Knowledge based case studies

Znalostně orientované případové studie

J. Havlíček, J. Hron, I. Tichá

Czech University of Agriculture, Prague, Czech Republic

Abstract: In the present development of a knowledge society and with the increasing impact of knowledge on economic growth, case studies have become vehicles of knowledge which can both store and transfer it. Knowledge based case studies describe the best practices as well as solutions of complex problems. Knowledge in case studies is described in both written and symbolic form. The content and form of knowledge based case studies should be in mutual equilibrium. Knowledge based case studies are both descriptions of methods and algorithms as well as narratives. As narratives, they should have a relevant literary quality. Case studies can involve mass media into their structure and use simulation techniques as well as techniques of entrepreneurial games. Case studies can thus be both dynamic and flexible. Users can personally influence the behaviour and evolution of the process. They can choose their role in the process and can also change it whilst performing the solution. Social, cultural and traditional values are respected during all steps leading to solutions of problems. Ecological aspects and conditions of sustainable development are taken into account when solutions are analysed, recommended and accepted. Case studies present the best practices which enable users to provide benchmarking examples of their own solutions. Data bases of case studies should provide more dimensions containing descriptors which characterize the studies. In the following article, six descriptors will be recommended: domains, objectives, critical success factors, indicators, the best practices explanations and case characteristics. These enable to sort out, categorize, classify and stratify studies in a data base and are helpful in assessing their quality. A vertical structure of the data base facilitates classification and ordering of studies according to subject areas. A horizontal structure of the database enables classification of case studies from the user point of view.

Key words: data, information, knowledge, case study, complex problem, knowledge based case study, best practices, benchmarking, database of case studies

Abstrakt:. S rozvojem znalostní společnosti a s rostoucím významem znalosti jako důležitého činitele rozvoje podniků se případové studie stávají objekty, které uchovávají a zajišťují transfer znalostí. Znalostně orientované případové studie popisují úspěšné řešení komplexních problémů. Znalost je v případové studii popsána textovou, nebo symbolickou formou. U znalostně orientované případové studie je vyžadována rovnováha mezi jejím obsahem a formou. Případová studie obsahuje popis řešení, tj. algoritmy, metody a postupy implementace a je to také literární útvar, který by měl mít dobrou literární úroveň. Znalostně orientovaná případová studie může pro prezentaci znalosti využít multimediální prostředky, simulační techniky a techniky podnikových her. Případová studie se tak stane dynamickou a flexibilní a uživatel může zasahovat do jejího děje, ovlivňovat jej a získat tak lepší poznatky o řešení problému. Do případové studie je třeba rovněž vložit doprovodné a rozšiřující poznatky a informace o sociálních problémech, problémech trvale udržitelného rozvoje. Případové studie bývají příklady nejlepších aplikací a uživatel může pomocí nich také porovnávat úspěšnost vlastního řešení komplexního problému. Databáze případových studií musí mít více dimenzí, do kterých se ukládají identifikátory. V článku se doporučuje šest dimenzí: domény, cíle, kritické faktory úspěšnosti, identifikátory, vysvětlení postupů nejlepších aplikací (best practices) a formální popis. Tyto identifikátory umožňují případové studie uložené v databázi třídit i hodnotit jejich kvalitu. Vertikální uspořádání databáze případových studií dovoluje libovolně podrobné třídění podle oboru, horizontální uspořádání umožňuje třídit případové studie z hlediska uživatele.

Klíčová slova: data, informace, znalosti, případová studie, komplexní problém, znalostně orientovaná případová studie, příklady nejlepších aplikací, benchmarking, databáze případových studií

