Construction of a knowledge based portal for agribusiness

Konstrukce znalostního portálu pro agrobyznys

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Abstract: Virtual portal (VIPO) is designed to provide users with a single-point access to information, and tools to support their decision-making. VIPO illustrates the best practice presented in terms of case studies coded along three dimensions: field, domain and objectives. The second major source of knowledge is based on software packages made available to users including tutor support. The third part of the portal provides useful links to the existing databases which have the potential to facilitate decision making in agribusiness. All three pillars of the VIPO are complemented by on-line consultancy services.

Key words: virtual portal, benchmarking, best practice, knowledge base, knowledge unit, case study, decision making support

Abstrakt: Virtuální portál (VIPO) je navržen tak, aby potenciálním uživatelům zprostředkoval přístup k informacím a nástrojům na podporu rozhodování z jednoho místa. VIPO ilustruje příklady hodné následování formou případových studií, které jsou kódovány podle tří základních dimenzí: oblast, doména a cíle. Druhý zdroj znalostí je založen na softwarových balících, které jsou zprostředkovány uživatelům včetně uživatelské podpory. Třetí část portálu zprostředkovává přístup do existujících databází, které mohou být při rozhodování v oblasti agrobyznysu užitečné. Všechny tyto pilíře jsou doplněny on-line konzultační službou.

Klíčová slova: virtuální portál, benchmarking, praxe hodná následování, znalostní báze, znalostní jednotka, případová studie, podpora rozhodování

INTRODUCTION

This contribution draws on findings of the survey carried in 2003 (Tichá, Moulis 2004) where decision support systems available to Czech farmers were examined. The survey showed that most of the applications have a rather narrow focus facilitating only one business function, often only part of it, and that the applications are mostly data-driven, while the vast expertise in the field of agriculture is somewhat neglected. In line with the research project objectives (QF3259 Virtual support for farmers decision-making, funded by the National Agency for Agricultural Research), and fostered by the survey findings, a knowledge based portal is being designed with the aim of facilitating the decision-making process by providing single-point access to information and tools (cases, studies, decision models and software). The knowledge base will consist of a set of databases with a common structure, common searching and usage facilities, and common updating possibilities. The portal (VIrtual POrtal, VIPO) will be tailored to meet the needs of both agribusiness facing major decision requiring support, and individuals who seek opportunities to develop their decision-making skills.

OBJECTIVES AND METHODS

The design of VIPO follows the standard procedure of a knowledge based portal with the emphasis on benchmarking and the best practice as the underlying concepts.

Benchmarking and best practice concept

Benchmarking is a technique where an individual organisation, case, project or network, identifies and measures its own methods, processes, procedures and the results against the best practice thus revealed. 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 the improved performance. The greatest benefit of benchmarking is the learning effect of how the best performance is achieved, i.e. through understanding the best practice (Bogan, English 1994).

The best practice is focused on seeking those methods, processes and procedures used within an organisation which lead to the successful achievement of its goals and implementation of its policies, whatever these may be. The best practice can be: a method, a tool, an organisation, a system or a technology, i.e. anything used to achieve excellent performance. Identification of the best practices facilitates the process of learning and applying these practices in new but similar circumstances. The best practice concept is more a statement of intent and part of a learning process with the aim of moving towards higher performance in achieving the given purpose in the given situation (BEEP 2000).

Users inspired by examples of good practices can start changes in their organisations in order to make the business better.

The VIPO's methodology approach consists of a series of steps which include:

1. Research the background to the five fields and six domains of benchmarking and the best practice.
2. Clarifying user needs in the fields and domains.
3. Knowledge base structure and design.
4. Defining criteria for case study selection.
5. Validating and updating case studies including copyrights and permissions.
6. Case processing – coding case characteristics, identifying indicators and preparing best practice explanations in texts (stories).
7. Evaluating usefulness of knowledge base using pilot groups.
8. Analyse case studies for patterns – synthesise the best practice.
9. Selecting useful and demanded study texts and materials.
10. Creating and offering suitable software support for decision making.
11. Organising online professional help and assistance at departments.
12. Reviewing and refinement of the methodology.

RESULTS AND DISCUSSION

VIPO is composed of three parts (Figure 1):
1. Knowledge base of the best practices.
2. Self-study materials and lines to other relevant information sources.
3. Free software tools for decision making support.

