Scenarios for f-Learning

Zoltán BARACSKAI
Doctus Co.
Budapest, Hungary
zoltan@doctus.info

Viktor DÖRFLER
Management Science Department
Strathclyde University
Glasgow, United Kingdom
viktor.dorfler@strath.ac.uk

Jolán VELENCEI
Doctus Co.
Budapest, Hungary
jolan@doctus.info

ABSTRACT

In this paper we take the idea of e-learning a step further, from "e" to "f", indicating that the post-e-learning is on the doorstep. The "f" stands for freedom focusing on the freedom of the f-learner. As we will show, the demand for the freedom of the f-learner imposes certain boundaries to the freedom of the f-teacher – this is what we propose to handle by adopting the f-learning scenarios. For this quest we have developed a systems-description of the increase of personal knowledge, we analyze the interaction of the individual and organizational value systems, and we examine the possibilities of standardization of the user interfaces to finally be able to offer scenarios for f-learning. More precisely, we do not offer instant scenarios applicable in any situation but a conception of how scenarios can be developed, what they should contain and what should be taken into consideration during the development. The outcome of this research also indicates some new problems regarding the roles identified in f-learning.

Keywords: e-learning, blended learning, learning organization, personal knowledge, knowledge increase

INTRODUCTION

We adopt Polányi's [1] conception that all knowledge is personal; i.e. that knowledge cannot be properly divorced from the whole personality of the individual. This means that in our approach the organizational knowledge does not exist in the sense of the personal knowledge. Of course, we do not neglect the importance of knowledge for the organizations; but for the organization it is the knowledge of its employees. As Nordström and Ridderstråle [2] have put it:

"The critical means of production is small, grey and weights around 1.3 kilo-grams. It is the human brain."

The organizational knowledge is a metaphor, and it can more precisely be named the "*knowledge capital*", "*intangible asset*" and "*intellectual capital*" [3], "*knowledge as corporate asset*" [4], or "*invisible assets*" [5]. We also do not neglect the role of organization in shaping the knowledge of the individuals. This role is twofold: Firstly, the organization is the context of personal knowledge and is in interrelation with it, as described by Tsoukas and Vladimirou [6]. Secondly, the organization affects in various ways the knowledge increase of its employees. This is even more important if we consider that the organization will usually be the place and often the initiator of f-learning.

In f-learning our aim is to provide the greatest possible freedom to the f-learner. The freedom of the f-learner can be described as freedom to choose her/his own learning route. To enable the f-learner choosing her/his own learning route the bits and pieces of the provided curriculum must be of the same size and all the linking possibilities must be examined: where a link is possible there will be an allowed path where the f-teacher cannot make links there would be a denied path. This means significant additional work for the f-teacher. The structure and the mode of delivery used in the curriculum from the classroom-based teaching cannot serve even as a starting point. Assuming that one topic covering three keywords corresponds to one lecture in the traditional classroom environment, the curriculum for one semester may be regarded as 12 topics with three keywords each; so there are 1,260 potential links. The curriculum also must be highly structured, i.e. we need two-level topics 3*4 or 4*3 as 12 topics are beyond our cognitive capacity. Apart from structuring and examining the potential links the content also must be significantly rewritten to get for each keyword units that are wholes by themselves, that are of the same size and for which all the potential links are supported; we have discussed the problems of content structuring elsewhere [7, 8]. The scenarios introduced in this paper are meant to handle these structures and some other aspects rising from the discussion in the following sections.

In the next section we introduce a systems model for the increase of personal knowledge. This will help us define three types of new knowledge according to the level of complexity. After this one section is dedicated to analysis of the interaction of the individual and the organizational value systems regarding the knowledge increase. This will provide an additional criterion for the knowledge increase. These two sections focus on the content aspects of f-learning. In the following section we concentrate on the user interface (UI). Our aim is to get an UI which is beautiful as well as intuitively obvious to use. When thus the content and the look-and-feel issues are discussed we can finally put together the scenarios for f-learning.

