

From implicit skills to knowledge.

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1. What is implicit knowledge?

1.1. We need a definition.

Tacit knowledge is often reported to be "what we know but do not express ". In such a general definition we cannot get any indication about how to use this knowledge or even how to find it. We know that it stands somewhere in the mind of someone and that it can be useful, but it doesn't correspond to any single conceptual category. This sparks some useless slogans like:

- "it changes your approach to the customers";

- "it is your most valuable asset",

and so on.

Although containing an element of truth, such slogans do not help us in developing organisational and technical tools that can capture the implicit knowledge and make it available to a wider arena of actors.

1.2. Implicit knowledge as a set of relationships.

1.2.1. Starting from what we know.

A good starting point in the search for implicit knowledge could be a deeper examination of

the way we act normally in our working environment.

During the daily life every one of us makes use of a wide variety of information. Starting from the label of the morning corn flakes, going on with route signals, radio and the newspaper an enormous amount of information, housed in a surprisingly wide variety of physical objects (I'll call them *information stores*), populate our daily life.

In the workplace clerks and other "knowledge workers" use a full set of information and tools where information is stored, shared, distributed, and delivered.

Agendas, telephone directories, folders, databases and web sites are commonly used information stores for everyone and are also "explicit knowledge" containers. The key is to identify the business as well as the social mechanisms which maintain the vitality of these stores.

1.2.2. Implicit knowledge as a glue.

But let's go on with a more specific example. Everyone of us has one or more big folders where documents about projects, or specific issues, are stored. When you open one of these folders, it is more or less clear to you the internal order of the papers, articles, newspapers and business cards you putted inside the folder. Is almost clear to you who are the authors of the different papers, how to find them in your personal telephone directory or on the web, and the vision of that papers brings up to your memory further important things, like your judgements about the results of the project and the values of the different contribution to the final result.

But what will happen when you pass your folder to another friend or colleague that wants to know more about that project?

Usually you have to explain those relationships. As they are so complex and rich, the best way to do it is just to say which papers are the most valuable in the folder.

The general, overall vision of that project acted for you as a glue for your understanding of that problem, and is not transferred with the paper.

Your knowledge is lost and your colleague will start again from the beginning.

1.2.3. Semantic values of relationships.

Relationships in the real world have different values. We can say that a document A is "better than" document B, or that "this business card is from the author of the document A".

Therefore, we can begin to define implicit knowledge as the value of the relationships established among information. If we can capture this value then we can use the relationships even without making them fully explicit.

1.2.4. Context makes value.

The above example shows another important issue. The relationships among the documents, business cards and so on stored in the folder have a value within the project, are related to that project, and the values are not absolute, but relative to that project. The same article about car manufacturing in China should be very important in a car-related folder, while less important in a China-related folder.

Knowledge goals of the information-users are very important in establishing the values of the relationship.

We can say, to add another brick to our building:

We can refine our definition of implicit knowledge as the value of the relationships established among information in a given context.

1.2.5. Multiple relationships.

Between two pieces of information we can establish more than one relationship. We can say that document A is better than document B, but also that document B is more updated than A and, again that document B is easier to read than A.

1.2.6. Relationships as chains.

It is easy to extend our definitions from a single relation established between two pieces of information to a wider set of information. As in all processes where individual steps are performed at different times, relationships are established in time as chains of separate relationships, relating a set of information in time with their use.

1.2.7. Relationship constellations.

Chains of multiple relationships constitute a constellation. The constellation will be very complex when the context or the process is complex and takes a long time. A two-year long project can contain many relationships chains which are impossible for outsiders to understand. In complex organisations the implicit knowledge of this complexity makes some experts or project leaders un-replaceable, and their natural turnover is a nightmare for general managers.

Often enterprises tend to confuse the ability to use implicit knowledge with work competencies or skills. . In this case the process of recruiting new employees is performed by looking for people with similar levels of implicit knowledge instead of looking for people with the appropriate skills. Past "experience" is required in job advertising and is used as a proxy for implicit knowledge, while ability to do and ability to learn are often undervalued.

