SCATE

PROVINCIA DI GENOVA

Cité des métiers

Handbook on Trees of Knowledge

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To know more about SCATE: www.scate.info

Preface

Olivier Las Vergnas

Popular Education and choosing knowledge

The purpose of this handbook is to enable using knowledge mapping techniques. Drawing maps of the knowledge one has or wants to acquire presents an unquestionable pedagogical advantage by making the assemblage of one's learning, visible on both individual and group or community levels.

Though gaining the power to visualise and map knowledge goes well beyond this pedagogical benefit. This gain resides above all in the power to move from a logic of *imposed knowledge* to that of *chosen knowledge*; where not only does one learn through active pedagogies, but one also asserts free choice to assemble one's curricula by openly managing one's needs and motivations to learn.

In fact, young people in our countries often perceive mandatory public education as a painful obligation that is neither motivating nor satisfying; where no one ever chooses what one learns. Invented in the mid 19th century in an ambiguous context, between raising children based on *rote learning* and social emancipation, school appears analogous to a social refinery where people have only the right to follow the educational programmes that will place them in the box and caste they belong in.

To the contrary, a Popular Education programme today may be defined as one allowing to emancipate oneself and gain power to act individually and collectively by constructing and sharing one's knowledge. Seen from this angle, the question of motivation and free choice of what one shall learn, is crucial. To enable to visualise; and beyond, to chose what one shall learn, enables to shift from a pattern of imposed knowledge to that of chosen knowledge.

Introduction

The majority of European Countries are faced with an ever-increasing adult and senior population, for whom traditional learning provision, be it formal schooling, training or adult lifelong education are becoming inadequate. As a consequence, it is significantly difficult for these people, whether or not they are still working, to re-enter education and thus to have access to adult lifelong education schemes.

Furthermore, available data shows that there is a specific tendency on the part of women to exit the labour market and abandon paths of education/refresher training, thus increasing the under-representation of women in the workforce.

From a cultural point of view the dissemination of such lifelong learning paths, which are still not widespread enough, favours local development promoting the creation of new entrepreneurial projects or a better use of existing resources.

These methods are also ideal for those areas (rural areas, large urban suburbs) whose geographic characteristics hinder access to formal education, which is generally available in urban contexts. In all these cases an informal and self-organised provision of education – adequately supported by the use of distance education technologies – would favour the access to citizens who are not willing or not in a position to *reach* the available education and training opportunities.

Also, the use of recognised individual study vouchers would have a favourable impact on the *social productivity* of those involved, activating or re-activating circuits of interchange among individuals and groups who would otherwise be unable to communicate and without common goals. The establishment of productive *Circles* in terms of ideas would also certainly be of value as it is a known method of dissemination of knowledge and refresher training (the Province of Genoa in Italy, for example, has been using this method for some time in favour of different target users)

Among the most innovative solutions, that are still not widespread enough and that have been identified by the partners of the SCATE project as worthy of further analysis, are t Study Circles. These envisage the financing (through the allocation of group training vouchers) of non-formal education activities requested and organised by adults sharing a specific interest and with the

support from other players such as local authorities, schools, training agencies, local guidance services, etc.

The way Study Circles are organised and managed is fairly well known and a number of projects have already been implemented in various countries.

What needs to be studied, tested and analysed, in order to identify and promote good practices and specific protocols, are the actions to support and promote Study Circles as well as the ways to activate local and trans-national networks of individuals interested in the transfer of good practices.

Given these premises that indicate the need to foster the dissemination of innovative financing models for adult learning and stimulate the demand for learning in a population that is generally reluctant to develop lifelong learning strategies, the project has had three main goals:

1. Developing pathways to promote the creation of Study Circles (in particular suitable ways have been studied and tested to provide assistance with respect to: a) the definition of the studies project; b) the identification of learning resources in contexts which guarantee the overall quality of the learning activity; c) the enhancement and sharing of study projects/group learning and their outputs, encouraging the exchange of acquired knowledge through the method of Trees of Knowledge®; d) the development of learning paths with the use of distance learning tools).

2. Favouring the dissemination of knowledge built within Study Circles without using any further public resources (or, in any case, at lower costs).

3. Encouraging new users to access Lifelong Learning Centres or other adult learning providers using these non-formal methods and aiming at lifelong learning.

In the SCATE project we believe that if the individual has knowledge, the group does too. The group project therefore entails the formalization of group knowledge into a simple description, represented through Coats of Arms that can be exchanged with beholders of other Coats of Arms in other groups. Intermediate players will help formalize, launch and monitor this system. The method proposed is primarily derived from the concept of the Trees of Knowledge created by Pierre Levy and Michel Authier (Les arbres de connaissances, La Découverte, Paris, 1992) as a mapping system for knowledge recognition and exchange within communities.

This booklet aims to help us learn about Trees of Knowledge thus promoting their integration with the other tools analysed in the project.

Concept maps, semantic networks, knowledge management

Giani Vercelli, Emanuela Farmeschi, Rita Bencivenga

Semantic Networks, Knowledge Representation and Knowledge Management

In order to establish a time relationship between Trees of Knowledge, Concept Maps, Semantic Networks and Knowledge Management, it is necessary to distinguish two different areas: Knowledge Representation and Knowledge Management.

With regard to the first concept, Knowledge Representation, it may be said that since the beginning of the sixties it has involved all those interested in AI — Artificial Intelligence — and has also included Semantic Networks. Therefore, it is possible to trace semantic networks back to precisely those years, towards the mid/end of the sixties, as it is a conceptual processing typical of that period.

Knowledge Management on the other hand is conventionally dated from 1986 when Karl Wiig coined the term. In reality, Knowledge Management obviously existed also before 1986, but Knowledge Management as a discipline transformed itself from the mid eighties. At start the approach was that of production management i.e. management of human resources, time and methods in the industrial field, which was to indicate a way to organise production inside a structure organised according to the mental frameworks of the time. Around the mid eighties the concept changed as it extended from the company to also encompass the authority and the organised structure, giving rise to the concept of know-how management. Know-how management includes not only working procedures, but also areas of formal and informal knowledge, working relationships, competences of each individual member, group competences etc.

Knowledge Representation and Knowledge Management are two disciplines sharing many similarities but with very different approaches, especially from the point of view of the practical realisations and theories behind them. KM is usually tackled by using operational empirical research methods. Those scientists whose research focuses on Artificial Intelligent, have a much more empirical approach, typical of production engineers. Since the beginning of the eighties a whole series of software products have emerged for Knowledge Management. This was the result of the considerable work carried out during that period.

As for the concept of Knowledge Representation, the seventies and eighties were marked by the strong conviction among Artificial Intelligence *gurus* that anything could be represented in a formal-logical way; thus inaugurating the era of Expert Systems. Indeed, the time from the seventies to the mid eighties is referred to as the great era of the so-called GOFAI (Good Old Fashion Artificial Intelligence), known for systems of formal-logical rules capable of defining and representing knowledge in an explicit way.

Neural Networks

In the years that followed, some people saw representing knowledge in this way as ineffective. This led to the development of connectionist approaches. The connectionist approach considers the cognitive processes as the interaction of elementary modules. Compared to classical AI, connectionism launched the studies on neural networks. Indeed, according to this approach, the brain does not function as a calculator, given that it is a bio-chemical system in which knowledge is processed according to parallel mechanisms. An artificial neural network functions on such a parallel mechanism; where the information processing system draws inspiration from the nervous system of living beings. This makes it possible to solve tasks that would otherwise be impossible to tackle when using different systems. An example would be, recognising images or forms (artificial vision) or retrieving complete information starting from fragments (associative memories).

The processing elements making up a neural network are the same as biological neurons, and form a pattern that is similar to a nervous tissue (obviously very simple compared to biological nervous tissues).

There has therefore been a split in the discipline of Knowledge Representation. In spite of this, it is incorrect to say that neural networks are the next step from semantic networks. They are two different approaches. Semantic networks are basically a hybrid mechanism that emerged with the idea that it is possible to create a representation of concepts and relationships, not only in terms of concept hierarchy (from the general to the particular), but also in terms of relations, by building semantic networks in a knowledge domain. The result is the creation of a hybrid knowledge representation, i.e. not strictly formal-logical, that may be evoked by a hierarchical tree-like organisation. The fact of introducing transversal relations creates a way (which may be defined as procedural) to represent the knowledge.

Semantic networks therefore, did not emerge as a formal graphic representation in a knowledge domain; but rather as a method to represent content domains and to reflect on them.

It may be restrictive to state that Knowledge Representation only regards computer engineers or information technology.

It should be kept in mind that, because AI developed in the United States of America, it emerged in circles where computer engineers, psychologists, linguists, psychiatrists, neurobiologists etc. cooperate. AI therefore is not just information technology; although, and in Italy in particular, it has taken on this meaning.

Artificial Intelligence and Knowledge Representation form therefore an interdisciplinary subject.