INCREASE OF PERSONAL KNOWLEDGE

Knowledge increase may happen by absorbing new knowledge, by practicing skills, by experiencing events, by inner experiencing, or by rearranging existing knowledge. Knowledge increase by absorbing new knowledge we call learning; this kind of knowledge increase is investigated in this paper. The source of the *new knowledge* we call the *available knowledge* the personal knowledge before the increase is the *existing knowledge* and after the increase it is called the *increased knowledge*. (Figure 1, upper part) If knowledge was simply additive, the new knowledge would simply be attached to the existing knowledge. However, incorporation of new knowledge is a constructive process [9] which means that the existing and the new knowledge together construct something new – the increased knowledge.

In this paper we adopt the conception of cognitive schemata [10] as basic building blocks of knowledge to examine knowledge and knowledge increase. Cognitive schemata are described by Mérő [11] as:

"… units meaningful in themselves with independent meanings. They direct perception and thinking actively, while also being modified themselves, depending on the discovered information. Cognitive schemata have very complex inner structures, various pieces of information are organized in them by different relations. The various schemata are organized in a complex way in our brains; in the course of their activities they pass on information to each other and also modify each other continuously."

Knowledge can be regarded as a system elements of which are the cognitive schemata. Building on work of Flood and Jackson [12] we describe knowledge as system using five system features (listed according to increasing complexity):

1) *Elements* are the cognitive schemata (as above).
2) *Relations* between the elements, as knowledge is a dynamic system, are constantly changing; those relations that can be regarded as stable are included into the structures.
3) *Structures* correspond to the subsystems. As cognitive schemata are organized hierarchically knowledge is pictured as a hierarchic system. A meta-schema corresponds to each subsystem and thus to each structure.
4) *Processes* are activities of the structures; knowledge of processes can answer the question of how to do it.
5) *Validity* indicates the domain within which the knowledge is considered as true. We may speak of rules when we know nothing at this level; if we can identify a domain of validity we speak of laws; the complete knowledge of validity is the theory, meaning that we know both where it is valid and where it is not.

Using the concept of cognitive schemata we gain better understanding of the process of knowledge increase. The absorption of new knowledge can always be regarded as absorption of a single cognitive schema – if it contains several schemata they should be organized into a structure, so into a meta-schema. When received, the new schema may transform or replace existing ones, and it may break or modify existing relations between the existing schemata, and therefore it may transform existing structures as well. The bottom part of Figure 1 zooms on the connection of the new schema to a group of schemata. New schema ***X*** connects to the group of schemata **A-*B*-*C*-*D*-*E*-*F*-*G***. It connects itself to schemata ***A***, ***B***, ***E*** and ***G***; it displaces ***F*** dismissing its connections to ***A***, ***B*** and ***E*** as well; due to its effect ***G*** establishes connection with ***A*** and ***C*** connects to ***D***; the connection between ***B*** and ***D*** breaks off.

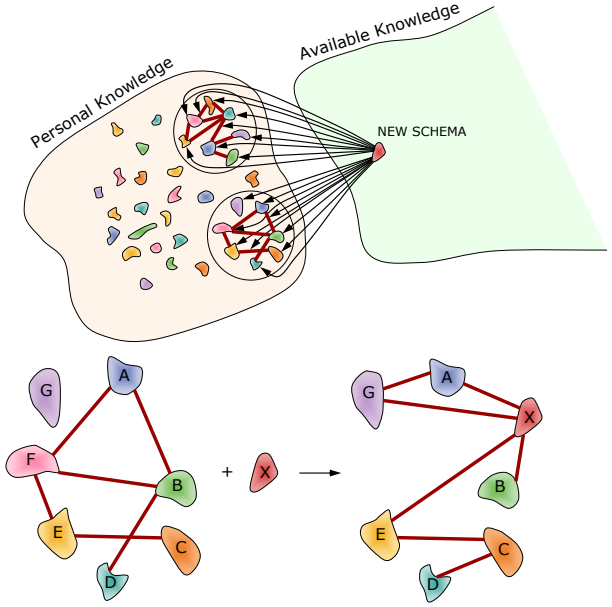

Figure **1***: Increase of personal knowledge*

Using the system features that described the system of knowledge the new knowledge can be put into three categories:

1) New knowledge of *concept* covers the first three levels of the system features; as a concept corresponds to a schema which may be a meta-schema. This type of new knowledge is a description usually put forward as a keyword; it corresponds to "*that*" type [13] or declarative [14] knowledge.
2) New knowledge about *functioning* is of level 4 of the system features; it usually appears as an explanation or a model. This type of new knowledge is "*how*" type [13] or procedural [14] knowledge.
3) New knowledge about validity indicates the domain in which the new knowledge may be used. This type of knowledge is related to the "*why*" type knowledge as introduced by Gurteen [15] to extend Ryle's original model.