1.3. Reduce complexity.

To manage, capture and store relationships chains and constellations, we have to reduce the complexity of all the potential links among information. The question is: how to identify the most relevant relationships? Is clear that reducing complexity will require some sacrifice in terms of potential description of the implicit knowledge. But we have to choose some starting points. We will try to find the minimal set of relationships that, reducing complexity, will maximise the amount of described relationships.

1.3.1. Transfer papers to networks.

Transferring paper to networks makes things easier. A folder is replaced by a set of web pages linking to different documents and, when possible, to databases storing other relevant and related information (names of the authors and so on). Instead of transferring papers and folders we can transfer links and reference. This is faster, but doesn't capture the full set of relationships you have established among the different issues and pieces of information.

1.3.2. Links are not enough.

Many KM projects fail by thinking that "linking relevant documents is enough to transfer knowledge".

That's not true, because links are, up to now, just pointers and do not contain shadings which correspond to evaluations. We can say that they have limited semantic value. The common feeling of frustration using the result of a search engine comes not only by the waste amount of useless links, but also by the doubtful relevance of the results.

1.3.3. Processes.

In the business world information is used mainly for operational objectives, in international trade it is used for example to gain more market share, to open up new markets, to find partners and business opportunities.

All these contexts, where return of value can be transformed into return of money, are not only knowledge acquisition processes, but also operational processes. Information is used to take actions inside a fixed time frame and following a fixed sequence of steps. In each step of a business process, some information is used by the operators and some information is produced and distributed, each process being identified as a set of logically related tasks performed to achieve a definite business outcome.

The operational context in the business world is also known as "process".

In operational contexts the value of the relationships is not only related to the goals, but also to the different steps or sub-steps to be performed.

1.3.4. The "belongs to" relationship.

In operational contexts time and processes can help to classify information as input and output of a specific step of a process.

The most useful link to describe the relationships is the "belongs to" link. A sub-task of a process "belongs to" the process, the information used and generated in that sub-task "belongs to" the sub task.

At the same time, a business card in our example "belongs to" the author of document A, while the document A belongs to the sub-task of a process. In this way we can build a full set of meaningful and transitive relationships. The author of the document A "belongs to" the sub task of the process.

1.3.5. Another property of the "belong to" relationship.

The "belongs to" link is not only transitive, but also a bi-directional relationship. The author of document A belongs to the document, just as document A belongs to its author. Also, "classical" Knowledge Representation – that is, the Cognitive Science of fifteen or twenty years ago – speaks of the "is-a" relationship and the "part-of" relationship. "Belongs to", while similar to "part-of" is not the same and has some properties of both the classical relationships.

This property, we will see, is very useful to build chains of relationships.

1.3.6. What's about evaluations?

In the "belongs to" relationship, any evaluation like "better than" or "more interesting than" is lost. But, as in the real life example we have done before, each class can be sorted using a "more relevant than" criteria or by any other metric system. It is not an unbiased criteria, as depends only on the personal evaluation of the "expert", that is, at the end, exactly what we want.

1.3.7. Identify relevant classes of information.

All information "belongs to" a relevant class of information. All information can be related or linked to more than one class. In that case each reference becomes an attribute of the information itself.

Relevant classes should be identified in each domain or information system. An authors is an instance of a class of information we can call "the authors class". As we establish a relationship between a specific author and his document we also establish a relationship between two classes. Relationships should be established and chained between classes of

information. Processes belong to a particular class, that is the "processes class". It is different from the other classes because is ordered by time, or, we can say, the timing of its subclasses and instances is a relevant attribute.

Identification of relevant classes depends on the contexts and the processes. For the operational activities of the international office of a company, the various stages of a market approach strategy are the processes. We can have an evaluation stage or sub-process, than a first contact with the market, than an introduction in the market, than a consolidation. Evaluation, first contact, introduction, consolidation are four sub processes. Each document produced or used in the process of approaching a new market can be referenced to each step. For example, documents can belong to the market evaluation process: a country profile, a market survey, a Financial time country report, an internal report, a web site with news from that country. These documents can be sorted by their level of relevance in the evaluation stage. Also lists of clients, lists of products we want to sell on that country, and competitors can be identified as useful information for this stage.