Concept Maps

Concept maps, which include Trees of Knowledge, appeared as part of this logic. This began at the start/middle of the eighties, as representation formalism in the learning field, and essentially as a mechanism not so much to help when teaching, but rather to represent a certain subject and the concepts relating to it. Concept maps enable taking advantage of concept organisation in order to then accomplish a series of teaching activities.

It has now been ascertained that it is very difficult and unlikely to have an unvarying and complete representation of any content domain. It is true all the same that in general, the representation of a content domain is possible precisely because it is a representation, in the sense that it is a model, therefore it is possible to consider it as closed. This makes it possible to reflect upon it in an efficient and effective, formal logical way; as opposed to an open model where no formal-logical conclusion can be drawn, as there would always be a lacking of arguments and facts.

It is also true that normally when reasoning occurs not just in a formal-logical way, but also by applying other techniques (for example, procedural, connectionist, empirical techniques etc.), a model is used to work on that which can be considered as a partition of the real world.

An example of this is given by what happens on The Net. The Net is a huge knowledge container, a non-orderly graph with no precise topology. It is possible to apply to it all the techniques deriving

from the mathematical theory of graphs, in order to be able to reason on a partition of the Net itself, change partition and apply another type of reasoning and so on.

Conclusions

The existence of other approaches should not be ruled out. It would also be wrong to assume that one software application such as See-K® is the ideal solution.

Mapping implies modelling, and when the knowledge of a group of people is represented with the attempt to organise it in a graph, it is important to establish the goal that one wants to achieve.

The approach in Trees of Knowledge aims at reflecting on that map, with the purpose of discovering the various relations existing among the various components. With such a goal it is possible to apply a procedure, an algorithm to achieve this.

Trees of Knowledge

Jonathan Kaplan

Background

The Trees of Knowledge started out as a concept when Michel Serres, philosopher, science historian and Stanford University professor, is entrusted in 1991 by then Prime Minister Edith Cresson with developing a skills recognition system.

The concept of Trees of Knowledge is proposed in 1992. It is based on the idea of mapping knowledge or skills in a manner that shows the interdependency of knowledge objects. The concept relies on mapping knowledge in a group (workplace, neighbourhood, team), structuring the knowledge objects to form a tree-shaped visual representation that shows the groups' knowledge assets. The concept relies on a separation between knowledge objects and their possessors, whilst giving one the ability to see what parts of the tree are knowledge objects possessed by one (or several) of the group members. Taking things further, the definition of a set of knowledge objects to form an identified aptitude (say, in terms of qualification needs) gave birth to what the inventors of the concept named, a coat of arms or blazon. The coat of arms may be attributed to someone possessing the whole set of knowledge objects needed in respect to a specified skill. Each set of knowledge objects related to a coat of arms can be highlighted too in the Tree of Knowledge.

The tree of knowledge is a representation of knowledge assets at a given time. From that point of view it has the powerful potential of a managerial tool. The software later developed offers flexibility in the representation of the knowledge objects in relation to one another. One can change the parameters so as to represent the knowledge objects in different forms, i.e. changing the tree shape. As mentioned, the tool may seem like a potent managerial tool; but as a matter of fact, the idea was to develop a tool for the empowerment of those that are the beholders of knowledge objects represented in the tree-shaped chart.

The mathematician Michel Authier, Michel Serres and Pierre Levy, now professor at Ottawa University, founded a company in 1992. This company set out to develop software to implement the

concept. The company, named Trivium, developed in 1993 the first computer-based application, called Gingo®. Later a book was published[1]. It set off some controversy, as the concepts' underlying implications were obviously perceived as threatening to the educational establishment. In 1999 Gingo® was integrated into new software, commercialized by Trivium under the name See-K®.

Trivium strives mainly to build and maintain a business base. This has led the company to establish partnerships with some major software and consultancy corporations over the years. Its software was integrated in 1998 under the name Kartograph as a Lotus®[2] Knowledge Management solution. Today Trivium is linked to Accenture[3], has setup a US based company called TriviumSoft[4] and a Brazilian partner named DDIC[5].

Parallel to pursuing a business venture, many people have been involved over the years in experimenting and using the software out of ideological belief or social conviction. As a result, and because of the immense contribution this has had to the initial concept, Arbor & Sens[6] was established as a unit operating out of Trivium. Arbor & Sens offers access to the online See-K® system and fosters exchanges between those using See-K® for the empowerment of individuals. Some examples of these uses are: as a means for developing skill recognition, as a tool to develop new processes for promoting employment, as a device integrated into learning environments, or the use of See-K® in academic environments. Arbor & Sens also functions as a repository for these types of non-corporate projects.

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[1] Authier M. & Levy P., Les Arbres de Connaissance (1999), Paris: La Découverte
http://www.yodawork.com/websp/SW2_consult_ref?F_refid=1506&F_ent_diff_id=1

[2] Lotus® is now a trademark of IBM®.

[3] Accenture was originally known as Andersen Consulting.

[4] http://www.triviumsoft.com

[5] http://www.ddic.com.br

[6] Phonetically meaning in French branching (arborescence).
http://www.arbor-et-sens.org

Companies, both public and private, as well as social and educational institutions make use of the software developed. According to Trivium, some 60 clients use See-K® today in about 10 countries.

A tool to engage in a process

The tool itself is relatively easy to deploy. Nevertheless, the process of preparing the data to be inserted into the software system ought to be considered as a major goal. The extent of work that goes into this is a bit of a pit-hole. One has to be aware of the amount of work this requires and have all those who are involved prepared to spend time. One can avoid the pit-hole by realizing that the process is a group project activity.

As a matter of fact, the tool gives us several advantages in this process. It has something of a metaphorical power in translating skill labels into a somewhat visually beautiful pattern. As such it works as an incentive for the skill bearers. Once the skill recognition process is over, it gives the development agents (those that are manipulating and analysing the results of the skills identification) a tremendous tool for identifying strengths, weaknesses, opportunities and threats[7] to the organization or the group.

The skill recognition process starts by individuals describing past experience, activities and their learned skills. These are then formalised through various processes. One has to consider the knowledge structure, work on the way the knowledge objects or skills are related and agree on their labelling. The data is then fed into the computer. The software's algorithm will process, in real-time, the knowledge data (elements) of the knowledge objects. As mentioned earlier, this is when the manipulation of the data can begin by modifying parameters of the algorithm used. The form of the mapped knowledge will also vary with every data change introduced.

Benefits and fallbacks

Skill-bearer benefits are the ability to perceive ones position in the organization and to realize one is an essential part of the whole group. Another benefit is the ability to identify ones uniqueness and

[7] Referred to as SWOT analysis.

ones shared knowledge. This contributes to reinforcement of self-awareness and to self-esteem. In turn this provides for implication in the group's development.

Decision-maker benefits are the ability to detect current assets in human resources and potential for development. Options for development can be analysed and secured in real potential through the analysis of the Knowledge Tree shape. The analysis of interdependencies also grants fine-tuned provision for needs.

See-K software

Knowledge objects

The list of knowledge objects can be the produce of the group or can be produced by any other method the group finds appropriate. Each person participating in the construction of a Tree of Knowledge, assigns himself or herself a list of skill or knowledge objects. The person can then freely describe the sort of relation he or she has with each self-assigned skill or knowledge object.

Coat of arms

An entire set of skill or knowledge objects that is inputted into the See-K software database, will produce a tree of knowledge.

Each colour block in the tree represents a skill or knowledge object. The skill or knowledge object thus represented may be the asset of one or several people. The graphic representation of a person's collection of assets in the Tree of Knowledge is comprised of a set of such blocks. The list of his or her skill or knowledge objects represented by the blocks is called the person's coat of arms.

A person can see whether their position in the Tree is central or marginal, which skill or knowledge objects he or she shares with others, which of his or her skill or knowledge objects are unique to him or her, who are the people with similar assets, those who may be complementary in achieving a goal and so on.

Each colour block in the Tree represents a skill or knowledge object. It represents the asset of at least one member of the group and only has one occurrence in the Tree. The brick colour informs the viewer about the number of persons that hold the asset.

Shape and colour

The shape of the Tree enables one to perceptive the structure of knowledge of the population that composes it. The majority of the group members share the skills or knowledge objects in the trunk. Branches represent specialization. When several people have assets represented in a branch one may consider them as a specialised community. A colour code for the blocks indicates how frequent each skill or knowledge object is. At the bottom of the scale, dark green represents a rare skill or knowledge object. At the top of the scale, dark red represents a recurrent one.

Human resources deployment

A Tree of Knowledge is a graphical representation, or shall we say map, of skill or knowledge assets in a group. The map also enables perceiving human resources and needs for carrying out a project, occupying a job position, and so on.

The colour zones in the map on the left indicate scarce and frequent skill or knowledge assets **shared by the group members**.