The types of new knowledge are here listed according to increasing complexity; new knowledge of functioning only makes sense in relation to concepts and new knowledge of validity needs both previous levels. Therefore it is more accurate to speak of type 1 new knowledge (concepts) of type 1+2 new knowledge (concepts + functioning) and type 1+2+3 new knowledge (concepts + functioning + validity).

FILTERS OF KNOWLEDGE INCREASE

The previous section engaged with new knowledge from cognitive aspect; the present section focuses on the value of new knowledge. There are two value systems judging the new knowledge: the *organizational* and the individual; to emphasize the personal nature of the individual value system henceforth it is called *personal value system*. There are twofold judgments of the new knowledge in case of both value systems, the first is the *judgment* about the particular piece of new knowledge and the second is a *meta-judgment*, i.e. it is about the approach to new knowledge in general.

For individuals knowledge is today rarely of survival value but it is one of the most important sources of career advancement. On meta-level the individual decides about her/his behavior in relation to particular judgment. For the organization knowledge is literally of survival value; and the meta-judgments say what the actions of the organization are.

If we say, based on Bertalanffy [16], that the organizational value system may judge a particular piece of new knowledge as "*useful*", "*indifferent*", or "*harmful*", than the organizational meta-judgment will indicate if the organization "*supports*", "*tolerates*", or "*forbids*" it. The personal value system may judge the same piece of new knowledge as "*promising*", "*neutral*", or "*ominous*"; using the meta-level the person decides what (s)he will do in each case. The personal meta-judgment, beside the judgment of the new knowledge, also considers the organizational judgment and meta-judgment. E.g. if a particular piece of new knowledge is judged by the organization as "*harmful*" and the organizational meta-judgment indicates that the organization "*forbids*" it, and the personal judgment is "*promising*" the person may decide to try to show the usefulness of the new knowledge to the organization, (s)he may withdraw or may just learn it in secret. At the end of the day it is always the individual who decides whether to accept a particular piece of new knowledge or not. There is also an interaction between the organizational and personal value systems, meaning that the individual and the organization may influence each other to reconsider the judgment about the new knowledge.

What has just been described we call the filtering of knowledge increase and it is shown of Figure 2. The source of new knowledge is the available knowledge; to reach the personal knowledge the new knowledge is first judged by the organization, then it reaches the personal value system accompanied by the organizational judgment and meta-judgment, it is judged by the personal value system (personal judgment and meta-judgment), the two value system interact influencing each other to reconsider the judgments.

The aim of knowledge increase is often presented as filling the knowledge gap between the existing and the required knowledge – so the person wants to acquire the missing knowledge. (Figure 3) The first point on which this presentation fails is the ancient dilemma of Meno: how do we know that which we do not know? So, we do not know the missing knowledge that is why we talk about the knowledge gap; but in this case we also cannot know what the required knowledge is.

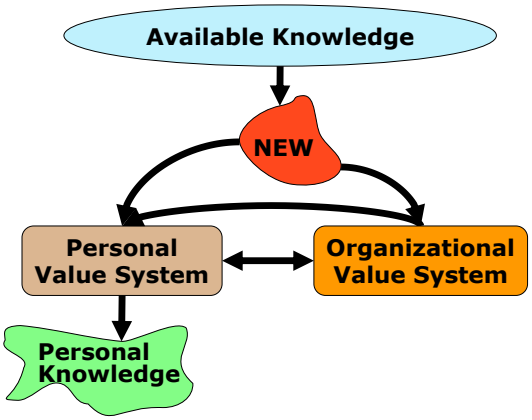

Figure **2***: Filters for new knowledge.*

The second reason is that the knowledge is not simply additive, as it has been described in the previous section, but it involves a complex constructive interaction of the existing and the new knowledge from which the increased knowledge is born. So, even if we could identify what the missing knowledge is, we cannot say ex ante what increased knowledge will evolve if the person with existing knowledge absorbs it. It may well cover, on many occasions, the whole of the required knowledge but will usually extend beyond it.