Process, clients, products, competitors authors of documents and countries should be the relevant classes in our example.

In the second stage (first contacts with the market) these classes are still relevant, but probably now internal reports produced after a visit of the market, or profiles of the best clients are now much more important than country profiles. A good author of country profiles is now less important than a good agent on that market. Sorting order differs, and the "belonging to" relationships chain make more clear to us the methodology used by the responsible of the operations in that market.

The availability of this information makes the "folder" much more clear to colleagues and new users. The "winning recipe" of information about clients, markets, products, procedures can now be transferred and reused, even if it is very complex, using the appropriate granularity in the description of the process.

1.3.8. How much is lost and how much is retained?

Now we have simple manageable elements we can use to capture implicit knowledge. Using classes (one of them being the "processes class"), ordered with a "more relevant than" criteria and related with the "belongs to" relationship we can describe a wide variety of implicit knowledge systems.

The folder containing the paper can be processed:

- each paper referenced to steps of the process (produced or used during that sub-process);
- each paper can be assigned to the most relevant classes (or the document can be described in terms of attributes);
- inside each class the owner of the folder can sort the documents in order of "more relevant than".

These three actions:

- referencing processes;
- describing attributes;
- sorting;

are the simple atomic actions we can ask of the expert or operator of an info-system.

1.4. A final definition.

We can define implicit knowledge as the value of the relationships established among information and steps performed in a given context.

2. A business case: the Netprise project.

2.1. What is Netprise.

Netprise is a pilot project that helps Chambers of Commerce and Industry (CCIs) in Italy and Germany to realise their full potential as one-stop shops for services to small and medium enterprises (SMEs) in the area of internationalisation and Foreign Trade.

2.1.1. Supporting SMEs in international activities.

A major task of the Chambers of Commerce and Industry (CCIs) is to support their member companies with fast, efficient and reliable information when handling and improving their business processes.

Especially those enterprises who trade throughout the European Union face many different obstacles during their daily life and need adequate services to strengthen and to improve their presence in these foreign markets.

The objective of Netprise is to help CCIs realise their full potential as providers of information and services which concretely help enterprise to make business, (and especially small and medium size enterprises, SMEs), and to tackle global markets by offering improved and timely services in the area of Internationalisation and Foreign Trade.

2.1.2. Using knowledge.

In order to achieve this goal CCIs should act as a single Networking Enterprise (Netprise) leveraging organisational and technological networking to create economies both of scale and of specialisation. CCIs are already well positioned to act this role thanks to the knowledge acquired in the area of Internationalisation and Foreign Trade.

Netprise intends to allow CCIs to better exploit and share the knowledge contained in the CCIs network in a better way, by taking advantage of web-based information systems.

Netprise involves, as main end-users, the Chambers of Commerce and Industry of the Italian region Emilia-Romagna as well as several German Chambers of Commerce and Industry.

2.1.3. Goals.

The wider goal of the project is to build a one-stop shop for SMEs. In order to act as One-stop shop CCIs need to become able to use more efficiently the information they gather daily and to share more widely their store of accumulated knowledge. To allow such an evolution CCIs need to initiate an ambitious and challenging change in their organisation.

The result is the creation of a collaborative networking environment where information and knowledge are shared by the CCIs to jointly improve their offer of services to enterprises and to fully exploit their potential as promoters of the local economies abroad.

In particular, the Netprise Web-based systems should:

- allow easy access to information resources by all CCIs employees, even without any extensive IT training;
- ensure that CCI users can benefit from relevant information and knowledge even if they are not specialist or active info-seekers;
- enable CCIs users to take advantage of the ongoing experience of their colleagues, even if remote experts with whom they do not normally work;
- in the final phase of the project, allow SMEs to access high-quality CCIs services on internationalisation via Internet without having necessarily to physically visit the CCIs offices.

