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# A New Generation of Knowledge Books: K-Ebook 2.0

Vincent Ribière[1+] and Christian Walter [2]

[1] The Institute for Knowledge and Innovation Southeast Asia, Bangkok University
[2] The Institute for Knowledge and Innovation Southeast Asia, Bangkok University

**Abstract.** A knowledge book is the result of the elicitation/capitalization of the knowledge of an expert during a series of interviews. The expert's knowledge is often represented using models made available to users through an IT system (the knowledge book not being a regular book). The literature on the structure and presentation of the content of knowledge books is almost inexistent and too often in practice the usage of such static knowledge book remains very low. In this paper we propose the structure of a new generation of knowledge books based on Web 2.0 technologies (K-eBook 2.0) that addresses many of the limitations of the traditional knowledge books.

**Keywords:** knowledge book, knowledge elicitation, Web 2.0, knowledge capitalization, knowledge visualization

## 1. Introduction

The field of Knowledge Management has evolved from being Information Technology (IT) centric to become people centric (using IT only as an enabler). Okimoto [1] refers to this evolution as moving from KM 1.0 to KM 2.0 particularly with the recent emphasis on using Web 2.0 technologies to facilitate connection, communication and collaboration inside and outside organizations (Enterprise 2.0). The first KM wave, with its IT emphasis, supported what is usually referred as a codification approach centered around documents (explicit knowledge) [2]. The knowledge artifacts created, were often created in a format, context or view that was not always directly useful to the recipient. The second KM wave emerged where the individual became the center of all KM activities. We often refer to this approach as socialization [2]. Technology is used to moderately support such practices by providing collaborative environments and synchronous live communications tools (i.e., videoconferencing). The emergence of Web 2.0 tools gave a new dimension to the role of IT in the socialization approach. Wikis, blogs and social networking tools made "sharing" a more natural thing, using friendlier and seamless IT tools. The best way to transfer knowledge remains, particularly when it contains a large tacit component, to have the knowledge receiver spend some time with the giver (expert) to share, observe, get involved, practice and understand why and what things (actions, decisions, behaviors, etc.) are done in a particular way. Unfortunately, it is not always possible for the giver and the receiver to spend time, thus preventing the receiver to acquire the giver's tacit knowledge. In such cases knowledge capture must be used to transfer knowledge.

## 2. Methods and Models of Knowledge Engineering and Capitalization

Apart from the MASK methodology (explained later on) five other methodologies were identified in the literature; 1) CommonKADS an evolution of KADS and its multiple agent approach MAS-CommonKADS, 2) MOKA (Methodology and tools Oriented to Knowledge-based engineering Applications), 3) REX, 4) CYGMA (CYcle de vie et Gestion des Métiers et des Applications), and 5) KREST.

[+] Vincent Ribière, Tel: +662 350 3677; Fax:+662 350 3671
E-Mail: vince@vincentribiere.com

CommonKADS is probably the most popular knowledge engineering model; it is an evolution of the KADS methodology. It tries to answers why the knowledge is relevant? What is its structure? How can it be implemented into a computer system [3]? Six different models answer each of those questions. The organizational model, task model and agent model analyze the organizational structure as well as the success factors for the knowledge system [4]. The communication model and the knowledge model capture the concepts and describe how problems captured can be solved. The design model eventually translates all of the previous models into the technical specification which makes it possible to implement it into a software system. An extension of the CommonKADS methodology is MAS-CommonKADS developed for multi-agent systems [4], focusing more on the agent model.

The Methodology and tools Oriented to Knowledge-based engineering Applications (MOKA) consists of six steps, 1) identification, to identify the industrial needs and technological feasibilities, 2) justification, to analyse the risk, validate the scope and study the projects profitability, 3) capturing, the collecting and structuring of the raw knowledge, which is then 4) formalised, by developing product and process models, followed by 5) packaging, the development of the application itself, and 6) the activation phase [5]. Most important for the construction of the application are the capturing and formalisation phase, also called MOKA Phases. The result of the collected knowledge structuring is the MOKA Informal model, which are sets of ICARE forms; Illustration, Constraints, Activities, Rules, and Entities [5].

The REX method reuses experience formerly captured [6]. The method relies on four relatively broad steps. Identification, to find the source that possesses the knowledge, which is then followed by the construction of that knowledge. This stage is followed by creating the representation and installing the final software package. The software includes a multimedia interface that allows the user to ask questions in natural language and produces information files on this basis [7].

The application of CYGMA will produce four different documents, a profession glossary, which presents terminological knowledge, a semantic catalogue for the description of the structural knowledge, for behavioural knowledge the rule notebook and for strategic and operating knowledge an operating manual. CYGMA was designed as a profession memory in the manufacturing industry [7].