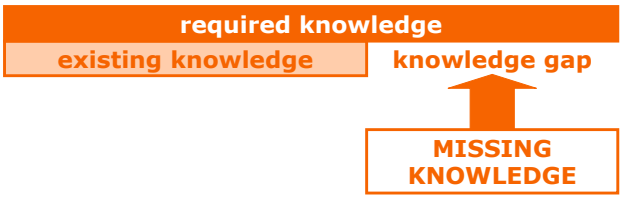

Figure **3***: Filling the knowledge gap.*

This means that we cannot aim for the required knowledge in knowledge increase; instead we may aim for an *allowed* knowledge increase meaning that it evolves from the existing knowledge of the individual and the new knowledge which passed through the judgments and meta-judgments of the organizational and personal value systems. In f-learning we support the idea of self-testing; i.e. before getting to a new knowledge element on her/his learning path, the f-learner takes a quick test.

THE USER INTERFACE

Minsky [17] showed that in communicating with aliens we would be left with mathematics, i.e. nothing else is sufficiently independent of language and culture. If trying to create an f-learning system we need neat user interfaces, furthermore, we would like user interfaces that are beautiful and intuitively obvious to use – at first sight there is no place for mathematics.

Beauty is the pursuit of the artists – is there a standard that can provide us with beauty or we need artists all the time? The an-

swer is both. There are standards for color schemes (which color should be combined with which), font faces and sizes, and there are variations of these for the various visual impairments. Apart from these it is also important to follow the fashion.[1] There are handbooks for color schemes and fonts, so we are not engaging with the topic. However, there is one less known standard which will address briefly.

There is an additional standard that can be applied for defining the space, more precisely the ratio of different parts of the user interface. This standard is several thousand years old and is known by various names, such as *"divine proportion"*, *"golden section"*, and *"golden ratio"* [18]. Usually to describe a ratio we need 3 numbers: $\frac{a}{b}$ $\frac{b}{c}$. The golden ratio is a special kind of ratio which can be described by only 2 numbers, i.e. if $c \quad a \quad b$ then $\frac{a}{b}$ $\frac{b}{a \quad b}$. The $\frac{a}{b}$ is called phi (=0.6180339887…) and $\frac{b}{a}$ is called Phi (=1.6180339887…); both are irrational numbers.

Leonardo Pisano, alias Fibonacci, discovered the Fibonacci numbers, which is a series of numbers in which the number is always the sum of the previous two:

$$F_n \quad F\,n \quad \begin{array}{ll} 0 & n \quad 0 \\ 1 & n \quad 1 \\ F\,n \quad 1 \quad F\,n \quad 2 & n \quad 1 \end{array}$$

The division of space according to golden ratio can often be observed in nature and also in masterpieces of the fine arts, music, architecture… [19]. As it cannot be assumed that all these appearances in nature and arts are intentionally aimed at this mathematical construct, we can only recognize that it expresses an aspect of beauty. On Figure 4 we show the draft of a Fibonacci-screen – the elements on the screen should be places according to areas.

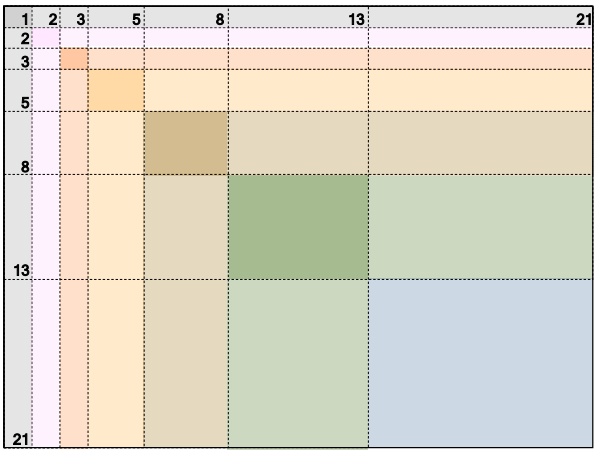

Figure **4***: The Fibonacci-screen.*

[1] *The fashion of colors on computers seem to follow the fashion of clothing with some delay, e.g. the orange is still one of the latest computer-fashion-colors.*