2.2. The organisational analysis.

The first step of the project has been an organisational analysis, performed to capture:

- the main business processes of the CCIs;
- the most relevant classes of information.

2.2.1. The right description of processes.

From the above definition of process it follows that any process can be represented as broken down into tasks, each one representing a unitary component of the process. There is no absolute rule one can follow when breaking down a process into tasks. As such, a task can be chosen somewhat arbitrarily, as perceived from the process observation. A task is a meaningful, atomic and scale-homogeneous entity, whereas:

- Meaningful means that it should be significant within the process description framework, i.e., it represents an understandable, objective, measurable step in the process progression;
- Atomic means that a task should be detected as a self-contained entity whose functional boundaries and time limits - be they defined or detected - are well shaped. In other words, for each task it should be clear under which conditions or circumstances it can be considered complete, i.e., what is to be expected as the final task outcome;
- Scale-homogeneous means that all tasks in a process should be detected on the basis of a (roughly) common level of granularity, i.e., process description should be uniform as far as its breakdown detail is concerned.

The three conditions discussed above imply that a task itself is a process. For this to happen, two conditions must in fact exist:

- The task objective must be definable. This is always the case according to the very definition of task given above;
- The task can be represented by means of further task breakdown. This is always true as well since a task represents an arbitrarily chosen piece of work, and as such synthesises and embeds a goal-oriented set of operations. This fact is well known as procedural abstraction.

Each task being itself a process, can be represented in turn as a set of tasks. This procedure can be carried on, further detailing top-down until the required level of detail is reached. Vice versa, a process can be thought of as being yet another task encapsulated in a higher-level process. This procedure can be carried on further synthesising bottom-up until the required level of abstraction is reached.

2.2.2. The analysed processes.

The principal services, analysed to create the Netprise CCI Process Models in the area of Foreign Trade promotion and Internationalisation of SMEs are:

- Trade Fairs and Exhibitions - organisation of the participation of local SMEs in trade fairs abroad,
- Trade Missions - organisation of SMEs delegations to put them in touch with foreign countries for contacts, market and technical information,
- Partner Search - response to SMEs requests for commercial or industrial foreign partners,
- Grants Proposal - definition, implementation and allocation of a grant (in the area of internationalisation) to an applicant SME by the Chamber Council.,
- Partnership Program - organisation and development of a partnership program (European Union Program). The actors are the Foreign Trade Officers of a group of CCIs in the region and the European Commission that has to approve the program and to allocate the grants for the development of the project.,
- Market Research - market research and analysis performed on direct request of SME customers;
- Training And Educational Programs - organisation and carrying out of industrial and professional training for SMEs.

2.2.3. What has been done.

Each main service/process has been developed in sub-processes and deeply analysed through interviews with the personnel of the CCIs working in the international services area.

In each process we have analysed:

- time spent on the process;
- how and when the chambers get in touch with the enterprises during the process;
- existing best practices in the system;
- identification of the main problematical areas or steps in the process in order to develop further actions;
- design of the map of relationships among the people and institutions involved in the process flow;
- how and when people involved in the processes will use or produce information, what kind of information they produce (formal, informal; structured, not structured...);
- channels and media used to communicate with enterprises, institutions and other users involved in the process flow;
- a first level analysis of new metrics to be used for the evaluation of the services.

2.2.4. What kind of Knowledge has been found to be relevant?

The following kinds of knowledge have been mapped and described during the project:

- Process description and information sources activation points;
- Best Practice (expertise) and Daily Practice (experience);
- Users skills and experiences;
- Unstructured knowledge (paper, documents) and links to Internet web sites;
- Clients profiles.

For each item in this list, two common attributes have been identified to help the organisation and search of knowledge:

- the country;
- the industrial sector.

2.3. Adopted solutions.

As a general rule in the Netprise system an application has been developed or adapted to hold the data for each of the relevant classes mapped during the organisational analysis. The only requirement strictly imposed on the applications was the ability to hold the two common attributes (country and industrial sector) for all the classes.

Italian and German Chambers were generally left free to choose, inside their national networks, the preferred applications to store the classes of data, using flexible workflow solution for integration into the processes.