Knowledge base of the best practices

Knowledge base of the best practices is the basis of the VIPO and represents a comprehensive knowledge base, accessed via the Internet, which anyone can use to:
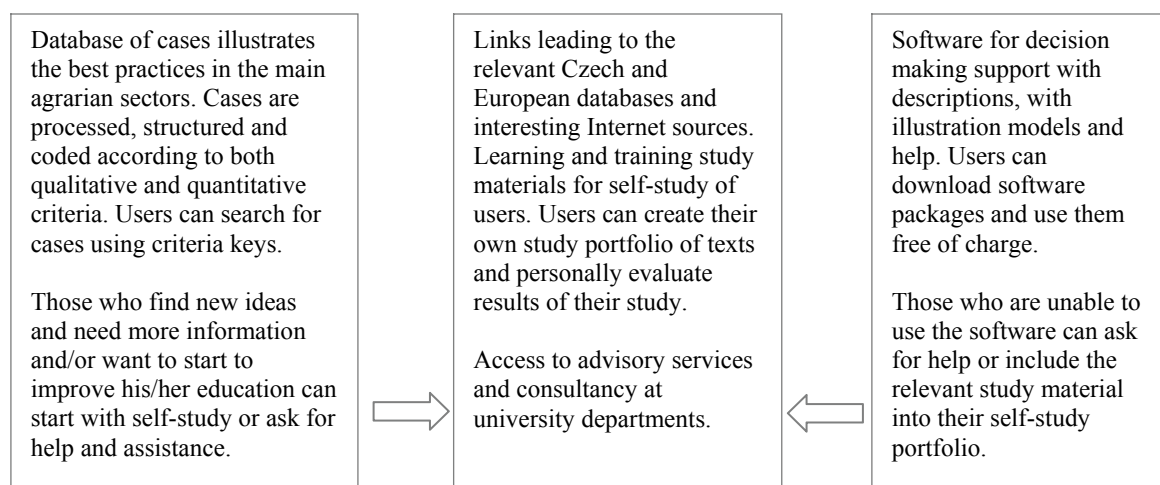– Survey of who has done what in a variety of selected fields of practice.

Figure 1. Structure of the VIPO knowledge base

Database of cases illustrates the best practices in the main agrarian sectors. Cases are processed, structured and coded according to both qualitative and quantitative criteria. Users can search for cases using criteria keys.

Those who find new ideas and need more information and/or want to start to improve his/her education can start with self-study or ask for help and assistance.

Links leading to the relevant Czech and European databases and interesting Internet sources. Learning and training study materials for self-study of users. Users can create their own study portfolio of texts and personally evaluate results of their study.

Access to advisory services and consultancy at university departments.

Software for decision making support with descriptions, with illustration models and help. Users can download software packages and use them free of charge.

Those who are unable to use the software can ask for help or include the relevant study material into their self-study portfolio.

– Measure and compare (i.e. benchmark) themselves against the best examples in their selected field.
– Investigate what constitutes the best practice in their selected field using real-life examples and achievements.
– Access a variety of up-to-date surveys and analyses of the best practice in their selected field.

VIPO provides users with a ready made Internet platform for inputting, analysing, benchmarking and accessing the best practice examples, projects and cases. VIPO has initially selected five broad fields such as:
– plant production,
– animal husbandry,
– forestry, pond culture and fishery,
– non-production activities, services for agriculture,
– agriculture production processing,
but its approach can in principle be used to benchmark and access the best practice in any other field.

Conceptual design of case coding

VIPO knowledge base can be depicted by three dimensional cube coordinates of which are the "fields", "domains" and "k-units". Soft indicators express the relevance of the case with respect to the given objectives (Figure 2).

This means that each case gets three main measures describing the level of consistency for the field, domain and objective. These data are topped up with a number of other characteristics namely managerial characteristics and the best practice explanation.

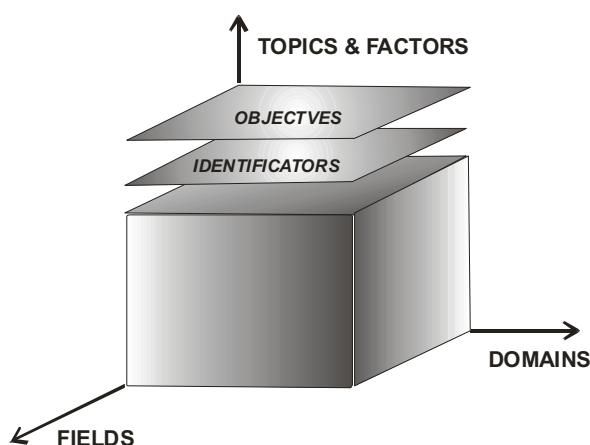This coding system makes it possible for users to find information according to their requirements.