These standards give us some guidelines on how to position the elements of the user interface, how to combine the colors and what font type and size to use. There is also a simple rule on how many item can be placed at once on the UI: the limit of STM can be used. As Miller [20] suggested we can only pay attention to 7±2 elements at once. We can take this as a rule of thumb: 7 UI elements at once. It is, however, not clear what is an element of the UI. We believe that this is, at least partly, up to the designer. E.g. one button can be an element but, if we appropriately combine several buttons e.g. into a *"navigator"*, it can be perceived as a single unit. And this is what is important: how the user perceives it?

Of course, not all the 7 UI elements will be the *"same"*, we do not process all the 7 at the same depth; there is always only one main element. We can learn from the Gestalt psychology [e.g. 21] that we always put only one element of what we see into the focus. If it is not clear which element that should be, ones mind will use its own reasons; it e.g. selects the picture which corresponds to ones mood, etc. By using an appropriate scenario, we can direct the attention of the f-learner. To do this successfully is crucial for the successful f-learning. Actually, this issue of managing attention extends well beyond the scope of f-learning; as Davenport and Völpel [22] suggest:

"… within knowledge management, attention management has become the most important success factor."

We do not want to engage with the wider issue of attention and attention management, we only wanted to emphasize the importance of paying attention to attention.

Having adopted the previously mentioned standards for colors, fonts and space allocation, using 7 elements at once on the screen and always putting one into the focus still does not mean that we can allow not having an artistic designer. It is very important to have all the elements beautiful and intuitively obvious. Creating a UI which corresponds to the standards is not enough. As Steve Jobs described the most important strength of the – then new – OS X in 2000 [23]:

"We made the buttons on the screen look so good you'll want to lick them."

This means that we will need an artist all the time to design the appearance. What are the elements that would appear on the UI? For this we need to break off from the false idea of e-learning as putting the paper-based teaching available online. This may be very useful approach for those selling e-learning solutions as it is cheap. However, we see the essence of e-learning in making advantage of what the computer and the internet enable us providing: the *multimedia* and the *interactivity*. We can see that the elements we suggest are coming from making the "traditional" elements of learning more dynamic by using these two features. Therefore we distinguish the following element types:

> Text should be replaced by *hypertext*, which means that the pieces of text are interlinked forming a web of concepts and the explanations are provided from glossaries. This involves interactivity. Further enhancements may be introduced giving the choice of the different variations of text (e.g. more or less detailed texts, variations for f-learners with different background knowledge, etc.). The links to external sources

may also be considered here but we see this as an additional element, not as a part of the hypertext. We might think that the hypertext is an idea old enough to be fully exploited but on closer look we shall find huge unexploited possibilities.

Diagrams should be replaced by *animations*; as a prototype we may think of flash animations, although there are other types and new ones may be expected very soon. The animation is not simply a moving diagram, although it certainly covers that description as well. The essence of animation is to show phases of the development of the diagram instead of giving a complex final diagram at once. A step-by-step interactive process replicates the thinking process of the construction; the particular steps can be repeated to achieve full understanding. Even more can be achieved by taking the interactivity a step further so that some users may be interested in some details others not – thus the animation becomes personalized.

Pictures should be replaced by *movies*; as a prototype we may think of avi or mpeg files, although there are numerous different formats. E.g. instead of putting a text with an optional picture to describe a case study, it can be much more convincing and comprehensive if the person, who did the case study talks about while we can see her/him and we see the factory and the employees (s)he is talking about, etc. Potentially, the movies may also be combined with the animations from above, although at the moment this is well beyond the skill and/or capacity of a typical f-teacher. Additional variations to be considered here are the real-time movies, i.e. the broadcasts; today we have a number of solutions to broadcast audio material over the internet but the video broadcasting solutions are becoming more and more popular.