The colour zones in the map on the right indicate scarce and frequent occurrences of skill or knowledge assets **in respect to a specific need**.

Human resources development

The map enables spotting expertise and identifying resources that may be rendered in training modules to develop knowledge for others.

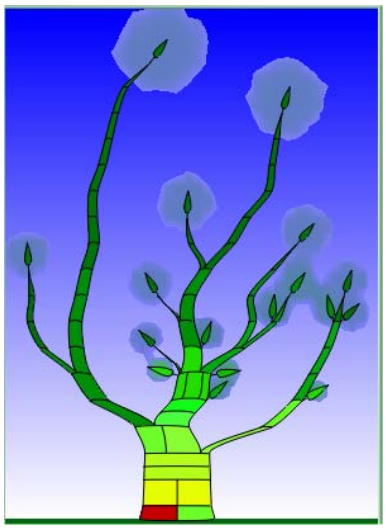
One can notice in the figures (next page) that human resources are lacking and may require development.

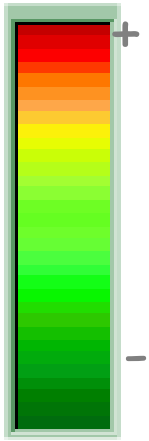
Each member of the group may decide in respect to his or her specialties, needs or interests to offer services or undertake training.

Software requirements

Operating System:	MS Windows 9x/NT4/2000/XP
RAM:	32 Mo. 64 Mo recommended
Hard-drive:	30 Mo
Web browser:	MS Internet Explorer 4.0 or above

The tree of Knowledge of a group



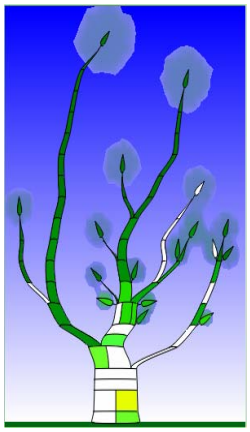


In red what is the most shared
In green what is the less shared

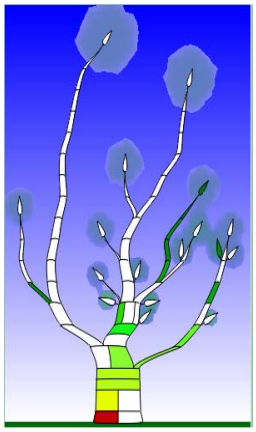
f

Each person can visualise ones knowledge in white inside the tree of the group

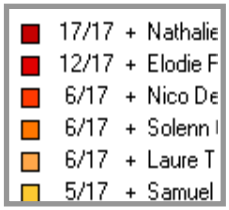
The position of this person in the tree of the group can be central, marginal, specialised, multi-purpose…



The same person can visualise with the colors what is the most and the less shared with the group



… and is able to know the proximity with the other members of the group (Elodie is the closest one with 12 common items)



Source: http://seek.arbor-et-sens.org/linkage//help/Fr/helpContext/arbor/Flyers/adc.htm

Case studies

Trees of Knowledge in an open learning environment

Marie-Laure Genton

Context

The Larzac Coeur d'Herault rural area is a territory of 1300 sq km, or 21% of the Herault county, with more than 56,000 inhabitants. It mostly is mostly made up of villages (many with less than 500 inhabitants) and seven towns, two of which (Clermont L'Herault and Lodève) account for more than 24% of the area's population. The overall demographic growth, except around Lodéve, is primarily due to migration.

The villages offer very few jobs outside of the three urban centres. The jobs they do are mainly agricultural or civil service jobs.

The imbalance in the territory, that splits the area between a less developed highland and a more dynamic urbanised lowland, amplify the social and job access inequalities.

The Larzac Coeur d'Herault has also formed a small political entity that has defined its major action lines as follows:

- Organising and developing regulations in proportion to the size of the area so that local actions are coherent, and in order to achieve territorial cohesion.

- Favouring the integration of individuals to combat social, economic and cultural disparities.

- Encouraging and supporting local innovativeness, promote human diversity and develop potential to reinforce employment.

It is in this context that the APP (*Atelier de Pédagogie Personnalisée* or Personalised Pedagogy Workshop) of the Lodéve area is offering a collaborative platform. This platform is based on the APP's experience in adult education and training, orienting and acting to improve social and occupational integration for disadvantaged publics. The project integrates the methodology and

operations of two approaches with the objective to increase these publics' possibilities to access training and be socially and professionally integrated.

It also involves encouraging the development of operational models that associate all institutional players in the concerned fields of: training, professional orientation and integration, services and companies. The two instruments we propose to integrate are the methodology developed around Trees of Knowledge and competency reviewing.

History

The principle of trees was going to become a driving force in the development of personal knowledge to serve a group. The APP's first experiment with the tree of knowledge system occurred in 1994. Using the tool, which required connection to a remote computer server, constituted a heavy and restrictive technology, an innovation and an adventure in terms of concept. We didn't know where it was going to take us.

In 10 years, the work around trees has gone through several phases from euphoria to discouragement. We were able to develop and promote publics, but as part of extremely targeted projects that were heavily dependent on financing from the systems (SIFE, PLIE, etc.). It is difficult to work over the long run without a political commitment at town or territory level to develop this type of action.

The last experiment carried out with unemployed citizens took place in 2000, in an action called: "A step towards employment" that was financed as part of a PRIE (*Plan Rural d'Insertion par l'Économique* = Rural Economic Integration Plan).

The objective of this action was to enable people to find a job. The method provided for three months of personalised follow-up. It was in this context that we implemented a "Tree of Knowledge" workshop.

The stated objective was to improve the effectiveness of matching the employment supply and demand in a given territory by matching participants' individual diplomas and certificates with the position profiles desired by companies. Ten work sessions were held from March to June 2000, which:

- analysed participants' skills,
- defined and identified skills in everyone's experiences, and
- appropriated and transferred to software the development of individual diplomas and certificates enriched and validated by peers.

This phase, as was the case each time, was enriching for the participants. On the other hand, the work of promotion and establishing contact with companies did not happen as we would have liked. The employers relied on us to develop their company's position profiles. Sometimes they even asked us to choose the applicant for them. There was no involvement on their part in the system that they found too complicated. Or were they short of time?

Three other experiences were carried out in different contexts to attempt to create openings with companies. The result was the same. The experiences were:

- Analyse the skills of secretaries in the Wine cooperatives and develop a skills frame of reference with a view to validating recognised professional knowledge in the Aude administrative department,
- Train counsellors from different regions in Paris in the Trees of Knowledge system with a view to implementing it in the Women's Rights Information Centres.
- Train and develop a tree of counsellors to provide assistance to a project promoter that required establishing a network of the various participants in Marseille.

The advantages

Throughout my professional career, I have never experienced something as important as this experiment with trees of knowledge. The practise at the training centre I am in charge of has been profoundly changed.

While respecting our organisation's terms of reference, the instructor's position, the centre's organisation and the learner's role have taken on another dimension. In fact, the position of knowledge has changed: it is no longer centred on the instructor, but distributed, shared and discussed.

This experience provides recognition vis-à-vis oneself first and then vis-à-vis others in the safe space of the group.

This work required a real **commitment** on part of the APP team and the confidence to question its own knowledge and convictions.

The problems

The resistance of institutions that work for occupational integration vis-à-vis such a system raises questions. The development of each person's potentialities, which enable them to actively participate in their integration, is not questioned if one doesn't interfere with the system established by the institutions. This poses the problem of the occupational integration world accepting the recognition of knowledge outside of the existing frames of reference and diplomas. The lack of mastery of the concept and the fact of straying from the beaten track is disconcerting. There is a fear of manipulation or even that an authority might be damaged. There is a big problem in disregarding the institutional logics to serve a group in a territory.

This type of project requires getting involved in the game. A game in the first meaning of the word with defined rules and a framework of free speech, collective action and a precise goal for the game. To do this, time has to be financed so the game can play out. Today, for already overloaded professionals, the search-action is no longer obligatory.

On the other hand, I believe that in this type of experiment, the experience cannot be transferred as such. The method and tools can be transferred, but there are no magical recipes to avoid an investment in appropriating the concept. The trees of knowledge system is an approach and a concept **that has to be experienced**. This requires time and energy.

After ten years of experimentation, we see that promoting people in an established group can't be denied, but that there is no recognition outside of the work accomplished unless it is identified with the usual tools (CV or diploma). Several explanations emerge: first of all the discrepancy between the participants' appropriation of new technologies. The system was often too innovative, but the development of the Internet has changed this reality. Next the trees of knowledge concept disrupts the representations related to knowledge and power. In fact it is a comprehensive approach that requires the support of several participants. Since it is impossible to work alone, the world of work,

vocational training and policies has to be federated. But it is difficult to convince everyone at the same time as soon as the approach proposes a new concept of society.