The word "knowledge" is nowadays largely used and overused. There are some situations which have virtually nothing to do with knowledge and yet they tend to be characterised as such. Not only in common conversations, but even in scientific articles and inputs, knowledge is sometimes used inadequately with misunderstandings as a result. The equivocal usage of the word knowledge is based on the insufficient identification of the concept of knowledge and its exact delimitations within the concept cluster "data-information-knowledge". The problem of identifying and delimiting knowledge in scholarly circles has already been addressed in another article of this journal (Havlíček et al. 2006; Havlicek et al. 2003), where knowledge has been described from the point of view of matrices and knowledge life cycle with regard to place and time, from the point of view of Jung's classification of the human psyche, from the point of view of social educational systems, institutional learning etc. In this article, we will be concerned with case studies which, being specific literary units, can store knowledge and also insure knowledge transfer to various educational institutions at different educational levels. Case studies are generally used in textbooks. The development of IT and mass media allows their presentation in virtual data bases, wherein they can be stored, diffused according to the needs of users and even updated and expanded. Case studies thus do not require to be directly correlated to the specific study material or lecture cycles as their part and parcel. Case studies may be available to the user independently and in a great quantity out of the range of standard study materials and the user may choose either on the basis of recommendations made by a teacher or even according to one's own discretion. A data base of case studies may be common to more than one educational institution which co-operate in their elaboration and use (Antonelli 1999; Mentzas et al. 2003).

OBJECTIVES AND METHODS

This paper focuses on two issues related to a) requirements to be met in order to insure the safeguard and transfer of knowledge; and b) classification and description, which allow case studies to be filed and subsequently used for extracting data according to the subject and study demands.

A thorough literature survey and experience gained in various projects served as the starting point to discuss the two major issues: characteristics and features of knowledge based case studies and structure

of the database. The four layers in both horizontal and vertical dimensions are described..

RESULTS AND DISCUSSION

General characteristics and features of knowledge based case studies

A case study should provide the user with a clue as to the solution of a complex problem. A case study should also enable the user to solve any other similar types of problems. As a conveyor of knowledge, a case study features both the object and the process. The object feature of a case study is manifest in its literary *form.* Its process feature is manifest through its pedagogical and didactic *content.*

As any other story, a case study deals with living people who work in teams, negotiate, act and live their own social life. Case studies should describe the real world and real life. As such, they should be able to illustrate to the user both good and bad effects. An exact description of reality is the most consequential feature of a case study.

A process case study describes approaches using algorithms, formulas and rules in the process of (i) identification of the problem, (ii) design of solving procedure and (iii) choice of the optimal or "good enough" solution.

A case study is also a pedagogical facility and must be adjusted and adapted accordingly in order to accommodate its didactic purposes. Simplifications can be introduced, some data may be changed (some may be latent), real problems can be moved through time and space. There are many varieties of case studies. Case studies may vary according to the nature of problems, the methods used and the solutions that the users expect to gain from their presentation. There should be a balance between the content and the form of a case study. Not all case studies satisfy this prerequisite. In many literary sources, we find case studies, in which an imbalance between form and content is quite evident (Barbazette 2003):

1. Some case studies seem to be "black and white". The stories are purely optimistic or purely pessimistic, contrary to real life, which may be grey.
2. The user/reader may be only a passive observer and cannot actively influence the behaviour manifested in the story. He/she cannot influence the process and change data or rules and get an immediate and appropriate feedback. The conventional form of a case study is a written text with tables, graphs and pictures. The user is a passive user. He/she cannot

influence the process and change it according to his/her opinion.

3. Case studies may be concerned with the main restricting conditions of a problem and may not consider or involve other social, cultural, gender and national impacts. In other words, case studies may be self-centred. The user is involved in the problem without being disturbed and challenged by the surrounding problems, which are seemingly not pertinent to the core problem. Human factors are not involved.

4. Most case studies may describe the behaviour and action of rather big and very well known companies with the highest positions in the market. There is a lack of case studies which operate on the level of middle management and deal with smaller business, low budget and non profit organisations.

5. Solutions may often be presented as unique, derived from feasible variants under one criterion. Case study should prefer the ways of multi-criteria decision making.

6. Stories may be too simple, more or less cold, and may be the same for all readers. They do not vary according to the audience. No elements of play and fun are involved.

7. Case studies may be presented in a rather static form devoid of any dynamic and flexible features. The teacher is not able to purposefully change the frame and design according to the specific didactic needs.