2.3.1. Integration of legacy systems and databases for clients

Databases of trade operators, company and country directories, product lists, supply and demand of services, bulletin boards were also in the past with old interfaces.

It has been necessary to integrate all the useful resources already in use, including the Trade Operator Database and other applications.

New interfaces and integration with other services make well known contents available to the users in an easier way, but above all, the Best Practices suggest to CCI operators which resources are most useful to carry out specific CCI processes.

2.3.2. Document management system for unstructured documents.

During the daily work, every CCI operator produces documents (letters, reports, press releases) or uses links to web sites with the normal office's applications.

To share them and make them available to the colleagues, Netprise uses a web based solution which is easy to use. You can use the document management system to upload and find documents, to publish them, without knowing HTML syntax.

If you just point out the file to the content management system, it will then provide translation into HTML format, publishing, linking and referencing the document into the system.

2.3.3. Users databases for experts.

How to find a colleague expert specialised in contracts in China?

Who knows how to deliver frozen food to Thailand?

Who has visited Australia in the last four months?

These are typical of the every day questions encountered in the CCI international trade offices.

Netprise helps you with finding the right person at the right moment, just browsing the user database and searching for the required expertise or experience.

It has been built on the real expertise of the CCI officers and it is updated by them just by working with the flexible workflow system, that takes notes of their recent and current activities.

2.3.4. Flexible workflow for daily practice and first level integration.

The Virtual Trade Office is a flexible workflow (workflex) application that integrates Collaborative Document Archives, Users and resource Maps, Legacy systems in one application.

The processes and services as described during the organisational analysis, are suggested to the operator by the application, giving him/her support for:

- the organisation of events - economic missions and trade fairs abroad, SME training seminars, market studies, etc.
- publishing standard documents in the common archive as well as for the creation of personal and group work areas available anywhere via Internet
- the harmonising of procedures for effective sharing of experience and Best Practice
- the integration of useful resources - databases, contacts, websites,
- direct re-use of past experience.

2.3.5. Process Engineer functions for Best practice.

In the flexible workflow solution it is possible to generate and declare new processes. In this way, it is not necessary to rewrite the system to implement evolutions and further development of the processes. The CCI Service Managers can act as "Process Engineers", turning their knowledge of how services are driven, as well as using the daily experiences of their colleagues, to keep the Best Practices up-to-date. Thus, an active Service Manager performs constant process improvement and continuous process re-engineering.

2.4. The solution to capture relationships: Inter-application manager.

Realise a description and capture relevant relationships among different pieces of information is not that banal a task, even with a good description of processes.

In the Netprise project the solution has been found in an inter-application software that will:

- enable the description of the relationships;

- know how each application works, describes information, describes relevant classes and hold many to many relationships;
- store and propose already used relationships.
- monitor what a user is working on in any application and ensures that the user is aware of related information and of the way the latter is related to the current context;
- take the user to related information directly inside an easy-to-use interface, preserving security, functionality and training, while actual data/documents are left inside original applications.

A similar application does not need to point at every single item of information inside the integrated applications. Only classes need be known to the inter-application integration manager.

2.4.1. A further level of integration

As a result of knowing relevant classes of information and common attributes, the adopted solution can monitor each step the CCI officer takes, and it instantly generates personalized suggestions that foresee the user's attitude ensures that every valuable chain of thought can be followed.

Suggestions are coming not only by the national system of the user but also from the other national systems connected to Netprise.

The suggestion chains appear inside the browser, either along one side or embedded as a dynamic layer inside the page.

A CCI officer looking at country information about China at the Netprise Web site will immediately see a number of suggestion chains presented as a tree within the Web browser, like:

- interested clients or exporting clients to China;
- other colleagues working on China;
- other processes concerning China (e.g. a seminar about contracts with China);
- documents and links about China.

Clicking on one of the items (e.g. documents) the author, the industrial sector, the processes and the related clients are shown. The chain can be expanded as the user wants to.

There is no querying, and no forms to be filled, nor any need for the Web site designer to try to anticipate every path any user needs to take.