Figure 2. Three-dimensional design of case coding

It is obvious that the "best practices" refer to different processes, settings and target groups, for instance in terms of economic sector, social background or type of activities analysed. Many cases will overlap. In the VIPO, a generic distinction among the level of correspondence with the field, domain and knowledge unit and the level of achieving the objective will be measured by a set of six soft identificators. One case study can be denoted by more than one code in each criterion. Indicators express the fact that the item is in relation with the chosen category and measure the correspondence with the chosen topic.

The cases are classified and ranked into the VIPO base according to five selective criteria: (1) relevance to a field, (2) relevance to a domain, (3)

Fields: "Selected fields of agricultural production" – horizontal view
Plant production
Animal husbandry
Forestry, pond culture and fishery
Non-production activities, services for agriculture
Agriculture production processing

Domains: "Main activities performed in fields of agricultural production" – vertical view
Innovation, modernisation, new technologies
Organisation and management
Business environment
Regional development
Equal opportunities
Virtual society

Objectives: "What do you want to achieve?"
Sharing knowledge
Improvement of education in agriculture
Personal features and motivation improvement

Knowledge units: "Topics and factors helping in achieving of the objective" – cross sectional view
New technologies (in husbandry, in pond culture ...)
Improved innovation of products and services (in international influences for business environment in plant production, in organisation and management ...)
Networks (in virtual society, in modernisation)
Support for the mentally and physically disabled (in extra productive activities, in processing ...) etc.

Indicators: "How well the knowledge unit achieves the objective?"
No correspondence (relevance?)
Marginal correspondence
Partial correspondence
Important correspondence
High correspondence
Complete correspondence

Figure 3. Structure of VIPO base

satisfaction to the objective, (4) activity leading to achieving of the objective, (5) degree of achieving of the objective.

Figure 3 describes the structure of the VIPO base.

In addition to fields, domains, objectives, k-units and indicators, and also the best practice explanations, which are clearly domain-specific, the VIPO knowledge base includes generic case characteristics. These describe the background but important attributes of a case which will mainly be used for searching in the VIPO bases.

Other case characteristics selected, described in detail in a separate document, are management characteristics:

1. name and number
2. contact details
3. timing of case
4. geographic setting
5. ICT employed
6. main actors involved
7. number of people contributing
8. number of people benefiting
9. EU or other programme affiliation
10. finance – investments and costs

Fields

The category "Fields" brings into play the main users of the studies sorted by their main fields of business. In setting the "Subjects", it is necessary to consider the classification usage in Czech agriculture and intelligibility. The project works with the following categories:

Category: Fields

No.	Subjects
1	Plant production
2	Animal husbandry
3	Forestry and fishpond cultivation
4	Non-production activities, services for agriculture
5	Agriculture production processing

The categories No. 1 and No. 2 are the most frequent in the Czech agriculture. For combined husbandry, the code used should be both No. 1 and No. 2. The "Forestry and fishpond cultivation" contains often very specialised topics and even the way of management, work organisation etc., and it is essentially different from No. 1 and No. 2. The third category contains various services including veterinary and phytosanitary services, counselling, agricultural techniques, business and restoration. Category 4, "Non-production activities", include all items related to nature preservation, landscape maintenance and other ecological activities.

Domains

The Domains represent a set of vertical topics, which are theoretically applicable for each subject as well as for each objective.

Category: Domain

No.	Domains
1	Innovation, modernisation, new technologies
2	Organisation and management
3	Business environment
4	Regional development
5	Equal opportunities
6	Virtual society

Domains No. 4, No. 5 and No. 6 are very frequent and can be found in all project entries for Czech and European grant agencies. They are a very important part of projects with decisive influence to the final evaluation.

Knowledge units: topics and factors

A set of knowledge units is determined for each domain and objective. Knowledge unit expressed as a special topic of interest or special factor of activity describes what to benchmark, and it is these that are mapped and measured using indicators resulting in benchmarking scores.