Many case studies today are presented on video, in films, DVD etc.). Those visual means are used to better describe both the environment and process of solution. However, the imbalance, as described above, often remains (Bennet, Bennet 2000).

The up-to-date ICT environment enables us to develop case studies which satisfy the equilibrium prerequisite between form and content, e.g. in which the object-centred and the process-centred character is integrated. Such case studies may be created according to the following outline:

1. The user is involved in the problem and motivated and/or educated by the means of multimedia support. Problems and environment are supported by mass media.

2. The user can personally influence the behaviour and evolution of the process of decision making, i.e. the complex problem solution. The user can choose a role of one of the characters featured in the case study and behave as an actor who will influence the course of the story. This can be accomplished through simulation techniques and principles of business games.

3. The user can also change his/her role whilst actively acting and performing the solution. He/she can be involved in the case study in the role of a manager, an advisor or an observer.

4. Equal rights between women and men (gender problems) may be illustrated while solving the problem as an organic part of the story.

5. Social, cultural and traditional values can be respected and implemented during all steps leading to the solution.

6. Ecological aspects and conditions of sustainable development may be taken into account when solutions are analysed, recommended and accepted.

7. Information technologies and modern analytic quantitative and qualitative methods should be used as much as possible in all steps leading to the solution.

8. Multimedia support should be used in order to induce the elements of play and fun into the educational process. This motivates the users and makes them to study easier.

9. Case studies are flexible and can be easily adapted to a new situation/problem according to the pedagogical needs; the characters may be changed, the environment may be modified.

Knowledge case studies, benchmarking and best practices

Knowledge based case studies may be considered as vehicles that provide users examples of the best practices and thus enable them to copy or benchmark according to their own problem solving methods.

The best practice and benchmarking are concepts which are quite easy to define in principle but very complex to operate with. Case studies recognised as examples of best practice are very relative assumptions. In reality, this implies seeking more examples of good practice or good performance as methods, processes and procedures used within an organisation (or between organisations in a project or network) that lead to the successful achievement of its goals and implementation of its policies, whatever these may be (LOCAL FUTURES GROUP 1999).

Benchmarking means that an individual organisation case project or network identifies and measures its own methods, processes and procedures with the result of finding the best practices. This enables the organisation to compare its own operations and achievements with the best available ones and thereby to design and implement its own strategy for improving performance. It is obvious from the above that

the best practice is a very subjective concept and that it is not possible to directly transfer the experience of one case study fully to the unique situation and assumptions of another. Although it may be relatively easy to determine the precise methods by which certain goals are achieved, in specific cases successfully transferring these to new situations and contexts depends upon the degree of "receptivity" (both ability and intent must be present) and of "similarity" of each new case study and its background conditions, and these change from case to case as well as over time (Millard et al. 1995; Millard 1999; Ralph, Peters 2006; Hoffman 2005).

What is the best for one organisation in one situation may not be the best for another. This does not imply, however, that nothing can ever be learnt or transferred. The purpose of presentation of the best practice and related benchmarking techniques via case study is to understand what the best practice methods are in the given set of conditions and with the given goals, and when, how and under which assumptions the transfer of these methods from one case study to another can successfully take place. It is a learning process, both for the individuals and organisations using the technique, meant to improve the technique itself, which will never be perfect but which nevertheless, if professionally and critically carried out, can provide immense benefits (Biser, 2002; Davenport, Prusak 1998).

Database of case studies

Structure of the database

The database of case studies is a virtual environment in which cases are stored. It is also an interface between cases and users. Being an interface, the database enables to:
a) Store, maintain, improve, upgrade and sort out cases;
b) Provide selection among cases according to different criteria, such as problems, solutions, quality, targets, etc.

The structure of a database that satisfies the above mentioned requirements should consists at least of six dimensions:
  1. Domains,
  2. Objectives,
  3. Key factors,
  4. Indicators,
  5. Explanations of the best practices,
  6. Case characteristics.

