Using Expert System Technology for New Venture Strategy Planning

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INTRODUCTION

The research presented in this paper is concerned with the question "Can advanced information systems, such as expert knowledge-based systems (EKBS), help in new business strategy formulation?" More specifically, it focuses on how EKBS can help a user formulate a new venture business plan.

EKBS are a branch of artificial intelligence which gained acceptance in business almost two decades ago (Bowerman and Glover, 1988). An EKBS is designed to replicate the functions performed by a human expert. By asking questions and by comparing the user's answers with the information stored in the extensive expert knowledge database, the EKBS provides intelligent, knowledgeable answers (Mockler and Dologite, 1992).

A prototype EKBS, the Business Planning Analyst (BPA), was built that focuses on helping a user explore new venture opportunities in the travel industry. The EKBS' entire design is based on allowing a user to browse through competitive success profiles (CSP), such as the ones shown in Figure 1. These profiles represent scenarios of successful businesses in a selected industry and market segment, and are readily conceptualized as objects or in-

stances of the class competitive success profile. These profiles are the heart of the EKBS design.

Although the prototype is still evolving, some observations are possible. An EKBS for new venture planning could, for example:

- Help to support idea generation by providing various industry and market segment specific CSP.
- Evaluate and provide instant feedback on a user's potential for successful entrepreneurship.
- Guide a user through a systemic and thorough risk analysis of all the key factors involved in a new venture.
- Provide an initial business plan that can be used as a starting point for implementing the new venture.

CONCEPT AND DOMAIN AREAS OF THE PROTOTYPE

The described system development project, the BPA prototype, has been built around the concept of new venture planning using expert system technologies. According to Mockler (1989A, B), the area of new venture planning is especially suitable for EKBS implementation because:

- The planning process requires decisions based on business plan-

Figure 1: Sample Competitive Success Profiles (CSP)

	Profile 1	Profile 2	Profile n
Strategic Objective	Major Marketer & distributor of wholesale & retail travel services. Organizer of all types of tours with privately owned tour busses & limousines	Regional marketer & distributor of retail services to pleasure traveler. Organizer of weekend tours for young travelers.	
Opportunity Dimension	25% are business travelers, growing at 13 % annually. 75% are non-business travelers, growing at 7% annually.	75% are pleasure travelers, growing at 7% annually. The 18-34 age group, growing at 3.5% annually.	
Keys-to-success Customer	"Have ability to" Attract business & non-business travelers of all ages; work with all direct providers & small retail travel agencies. Provide corporate incentives & special group programs, meeting planning, limousine, ticket delivery, passport & visa services, in-house frequent flyer program, travel insurance, expert vacation planning, worldwide & local tours.	"Have ability to" Attract non-business travelers, provide tours for 18-34 age group. Secure travel services from direct providers & wholesalers, provide expert vacation planning, weekend getaway & regional trips.	
Marketing	Use one segment to promote & compliment the other, provide innovative travel packaging, have a wide range of current travel information, project a positive company image.	Use one segment to promote & compliment the other. Sponsor parties, wine & cheese get-togethers, use word-of-mouth.	
Operation	Support total computerized access to major providers with on-site interactive telecommunication terminals. Acquire a minimum of 3 locations each with 1,000 sq.ft., furniture, fixtures, equipment, 4 tour buses, 3 limousines.	Use computer software & buy or lease computer systems. Rent a 750 sq.ft. office, get office equipment, lease tour bus.	
Financing	Obtain $4 million loan from commercial bank or investor.	Obtain $1-2 million loan from commercial bank or investor.	
Etc.	…..	…..	
Specific Examples	Liberty Travel, American Express Travel Agency, Club Med, Perillo Tours, Tom Crown Ski Tours, Classic Coach	Cameo Travel Service, Inc.	
Etc.	….	…..	

ning expertise.

- The number and complexity of tasks involved in the planning process are definable for mapping into an EKBS.
- There are recognized experts in the field.
- The task is well understood and manageable.
- New venture planning requires informed judgment.
- The decision can lead to high payoffs and have practical value.

The systems domain area, the travel agency segment of the travel industry, is used to test the prototype's technology and concept realization. The following background sections provide an insight into the systems focus areas.