COMMET (COMponential METhdology) is based on the knowledge level modeling framework and is the basis for KREST. The COMMET methodology uses three different perspectives to ensure that the knowledge is completely captured [8]. Models contain the relevant application data, task identification addresses the question of problem solving in order to solve the problem addressed by the application. Method specifies how the knowledge can be used to perform the task. Those models represent the knowledge level were designed to provide a tool that can be used by programmers and non-programmers alike to design, maintain and configure applications. KREST visualizes the identified components by using different kinds of diagrams.

All presented procedures have their specific foci. CommonKADS, MOKA and KREST were developed to create expert systems, whereas REX and CYGMA are approaches that lead to corporate memories [7]. CommonKADS, MOKA and KREST provide the possibility of visualization and are reusable but for non-programers it is very difficult to use those techniques. Usually the help of a knowledge engineer is needed. REX and CYGMA do not provide any specific way of visualization. None of the methodologies provide visual models that are easily understood and can be easily modified or constructed without the help of a knowledge engineer.

## 3. Proposed Approach and Conceptual Description of the K-Ebook 2.0

The literature review presented the various approaches and techniques commonly used to capitalize knowledge from an expert and to present it so it can be shared with recipients through various forms and formats. As mentioned in the introduction, too often knowledge is shared and captured by "volunteers" through an unstructured format (text) or, at the other extreme, it is modeled by knowledge engineers in complex and highly structured representations that only them and computers can understand! We strongly believe that only models can fully represent the depth of experts' knowledge but we also think that the model created should be easily understandable by the future users (recipients) without requiring some training (as intuitive as possible). By analyzing all the techniques and tools previously presented, we found that MASK (Method for Analyzing and Structuring Knowledge) being the closest one to meet these requirements.

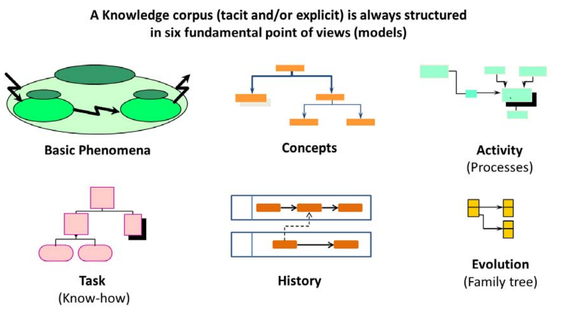


Fig. 1: The six MASK models

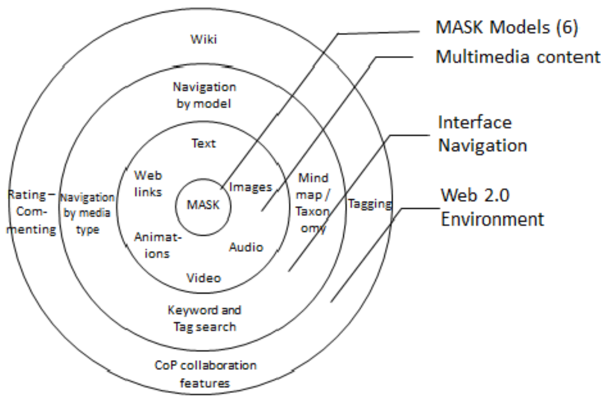


Fig. 2: Structure of the K-eBook 2.0

The purpose of this paper is not to present in details the MASK but it is important to understand the core concepts of this method. This method was created in France in 1996 by Jean Louis Ermine [9] while he was working for the CEA (Atomic Energy and Alternative Energies Commission). It is an evolution of the MKSM method [10]. In MASK the models are co-built with the expert during the interviews. MASK uses six models to structure knowledge under: systemic, ergo-cognitive, psycho-cognitive, historical and evolution analysis [11] as presented on Figure1.

In brief, the basic phenomena model is used to describe any type of phenomena (physic or not) where an event/triggers modifies the state of the source producing a flow that will affect the target and generate the phenomena. The concepts model describes and organizes concepts like a mix of taxonomy, semantic network and object-oriented diagrams. The activity model is like a workflow model describing sequences of processes and sub processes as well as resources and actors similarly to the Structured Analysis and Design Technique (SADT). The task models is used to represent know-how, it is a representation of the strategy used to solve problems. It gives the description of the tasks scheduling using a hierarchical recursive decomposition of a high level task into lower levels sub-task [11]. By describing the evolution of objects and techniques among years and experiences the history model provides a contextual representation of the evolution [11]. Finally, the evolution model reflects a mental analysis of concept evolution (how and why) and it is adapted from technology history theory [12]. The output of MASK is a set of interconnected models, which will become the content of the knowledge book. After various phases of validation (by expert, by peers, by management) the content will have to be formatted so users can learn from it and find what they are looking for. MASK recommends the creation of a knowledge server on and Intranet that will present the models and will link to different documents and references available on the company servers. The MASK literature on how to format/present and navigate the content of the book is almost inexistent.