The outlook

Recognition of the approach outside of the centre is fundamental to avoid creating disappointments. In our territory, the creation of the Maison de l'Emploi (*Employment Centre*) provides hope. The APP proposes to test a system that maps, capitalises and develops the human resources in the Larzac Coeur d'Herault area using the trees of knowledge concept. Before the system, we proposed forming a specific project group whose objective was to collaborate building up local resources, where everyone is a participant in the project that becomes the territory's collective property. The objective was to simultaneously mobilise all participants (integration, public sector, business and political participants) to equip the area with a dynamic and strategic observatory. Forming the basis of common knowledge, this observatory would become a guidance tool that could help orient and choose priority development actions and to adjust them in real time.

Reveal the map of a territory, provide access to all resources, know expectations and anticipate needs are all valid reasons to facilitate participants' networking and to encourage a consultation and exchange approach.

Using Trees of Knowledge in a school setting

Amadou Ka

A team of teachers practicing the Freinet pedagogical method

The Léon Grimault elementary school was founded in 1973 in a priority urban development zone located south of the city of Rennes. Residents of the neighbourhood are of modest backgrounds, most of whom are immigrants. In terms of school, pupils from this neighbourhood encounter difficulties due to the distance between the family culture and the requirements of the school system.

Under the instigation of its first director, Roger Biscéré, the Léon Grimault public school joined the Freinet[8] movement whose goal is to develop alternative methods to the ever-ubiquitous classical and rigid pedagogy. We acknowledge that the modern pedagogies in general and the Freinet pedagogy in particular must be taken as a strategy and not a sum of techniques or the implementation of principles. The multimedia journal and Trees of Knowledge system occupy a privileged place among the strategies developed by the educational staff in this school. This medium, which is more accessible to children than printed mediums, can be used by displaying the class diary on a screen to reflect a slice of school life. The screen is quite large so a maximum of children, who are participants because they are authors, can express themselves and thereby develop their ability to express themselves by using different means (drawings, photos, stories, etc.). The opportunity to practice computer science and imaging strengthens their language skills through tools they master (computers and images).

Introducing trees of knowledge

Trees of Knowledge were introduced at the Léon Grimault school in 1994 as part of the Acadia project (*Association pour la Constitution d'Arbres de Connaissances Inter-Actifs* = Association for the Creation of Interactive Trees of Knowledge). This project arose from Pierrick Descotes,

[8] Celestin Freinet (1896-1966) founded ICEM, a pedagogical movement based on the cooperation and pedagogy of work, in 1947. For a complete bibliography, go to: http://www.icem-pedagogie-freinet.org/icem-info/publications/bibliographies

Christian Légo and Bernard Collot's[9] meeting with Michel Authier during the Popular Education Days held on the Crozon peninsula. The purpose of this project was to ensure children's success at school and develop parents' educational role by implementing the Trees of Knowledge system.

At the beginning of the school year in September 1995, teachers from two public primary schools in Rennes, including Léon Grimault, and teachers from Maxent, along with the Scola association, set out to plant "Trees" in and around the school as part of a partnership with the City of Rennes. These participants worked with a cooperative spirit that characterises the Freinet movement that most of the project participants came from. The sharing of common values (sense of mutual aid and open mindedness) made it easier to develop the project.

Subsequently, other entities joined the project (e.g.; the Marbaudais neighbourhood home, a working-class neighbourhood in north Rennes, and the Forum du Landrel, a Social Centre that serves both as a drop-in centre for youth and an exhibition and special events space). The Forum du Landrel, which since 1998 has become a cyber-community, a site that makes computer equipment available to neighbourhood residents, is more than ever a landmark, a place for neighbourhood residents to get together and exchange. This special situation has favoured the development of an inter-generational Tree of Knowledge under the impulse of the Acacia project.

Trees of knowledge, a tool in the service of cooperative methods

The Acacia project began in schools in the form of knowledge sharing workshops. Over time and through exchanges between teachers from the different schools, the Trees of Knowledge system has become a cross-functional activity fully integrated in the classroom practice, thereby allowing the cooperative approach carried out for a long time in Freinet classes to be documented.

The Trees of Knowledge system develops self-esteem and involvement in classroom life among children experiencing difficulties. The recognition and image enhancement in the non-educational areas that the Trees of Knowledge can provide constitute a breath of fresh air for children experiencing difficulties or disabled children. These children are extremely sensitive to the display of their coat of arms in the tree.

[9] All were members of ICEM (Institut Coopératif de l'École Moderne – Freinet Pedagogy)

From the point of view of classroom dynamics, what turns out to be interesting is the liberation of the creative potential thanks to the trees. Thus the trees have developed certificates that weren't expected (e.g.; a certificate titled "calming down after a tantrum").

For teachers worried about the child's creative development, the Trees of Knowledge approach is not only a resource, but also a veritable pedagogical tool.

The lack of personnel to provide the continuity and interface between the school and the neighbourhood has been a recurrent problem. In addition there is the innovative character of the Trees of Knowledge, both in their principles and their methods. In fact, the novelty of the concept they are based on is completely out of phase with the rationalist and analytical trends in education today. The logic of competition and selection of elites that prevails in the schools and that the adults reproduce amongst themselves makes it difficult to perpetuate such a project, once the original character has past. Another difficulty that the Acacia project was confronted with arises from the fact the activity leaders are used to starting with turnkey projects, whereas with the *trees* system the organisational activity has to be reinvented every day.

To overcome these difficulties, the activity leaders set out to initiate the parents in the Trees of Knowledge practice through Knowledge Fairs organised in the school. At the Léon Grimault school, these fairs gave pupils' parents from all horizons, especially those from foreign cultures, the opportunity to enhance the status of their knowledge and to share it with pupils and other parents.

At Forum du Landrel, a new institutional context hindered the project's development by blocking the recruitment of the person who was supposed to provide the continuity and interface between the school and the neighbourhood.

Trees of knowledge, the first step towards the knowledge market

Trees of Knowledge, as a sociotech system, have had a major impact in terms of distributing and sharing knowledge and developing skills. Based on social interaction as the method of acquiring knowledge, they have enabled children, especially those who were out of step with the requirements of the educational system, to enhance their self-image and get actively involved. The experience has also strengthened the cooperative dynamic, a characteristic of the Freinet pedagogy.

At the Léon Grimault school, meetings are organised between classes using the system where children, standing behind booths, show the others the certificates they have filed or succeeded. This Knowledge Market, instituted at the rate of one two-hour session twice a week, has enabled the school's teachers and activity leaders to reconsider the nature of exchange. In current societies, exchange is a zero sum game (i.e.; what I win is what the other loses). In the Trees of Knowledge system, a skill or knowledge are only real when they can be shared. In this way, by sharing them, the person that holds them increases his capital.

Behind each stand, a manager explains to the candidates how to obtain the proposed certificate and then the candidates attempt in turn. In case of failure, the manager delivers a card titled "started to learn." In this way the failure is downplayed and the adult, in this case the teacher, acts by getting the applicant to think about the reasons for his failure and the obstacles that still have to be cleared. These moments of sharing knowledge are also opportunities for negotiation and the practice of otherness, socialisation and learning mutual respect. At the end of each Market, time is devoted to the assessment where pupils give their opinion on how the Market went and recall the rules for those who missed them. The rules being those they enacted themselves. Isn't that a lesson in citizenship in the sense of Living Together? The Trees of Knowledge system constitutes an alternative to an educational system that has chosen to repress differences instead of valuing them. Remember that the project behind the Trees of Knowledge was to create a system of recognising knowledge excluded from the official systems. Nevertheless, other than the schools that practice the Freinet pedagogy, schools do not take into account knowledge that is not written in the official programmes, which is a source of exclusion for those who hold this knowledge. It is by recognising and valuing non-educational knowledge held by children experiencing learning difficulties that such children have been able to make a place for themselves and take an interest in life and in schoolwork.

Moreover, in spite of the inherent difficulties with any innovation, some teachers are continuing the Trees of Knowledge experience.

Placed under the auspices of the ICEM (Institut Coopératif de l'École Moderne – Freinet Pedagogy), the experience can continue by networking Freinet schools with the See-K software.

For these practitioners of the Freinet pedagogy, the specific meaning of any action comes from its reliance on the local reality (the classroom) before spreading out. They see in this tool the means for

individuals to more effectively exchange their experiences over wider areas and match their representations with others in similar situations, thereby creating educational (school and non-school) networks. These networks to exchange knowledge of any kind can be visualised and structured in the See-K relationship platform.

In an education and lifelong learning context, this collaborative work and learning platform can be a training tool for self-learning (Dumazedier, 2002)[10] and thereby meet everyone's desire by relying on the ability to educate and train oneself alone and with the help of others.

10 Dumazedier J. Penser l'auto-formation: société d'aujourd'hui et pratiques d'autoformation. Lyon : Chronique sociale (Synthèse), 2002, 172 p.

