Knowledge Pools

Ambition

A knowledge pool is generated as part and parcel of a self-managed learning knowledge and experience sharing environment. It is used as reference source, interaction environment and communal ‘brain’ for those involved in the arranged learning and interaction initiatives, irrespective of which side of the consumer-provider or teaching-learning duality one is expected to belong to if the learning and sharing initiative took place in a more traditional education&training scenario.

Development process

The knowledge pool is an interaction and knowledge accumulation environment forming the platform for collaborative initiatives taken all the way from the early idea-generation stages of a knowledge development initiative and to the final stages of delivery of generated products e.g. in form of publications, collaborative products, or learning opportunities and post-'interaction' continuation of the knowledge updating processes.

Invitation to participate

Depending on the content-creation stage of development a particular knowledge pool is at, the handling of the knowledge membership or ownership may be more or less segregated. An invitation to participate could therefore be generated from contextually different perspectives. A common approach to classify the participation in this respect applies during the initial stages of developing a knowledge pool, where the membership/ownership is partially determined on the basis of the dichotomized expectation of member-production and member-consumption.

One entry point to the knowledge pool is that an invitation is submitted to a ‘subject matter expert’ with the aim of involving him/her in the process of building up a collective ‘knowledge bank’ within which ‘experts’ collaboratively generate a more comprehensive knowledge-base than what each of them individually are capable of generating. As such the knowledge pool is also acting as a learning tool for those ‘experts’. Another entry point is when a ‘learner’ is introduced to the knowledge pool with the ambition to enable him/her to explore in more depth a particular subject matter area. The predominant purpose and ‘trait’ in this case is more focused on consumption rather than on production, even if one man’s interactive struggle from not-knowing to knowing also generates for those on the other side of the teaching-learning duality a learning opportunity (compare with the traditional statement that “the best way to learn is to teach”).

In many contexts it may be an advantage, at least initially, to distinguish between these two participation directions. One way of doing this is to initially generate a ‘core group’ and a broader ‘membership’ group, giving the ‘core’ group certain added privileges, at least initially when the base-structure of the knowledge pool is being built up. At later stages it may be very likely that the established and content-rich knowledge pool is actually, and in proportion to the investments made for participation in the collective pool ownership, more valuable to the subject matter expert than the value it is perceived to have for someone who are just entering into a particular subject matter area.

Methodological and technological support

The knowledge pool contains three major activity-patterns. The unstructured collection, the interaction with others about what is available (and what is missing), and the structuring of the knowledge-base. If the knowledge pool is initiated, operated and made use of via telematic channels it is also required that the telematic tools are capable of facilitating all these three knowledge pool development and utilization processes. In light of the potentiality of a 'segregated' pool membership/ownership it may also necessary to have the access, modification capability and replication processes under the control within the environment.

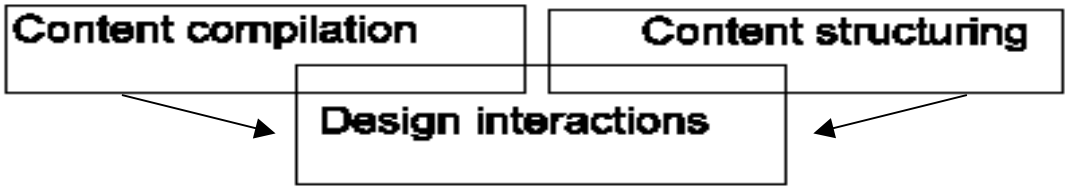
One practical application of telematic-based knowledge pools, developed by Noesis-CMI AB, contains all these three components, each interacting with each other, as well as being capable of 'segregating' the knowledge pool manipulation capabilities among those having entry rights to its facilities. The system contains three major blocks; a content compilation system, an interaction system and a content structuring system.

The content compilation system is built around a 'mindmap' paradigm. It enables people to, either individually or in collaborative groups, compile knowledge elements in terms of descriptive text, illustrations/diagrams, document references/files and links/URLs, relate those hierarchically, internally relate those, classify them, sort them and restructure them. This is done through dynamic mindmaps, presentable to others as either structured outlines, or graphical representations, produced as PDF/Word documents, web-pages, graphic presentation material or as collaborative 'white-board' presentations.