Domains define the main environment in which decision making takes place and/or problems are solved. They are like the subject catalogue used in libraries. The following are standard classification lists of branches and areas of human activities as used in the OECD, LCC/DDC, Frascati and other organisations and agencies (OECD 2001).
– Examples of domains:
– Work & Skills;
– The digital SME;
– Social Cohesion;
– Regional Development;
– Better use of Social Capital;
– Agriculture;
– Plant production etc.

Objectives are assigned to each domain and describe what the aims of the solution of the complex problem presented in the case study are, i.e. "what do we want to achieve"? In answering the question "what needs are the most important to the user?" objectives have to be user-centred. For example one case can represent more objectives and a set of relevant objectives for each user type. In this sense, the user objectives are the traditional critical success factors but at a higher level, e.g. useful for resolving human resource problems, cutting costs, learning, etc.

Examples of objectives:
– to improve access to information for all;
– to develop production plan of a farm;
– to start with organic farming;
– to improve ICT training for adults; etc.

Critical success factors (CSFs) are factors that are "critical" in order to achieve success in the given objective. A set of CSFs is determined for each objective. CSFs describe what to benchmark. They are mapped and measured using indicators, resulting in benchmarking scores. In this sense, CFSs and objectives are the same, although CSFs are a subset of an objective. The purpose is to select CFSs that are most important for the provider of database cases and to indicate the achievement of the given objective. CSFs must always be measured (using indicators) as changes resulting from case implementation, and which the case presents as being wholly or partially influenced by the case. However, it is important to note that no causal relations can or will be inferred.

Examples of key factors: If the objective is "to *improve* ICT training", that objective can be achieved by having the following factors:
– improved access to ICT in schools;
– improved training of trainers;
– improved educational resources; etc.

Indicators measure Key Factors. The achievement (or other results) of each CSF is measured using one or more indicators, that can be quantitative, i.e. based on real numerical data, or qualitative, based on subjective yet rigorous assessments of the level of achievement. The means by which we measure indicators are both value and scale:

– Qualitative: negative, none, some, reasonable, good, excellent;
– Quantitative: minus %, 0–10%, 11–25%, 26–50%, 51–75%, >75%.

Example: The key factor "improved ICT training programmes" is measured on a scale from 1–4 through the indicators:

– An increase in the offer of ICT continuous training programmes;
– An increase of training methods to teach ICT skills;
– An increase in numbers of ICT training participants;
– An improvement in ICT skills among target group;
– An improvement in user satisfaction with achieved progress in ICT skills; etc.

The best practice explanation shows how the score(s) of the indicator(s) for the given CSF were achieved, i.e. what assumptions and background conditions were set in place, which resource and other inputs were used, which activities were implemented, which results and outputs were obtained, and what lessons learned and conclusions were drawn (Prisma 2001). The best practice explanations prepared for each CSF will normally be colleted together within the given case in order to avoid repetition and to optimise synergy across the case. A full understanding of the best practice explanation for the given CSF can only be obtained by placing it within the context of the whole case.

Case characteristics. In addition to domains, objectives, CSFs, indicators and the best practice explanations, which are clearly domain–specific, the database of knowledge–oriented case studies will include generic case characteristics. These describe the background yet important attributes of a case which will mainly be used for searching in the database. Important case characteristics are:

Management information:
– Name and number;
– Contact details.

Content information:
– Timing of case;
– Geographic setting;
– ICT employed;
– Main actors involved;
– Number of people contributing;
– Number of people benefiting;
– The EU or other programme affiliation;
– Finance – investments and costs;
– Copyrights.

