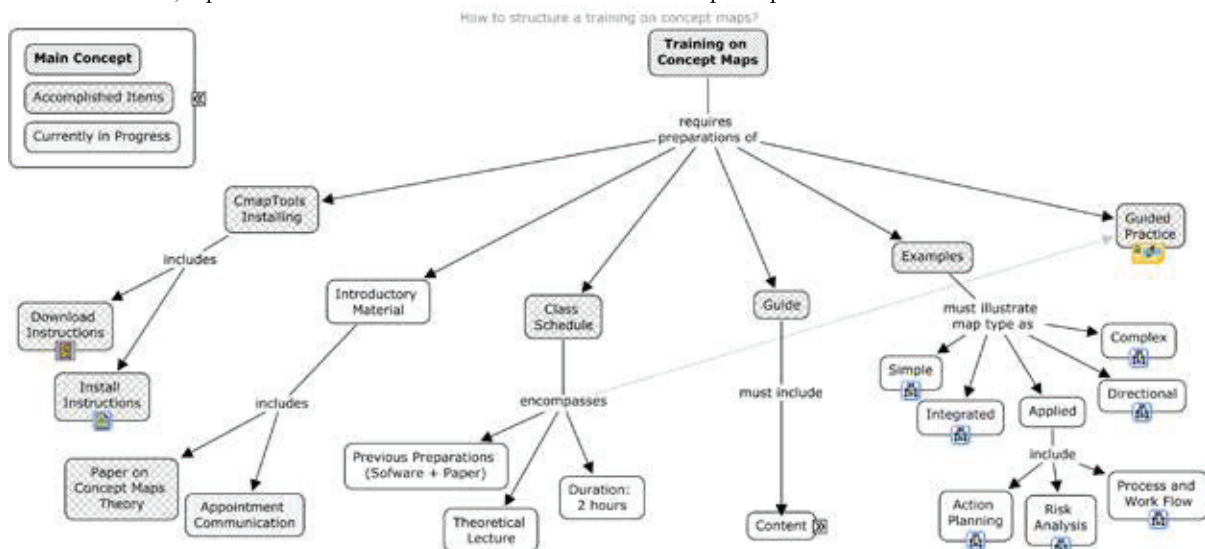


Figure 4. Map including training plan and content about concept maps.

4.4 Process Representing

Although concept mapping is not deliberately meant to be a process modeling technique, it may be used for organizing and structuring information gathered in initial interactions, interviews and field observations.

Several business departments or working groups hold subjective concepts and tacit values merged into their activities, what often requires initial interactions to explore and collect main concepts and their relations, followed by further discussions to refine and validate those concepts/relations and the resulting process arrangement. In this way, concept mapping can be used both as a knowledge elicitation tool and as a process representing tool in a higher level of abstraction.

See for instance Figure 5, where an upper level of transport scheduling process has had its inputs and outputs mapped. Each concept in this representation comprises a large subset of data sources, data itself, links to other processes and areas. Nevertheless, all things the transport scheduler needs to know and to produce are summarized in this process representation. As additional details are raised, they may be registered in other concept maps, which will be linked to this upper level map (as indicated by the map linking symbol at the bottom of the central concept). In the end, a set of concept maps will constitute a knowledge model for the elicited work process.

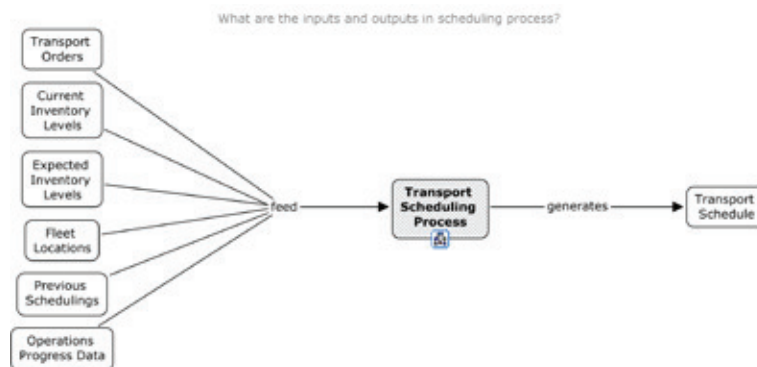


Figure 5. Work process represented by concept map during requirements elicitation.

There are also unusual ways to explore the propositional structure of concept maps (as a set of concepts and propositions). For instance, the concept map framework can be used to represent work flows, where sequential steps can lead to multiple results. Figure 6 depicts how a ship voyage created in a tactical level was unfolded to the operational level, during the implementation of an workflow managing system. This lead to a transition phase where pre-existent registries had automatic approval; while new registries were sent to analysis staff.