EXPERT KNOWLEDGE-BASED SYSTEMS AND THE TRAVEL AGENCY BUSINESS

Doll (1989) predicted that expert systems would be one of the successfully applied technologies in the travel agency industry. Crouch (1991) mentioned potential applications areas in that industry, such as: accommodation, transportation, and tourism development, etc. For example, Law and Au (1998) developed an EKBS for hotel selections in Hong Kong. This system attempts to provide the optimal match between the customer's requirements and available hotel services and facilities. In 1993, a pilot Travel Expert System was developed for and by the Canadian Federal Government. That pilot was designed to help travelers prepare travel requests and claims directly on their personal computers rather than prepare forms (McCrindell, 1993).

Today, EKBS drive many web-based inquiries and other systems on the Internet. Large travel websites (e.g., Internet Travel Network, Microsoft Expedia, and Priceline) and major Airlines, e.g., Delta and American) use EKBS and other advanced IT to conduct web-based tourism information exchanges and business transactions (e.g., ticket sales) electronically directly to the consumer, experiencing the cost-cutting impact of advanced IT on businesses (Mullaney, 1999). Despite the success of the Internet and the attempt by large travel websites to bypass the traditional travel agent, 80% of all airline tickets in 1998, for example, were still sold by human agents (Gaw, 1999).

THE TRAVEL AGENCY AS A NEW VENTURE

A successful entrepreneur, according to various studies (Brockhaus and Horwitz, 1986; Das and Teng, 1997), has certain personality traits, e.g., the need to achieve, risk aversion, creativity, and tolerance of ambiguity. Recent literature includes additional traits, e.g. deal-driven opportunism, pro-activity, self-motivation, goal-orientation, and the willingness to learn, change, and grow (Becherer and Maurer, 1999; Edwards and Edwards, 1998).

A new entrepreneur also requires financial resources and certain management, marketing and other business skills and knowledge, e.g., decision-making, strategic planning, product focus, financial and accounting sense, and leadership effectiveness, as well as the abilities to use outside resources and to transfer skills and profitable opportunities from one industry to another (Teal and Caroll, 1999).

Based on these studies, the BPA evaluates the user in terms of the user's entrepreneurial potential before the system provides expert-based guidance on deciding whether to start a new business venture – a travel agency – by helping the entrepreneur to formulate a new venture business plan.

The current size ($3.4 trillion) and predicted growth (expected to double by 2005) of the travel industry makes it an appealing one to be in (Bureau of Labor Statistics, 1999). Weak barriers of entry, such as low start-up costs, make it easier to start a new venture in this industry. The above data also shows the

industry's competitiveness, which dictates the importance of careful planning. The BPA has been designed in such a way that it provides the entrepreneur with a competitive advantage, if used for the intended purpose of assisting the entrepreneur in starting a new travel agency.

PROJECT BACKGROUND

The authors began to develop EKBS in 1986 as a way to gain insight into the enterprise-wide strategic planning process. The systems developed were designed to improve the effectiveness and efficiency of strategic planning. An EKBS for strategic corporate planning is discussed in Mockler and Dologite (1987) and Dologite (1987). It has affinities with the EKBS described in Schumann, et al. (1989), and Maybury and Belardo (1992).

While the first EKBS was a generic system, a later prototype focused on helping to determine where use of computer IT would provide a competitive advantage. It is described in Mockler (1989A, B) and builds on the work of Krcmar (1985).

The main lesson learned from the early work was that, unless there are specific feeder systems with impact data from many functional areas, a strategy planner must answer an inordinate amount of EKBS questions. This is tiresome, and the detail required can stretch the limits of the most astute planner. The functional area data, however, is vital to developing an enterprise-wide strategic plan. Without it, any result lacks the realities involved in successful strategy implementation.

Therefore, a second phase of this research, resulted in over 160 mainly end-user developed EKBS (Dologite, 1993; Mockler and Dologite, 1992), focused on developing the feeder systems. Of course, it is unrealistic to expect any organization to dispatch functional area knowledge engineers to build EKBS to feed all functional area data into enterprise-wide EKBS for strategy planning. The alternative was to enlist end-users in functional areas to help build some of the necessary feeder systems.