Vertical structure of the database

The structural framework of a database consists of four hierarchical levels. The top level (level 1) has been named "*domain*". Each domain subsumes a sub-set of one or more "o*bjectives*" (level 2), each of which in turn is made operational by one or more "*Critical Success Factors (CSFs)*" at the third level
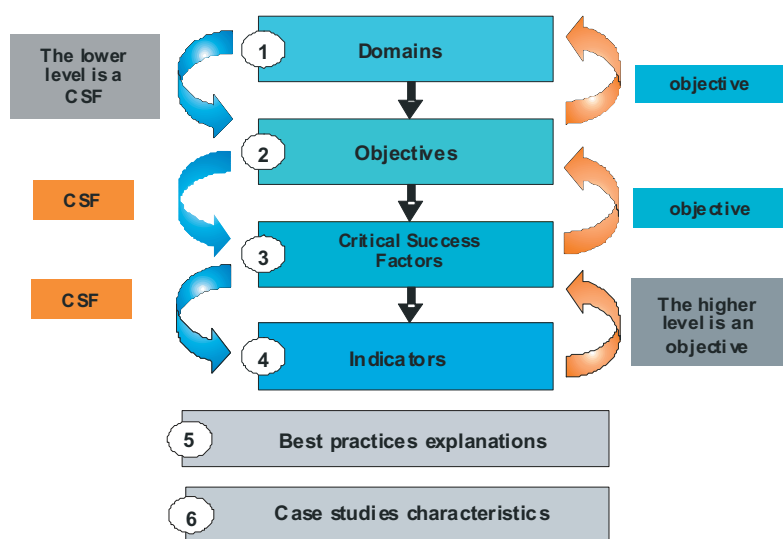

Figure 1. The vertical structure of database: "objectives" and "CSFs" by relation to each other

in the hierarchy. Finally, at the fourth level of the database hierarchy, each CSF is measured by one or more "*indicators*", see Figure 1.

It is important not to confuse the usage of the terms "objective" and "CSF" as generic concepts with their actual positioning in the hierarchy as used in the database. In principle, each of the four levels can be regarded as an "objective" in the generic sense of the word. For instance, "social inclusion" which is clearly an objective can be put on level 1 as a domain; on the second level, there can be the objective "to help disadvantaged groups". Analogically, "to support people with disabilities", which has been defined as one of several CSFs to this objective, could also be considered as an objective in its own right. And finally the indicator "improved mobility conditions for people with disabilities" could again be considered as an objective which can be further broken down into a sub-set of specific success factors. By reversing the perspective, i.e. looking from the lower to the higher level, wherein the lower level is seen as a "critical success factor" in relation to the "objective" at the level above. To use the same example: "Improved mobility conditions for people with disabilities" (level 4) is a CSF in order "to support people with disabilities" (level 3), which again is a CSF in order "to help disadvantaged groups" (level 2), which is a CSF in the domain "social inclusion". Even at the domain level, "social inclusion" would be regarded as a CSF, if an even more general objective were to be defined above it (e.g. "sustainable development").

The actual labelling of levels (whether "domain", "objective", "CSF" or "indicator") depends upon the level of specificity required in the benchmarking process.

Horizontal structure of conceptual framework

The horizontal structure of the database refers to the *unit of observation* of the best practice descrip-

tion. There are at least four different types of units to which the best practice which is contained in a provider of database case can relate:

1) The smallest units of observation examined by the database are the individual citizen or worker. They are critical success factors and the related best practices operating at this level are those practices which have a direct impact on individuals rather than on larger units as described below. For instance the CSF to "improve conditions for flexible learning" addresses in the first line the needs of employees as individuals.

2) The second unit of observation is the institutional unit, very often an enterprise, and particularly a small or medium sized enterprise. The best practices at this level will describe processes that contribute to the success of an institutional unit in order to provide a model for other units of a similar type as the one analysed. Of course, these processes will also have an impact on the individuals working in these institutional units, but the primary concern of the best practice described is the whole unit rather than its individual member/worker.

3) On the third level, the unit of observation is a geographic entity, e.g. a region. Some of the cases will describe solutions of complex problems and initiatives, the aim of which is to improve the situation for the whole region rather than for only one business. Again, the individual citizens will – in the long run – also benefit from this, but the direct target of the case study is regional development as a whole and not the selected individuals or organisations within the region.

