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19 Expert systems for consulting in business start-up phase

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Expert Systems as a help to founding a Business

In an economy which is marked by strong structural changes like that of the "Ruhrgebiet" (Ruhr-Valley) of Western Germany the necessity of successful business start-ups becomes increasingly apparent. Successful foundations of this kind create new jobs and support structural changes.

By what means is it possible to help new enterprises to become successful?

The basis of a successful business start-up is laid with the decisions of the actual founding process. The necessity of making the best possible and most adequate decisions usually surpasses the abilities of the founder. Up to now a founder has found himself employed in a subordinate position in a firm and has not been in the possession of any knowledge in the field of founding a business. The wide range of problems involved in founding a new business (contacting public authorities, facing state regulations, sorting out possibilities and necessities of finance, formulating a deed of partnership, choosing the adequate legal status, choosing possible suppliers, planning a system of distribution, assessing the market, etc.) as a rule prove to much for a founder of a new business.

For all these problems the prospective founder of a firm has to rely on the support by consulting experts. These are to be found in consulting firms, in the practices of lawyers and tax advisers, banks or regional development agencies. But experts can only offer their advice on specific business

domains. Bankers can offer advice on the best possible mixture of public money and private bank loans, tax advisers sort out the legal form of a business with a minimum of tax burdens, lawyers make up the business contract. Business consultants possess knowledge on all these domains, but mainly assist in setting up a business plan for the first years of the prospective firm and in other domains refer to expert advice.

The short-comings of the current procedure of business consulting can be described as follows:

1. Expert knowledge on business consulting is scattered about among too many different types of advisers. This may well lead to decisions which do not take into consideration all possible arguments. If e.g. a tax adviser recommends the legal status with the least tax burden, he may not consider aspects of company law or financial aspects.
2. The domains in which the individual experts for a business start-up feel at home are of a very complex nature. E.g. the combination of public subsidy programs requires the knowledge of an enormous number of details which constantly have to be updated. Decisions by advisers can be impaired by a shortage of time, stress, and lack of concentration to an extent that important aspects may remain unconsidered.
3. Advisers often make decisions for a founder which he is unable to understand. E.g. the sense of particular clauses of a deed of partnership are not easily understood by the prospective founder.
4. Once a consultant has finished his job, valuable experience is lost.

Through the elimination of these short-comings, business consulting could be much more efficient and thus lead to successful foundations of new firms.

One possibility to overcome these problems is offered by the employment of expert systems.

Expert systems are computer programs that simulate the reasoning of human experts in a certain domain (Chadwick and Hannah, 1986). They are most efficiently employed with complex problems to which there exist no algorithms for a solution (straight-forward solutions), but knowledge gained by experience in the shape of thumb rules and heuristic processes (Kurbel, 1989; Schnupp and Leibbrandt, 1986; Savory, 1989; Mertens et al., 1990).

How do we rid ourselves of the above-mentioned short-comings?

1. Expert systems can comprise the expert knowledge of many different experts on one particular domain. This means that e.g. concerning the choice of the legal form, tax considerations, legal implications of the choice of business form, and financial aspects can be considered

all at the same time. Thus employing the expert systems means tapping on the knowledge of the tax adviser, the lawyer, and the banker at the same time.

2. Expert systems are most efficiently employed with complex domains. They most effectively and most systematically take into consideration all known aspects and remain unimpaired by such factors as stress. By constantly updating these systems they are adjusted to the most recent standard of knowledge.
3. An essential factor of expert systems is the explanation facility. It is designed to explain its user why particular decisions are made and justifies the steps used to reach them (Schnupp and Leibbrandt, 1986; Kurbel, 1989; Waterman, 1986).
4. Knowledge that has been stored in an expert system cannot be lost. Consecutive experts can take recourse to all previously gained knowledge stored in the system.

Conclusion

Supporting a consulting expert by a bundle of interdependent expert systems (e.g. for choosing the adequate legal form, for designing and formulating a business deed, for a comprehensive survey of all available state subsidies, etc.) can increase the efficiency of consulting. The consultant uses the system together with the prospective founder. Thus he is supported when coping with the problem of complex domains whereas the founder is provided with explanations concerning individual decisions which he there and then can discuss with his consultant.

It stands to reason that consulting is not necessarily supported by expert systems only. They can be accompanied by conventional computer software, e.g. by text editing software, spreadsheet software (in order to establish a business plan), and data banks.

A comprehensive support by information techniques renders possible a well-founded support of the decision-making process.