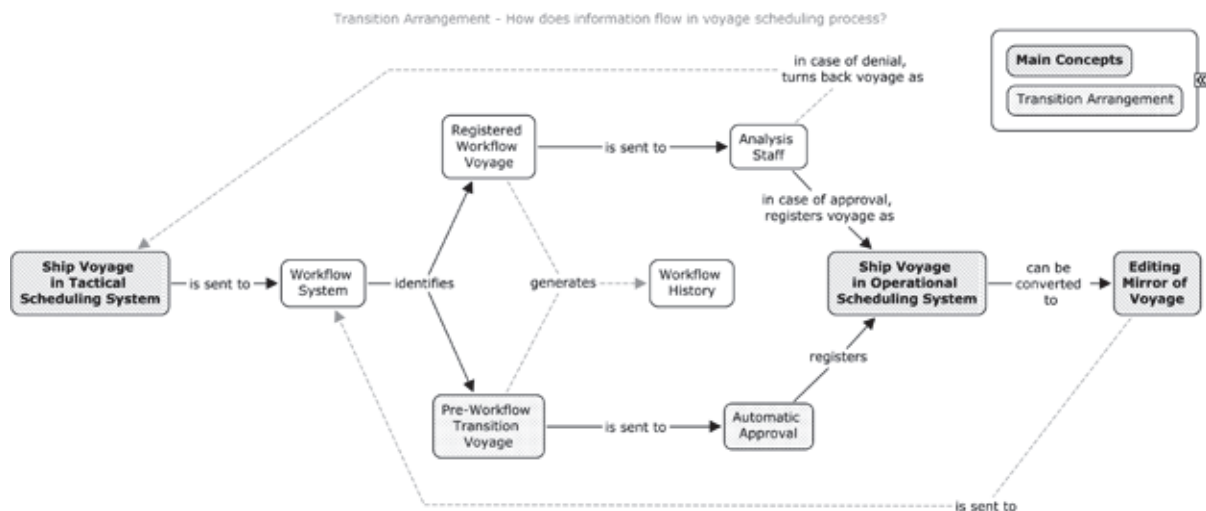


Figure 6. Concepts and propositions used to depict a work flow, in a less usual approach.

4.5 Work Load Balancing

The inherent panoramic capabilities of concept maps may yet be applied to balance the work load of employees, guaranteeing adequate distribution of effort. Expressing and grouping activities into a concept map can be a way

to manage tasks and also to improve communication inside staff. An example for this application is provided in Figure 7, where activities are gathered under main groups. This feature can be used either for planning as for monitoring, being subject to revision at any time, since it addresses a dynamic situation.

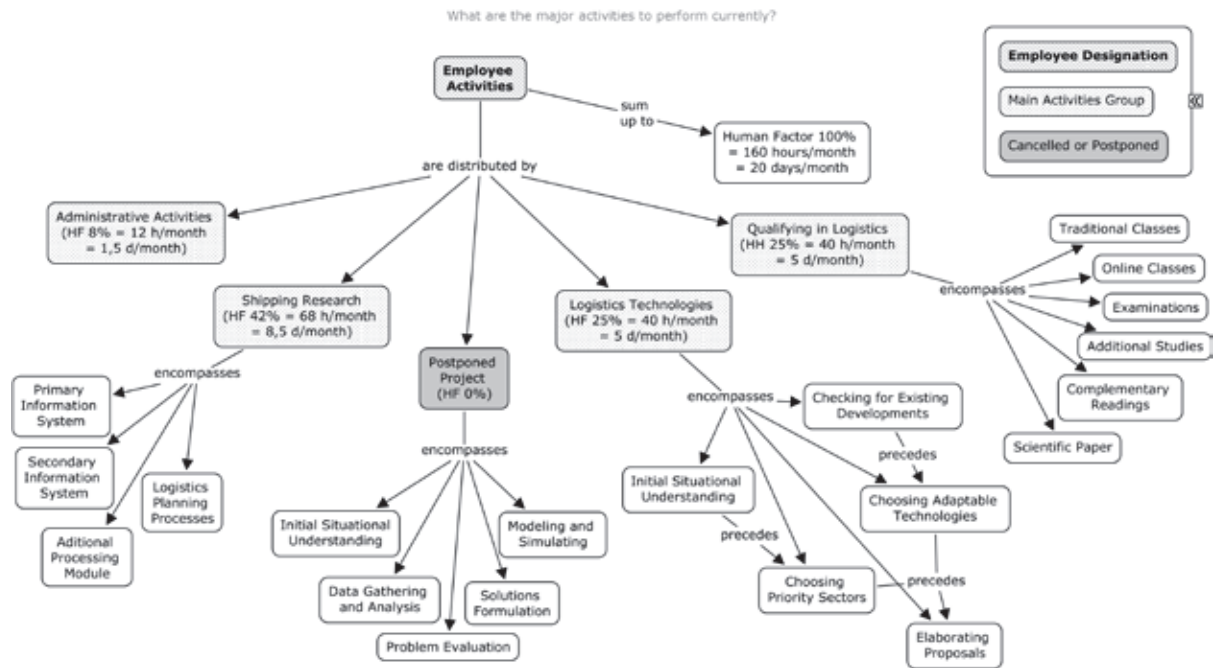


Figure 7. Visualization properties enable map use for work load balancing.

5 Summary

This paper aimed at remarking the feasibility of applied concept mapping in corporations under innovative ways, often different from those usually predicted in educational settings. For this purpose, some particular features of concept maps have been discussed, such as the importance of adequately using focus questions and the use of styles and colors to group and categorize concepts. Several applications for concept maps in corporations have also been presented, illustrated and discussed.

From our experience, the use of concept maps seems to be specially promising for action planning, risk analysis and for the elicitation and understanding of work processes. As those activities are widespread across many kinds of organizations (corporations, government agencies and non-governmental organizations in almost any field of operation), there is a vast potential for the application of concept mapping techniques.

Considering the flexibility of concept maps, and in face of those possible applications (far away from being an exhausting list), it can be stated that concept maps fit corporate uses in several ways, as well as innovative uses must be tried for different approaches and needs.

And surely those innovative approaches must be reported to the community of concept mappers, in order to improve and spread knowledge.

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