2.4.2. Who makes links

Some relationships represent the substantive knowledge of end-users and can be created manually on an ongoing basis.

In practice, users will *not* normally make the effort for a manual relationship unless users have already been making substantial effort to record crucial knowledge in the organisational analysis of the processes.

2.4.3. User profiling.

The profile of the user depends on the activities performed while using the system (processes performed, country and products of interest, visited pages and links on the document management system). The expertise depends on the real activities performed as well as on the self-declarations.

2.5. Timing and actual status of the project.

The system components were introduced in the order listed above. The development and introduction of new features has been slowed down to reduce the progressive difficulties perceived by the CCI officer when using the more sophisticated functions of the system (like

the Process engineer functions).

The introduction of the interapplication manager has been delayed to promote a wider user of the existing components of the system and to produce further refinement of the user interface.

The adoption of the system components has also suffered from different behaviours in sharing knowledge by different users. There are still users thinking that knowledge has to be kept inside their heads to prevent loss in power. Most people do not realise that knowledge, unlike money, *increases* in value every time you use it, and disappears when not used.

3. Lessons learned

At last we can summarise lessons learned by working with implicit knowledge by capturing systems in the Netprise and other related projects.

3.1. Focus on the final goal.

Do we really need management and re-use of implicit skills for knowledge?

Yes, capturing implicit knowledge helps us to serve our customers better, and is essential for them to develop competitive advantage. In this case, we can build successful knowledge management projects.

3.2. Be aware of your actual culture.

Even successful and profitable organizations often fail in convincing senior management and employees that a change in how people create, share and use knowledge is necessary to survive. Without the feeling of competition and potential failures everyone will think that the past solutions could work well even in the future.

3.3. Let managers guide the project, not technicians.

Without managers' commitment it is impossible to start a real knowledge management project. They have to guide technicians to develop solutions built on the desired organisation, and not to build organisations around the functions of the software system; this can have tremendous negative consequences.

They also have to guide and reward people for sharing knowledge, or system will never achieve a "critical mass" of activity necessary to stimulate constant improvement and evolution of Best Practices.

3.4. Encourage people to share information.

The existing management structures and reward systems are used in many companies to encourage people to share information. Sometimes people think that their information is not useful to others. Sometimes they don't have enough time to share, or they cannot bill the time spent to share information and write documents.

Running successful knowledge management projects requires a change in company culture and a system to encourage employees to share information and to create and exploit interpersonal networks in a more open way than in the past.

3.5. Stop for looking the "killer solution".

Knowledge management is not "the Solution" or a specific software solution, but a never-ending improvement activity. Software and hardware are important, but not the point of ensuring you succeed. The human element is much more important than software and hardware. Using and giving value to your human resources is the final goal of knowledge management tools and practices.

3.6. Build on what already exists.

Using already existing software, already existing working practices and solutions will give you

the possibility to develop a sustainable knowledge management approach, that will make you share knowledge because you want, and not because you are forced to.

Introduction of knowledge management tools should be based on what is also an organisational common practice, like working groups or quality groups. The more you use successful people, the faster you will see the results.

3.7. Keep it as simple as possible

Don't hesitate to adopt simple solutions by developing easy-to-use software and by keeping away smart features when you can live without them. Antoine de Saint-Exupéry said *“Perfection is achieved not when there is nothing more to add, but rather when there is nothing more to take away.”*

A few functions with a strong understanding of organisational processes and behaviours will be more effective than any other smart solution.

3.8. KM is a marathon.

It is possible to have knowledge management systems which capture implicit knowledge. There are many technical and organisational issues we have to consider before starting a really effective knowledge management project that will capture the above described implicit knowledge.

The goals of such Knowledge management systems are:

- capture relationships;
- make it easier by avoiding extra-efforts from the users;
- have a smooth introduction, with a minimal initial impact on the already existing working procedures.

As in each organisation there are many cultures and working attitudes and already existing information systems with:

- a manageable definition of implicit knowledge;
- a smooth approach to organisations;
- a real focus to your business environment

good operational results can be reached.