It is possible to find an overlap of topics and factors between objectives, but also between different users and domains. The purpose is to select topics and factors which are the most important in the VIPO cases in indicating the achievement of a given objective. Using indicators, these are always measured 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.

Each of the domain topics covers a comparatively wide and heterogeneous area. The knowledge units were designed to a more precise definition of the category Domain.

The domain "Innovation, modernisation, new technologies" covers the transfer of new information, often from scientific and research institution or leading firms. News about new products and services in the market, their features and application experiences are also important in this context (Millard 1999).

Domain: Innovation, modernisation, new technologies

No.	Knowledge units
1	New technologies
2	Improved innovation of products and services
3	Support for sustainable development
4	Organic farming

The domain "Organisation and management" deals with new approaches and practices in this area and should serve as a support for managerial work.

Domain: Organisation and management

No.	Knowledge units
1	Management of business processes
2	Matching of human capital to business needs
3	Organisational structures
4	Scientific methods in managerial decision-making
5	Management of business processes

The following domain "Business environment" brings experience from exploitation, assimilation and induction of externalities.

Domain: Business environment

No.	Knowledge units
1	Government regulation and control tools
2	International influences
3	Financial support offers and grant calls
4	Orientation in market surroundings
5	Price, customs and financial politics

The "Regional development" is connected with all aspect of life in rural areas including support of regional identity and specifics.

Domain: Regional development

No.	Knowledge units
1	Infrastructure, transport, networks and services
2	Regional governance and self-government
3	Regional associations and societies, well-balanced life style of citizens and communities (culture, sport, free time)
4	Improved regional identity and cooperation
5	Improved and protected natural landscape and human settlements
6	Support of tourism and agri-tourism

In modern society, the "Equal opportunities" have acquired new consequences, and solutions of dis-crepancies in this area have become of considerable importance for the society sustainability and elimination of conflict situation.

Domain: Equal opportunities

No.	Knowledge units
1	Equal opportunities of men and women
2	Support for mentally and physically disabled
3	Support of work and social engagement of people after interruption of professional carrier or before its termination
4	Inclusion of minorities
5	Support for active and valuable life of the elderly

In line with the policy of the Czech government and EU measures, the project contributes to the European e-society building. The users have to learn how to use ICT and Internet first and then how to apply them for increasing competitiveness of their undertaking, raising their value in labour market, and generally improve the quality of life. Corresponding cases will be placed into the domain "Virtual society" (European Commision 2001).

Domain: Virtual society

No.	Knowledge units
1	ICT and Internet exploitation for increasing competitiveness
2	e-business and e-administration
3	Improve ICT training, raising PC literacy

Objectives

In answering the question "What needs are most important to the user?" the users' objectives are defined. In this sense, the users' objectives are the traditional success factors but at a higher level, e.g. resolving human resource problems, cutting costs, learning, etc. Objectives correspond to the European action plans and are relevant the users' objectives.

Category: Objectives

No.	Objectives
1	Sharing knowledge
2	Education in agriculture
3	Personal features and motivation improvement

The extent to which the objective was achieved is in fact the measurement of quality of the case study.

Indicators

The indicators serve to express how the case study corresponds with the chosen category. Each code must go together with an indicator. The indicator for objective in fact reflects the quality of the case.

Quantitative or qualitative measures can be used for indicators. Quantitative score can be constructed as a grade scale or as a percentage of coincidence (achievement of objective). The qualitative score uses language operators:

Indicators scales

Grade scale	Percentage	Language operator
0	0	No correspondence
1	1–20	Marginal correspondence
2	21–40	Partial correspondence
3	41–60	Important correspondence
4	61–80	High correspondence
5	81–100	Complete correspondence

The above-mentioned scales are not necessarily equal and simply assignable. The language operators represent non-robust evaluation and their expression in numbers should involve operations with fuzzy sets.

The importance of indicators in searching the database is in the ordering of chosen cases. All items with codes specified by the user are displayed in descending order of indicators. The system is similar to Internet browsers that display the most relevant item as the first one and go on to less and less corresponding ones.

The best practice explanations

The best practice explanation shows how the scores of the indicators for a given knowledge unit were achieved, i.e. what assumptions and background conditions were in place, which resource and other inputs were used, which activities were implemented, which results and outputs obtained, and what lessons were learned and conclusions drawn. The best practice explanations prepared for each case will normally be collated together within a given case in order to avoid repetition and optimise synergy across the case. Also, a full understanding of the best practice explanation for a given case can only be obtained by placing it in the context of the whole case.