An Introspective stance on Trees of Knowledge by one of its authors

Michel Authier

The representation

The representation as a tree is the result of a mathematical treatment. As we have seen, in principle the system does not seek this form more than another. The *aesthetical* choices of this representation are those of the computer graphics artist. They are dictated by the desire to give satisfactory visibility to a large group of skills.

The Trees of Knowledge have often been criticised for their lack of stability. Sometimes, we are told, a simple variation in the information system (all of the lists of skills associated with individuals) is enough to disrupt the representation. It is always strange to be reproached for the effect one is striving for. In a time where one only speaks of chaos in describing the behaviour of complex systems and where alleged butterflies would change the weather with a simple movement of their wing, it would be surprising that the disappearance of a person in a work organisation or a pupil arriving in a classroom could disrupt the apparent stability of a system whose equilibrium is always fragile. We all know from experience that this happens.

We believe it would be a pity if the Trees lose this quality and that, like pie charts, histograms or any other form of statistical representation, they remain indifferent to the disappearance of a few. It should be noted that the Trees are not systems of statistical representation. They are there to track the dynamic changes in a community described by its skills, where the transformations occur in discontinuous and not progressive steps.

In addition, in terms of projects based on this system, the fact the Tree is sensitive to every individual's changes is a major motivating factor for each individual. It is in large part due to the effects that one's appearance or disappearance produces in the system that everyone is aware of the quality of his membership in the community and the need to improve it. As we saw at the beginning of this text, this awareness is the source of increased empowerment.

The Trees are in no case opposed to the statistical approaches whose qualities of rigour and usefulness are unquestionable. They explore the very precise field where everyone attempts to

measure the effects of his existence in the community. Too often the collective requirements serve to hide, behind the mass effects, the quality of each person's presence. The main source for creating the trees of knowledge was, and remains for its creator, the desire to give everyone vis-à-vis everyone else a singular representation of his originality.

Robot or instrument

To give everyone his due, the logic of reading the Trees resembles more a musical interpretation than a robot deciphering the meaning. With the Tree, which he is a member of, everyone is able to explore the nature of his relationship with the others: similarity, difference, common or divergent interest, etc. In the face of the partition by which we can identify all of the information concerning all participants, everyone has his own point of view and develops a vision of his relationship with others that will influence the quality of his involvement in the group. Obviously this involvement is important for a community since it will be the basis of the person's motivation and his desire to progress, adapt, educate himself, anticipate changes and propose changes himself.

Let's recall once again: it is women and men that matter. Skills, knowledge and their cohort of knowing, know-how, attitude, behaviour and aptitude are only the more or less well-suited means to identify the qualities of those who work, collaborate and participate in collective undertakings.

In conclusion, a Tree of Knowledge is an instrument that serves those who want to obtain a clear and dynamic vision of all of the resources they are likely to use and produce by collaborating with one another. In this very way one participates in efforts to integrate, value, educate and enrich everyone. Clearly they can be, through the methods they promote, the behaviours they require and the techniques they put forward, an especially relevant instrument in support of the practices studied by the SCATE programme.

Getting started

Olivier Las Vergnas

Empowerment and visualisation of knowledge

Creating networks, trees or maps to connect the information

To know is to connect information; to understand is to connect knowledge. The tools that can be used to organise and visualise such relationships are precious aids to structure one's thoughts or knowledge. Based on the network diagram, trees or maps, these instruments or methods represent respectively the interactions, relations and proximities. Depending on the contexts, they improve the structure of note taking, encourage group dialogue, help find one's way among words, ideas or documents and even help one formalise or share visions of his skills and knowledge.

Organising individually by listening to and mapping what one receives

This is the case of so-called "heuristic" note-taking methods that one can easily apply with pencil and paper by building, based on one's perception of the relationships between the different subjects or bits of information, a network of nodes and links (i.e.; a representation of connections), which can be a tree diagram (i.e.; relationship links) or a map (that aspires to represent the proximities and distances, even to rely on a "metric" in the mathematical sense of the term), instead of writing linearly and chronologically. In this way, teachers at all school levels can give pupils an opportunity to represent all levels of knowledge fields (see diagrams extracted from Vezin). To be pedagogically effective, this strategy clearly assumes entrusting pupils with the power and responsibility to build their own trees or maps.

Moreover, when one listens to readers of explanatory texts speak of their impressions of progress or breakthrough, one thinks of using representations in tree structures or more generally networks to describe the sequential structure of concepts. This way, if one asks the readers of explanatory texts to represent these texts in a diagram with an instruction like "draw a tree that describes how this text is structured…," one obtains several types of diagrams. Vertical branches (like a poplar) when it is a question of texts that connect progressive changes in their readers' representations.

Independent bubbles (like an orchard or a lawn) when it involves texts that juxtapose everyone's individual contributions.

This transformation of talks into a network, tree or map lets one fill out his sheet synchronously with the talk he is listening to (or the text that is being read), while organising the layout of space on the sheet non-synchronously with the reception of the talk, based on the perceived logical hierarchy (an operation that is sometimes qualified as going from the synchronic to the diachronic). To give an example regarding the construction of a tree of heuristic notes, the rule is to determine whether the understanding of a paragraph requires that the preceding paragraph be understood or not. If yes, one continues on the same branch. If no, one goes up one (or several) levels and creates a new branch (at the right level).

Choosing well the subjects and shape between map, network or tree

The limits of such a process are rather obvious. The progressive construction of the hierarchy doesn't provide an overall view, which produces pragmatic hierarchical organizations that lack hindsight. On the other hand, the instruction is relatively easy to formulate. One should also note that the nature or size of the elements mapped is far from being identical and easy to determine. They can be semantic units (paragraphs, words or phrases) in identified blocks (chapters, web pages, texts and documents) or abstractions more or less easy to define or demonstrate (ideas, concepts, learning, knowledge and skills).

This said, reducing note taking to a tree drawing amounts to making it a rule that contents will only be represented as pyramidal hierarchical relationships. In point of fact, one can break free of this simplistic constraint if one decides to also represent other links, like short-circuits that one overlays on the tree and that transform it into a network. Then the mapping is not limited to a transformation of a linear reading or a presentation that is structured and prioritised by a plan. In this case it also lets one discover the relationships between these bits of knowledge based on several complementary perspectives. This involves expansions similar to those provided through the use of a thesaurus and multiple criteria classifications or multiple frames of reference in the catalogues of libraries or web pages, as offered by so-called *intelligent* search engines (e.g.; http://kartoo.com).

Displaying to compare or consult with each other in a group

The more dynamic or collective methods build networks or maps using *post-it*™ notes. With them one can hesitate when making choices or exchanges between group participants, or when summarising the very structure of knowledge, which lets one explain implicit representations. This process of collectively organising information or opinions is the basis of the method formalised by Schnelle E. during his synthesis strategies known under the name Metaplan, which involves regrouping individual expressions in thematic packs to analyse them collectively as soon as possible.

Beyond letting one represent quite explicit content (chapters, documents, words, etc.), these techniques can also be used to help formalise implicit subjects, not easily identified by an individual or group. This is how they are used to initiate, favour or support individual awareness or awareness in *discussion groups*. In this group spirit, these techniques can be used to identify the formalisation and clarification of everyone's characteristics and complementarities as well as construct a potential *collective identity*. This type of work can involve several families of buried subjects like memories, unrevealed know-how and unrecognised knowledge.

Claire Héber-Suffrin, (Reseau d'échanges réciproques de savoirs) dealing with post-it in a SCATE workshop in Sofia (Bulgaria). Photo D.R.

Using computers just to display or construct structures

Of course, around these *manual* methods either computer tools have been developed, especially for taking heuristic notes like FreeMind < http://FreeMind.sourceforge.net/wiki > or its equivalents (see the francophone community at < http://www.petillant.com > on the Web). A first family of tools groups software limited to representing diagrams, where the computer's calculation power is not used to analyse or determine content connections, relationships or positions.

On the other hand, other computer systems determine the relationships shown: for this they use proximity calculations and assessments of relationships or similarities. To do this, they compare the frequencies of words or expressions, chosen definitively (based on index lists or structured like a thesaurus) or determined by an initial exploration. This is the case with so-called *intelligent* meta search engines like < http://kartoo.com > on the Web that organise their results into maps based on common words, which they present in addition to the words that are the search subject.

Developing empowerment by mapping knowledge

One may have to deal with two types of knowledge mapping. The first, more related to traditional pedagogy approaches, maps *scholarly knowledge* in a didactic approach with a view to assimilating it through their representation. This is the case of note taking during a traditional course or during school exam reviews [see *Organising individually by listening to and mapping what one receives* earlier in this chapter]. The second type, more related to knowledge exchange approaches, allows knowledge possessed by members of a group to emerge and be recognised so one can display the complementarities or distributions and even the possible exchanges. This is the approach that interests us in this manual and that the Trees of Knowledge methods have been specifically developed for. Far from being essential, the software developed for the Trees is in reality optional for carrying out initial work of this type. Drawing inspiration from the different methods presented above, with or without software assistance, one can organise sessions to express and create the first collective representations and individual positionings as the first steps in matching the supply and demand for knowledge. In this context, the last part of the Start section in this manual will give you a few examples of knowledge mapping tools you can use to start, by specifying the purpose and conditions of use in self-training or co-training situations.