The current third phase returns to the original problem of strategy "formulation" versus the strategy "implementation" focus of phase two, and shifted the focus from rule-based to object-based EKBS. The object-oriented approach provided a natural way to map knowledge in chunks that closer match a strategy planner's mental map of the strategy planning process. Maybury and Belardo (1992), as well as Hiddings (1989), make similar observations about using this approach to building EKBS for strategy planning purposes.

DESIGN OF THE PROTOTYPE

The Business Planning Analyst, is designed so that the user and the prototype, by taking turns using input and output information, will follow the steps outlined below:

1. User selects an industry and market segment of interest.
2. User selects a model (CSP) for the new venture.
3. User provides input on personal characteristics and capabilities.
4. BPA compares user information with the model and provides feedback on entrepreneurial success factors in the industry and in the market segment of interest, the chances of the individual succeeding, and steps which might be taken to improve chances of success.
5. User (or BPA) provides input on local competitors in the same area as the new venture.
5. BPA compares local competitors with the model and provides a risk analysis and startup business plan.

A diagram, Figure 2, helps to understand the prototype's detailed design and shows the process the initial prototype fol-

lows to provide guidance to an entrepreneur.

The prototype is being built using the expertise of professional strategy planners, travel agency experts, and computer information system experts knowledgeable in EKBS development.

The expert system shell used in this project is NEXPERT OBJECT. Toolbook is used to build the user interface. Figure 3 shows the subject, class and object, as well as the structure layers of the overall design. The object-oriented development technique used follows the Coad and Yourdon object oriented analysis and design methodology (1991A and B).

THE PROTOTYPE'S DESIGN OBJECTIVES

The following sections discuss how the prototype, when completed, is expected to address the major design objectives of competitive success profile selection, entrepreneurship evaluation, risk analysis, and business plan generation for planning a new travel agency venture.

Competitive Success Profile Selection

For the EKBS prototype, the authors developed several CSP for each of twelve industries/segments, including travel, banking, film, and greeting cards. They were developed by analyzing existing competitors and by studying how the market segment works. These CSP serve as models for the potential entrepreneur, since they represent a way human business consultants organize new venture opportunities when working with clients. In the consultant's mind, opportunities are organized as CSP that represent ways of doing business that have made, for example, other travel agencies successful.

Figure 2: Decision Situation Diagram
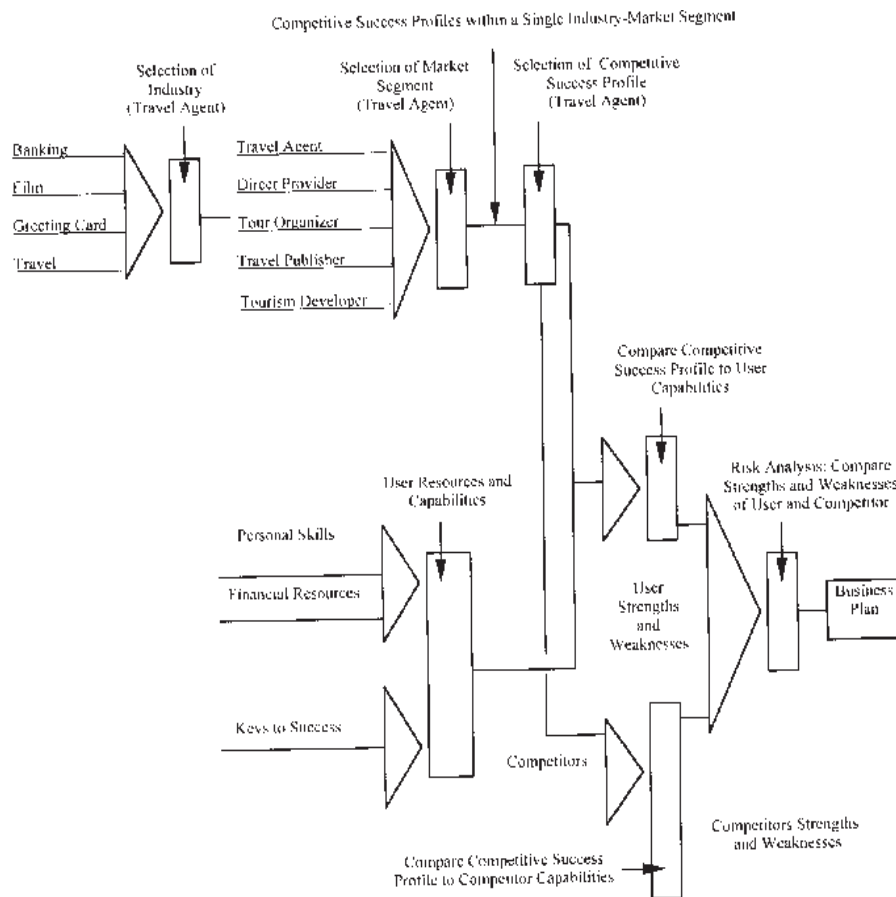
For the prototype described in this paper, before selecting a CSP, a user selects the industry sector and a market segment in which to start the new venture by browsing industry and market segment possibilities, based on a variety of characteristics or attributes available. As an example, exploring service versus manufacturing, industries would produce a list of possibilities such as travel, financial, and entertainment. More refined cuts of, for example, the service sector might concern type of customer, such as business professional, retirees, or young adults. Generally, characteristics identified with Porter's (1980) competitive forces model are planned candidate selection criteria. A user with preconceived ideas about the industry/segment for a new venture may simply make choices from menu lists.