To address these issues (commonly raised with KM 1.0 approach) we decided to develop a new generation of knowledge book that we named K-eBook 2.0. Figure 2 presents the structure of the proposed K-eBook 2.0. At the core of the K-eBook 2.0 (K-eB2) is the content of the book, the core knowledge elicited from the expert and modelled using the six MASK models (Knowledge Book 1.0) including links to documents already available but often scattered on the various company servers.

Even though the MASK models are easy to understand by people newly exposed to its representations, we decided to add some unstructured content around them to facilitate their understanding; brief descriptions in text format, the use of images and pictures to illustrate the concepts and to reduce ambiguity, audio recordings of the expert explaining a concepts using his/her own words and jargon, video recordings (short video clips) of the expert describing or explaining things and short video clips of difficult or risky procedures and actions (i.e, professional gestures), animations to better illustrate a concept or a phenomena through sequences of events, and additional links to Web resources and references that can of value to the reader.

The next layer is very important since it provides different ways to navigate and search through the content of the K-eB2. The first generations of KB allowed navigating through the content mainly following the logic and sequences of the models. We believe that other navigation mechanisms can be very useful and more efficient to find the searched knowledge. The use of taxonomies can help structure the content by topics and categories. We can imagine offering different views of the taxonomy based on the discipline of the user or its expertise level in the field, since the logic to build the taxonomy may vary from discipline to discipline. The use of Mind Maps (as knowledge maps) follows the same idea as taxonomies but they are structured and organized in a less formal way, allowing to provide more explanations, interactivity and links between different branches of the maps. Nowadays, Mind maps are becoming a popular way to represent structure of information and they are easy to use and to understand that is why we believe that they can be of a great value to users of the KB. The typical keyword and tag search engines should also be made available to identify content containing concepts associated with the keyword searched. The latest generations of users are used to and particularly like to watch more interactive media than plain text. One way to trigger or to maintain their attention might be to provide them with the ability to navigate through multimedia content of the K-eB2 (by videos, by pictures, by audio files, by animations).

The outside layer of the K-eB2, which gives the “2.0” label to its name resides around the idea of providing the KB into a Web 2.0 environment. In order for the KB to continuously evolve and to involve the community interested in this topic to contribute, the KB should be provided in a Wiki environment. It will allow users to edit the content of the book by adding, updating and modifying some obsolete content. This process will need to be overlooked by a committee that will review the proposed changes before they get officially released in the KB. Tagging features should also be provided to tag any content of the book (models, multimedia, …) so they can be better indexed and this will also make the KB more complete and will allow to support different points of view and disciplines (discipline related tags). Maybe one of the most interesting features of the K-eB2 is the ability to trigger the creation and to support Communities of Practice (CoP) activities. Successful CoP are very focused around specific topics and areas of interests. Any content of the KB can potentially trigger the interest and the need to develop a CoP around it. The Web 2.0 features of the K-eB2 will allow to create a CoP environment attached directly to a particular aspect of the KB. The CoP environment will allow its members (volunteers) to build their practices by developing tools, standards, sharing documents and ideas on the related topic, using a common document repository, participating into discussion groups, etc. The outputs generated by the CoP will become new additions to the KB and the CoP members can serve as the monitoring/validation sub-committee for this particular aspect of the KB.

Finally, rating and commenting features can be a way for users to add their point of view related a particular aspect of the book without modifying its original content. By rating content, users can indicate what they like and what aspect of the book they find the most useful. A further analysis of all the ranked content can be useful to integrate this aspect in training programs or to make them more accessible to future users. We could also imagine a navigation by most popular aspects of the KB. Commenting and tagging might also serve as way to identify who are the users and people interested in a topic, so it will serve as a CoP member and/or expertise locator in the company. Other features might be added to make the system more of a living KB than its previous generation. Very importantly, the K-eB2.0 should be fully integrated into the work processes. Links to it should be made available in work procedures, quality manuals, workflow systems and in any other system that relates to the treated topic. Its degree of integration will influence its degree of success and its added value.

## 4. Conclusion

Even though the fields of Knowledge Engineering and Knowledge Management are closely related, it looks like the language and approach used in each disciplines remains quite distant. A knowledge book, as we describe it, could become a tool that could help bring these disciplines together. The idea is to make knowledge models, content and interfaces accessible to everyone so they can be understood and so people can contribute to it to make knowledge books live and evolve overtime. It is too early to test how effective the second generation of knowledge books we proposed is compared to the first generation, but based on the initial feedback of our client it looks that they perceive it as being more user friendly and more engaging!

Knowledge books are not only a way to capitalize knowledge for not losing it but they are also a wonderful tool for training purpose and to develop Communities of Practice.

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