The interaction environment is built around a 'conferencing' paradigm. It enables people, either as email messages or as bulletin boards, to present ideas, reflect on what is already available (or what is missing), contribute with additional material (such as text, illustrations, file attachments or URL links to other conference items, Web-sites and other Internet carried material or even as email addresses) and propose linkages to or restructuring of any part of the 'mindmap' representation of the knowledge pool. The access rights to this interactive environment can be controlled from providing access to the overall system for a particular group down to restricting the access to a particular discussion forum or even down to a specific individual contribution. It is also possible to specify the access characterization for the entire population interacting with the knowledge pool down to a set of specific actor groups and even all the way down to an individual user's access at a particular point of time.

The content structuring environment is built around a 'flowchart' paradigm. It enables people to make use of structures of the content in form of multi-route paths, dynamically adjusted to different contextual factors (the users' previous interaction with the knowledge pool, their payment/investment readiness, the stated ambition/intention with the interaction, etc). The path structures can be both dynamically and statically presented to end-users, with conditional or unconditional entry- and exit-points.

All of these three telematic environments/tools within the knowledge pool are interacting with each other as illustrated with the diagram below.



Stages of access to the knowledge pool

In the earlier part of a knowledge pool development is the 'raw mateiral compilations and its structuring through is the mindmap generation tool, interconnected mainly with the conferencing tool that incrementally takes over as the main interface modality for the initial ‘contributor’ modality of the interactions within the knowledge pool. The later stages of content generation is either moderated via the interaction environment, or carried out in a more direct manner from the mindmaps, generating the paths or exploration flows later made use of and designed for learning purposes - either as self-learning among involved individuals, or used as collaborative learning environments by interacting groups.

The interaction system is also made use of during the consumer/learner interactions with the content of the knowledge pool, in particular when the initial 'raw material' collection is collaborative - which is the very core trait which the knowledge pool has been designed to facilitate.

As a learner/consuming user of the knowledge pool content it is likely that the entrance point to the knowledge pool is predominantly made through the path/flow generation/presentation tools rather than through the mindmap tools. This also implies that there has to be some phasing of the knowledge pool members access. At least initially, the predominant role is played by the ‘contributors’ and those that are expected to, at least initially, be operating with a ‘consuming’ modality, being introduced to the knowledge pool at a later stage.

One potential approach of handling this phasing of the different interface modalities is to initiate the knowledge pool development with a ‘core-group’ of resource persons, and provide them with some initial privileges in the knowledge pool environment, maintained up to a point at which these ‘contributors’ have received a fair return for their contributions. When the knowledge pool has been capable to both build up a substantial content volume, e.g. through the just mentioned ‘core-groups’, and has progressed from the initial more unstructured mindmaps to the more structured flow/path options, the knowledge pool is also better ready to be made available to a more broader set of members.

At such later stage the knowledge pool should, from a user's very initial entry into the knowledge pool, as well as during the entire scope of his/her interactions with it, both portray a vision of its full magnitude and be capable of delivering a fair return for the compensations/investments made for gaining the access rights to the knowledge pool. The knowledge pool should also at this stage of ‘broader usage’ have the dynamic capability and vigorousness to generate both the continued attraction to new entrants as well as maintaining the attraction and fair return for those who retain their prolonged membership in the knowledge pool.

A practical application of the Knowledge Pool approach

Noesis-CMI AB has in a number of project initiatives, pilot applications as well as in its own internal partnership and collaborative structures, applied the above mentioned approaches with very successful and productive results. Different telematic solutions have been explored and a range of combination of telematic tools have been tried out. One knowledge pool application already developed, and closely linked with collaborative training development, was implemented as an initiative in which subject matter experts, designers and course participants, interactively and incrementally developed on-line instructional materials / learning opportunities. This approach will be presented here as an illustration of the concept.

Course Development implemented via the Knowledge Pool concept.