Getting started with knowledge mapping

Four steps to discover and implement knowledge mapping

Display the knowledge relationships empirically

Several methods can be used to enable a group to display the complementarity of knowledge blocks that its members have or can exchange between themselves. One can use *post-it* notes to represent and organise these knowledge blocks spatially, more or less empirically. Then one can form, under the group's control, *trees* or maps to represent the proximities or links of these various blocks, depending on whether they are deemed to belong to the same chapters or themes (practical knowledge branch, computer sub-branch, software category, etc. or school knowledge branch, French literature sub-branch, romantic poetry category).

In a logic of knowledge exchanges, the same graphical representation can be used to locate supplies and demands (by using colours to differentiate them) and in this way to discuss them (e.g.; the prerequisites, steps or chronology of learning). Obviously, verbal exchanges in groups that work collectively to establish these maps or trees are just as meaningful as the final representations themselves. One can also clarify the supplies and demands by cutting the blocks into subparts that can be used to more precisely define the exchanges, session by session, and do a self-evaluation.

If, as the group's life progresses, one relies on the images already produced, then one produces drawings that can display the complementarities in terms of interest centres and participants' profiles and one can identify subgroups.

Use the heuristic note software to describe one's knowledge

The same type of tree construction work can be done on a computer with *heuristic notation* software, like FreeMind. There are several other heuristic notation tools like MindManager®. This type of tool offers the advantage of constructing hierarchical trees whose branches can be moved or changed in the block. Even if one can do group work with a video projector, this technique is nonetheless more suited for individual work, either note taking or to analyse a course summary in order to highlight the hierarchical structure and follow-up its appropriation. Of course, the complementarity that comes from working as a group posting *post-it* notes can create the desire to produce and print heuristic note sheets in lieu of *post-it* notes.

Implement Trees of Knowledge

The approach that has just been described can be used as an introduction to Trees of Knowledge. These visualisations of everyone's knowledge systems and their complementarity can make one want to build them more systematically and comprehensively. To do this, the See-K *trees* visualisation software is available free of charge via the Arbor & Sens network. The Arbor & Sens website [http://seek.arbor-et-sens.org/linkage] also provides several use example sheets that can be downloaded in the PDF format. Note: See-K, which can be used to administer Trees of Knowledge, requires the technical assistance of Trivium or Arbor & Sens if one doesn't have an extensive experience using See-K. Developments underway should improve users' autonomy. In particular, new maps will be available at the end of 2006. In the chapter Building A Tree of Knowledge, you will find all of the concrete elements to implement a Trees of Knowledge approach. In order to act in complete transparency, which is a key to emancipation (see the chapter Perspectives for Learner Empowerment in Cooperative Learning), one has to insist on the difference in nature between pure visualisation methods where individuals fully control the choice of the proximity or distance they represent between blocks of knowledge and a tool like See-K, which automatically calculates proximities (based on the frequency of words). Using See-K can result in a more intuitive than deductive interpretation.

Test other methods of displaying knowledge

Multiple other strategies of building maps or trees can be invented to *choose one's knowledge* better. For example, tables can be built with a spreadsheet to produce graphs that cross display the knowledge between members of a group. How many speak two languages and know how to do odd jobs or cook? Or something quite different. At what age did everyone learn to change a tyre, speak French, change a fuse or play chess? Or in what order? When do I learn?

Building a Tree of Knowledge

Chantal Lebrun and Bernadette Thomas

Trees of Knowledge capitalise on signs that represent uses comprised of living knowledge. They can be used to organise this knowledge when necessary. Thus the capitalisation of knowledge is not a goal in itself; rather it is the result of a representation that opens up possible uses. This construction requires an investment over time. That's why it is important to clarify the group's goal and ensure the tree's usefulness before growing it. Use of the See-K software, which can be used to display the map of skills or the group's knowledge through a dynamic representation, only constitutes a portion (albeit the most spectacular) of the approach that precedes the Trees of Knowledge. The approach described hereafter is first of all an empowerment approach that starts with users' expressions. Thus it is still useful even when there is no access to the software.

Clarify the goals

Clarifying the goals is a way to better define the objective for a group by developing the *tree*, this specific object that represents the sum of the users' interests. First of all, it is essential to know why one or more people want to develop a tree. Next, there are as many ways to tackle a Tree of Knowledge as situations that these *trees* can grow in. The result will depend on the number of users, the degree of confidentiality, everyone's rights to access the information and the possibilities to develop the initial representation.

The goals determine the entire approach, because in the end the maps will be interpreted based on these goals and the objectives the group has set.

Define a common objective for the different participants

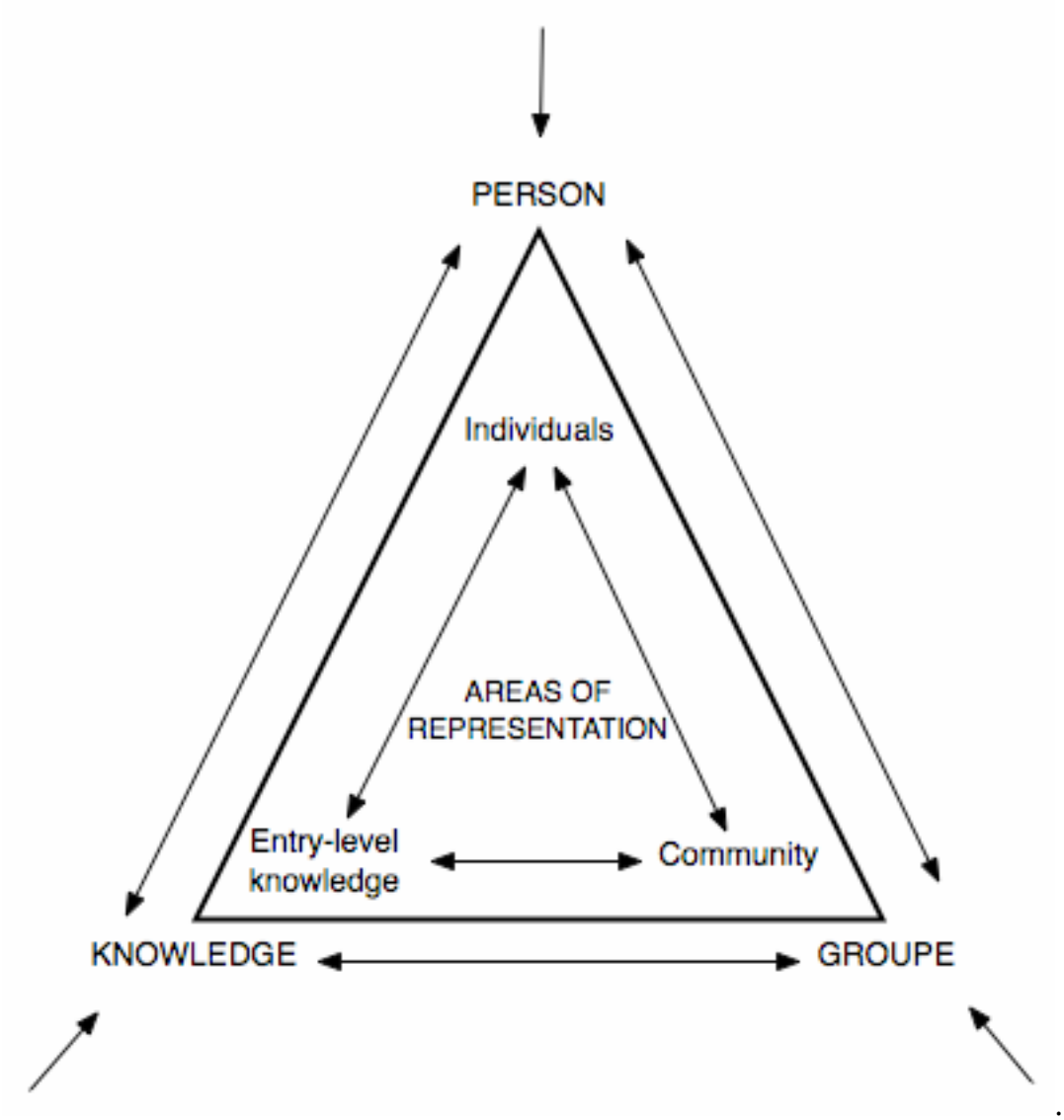
In the broadest sense the tree is the capital of information related to the goals. Several participants may want to construct a tree; therefore the goals will differ depending on the users. It is important to clarify the goals in the beginning so a consensus can develop on a common objective. Generally speaking, three types of participants can be identified based on the role they can play in the system:

- "individuals" that enrich and structure the tree by contributing signs of their knowledge; these signs constitute the human resources,

- "organisers" that record the needs to use the knowledge, and

- experts, instructors and facilitators that provide the resources to enrich the knowledge space.