Possible problems with the use of expert systems

The use of expert systems like the use of any other information technology has its merits but may also present some problems. Thus the founder may have a prejudice against computers as he is used to receiving advice from human beings and shows little trust in advice given by computers. By carefully planning of the consulting process, this lack of acceptance can be surmounted. The computer work should not play too great a role in the actual consulting, it should only serve as a support. The personal contact with the consultant forms the basis of the consulting. Before the computer can be made use of, a talk between the founder and the consultant is an indispensable precondition. Without detail-

- * The experts offered more criteria for the choice of legal forms than were to be found in the literature, as e.g. the criterion if a particular form was a common form with a certain branch of industry and the criterion of the size of a business.
- * Moreover, individual experts judge the criteria very differently, depending on the field they work in. It stands to reason that a tax adviser lays greater store by the minimization of the tax burden than other experts. As a consequence of diverging assessments, different procedures for choosing the legal form, i.e. in dealing with the individual criteria, have been employed.
- * On an average the following criteria were considered as being relevant: the size of a business, the liability, the number of partners, and the common acceptance with a certain branch of industry.

It is interesting to know that two of these particularly important criteria, the common acceptance of a legal form with a certain branch of industry and the size of the business are not even mentioned in the literature.

Next to the workshop, interviews were carried out with a tax adviser and a business consultant. These were asked for a detailed description of their procedure when choosing a legal form. The following criteria were considered as being relevant: the number of business partners, the size of the business, the common acceptance with a particular branch of industry, the procuration, and the tax burden.

The results of the analysis of the literature, the results of the workshops and the interviews were then used to develop the knowledge base. The problem of integrating the heterogeneous knowledge of the various experts was solved by starting with those criteria which had been given common priority (i.e. number of partners, liability, size of the business, acceptance with a branch of industry) and by arranging them in a purposeful order. Criteria which could not be brought into this order as they are too dependent on the preferences of the individual founders (e.g. avoiding compulsory disclosure) were included in the form of annotations. The founder has to decide for himself which consequences he prefers.

Special information which could not be dealt with in workshops and interviews was included from the literature.

The criterion of common acceptance with a certain branch of industry, which had been stressed by the experts as being particularly relevant, was included in the expert system in the shape of a data bank. In order to provide the user with a help to find a legal form which is common to a particular branch of industry, data of the German Statistic of Turnover Tax (Umsatzsteuerstatistik), which records the number of business enterprises according to their legal form and branch of industry were included in a data bank. If a user requires this information, the expert system takes recourse to this data bank and works out those legal forms which are common to the branch of the foundation firm.

The knowledge thus accumulated was first transferred into the shape of rules. Next, the procedure of the choice of a

legal form was laid down in a diagram. This "Conceptual Model of Knowledge" was implemented step by step - first for one-man enterprises, then for enterprises with more partners - by the help of the Shell Xi-Plus. (Xi-Plus is a rule-based tool, which was developed by ExperTech Ltd. in Great Britain and is distributed by ExperTeam GmbH in West-Germany.)

The knowledge acquisition for GEFOVEX Till this point of time, GEFOVEX has been a system exclusively derived from literature, i.e. as a source of knowledge standard works of the available literature on business deeds have been used. In developing the system a modular approach was chosen. On the basis of individual deed components (=output of the system, e.g. clauses concerning the seat of a firm, purpose of the firm, capital participation, capital withdrawal, capital contributions) the component factors of the clauses (=input of the system, e.g. legal form of the business, number of partners, relationship between the partners, capital of the individual partners) were collected, and interdependencies among the various factors on the clauses examined. Next the implementation of the knowledge base was carried out.

The design of the explanation facility

In the explanation facility the conclusions suggested by the system are justified. REFOVEX for example explains why in a particular case the legal form of a limited liability company has to be chosen. This component part of the system has the function of summarizing only the most important arguments in order not to overload the user with information.

In order to prevent the final reports, i.e. the explanation of the decisions made, from becoming too long, interim reports have been built into REFOVEX at crucial points of the consulting process. E.g. the remaining feasible alternative legal forms are listed and their choice is founded in short form before the tax burden is to be established.

In GEFOVEX there are included explanations concerning the formulation of a deed of partnership at crucial stages in the consulting procedure. They have the shape of explanations concerning individual clauses. There is no final report, but clauses are indicated as the result of each stage in the consulting process.

The design of the user interface

The user interface rules the dialogue between the user and the computer. In both, REFOVEX and GEFOVEX this is achieved by a menu guidance which leads through the consulting process and allows the user at each question to choose an answer from a number of possibilities or enter characters or numbers.

An important component part of the user interface is the help provided by the program. As opposed to the explanation facility which gives the reasons for the decisions made, it explains technical terms which might be unclear to the user.

Mr. Pert and Mr. Acker want to begin the business without additional staff so that the business starts as a small firm.

Interim-Report

REFOWEX recommends the legal forms of

- * a limited liability company (GmbH)
- * a limited commercial partnership formed with a limited liability company as general partner. (GmbH & Co. KG)

.....
.....