Traditionally course development has been seen as a sequence of steps where different actor-categories are involved at different stages. One such model is the Instructional Technology model (Analysis-Design-Development-Implementation-Evaluation). Modern perspectives on learning do however demand different instructional development processes. End-users of learning opportunities are no longer seen as the passive consumers introduced to a course or learning opportunity once it has been designed, produced and made accessible to the users in a 'take-it-or-leave-it' approach. Participation in the development or the formation of the learning opportunities from its very conception is increasingly demanded, and it will in the future probably be even more common as the desired approach among learners. The question is now how could one accommodate such participative approach to course development. One potential answer to this question may be found in the knowledge pool approach.

The earlier mentioned model of three main activity-blocks within a knowledge pool could be applied also here. The initial phases of an ambition to generate e.g. an on-line learning opportunity could be seen mainly as being concerned with content compilation initiatives, followed by an incrementally more predominant attention to the content structuring processes. During both of these major stages, as well as in the transition from one to the other, it is however important that there is sufficient scope and accommodation for dialogues and interactivity. This demand for context-connected interactivity is as natural and easily arranged for normal person-to-person interactions as it is cumbersome to arrange through conventional email interactions, on-line chat sessions and computer conferencing systems.

What is needed for a training development effort to be implemented as a collaborative on-line activity is some means, methodologies and tools that are capable to handle both the interfaces between the tools/applications used for the content compilation and content structuring phases as well as being able to maintain a continued interactivity within and across these two phases, including the transition from one phase to the other.

One technical solution satisfying these demands has been developed and tested by Noesis-CMI AB in connection with a range of recently initiated course development and electronic publishing initiatives. This solution is using a combination of six commercially available software packages, a set of document standards and some publicly available Internet/Java/ Web-technology standards. The software packages includes;

- **MindMan** Mindmap generator - for content compilation in mindmap format
- **Visio** graphics environment - for production of charts and illustrations
- **Adobe Capture** - for paper-to-file conversion of reference material
- **Trellix** - for generation of content structuring /flow definition processes
- **NetIt Now** - for production of presentation-oriented multi-page Java-based 'books'
- **FirstClass Intranet** Server - for computer conferencing / dialogue interfaces

All six of the above mentioned tools are capable of handling URL references within their output presentation formats (documents, illustrations, messages, etc) and all of these software tools are also capable of generating Web-browser readable products.

Extensive testing has verified that the above six tools interacts smoothly with each other and operates without conflicts on a Windows-based computers with either Windows95 or NT 4.0 operating environment. Extensive RAM and hard disk space will however be required.

This integrated environment will enable those involved in the generation of learning opportunities, and mediated via Internet-based on-line services, to produce their products/ services in a very time-efficient and relatively low-cost manner. They will also be able to do so with the assumption that the users of the products and services developed do only require a web-browser to interact with the material and services being developed. In addition, they will also be able to operate within a software environment in which the products from one tool can be interwoven into the products of any of the other tools. Not only that. The development and delivery of the learning opportunities could also be inter-woven into each other, and thereby enabling all actors (learners, stakeholders as well as designers and subject matter experts) to contribute to the incremental refinement of the learning opportunities developed by and made available to them. Production of outputs from one environment (e.g. the conferencing environment could also be directly linked to and integrated into one or more of the products produced with any other of the tools used (such as illustrations, a specific part of a document, an outcome of a discussion among a group of users, etc). This is also providing scope for an incrementally more intricate and comprehensive coverage of the issues catered for by a particular learning opportunity. Each of the above mentioned tools are available as downloadable demo/tryout versions, each having on-line provided manuals and installation instructions provided at their respective web site. For this purpose we will not elaborate on the technical details of each of these tools in this document, but rather refer the reader to the Web-sites where the respective tool's product information could be found;

- Mindman - www.mindman.com
- Visio - www.visio.com
- Adobe Capture - www.adobe.com
- Trellix - www.trellix.com
- NetitNow - www.netit.com
- FirstClass - www.softarc.com
- VocalTec - www.vocaltec.com

What we will here describe, although only in a summary format, is the ways in which these tools are fulfilling the task of each of the major phases or activity blocks of a knowledge pool-based course development process, namely the content compilation, the content structuring and the actor interaction handling processes.