Once selected, that CSP can be browsed by the user. These profiles consolidate characteristics inherited from higher order profiles and combine them with other characteristics unique to the individual profile, and will eventually become automatically updated by access to both commercial and government on-line databases. The automation of the profiles is a separate, future project. For this prototype, a database file simulates on-line input to populate and update profiles.

Figure 1 gives two specific CSP identifying *keys to success* for a particular approach to doing business. After browsing CSP, a user selects one as a model for starting a new venture. In future implementations this phase of user session will have extended value as an idea generator.

Entrepreneurship Evaluation

The BPA is designed to provide feedback on a user's potential for success as an entrepreneur by evaluating the user with question and answer sessions during which the user's answers are compared with the information stored in the BPA's knowledge database. The information in this database is based on expert knowledge and experience compiled using survey and personal interview data regarding necessary entrepreneurial personality traits, individual management and marketing skills, and available financial resources – as the studies discussed earlier indicate.

This entrepreneurial evaluation component of the BPA is presented in two parts:

I. Personal queries/feedback/recommendation: The BPA queries the entrepreneur in different areas of personal characteristics and behaviors, including queries about the propensity of competitiveness, risk aversion, problems and challenges, and learning-by-doing, thereby analyzing the individual's strengths and weaknesses.

This part also includes queries about the entrepreneur's financial resources, including queries for three sources: the entrepreneur's personal cash and cash equivalents, any assets that can be pledged as collateral for loans, and any borrowing capacity or credit that is accessible (Cheung,

Figure 3: Business Planning Analyst - Knowledge-Based System Subject, Class-&-Object, and Structure Layers

Legend:

△ Whole-Part Structure

⌓ Generalization-Specialization Structure
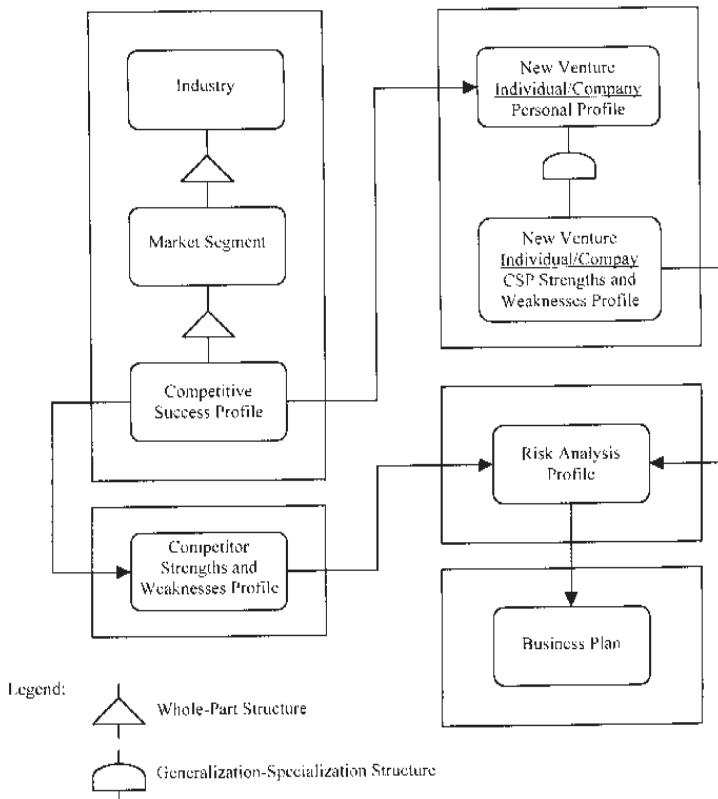
Dologite, and Mockler, 1992).