This recommendation additionally is explained by REFOWEX.

Do you want to sort out the legal form with a minimum of tax burden?

> yes
no

HELP -> Please press F1!

An external software is started which calculates the tax burdens of the two possible legal forms and determines the legal form of a limited liability company (GmbH) as the one with a minimum tax burden.

FINAL-Report

The legal form with a minimum tax burden is a limited liability company (GmbH).

For your decision please consider the following advantages of a limited commercial partnership formed with a limited liability company as general partner (GmbH & Co. KG). A GmbH & Co. KG is advantageous, if

- * you plan to acquire investment partners, but want to obtain decision making power. In a GmbH & Co. KG you can integrate investment partners as limited partners and you remain manager of the GmbH and the whole company.
- * you want to balance out losses with other earnings. This is possible in a GmbH & Co. KG, because it is an incorporated firm.
- * you want to avoid compulsory disclosure.

Please consider these advantages before you come to a decision!

In the final report REFOWEX lists further criteria for the choice of the legal form which depend on the preference of the founders and which indicate the legal form of a GmbH & Co. KG as the better one.

For the two founders prefer the minimization of the tax burden as an essential criteria, they chose the legal form of a limited liability company (GmbH).

Now the consultation of GEFOVEX begins:
(Only the essential screens are shown!)

At first GEFOVEX asks for the names of the partners and the firm of the company. Mr. Pert and Mr. Acker type their names and choose "Expert International" as firm of their company. After this they have to type the seat of their company, which is Dortmund (a town in the Ruhr-Valley).

Now the first clause, Paragraph 1, of the deed of partnership is finished:

Paragraph 1

1. The company has the legal form of a limited liability company (GmbH) under the firm of "Expert International".
2. The corporate seat of the company is Dortmund.

To create Paragraph 2 REFOVEX wants to know the purpose of the firm. "The development of expert systems" is the answer. Now the founders have to choose, whether the company will only work in the defined field or will produce further products or wants to found branches or wants to act on the international market. Because Mr. Pert and Mr. Acker are very ambitious they want to act on the international market. Now Paragraph 2 is finished:

Paragraph 2

1. The purpose of the firm is the development of expert systems.
2. The company is allowed to produce further products, to found branches and to act on the international market.

These were the first two and still very easy paragraphs designed by GEFOVEX. The next more complex paragraphs deal with the following objects:

- * business year
- * duration of the company
- * notice to terminate the contract of the company
- * share capital
- * capital increase
- * organisation of firm management and deputy firm management
- * annual accounts
- * profit distribution
- * voluntary retirement of partners
- * indemnity
- * arbitration agreement arbitration.

To establish these paragraphs GEFOVEX on the one hand asks questions to the founder but on the other hand also gives information and recommendations to lead the founder to a good deed of partnership.

GEFOVEX designs a deed of partnership with all these clauses and makes the deed available for the founders and the consultant in the shape of a text file, which can be altered with the help of text editing software.

References

- Chadwick, M. and Hannah, J.A. (1986), *Expert Systems for Personal Computers*, Sigma Press, Wilmslow, England.
- Kurbel, Karl (1989), *Entwicklung und Einsatz von Expertensystemen*, Springer-Verlag, Berlin, Heidelberg, New York.
- Mertens, Peter, Borkowski, Volker and Geis, Wolfgang (1990), *Betriebliche Expertensystem-Anwendungen*. 2. völlig neu bearbeitete und erweiterte Auflage, Springer-Verlag, Berlin, Heidelberg, New York.
- Müller-Böling, Detlef and Bröckelmann, Jörg (1989), *Entwicklung eines Expertensystems zur Gestaltung und Formulierung vorteilhafter Gesellschaftsverträge - GEFOVEX*. F&E-Bericht Nr. 5 des Betriebswirtschaftlichen Instituts für empirische Gründungs- und Organisationsforschung (bifego) e.V., Dortmund.
- Müller-Böling, Detlef, Bröckelmann, Jörg, Kirchhoff, Susanne and Sudhaus, Hans-Jörg (1989), *Expertensysteme in der Gründungsberatung - REFOVEX und GEFOVEX*. F&E-Bericht Nr. 4 des Betriebswirtschaftlichen Instituts für empirische Gründungs- und Organisationsforschung (bifego) e.V., Dortmund.
- Savory, Stuart E. (1989), *Expertensysteme: Nutzen für Ihr Unternehmen*. 2. völlig überarb. und erw. Auflage, Oldenbourg, München, Wien.
- Schnupp, Peter and Leibbrandt, Ute (1986), *Expertensysteme. Nicht nur für Informatiker*. Springer-Verlag Berlin Heidelberg, New York.
- Waterman, Donald A. (1986). *A Guide to Expert Systems*. Addison-Wesley, Reading, Mass..