Content Compilation process

The content compilation process is in this example handled by the MindMan tool, which is used to generate mindmaps. Through this tool a user can in a very intuitive and fast-development manner generate advanced mindmaps. Each element on this mindmap can be classified, annotated, linked to URLs and be related to any other element. The branches generated in the mindmaps can at any time and at any point of the branch be moved to or related to any other point on any other branch by a simple drag-and-drop process. It can also be linked to another mindmap as well as being expanded or contracted dynamically for easy overview of the whole mindmap or detailed assessment of each of its components. The URL links could be used for connection to material in the local filing system, linked to what is available on the Internet (as Web-pages, FTP, etc) or as connections to discussion-groups and forums in a computer conferencing system, and even provided as email links to individuals and/or news-groups. The file-options allows for attachment of documents, diagrams and other illustrations (e.g. produced with the Adobe, NetItNow or Visio tools), and which in turn can contain links to other URLs in the presentation formats which these are designed to provide (such as flowcharts, work-flow, document and database references, etc). These higher-end products could also be added on incrementally.

The mindmap development activities, using the MindMan tool, could also be implemented in a number of different modalities, such as;

Stand-alone mind-mapping - where one or a few people sits around a computer and produces a mind-map in a dialogue-format. In this case only one computer is needed and the file is stored on that computer. Different variants could, if found needed, also be produced.

Point-to-point mind-mapping - where two remotely located individuals are connected to each other via Internet. Each user has a copy of MindMan on their computer and they are either using MindMan's own conferencing facility, or an external system like NetMeeting. They decide on which one should have the 'command' over the mindmap chart (which can be switched over to the other party as and when found appropriate). Interactions between them could either be done via the built-in chat options, or via external voice options (such as via NetMeeting or Internet Phone, or even via mobile/ordinary phone connections).

Multi-site mind-mapping - where more than two actors are interactively generating the mindmap. This could be done with different Whiteboard software, such as VocalTec Internet Conference system, or by using Internet based video-conferencing/whiteboarding solutions operating over a bridge (CuSeeMe Reflector or MeetingPoint at www.cuseeme.com). In such environments it has been found as an advantage if one actor is nominated as the 'secretary' or 'chart-manager' while the other actors are engaged in the creative idea-sharing activities.

Large population mind-mapping - where a larger audience is participating in a mindmapping initiative. This is frequently carried out with a 'panel' or 'core-group' being the prime contributors and the larger audience predominantly act as 'spectators', with only occasional contributions via an 'audience- microphone'. This can also be implemented as a remote activity, e.g. by making use of virtual classroom tools like Placeware's Auditorium.

The mindmapping exercise does not have to be a single-event activity. The mindmap can be developed and interacted within multi-sessions, and refined over time by same or different actor constellations. Such incremental contributions could also be done on a dynamic mindmap (via interfaces using the MindMan program) or more statically (by using web-pages or mindmaps generated via MindMan and by linking those to a computer conference systems, e.g. FCIS, where people can contribute in a time- and space independent manner.

Transfer of the mindmap into structured content formats

The content compiled and documented via these mindmaps will however at some point be more efficiently handled if these were structured in some relational manner. The MindMan offers three main options for such transitions;

- Producing Web-pages replicating the mindmap in browser-readable format, which retains the initially introduced classifications, document references and URL-links.
- Producing Web-pages structured in a format compatible to the mindmap but presented as a branching structure, containing either plain HTML pages or with Java-based outlines.
- Producing outlines in a standard document management format capable of being transferred into a Web-authoring tool (e.g. NetObjects Fusion, at www.netobjects.com) or to the Trellix content structuring tool (and being part of the knowledge pool environment outlined in this document). The file standard used for this transition is the Rich Text format (RTF).

Content Structuring Process

When the content compilation process has come to a point where the material made available in the mindmapped knowledge pool are providing a sufficient coverage of the issues / subject matter areas intended to be served with the knowledge pool it is high time to initiate the detailed content structuring process. This structuring process can either be implemented as an activity initiated *after* the content compilation process is considered to be completed, or be carried out *in concomitance* with the later stages of the content compilation process.

Two of the more common major concerns in this 'second half' of a knowledge pool based course development process is (1) the inter-linkage between the mindmap-based content compilation process and the subsequent flow-based content structuring processes, and (2) the flexibility of that structuring process. The inter-operability of the MindMan and Trellix tools, and their joint utilisation of the FirstClass Intranet server as a consistent communication medium across the development processes responds to these transition concerns. The flexibility concerns, on the other hand, is addressed by the power and flexibility of the Trellix package.