One can show the representation space in the following diagram, which summarises the three methods of entering a Tree of Knowledge: people, knowledge or skills and the group. In addition to the participants that actually influence the system's development, an administrator is required to operate it.



Source:"Présentation théorique et méthodologique de l'approche des arbres de connaissances", mars 2001, http://www.arbor-et-sens.org/biblio/textes/B_Collot/Adc_et_educ/chancerel-collot.doc (Translated)

The administrator's different faces

If the administrator's position is central in the system, there are nonetheless two types of posture:

- participate in the network formed by the group and develop one's own coat of arms,
- voluntarily stay out of the group and just administer the system.

The group should define the posture before the experience based on the objectives to achieve.

The administrator is a key element in regulating the system; depending on the role he is called on to play in the community, his tasks can be varied: administration, preparation, creating conditions for open mindedness, establishing operating rules, assisting the group process, helping the group handle contents, increasing the group productivity, summarising exchanges and doing assessments with the group.

A tree of knowledge is always unique

A tree is nothing more than an information space created to provide a solution to a common problem for the users. When one claims that it represents a group's "knowledge space," it always involves knowledge set in a singular context. A tree is created by and for a given group of individuals. Consequently it is inseparable from the group that created it and the objective the group set itself. Therefore the knowledge is only as valuable as the group decides it is. The knowledge is interrelated by those that control it. Consequently, the information contained in a tree doesn't need to be homogenous because the individuals in the group determine the space for the information they are associated with. The lists of individuals' certificates structure the tree.

Identifying certificates

Certificates are the elements that make up the Trees of Knowledge attached to individuals. They represent skills, learning, knowledge or any other information depending on the context they are used in. In each case, the formatting of these certificates should be modelled as much as possible. This special work requires a few recommendations regarding the reliability of how certificates are attributed (the most important), how clear their usefulness is and how understandable their description is. The search for precision is not a necessary condition to use the tree. The tree's organic process will model its shape as one goes along.

User rights

From the outset, one should know what people are doing in the project and define their user rights when they enter the system, including in particular their rights vis-à-vis the certificates one wants to format. Since the rights are always closely related to the goals, choices should be made to clear up various questions (e.g.; since it is an informal tree of people's knowledge, should everyone have free access or on the contrary should confidentiality be preserved so the underlying logics can be seen; or what rule are we going to adopt to decide that a self-declared certificate is valid). It can be worthwhile, if one takes an interest in individuals' paths, not to make certificates' transmissibility a key validation rule, but to rather look at how self-declared certificates can be registered in the curriculum.

Once the problem(s) that one wants to answer has(ve) been identified, one has to establish how they are going to be answered and in particular decide on the tools and information that will be associated with the tree representing users' common goals. The rights can be defined top down by the administrator or collectively by the group. In some cases, the choice depends on participants from civil society (e.g.; if it involves an institutional order). In other cases, the nature of the goal imposes the choice (e.g.; if the goal is to develop individuals' "empowerment" or to nourish democracy, all users will participate in deciding rights and establishing rules).

Generally speaking, one has to make sure that, irrespective of his posture, the system administrator is present from the beginning of the project to get involved in the system architecture and, in particular, to define rights so they are totally in phase with the system during the operational phase.

Notions of time and duration

The trees are tools that one uses for very simple objectives (e.g.; quickly constitute a group's *face* and get acquainted so to speak) and for the most complex objectives (e.g.; a tool to be used as part of a territorial policy). The nature of the objective has an impact on the how long the tool is used and how long it takes to master it. One can create the simplest trees in less than three hours (see box below). However, when it involves building a very rich tool involving multiple participants, it can take several months to design it because the complexity increases the number of relationship tables (e.g.; a territorial community that wants to bring together participants, initiatives and information

resources in order to federate different actions in its territory by revealing skills that have not yet been mobilised).

Example of a simple sequence:

- collect data on *post-it* notes
- enter the information in the software
- analyse the images obtained

The use and choice of the organisation influences the duration considerably. Thus the time spent reading the images depends on the complexity of the goals set down at the beginning, the number of participants present and the organisational choices. Depending on whether the administrator sets himself as an expert or not, enters the data and reads the images or, on the contrary, it is the group members that share the work, the time devoted to each of these steps is quite variable.

How to grow a tree

Collectively define the objective pursued and the operational rules

Bring together all users and begin to develop a common objective:

- First of all identify the problems to solve
- Establish the objectives to achieve
- Identify the benefits that each participant can hope to achieve from the chosen objective.

Once the goals have been defined, what constitutes the certificates will have to be identified.

Create a base of certificates

In the beginning, an initial list of certificates has to be developed. The group dynamic will take over from this base to develop the tree based on the users' real needs. It is usually the first people involved who, exploring their learning path, reveal their coats of arms based on the group

objective.[11] This phase is decisive because it allows the issues to be clarified and reveals the reference items common to all participants.

Four known methods of developing certificates

There are several methods of developing the list of certificates depending on whether as a priority one fits into in a logic of capitalisation, involvement or sharing. The best known methods can be combined amongst themselves or with other methods. They are:

- a list of pre-established references: everyone is asked to choose amongst all the certificates the list of those they think they can proclaim. This is the case in particular with logics involving the capitalisation and mobilisation of knowledge or skills,

- collective exploration: the 5.5 method. This involves preparing an initial list of certificates that can represent a group's singularities and knowledge sharing while respecting the following two principles:

  Principle of discernment: every subgroup of people must be discernable by at least one specific skill. In the subgroup, everyone must possess a skill that people who are not in the group do not possess.

  Principle of otherness: the number one goal of trees is to value the participants. This esteem is obtained by others recognising one's knowledge. It is achieved through communication. The ideal way to proceed for this recognition is to get one subgroup to describe another subgroup's skill.

This principle can be used as inspiration for the main line of a first session with a group of five people:

1- Everyone in turn reflects on the knowledge or skill possessed by the complementary subgroup, while the subgroup reflects on the person's knowledge or specific skill.

[11] The same individual can have different coats of arms; depending on the groups he belongs to, he will reveal certain knowledge more than other knowledge.

Each session lasts five minutes. The person and the complementary subgroup can establish a dialogue. The work related to the five situations should take 25 minutes.

2- Each group of two people (10 combinations possible) searches for the specific skill of the complementary group of three people, while the three-person group does the same for the two-person group. Each session lasts five minutes. The two groups can establish a dialogue. The work related to the 10 situations should take 50 minutes.

3- During this time, the team leader records the skills in the software.

4- Each person establishes the order of skills attributed to him based on the decided order. This is personal reflection work that can be done simultaneously. It should take no more than 10 minutes.

If everything proceeds without too many difficulties, the tree should take shape after an hour and a half. Experience shows that the identification sessions can get intermingled and that if some identifications go quickly, others can take longer. What is most important is the group dynamics.

This last approach quickly poses the problem of standardising the wording of certificates, once one leaves the group that created the first list.

- The combination of the index: the AREB method. A four-dimensional matrix with five indexes is used to codify the certificate names. Example: an Action verb plus a type of Result plus a type of Environment plus a Beneficiary.

This method works when one is in a well-defined context (a school, company, community, etc.) from which one can rather easily establish an index typology.

- Mapping contributions based on the free expression of an initial group of people: the first phase breaks down into three steps: compile testimonies in free composition, analyse the corpus and create glossaries to establish a list of references. The information collected is processed with specific methods and then used to reconstruct everyone’s testimony in the form of an information map. These maps will become the discussion supports and clarification subjects.

Attributing certificates

In all cases, in the end, everyone will have a personal list of certificates. Each certificate claimed will be enriched with a personal comment exposing the reasons for its attribution. Other indications may enrich the connection between each person and each certificate claimed (e.g.; its context of acquisition, a level of mastery or any other element one deems useful to bring to the group's knowledge). The Trees and Knowledge software will produce a map of the community's cognitive territory, which will be a summary of all of the lists.

The operation

Shared certificates constitute a dynamic framework for exchanges and can be revised based on the uses. Each group of participants can position itself on the common territory by registering the list of certificates it makes available to the other groups, the list of certificates it wants to acquire (this can be for a job, an activity, etc.) and the list of certificates it wants to strengthen or acquire. Based on this decision map, the operations can proceed with the goal of:

- pooling and sharing knowledge between individuals,
- mobilising knowledge to serve collective or economic projects,
- improving the capital of knowledge by depositing training or expertise resources,
- allowing people to orient themselves towards an enrichment of their knowledge through training or sharing.