4) Finally, there is the level of society as a whole. Since this level acts as a type of umbrella for the other three levels, "society" is the system of relationships between individuals and their institutions in a certain geographic area. There is proximity of the best practices at this level to the other levels. Cases
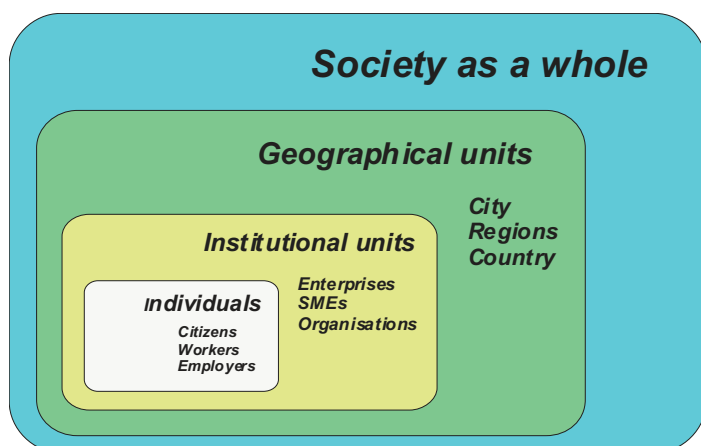

Figure 2. The horizontal structure of the database – the four units of observation

will, for instance, also be located in a geographic setting, maybe in a region, and could therefore be regarded as the best practices for regions also.

While not all CSFs within a domain will address the same unit of observation, there is clearly proximity between each one of the four domains with a corresponding unit, i.e. it is possible to build pairs. For example, the domain "work and skills" is – to a large extent – addressing objectives and formulating CSFs which have the individual worker, employee or employer as a target. If the domain concerns "small and medium entrepreneurs", the search will be predominantly for the best practices that relate to businesses as units of observation. The domain "regional cohesion" has obviously a strong proximity to the level of the geographical unit (region), and – finally – the domain "social inclusion" looks for the best practices addressing the largest unit of observation, i.e. society as a whole.

CONCLUSION

Many case studies are available in the printed study literature, on CDs or on the Web. There quality varies in content, extent, structure and design. This article formulated the principles which enable differentiation between case studies that present solutions (best practices) of complex problems, e.g. knowledge, and those cases which mediate more information than knowledge to the user. It is not a simple procedure to identify solutions of complex problems, to elaborate and narrate solutions, to articulate properties of these solutions by a set of descriptors, to grade case studies into databases, thus implementing a case study into its educational surrounding. Knowledge based case studies should involve mass media and simulations. They should offer the user qualitative, interesting inspirational and readable texts. Thus, elaboration, maintenance and performance of databases of the case studies need cooperation between professionals. It is a time and cost consuming process.

ICT and networks, connecting both educational institutions and users, enable us to build one common database of case studies. This database can become an excellent source of well classified and well described cases. Cases in the database can be properly managed, manipulated and successfully improved and applied in new but similar circumstances. Collecting as many examples as possible of good practices and/ or good performance allows us to "distil the "best" elements of all available data. The best practice thus truly becomes a statement of intent and a part of the learning process, with the aim of moving towards a higher performance in achieving the given purpose in the given situation.

There is a necessity to supply users with as much relevant case studies as possible. Let the user select the best ones (or the best possible ones). All this is achieved by implementing a common database. A common database enables users to access and share the relevant cases in many different types and levels of education. Lecturers may select open and present cases instantly, even while lecturing. Cases can be printed out or copied and then remade. Users can transfer cases on the web to their PCs, in order to help users in their self-study, etc.

Although knowledge based case studies databases will involve high costs and other related problems, universities should face the challenge and seek fundamental insights of how to produce and present a new generation of case studies in order to help organizations and people to nurture, harvest and manage the immense potential of knowledge, allowing them to create new maps and measures and to reinvent themselves in order to innovate and excel in the context of the knowledge society.

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Contact address:

Jaroslav Havlíček, Jan Hron, Ivana Tichá, Czech University of Agriculture Prague, Kamýcká 129,
165 21 Prague-Suchdol, Czech Republic
e-mail: havlicekj@pef.czu.cz, hron@pef.czu.cz, ticha@pef.czu.cz