Trellix has some unique format handling capabilities, and is essentially based on a page-based content handling process. A flow-design unit is basically a page with some pre-set, but adjustable, style-definitions. A page can either consist of a set of content material (as free-format text and illustration combinations) or a 'container-page which could make references to files and other external components (such as a web-page, ftp-files, email and FC forums). By combining a container-page with NetItNow generated multi-page presentations, Visio-generated flowchart/diagram-driven URL-links, or even MindMan-generated hyperlinked mindmaps, it is possible to generate very advanced user interaction formats.

A set of page-elements can also be blocked into sections, and handled as 'chapters' within a given programme. Routing options, as well different access-handling capabilities, combined with advanced branch- and path-handling features gives an additional flexibility in arranging flexible systems of path/flow- or walk-through options in the on-line learning material.
An additional option provided by Trellix is to display these paths and walk-through patterns on the user's screen. This will reinforce even further the level of self-control provided to the learners/users of this knowledge pool based (collaborative) learning/interaction environment.

The products/services generated with these tools can subsequently be viewed/interacted with using either a normal Web-browser or be accessed via a dedicated user client (free-ware), accommodating for both the options of stand-alone / CD-ROM and Web-delivery scenarios.

Interactivity environment

Through the deliberate selection of the just mentioned tools for content compilation and structuring, as well as for the interconnected interaction environment, it is possible to 'insert' interactivity and dialogues at any point in the knowledge pool development process, and anywhere in the compiled mind maps or at any point in the flow processes into which the content has been structured. Synchronous (as well as asynchronous) interactivity can be scheduled/programmed via traditional communication means (word-of-mouth, telephone, fax or email), via the conference system used or even via some more efficient time management/ scheduling systems, such as the TimeCruiser software (http://www.timecruiser.com).

Irrespective of which 'caller' or 'alarm' system is being used to generate the attention towards and participation in a particular interactive event, these events could also in them selves be implemented in different 'modalities'. Some of the optional modalities already tried out with successful outcomes are;

Round-table face-to-face discussion

Face-to-face interaction option for content creation could be carried out as a 'sitting in front of the computer' exercise during which one person acts as the 'secretary' / 'key-board operator' and the others as proposers of text-, link- and branch-additions. If the group is more than three persons the same process can be carried out with the assistance of a projector. Such interaction could be used during the content compilation and the content structuring.

Remote live conferencing

If the persons who intend to collaborate in some discussions/interactions are remotely located from each other the 'physical presence' could be simulated via telephone conferencing where the illustrations are provided via Web-pages, T.120 Whiteboards or similar electronic means such as videoconferencing facilities operated via the telephone network or via Internet. VocalTec and its whiteboard and screen-capture features, or some similar systems with remote terminal operation, could be used.

Remote asynchronous conferencing

The probably most attractive option is to link computer conferencing facilities to the content handling tasks, enabling the remote users to directly interact with and contribute to the work in a time- and space-independent manner. It is recommended that a computer conferencing system with full web-interactivity are used in such situations, e.g. SoftArc's FCIS solution. It is also an advantage if the conferencing environment used have both facilities for direct linkage into the charts and diagrams available in the knowledge pool via sub-forums and individual messages, as well as being capable of handling different access options such as providing selective 'read only' access, editing rights and opportunities for inserting comments/replies in forums linked to different content elements within the knowledge pool.

As both tools mentioned earlier for the content compilation and content structuring environments are capable of integrating URL-links at any point in the content breakdown- or in the content flow-structures it is then also possible, e.g. with FCIS, to insert interactivity-links at any specific point where those are most appropriate. This would also provide an option to keep parallel dialogues between 'experts' and 'learners' within the same knowledge structure, simply by providing different links for different actor groups, and/or by providing each involved actor-group with their own unique access privileges.

Additional information

For those organizations and partnerships that are interested to explore this approach for knowledge handling, collective knowledge development and collaborative learning facilitation it is recommended that contacts are made with us through the following address;

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