Cases selection

The overall approach to the selection of cases demonstrating the "best practice" is:

– to establish a conceptually sound and realistic framework for each domain, based upon objectives and knowledge units leading to the success practice;
– to look for cases which fit into the assistance offered;
– to examine potential cases which have the full and convincing documentation and explanation as to how this success has been achieved, and which can stimulate self-learning and innovation by VIPO users;
– to incorporate cases taking account of the overall balance of geographic spread and type.

Although as a working rule 'excellent cases' are the primary focus, it is recognised that effective learning also comes from cases that give insights into problems or failures, and thus help to contribute to the best practice learning strategy (Havliceket al. 2004).

Case material is based on the existing research, gathered through evaluation reports, the Internet, scientific and management journals, government reports, organisations, experts and potential VIPO users.

Cases are chosen by a team consisting of experts and technicians. Experts provide a selection of cases using multi-criteria methods of the complex analysis of the variants such as the Saaty method, Fuller method, Sequence method, etc. Generic case characteristics are then determined; the best case is structured, described and coded. The technician then places the case into the knowledge base and ensures its accessibility.

Case updating and validation

If selected for inclusion in VIPO, the case is:
– checked for accuracy;
– updated as required;
– validated if possible;
– referred to case contacts for appropriate approvals and release.

Updating captures the latest developments. It fills gaps in knowledge units to ensure that there is an adequate coverage and to standardise against the measures used in other cases.

Where possible, the viewpoints of a variety of case stakeholders are sought, both in initial research of the case through secondary sources, and in any follow-up research. This is particularly undertaken in situations where it is suspected that significantly different views about the case performance, and the winners and losers of this, are present.

As far as possible within the resources of the project, independent sources will be used to verify the content of a case. Such sources may include academics, the beneficiaries of such cases and other secondary sources. It is recognised that this may occasionally be impracticable, because of the resource and time constraints, and in such instances they will be put into the knowledge base.

Self-study materials and supporting software

Study materials based on feedback following from the "best practice explanations" of cases and supporting software are attached to the knowledge base in VIPO. These packets of e-learning texts and relevant software will help those users who want to assess their skills, competences, personality features and train themselves to become able to discover and implement new ideas in their entrepreneurial activities. Study materials consist of modules and are supported by user-friendly, motivating and entertaining multimedia applications. This makes it possible for the users to start with individual learning at the optimal speed.

To each study topic, a special questionnaire is given to show the users what additional training they need, in which areas of activities in the agrarian sector and related industries they may improve their education. The questionnaires should also enhance the motivation of users so that they will be encouraged to utilise and improve their existing skills and competences, and to improve their enterprise in these areas (Havlicek et al. 2004).

Topics of study have been divided into two parts, namely a) common topics and b) special topics.
a. Among "common topics", there are included themes: Essential Personal Competences; Skills and Proficiency; Self Development and Motivation Training; Essential Entrepreneurial Competences, Skills and Proficiency in Knowledge Economy; Public Relations, Marketing, Ethics; Finances, Investment, Banking; ICT competences and skills; Decision Support Systems in Entrepreneurial Decision making; Intellectual Property; Vocationally Oriented Language; etc.
b. Among "special topics", there are elaborated themes such as Ecology and sustainable development; Ecological policy of the EU; Economic spreadsheet of ecological farm; Marketing of organic farming produce; Basic technologies of ecological farming (plant production and special crops, main breeding and special breeding); Quality and certification of commodities; System of national and the EU support for organic farming; Information technologies and information systems supporting organic production; Ecological leisure and hospitality management; Modern methods of plant protection (parasites, weeds, plant protection procedures); Consumer protection; ICT and GIS in Transportation; etc.

Special topics will be continuously developed with relevance to the "best practices" discovered in knowledge base of the VIPO.

CONCLUSION

The knowledge based portal for agribusiness draws heavily from the experience gained through the EU funded project "Best eEuropean Practices", which was successfully completed in 2004 and applies the methodology of case study coding. However, by providing the single-point access to other resources, it goes beyond the BEEP database potential. The VIPO is ready for pilot testing; close monitoring of the testing phase is likely to bring new insights which will facilitate its further development. The project is to be completed in 2007 when tested and updated portal will go public for the benefit of the Czech farming community.

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