There are numerous tools facilitating the *collaboration*, such as multi-person chats, VoIP or video conferences, for real-time discussions; blogs, for offline discussions (may facilitate audio and/or video blogging); wikis, for putting together an online content in offline mode; applications sharing solutions, whiteboards, and polling tools, for supplementing the real-time discussions with further features; etc. Any and all of these may get a role in f-learning scenarios depending on factors that shall be discussed later on.

There are two basic *navigation* elements needed for the UI of an f-learning system: The first one is the essence of the f-learning; i.e. the tool which the f-learner uses to choose her/his personal learning route. This navigator also includes the facility of defining the accessibility needs and other options, such as customization. The accessibility is one of the top priorities to be realized in f-learning. E.g. the voice for the animations and movies may be substituted/supplemented with sign language, the colors and fonts may be adjusted to various visual impairments, and the written text may be read. This last is a common feature of most of the applications today and we have also developed a reader for small languages. The second navigator contains the buttons controlling the element in the focus, e.g. pausing and repeating parts of the movie, switching from the animation to the test, etc.

A special set of elements we call the *takeaways*. This means that the f-learner can take a piece of content onto her/his mobile device. There are already solutions for disseminating audio content usually called podcasting. This will in recent future be extended to video content (animations and movies) as well and there is no reason not to extend it to other elements of f-learning, namely the various collaboration tools and the tests.

A common element of any online solution may be to offer *useful links*. However, the potential of the useful links can be taken to a higher grade in f-learning. One part of this is that who selects the useful links is the f-teacher, that is an expert of the domain. (S)he also describes the links with keywords.[2] Instead of simple statistics we offer the machine learning algorithm Doctus[3] knowledge-based expert system for using the learning pattern of the f-learner to select the appropriate links – this is the second part of making the useful links much more useful.

In f-learning the tests also reflect the freedom, thus we can speak of *self-tests*. This means that the f-learner is taking a test when (s)he wants to pass to a next topic, that is to say at any time.

Various useful *reports* can be generated in our f-learning system. Some of them may support the content development for the next generations of f-learners, such as the aggregated analysis of the individual learning routes. Much more interesting are the individual reports of the f-learners. These are automatically generated and they contain the knowledge map displaying the individual learning route. This students may add their reflective comments to this, so we can get an enhanced version of the personal development planning (PDP) document.

Similarly to the portlets of a corporate portal, the elements of the f-learning UI are interlinked. A simple example is that the navigation tool of the course contains the same learning route as the report. A more sophisticated example is to have an animation building a diagram step-by-step and a movie (not a focal element this time) is providing comments; if the f-learner repeats a step of the animation the movie follows appropriately.

CONSTRUCTING SCENARIOS

The actual main part of this paper is very brief. To put it in the most simple form, we decide which level of new knowledge we want to deliver, structure the teaching material appropriately, we make sure that the new knowledge is allowed by the organizational culture (value system), we choose suitable elements for the UI and put them together observing the standards for the colors, fonts, spatial arrangement, and limits of STM. Of course, we needed prior to this a designer to develop the common ele-

---

[2] *These are not the same keyword which we used to structure the f-learning content, although they are related.*

[3] www.doctus.info

ments (such as the navigator) and now, together with the f-teacher, (s)he develops the animations, the movies, etc. As the final f-learning content need to fit the personality of the f-teacher (one may prefer to use a movie to describe something what someone else would describe using an animation), the particular subject, the organization, etc. there is no way to provide definite instant scenarios. We have, so far, described the factors that should be taken into consideration and some further guidelines can be also provided, which are partly drawing on cognitive psychology and are partly lead practices.

To describe a topic containing three keywords we need 8 screens. The first is an introduction facilitating the connection to existing knowledge, for this we may use a story with a movie in the focus. Than may come 3 pairs of screens each pair describing a keyword in common/professional terms. Finally a conclusive screen provides the structure of the three keywords. This example assumed that we aim at new knowledge of concept. A new knowledge about the functioning would also include two screens and this may be connected to 2 or 3 (usually) keywords. New knowledge of validity would add two screens again. This can now be linked back to the structuring of the f-conent.

CONCLUSIONS

In the present paper we have mapped the features needing consideration if we want to develop an f-learning content. This way our result is not a set of instant scenarios but a way of getting to appropriate scenarios. In terms of f-learning we could say that this is a knowledge of functioning. We do not believe that it is possible to develop universally valid scenarios but we do believe that we will be able to find further rules by analyzing lead practices.