The assessment

The solution provided will always be assessed in terms of the participant's interest and his role in the system.

How can one grow a tree remotely?

First of all, one has to be able to break free of technology to develop a common objective. When one chooses to grow a tree, it is always to respond to a problem of exclusion. To achieve this goal, it is necessary to create solid relations between the users. In this regard, distance is not an obstacle

and can even play a positive role (liberating or boosting) in some cases. For people suffering from a handicap with respect to one-on-one communication, distance can have the effect of emancipating them and freeing an unimagined energy. The weakness of the interpersonal relationship becomes a strength. Conversely, telecommuting will be all the more rich and effective if the people have already met and know each other. The relationships developed will be strengthened by the multiplication of exchanges made possible by the Internet. The emergence of groups that can be the objective of implementing a Tree of Knowledge system or the pre-existence of a coherent group are not mandatory. On the other hand, since geographic proximity is what gives meaning to the system, it cannot thrive and be perpetuated strictly from afar. Since the tree only lives by being used, co-presence, even limited, is essential. After that, for purely technical reasons related to the appropriation of the software at the beginning and the fact that through the social interaction that develops during the encounters between users, users' motivation is sustained. When one chooses to or is forced to make remote exchanges, these two aspects should be considered.

Constructing a tree in practice

The following action phases should be planned when one has access to the See-K software.

A. Modelling or prototyping phase

1. Prepare the database in terms of architecture and file configuration (done by the administrator)
2. Prepare the collaboration scenarios between the three types of participants (established by the group). Create personalised home pages (developed and implemented by the administrator)
3. Prepare access to the database based on roles and rights to view or change for each type of participant (configuration by the administrator)
4. Prepare uses of the database by proposing operating scenarios for each type of participant (established by the project group)

B. Testing phase

1. Create and integrate user files with an identifier, password and group membership
2. Organise the collection of information and participants' positioning on the certificates
3. Organise quick feedback to participants
4. Assess the working assumptions and adjust the scenarios

One ethical question that arises when discussing knowledge mapping, is the tension between what this enables in terms of empowerment, for example, and what this entails in terms of infringing privacy. To put it differently; one can state that showing whom one is (in terms of competencies) is also revealing somewhat the intimacy of one's being. Where is the boundary between empowering oneself to act through the readability of one's know-how in a map of knowledge and exposing oneself to the scrutiny of others? This may not be desired by the individual who has; for one, suffered from hierarchical categorization and; two, is aware of the reductionistic flavour of labelling.

Learner empowerment is conceivable for one under the condition that it does not reduce one's cognitive identity to a coat of arms.

People occupying positions in formal institutionalised education may perceive an ongoing flexible system, enabling dynamic recognition of knowledge objects and their beholders, as a menace to the hierarchical order of their social organisation. This can lead to a fight between the defenders of the formal system and the one being developed. The latter empowering individuals to be recognised for their knowledge assets gained through non-formal or informal learning, achieved through knowledge mapping. The position of those empowering themselves through recognition of their knowledge thanks to mapping may be relegated to being considered as holders of non-formal knowledge, i.e. of lesser value.

The dynamics of knowledge interdependency, highlighted with a tool such as See-K, enables the building of skills and expertise not as individual assets, but as knowledge traits (cultural marks) of a given society or group. Understanding knowledge as a collection of competencies in a group, is an illustration of the way ICT is contributing to the development of a society of knowledge. The increasing presence in our different daily environments of scalable, modifiable object representations through the use of ICT, is and will continue to develop cooperation in production, encompassing the shared acquisition and building of knowledge. Learning is no longer confined to specific institutions. The space and time of learning activities is becoming planetary.

If we take a look at the meaning of empowerment in the context of education, we may be able to reflect on the empowering capacity of such a conceptual tool as the Trees of Knowledge in this stance.

Empowerment is defined by the European Union as "the process of moving into a situation of inclusion or the development of capacity and opportunity to play a full role not only in economic terms, but also in social, psychological and political terms"[12] This definition does not reveal anything in terms of how this should occur, even though the noun does derive from the verb 'empower' and although as a transitive verb it signifies making someone stronger and more confident, it does not express explicitly if the gain in power is achieved through the concession of some by those who already have it, or if it is something to be gained through the strengthened efforts, forces or power of those empowering themselves. The alternatives are either considering being empowered through passive acquisition (power conceded or reinforced) or either self-empowerment which can be interpreted as the gain of power achieved through a struggle for recognition by those already beholding it. In both cases, it is worthwhile considering power not as something that is to be divided, but as something that can grow for all players without loss for some in favour of others.

According to Pimparé, S. the premise for most attempts to conceptualize the term is related to that of "inclusion of the excluded by the included on terms pre-designed by the latter"[13]. She puts forward notions different to the Paulo Freire liberatory learning as a means for engaging in restructuring the society. She speaks of *Swatantrata* and *Swaraj*, two notions from Jeevan Vidya philosophy developed by Shri A. Nagraj. With this outlook, reference is made to the learning of skills to fulfil one's basic daily needs – *Swatantrata* and knowledge at different levels of consciousness in order to attain harmony with self, body, family, society, nature and universe – *Samajikta*.

What I would like to point out here is my understanding of social interaction as systemic in nature. I consider learning as a means for achieving progress at different levels, therefore not dissociating the individual knowledge from the organic meaning it acquires in the system. Different contexts

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[12] Empowerment: Whose concept?' Integra Review, Issue 6: Summer 1999, p. 4. Cited in: Pimparé S. Developing learning communities – Beyond empowerment [online]. Paris: UNESCO, 2005, p.29 Available at: <http://portal.unesco.org/education/en/ev.php-URL_ID=43921&URL_DO=DO_TOPIC&URL_SECTION=201.html> (viewed on 2005-11-21).

[13] Ibid

provide different levels of reference. Each context i.e. various social groups, turn one's knowledge exactly into just that – knowledge. The value of knowledge is an attribute that is granted, or recognised differently at each of these various levels.

Preferring a systemic outlook, paralleled with the Hindu Jeevan Vidya philosophy, I shall situate the notion of empowerment out of a dichotomic relation between oppressor and oppressed. I am not saying that oppressors and oppressed do not exist, nor am I saying that they are both responsible for the situation in which the tension between the two exists. My stance is that of considering the entire system in order to shift power one has in a given context in a gradual and continuous movement of change. This gradual evolution places the players out of a strategy of opposing forces in favour of a harmonious empowerment. I would also like to stress that I do not believe that power gained for one implies power lost for the other. Once again situating the relation out of a dynamics-of-dichotomy is envisaging progress for the whole; else it would be hypothesising that no development can wholly exist.

The definition for empowerment could therefore be: granting or providing means for the dynamics of liberation. This liberation is that which enables a person to depart from what is known to him or her, and to set out to discover and to build new situations and knowledge.

In what way can we suggest that The Trees of Knowledge actually do contribute to empowerment as I have defined it? According to this definition learning surely contributes to liberation, at least in the sense that education is a learning process to build knew knowledge. Trees of Knowledge as a support for learning; and See-K, as a tool to support Trees of Knowledge, can contribute to learning dynamics. Hence, we can argue that they provide means for the dynamics of liberation.

Many means are used in educational processes to enhance learning, though there is something of particular interest to us when using Trees of Knowledge. The particularity is that the tool helps situating, and thus recognising individual knowledge as part of the group assets. Providing cartography of group assets is empowering oneself in the context of the group represented by the Tree. The group, through individual initiative can then evolve in a direction that harmonizes all efforts in the direction of the social project the group has.

Obviously we are on the verge of many other sciences like social and political sciences. Implications related to values the group sets forth as guidance to each individual's action play an

important role. As long as the group pursues the goal of learning, one may assume the outcome coherent with our definition of empowerment.

Trees of Knowledge can favour, through the recognition of acquired knowledge by some, the mentoring of others who may wish to develop their knowledge or skills in a specific area. Knowledge in a specific area can be made recognisable thanks to knowledge mapping. As mentioned, recognition lies at the basis of empowerment. By building a system that enables an alternative to recognition by the institutionalised educational system (recognised curricula, diplomas, titles and so forth) we are laying the basis for the development of a society of knowledge.

It is worthy of noting that computer networking on a global level, namely Internet, has further contributed to the development of awareness around social interaction in knowledge construction. Computer technology has contributed greatly to thought and theory in human sciences. These technologies have instigated the development of prototypic software in the early nineteen-nineties that materialised, so to speak, the concept of Trees of Knowledge. Nowadays, interest is growing in the field of co-learning and interaction between learners. This is most probably related to new communication habits and practices stemming from the use of online forums, Wikis, collaborative work environments and learning content management systems that are built around constructivist learning paradigms. Trees of Knowledge are clearly a means to develop cooperation between learners as it enables the recognition of skills and knowledge which is a key issue in providing people with a means for reciprocity in learning activities, thus empowering both individuals and societies as a whole.

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