Along the way we have also recognized additional problems of defining the roles needed in f-learning curriculum development; so far we have identified three roles, the visual designer, the f-teacher and the person getting the finances. All these roles seem to be quite different from what is usually expected and available for similar roles in classroom-type learning or even in e-learning. Our further research will focus on clarifying these roles and trying to put together a portfolio of rules on what is and what is not allowed in scenarios.

REFERENCES

1. Polanyi, M., *Personal Knowledge: Towards a Post-Critical Philosophy*. 1962, London: Routledge.
2. Nordström, K. and J. Ridderstråle, *Funky Business: Talent Makes Capital Dance*. 2002, London: Prentice Hall.
3. Sveiby, K.-E. *Methods for Measuring Intangible Assets*. 2005 [accessed 07/03/2006]; Available from: http://www.sveiby.com/articles/IntangibleMethods.htm
4. Davenport, T.H. and L. Prusak, *Working Knowledge: How Organizations Manage What They Know*. paperback ed. 2000, Boston, MA: Harvard Business School Press.
5. Nonaka, I. and H. Takeuchi, *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. 1995, Oxford: Oxford University Press.
6. Tsoukas, H. and E. Vladimirou, *What is Organizational Knowledge?* Journal of Management Studies, 2001. **38**(7): 973-993.
7. Baracskai, Z., et al. *Architecture of three-dimensional knowledges in the discipline of leadership*. in *Beijing International Conference on Applied Business Research*. 2005. Beijing, China.
8. Baracskai, Z., J. Velencei, and V. Dörfler. *Knowledge Visualization by Doctus Knowledge Galaxy*. in *IPS-USA-2005*. 2005. Cambridge, MA.
9. Neisser, U., *Cognitive Psychology*. 1967, New York, NY: Meredith Publishing.
10. Bartlett, S.F.C., *Remembering: A Study in Experimental and Social Psychology*. 1967, Cambridge: Cambridge University Press.
11. M érő, L ., *Ways of Thinking: The Limits of Rational Thought and Artificial Intelligence*. 1990, New Jersey, NJ: World Scientific.
12. Flood, R.L. and M.C. Jackson, *Creative Problem Solving: Total System Intervention*. 2000, West Sussex: John Wiley & Sons.
13. Ryle, G., *The Concept of Mind*. 1949, London: Penguin Books.
14. Anderson, J.R., *The architecture of cognition*. 1983, Boston, MA: Harvard University Press.
15. Gurteen, D., *Knowledge, Creativity and Innovation.* Journal of Knowledge Management, 1998. **2**(1): 5-13.
16. von Bertalanffy, L., *A Systems View of Man*. 1981, Boulder, CO: Westview Press.
17. Minsky, M.L., *Communication with Alien Intelligence*, in *Extraterrestrials: Science and Alien Intelligence*, E. Regis, Editor. 1985, Cambridge University Press: Cambridge, MA.
18. Huntley, H.E., *The Divine Proportion: A Study in Mathematical Beauty*. 1970, New York, NY: Dover Publications.
19. Knott, R. *Fibonacci Numbers and The Golden Section in Art, Architecture and Music*. 2006 [accessed 18/05/2006]; Available from: http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibInArt.html.
20. Miller, G.A., *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information.* The Psychological Review, 1956. **63**(2): 81-97.
21. Eysenck, M.W., *Principles of Cognitive Psychology*. Principles of Psichology, ed. M.W. Eysenck, S. Green, and N. Hayes. 2001, Sussex: Psychology Press.
22. Davenport, T.H. and S.C. Völpel, *The rise of knowledge towards attention management.* Journal of Knowledge Management, 2001. **5**(3): 212-221.
23. Schlender, B., *Steve Jobs' Apple Gets Way Cooler Mr. Apple's new mission: to marry the iMac and the Internet with an easy-to-use new operating system and free Web services for everything from your photos to your home page. If it works, Microsoft, AOL, and others will be playing catch-up with a company left for dead two years ago*, in *Fortune Magazine*. 2000.