Based on the answers, the BPA not only renders an analysis of personal traits, but also reckons the financial resources and compares that total with the required start-up funding specified by the associated CSP. Immediate feedback is provided by the BPA in the form of a recommendation display which also includes suggestions for improvement or acquisition of additional financial backing.

II. Keys-to-Success queries/feedback/recommendations: Each CSP is organized in several descriptive components, each one containing an action verb (such as attract, provide, market and support) and a characteristic profile in text format that describes the attributes, or so-called *keys-to-success* of the CSP (Cheung, Dologite and Mockler, 1992). For example, "Do you have the capability to attract *business and non-business travelers of all ages*?" would be a keys-to-success query.

A second level of queries is presented, only if, based on the entrepreneur's answers, the BPA determines the user is 'weak' in one or more keys-to-success areas, in which the potential entrepreneur answered with an AVERAGE or WEAK reply. The purpose of the second level is to find out if additional training or other resources are available to strengthen the user's areas of weakness.

The evaluation provided becomes part of the user's business plan, if the new venture has potential for success. If the match is not strong enough, the viewer is encouraged to study other CSP.

Risk Analysis

When starting a new venture, an entrepreneur, because of the inherent trade-off between high risk and high reward, generally evalutes risk very carefully (Kuratko and Hodgetts, 1989). Hussey (1994) calls the examination of various risks to which the new venture is subject, and the assessment of possible financial

effects of the various risks, as 'good management.' In regard to new venture planning, a final risk analysis emphasizes mainly the competitive threats to the new venture. This phase asks the user direct product/service related questions about potential direct competitors. During the risk analysis information in the following aspects is covered:

1.	The strengths and weaknesses of the entrepreneur This information comes from the entrepreneurial evaluation phase.

2.	The strengths and weaknesses of competitors. The data at present consists of simply rating the competitor on a strong-average-weak-none scale in each key-to-success area derived from the CSP, including the same action verbs used during the entrepreneur evaluation component. The saved, collected data has potential for reuse in similar new venture risk analyses. It also can serve as input to refining data in the CSP.

3.	The result of comparing the strengths of the entrepreneur under study with the strength of each competitor, or possibly each competitor group, is summarized in a table, which reports the chance of the new venture succeeding against each competitor. The rating scale ranges from very strong to very weak.

Like a live consultant, the BPA systematically guides a user through an analysis of the competition. The goal is to provide a detailed comparative analysis for each *key-to-success* and opportunity area found in the CSP.

Business Plan Generation

The final design objective of the BPA is the generation of a business plan for the potential entrepreneur. Since a business plan is the written document that details the proposed new venture and functions as 'the entrepreneur's roadmap' for a successful enterprise (Kuratko and Hodgetts, 1989), it forces entrepreneurs to analyze the venture in detail and design an effective strategy to cope with the arising uncertainties, and to signal if a new venture is destined to fail (Rowe, et al., 1994).

In the case of this prototype, it essentially converts the results summarized in the competitor's comparative table into a presentation script. The script gives the results of the comparison of the individual under study and the selected CSP against the profiles of potential competitors. It estimates the risk of a new business succeeding given the CSP selected by the entrepreneur, and considers the reactions of strong potential competitors to the new venture.

The business plan also covers the personal steps to take in order to meet the *key-to-success* requirements. This comes from the entrepreneurial evaluation phase.

THE NEXT PHASE

The BPA is still evolving and needs work before it can be verified and validated. More work remains in many areas. For example, an expanded BPA:

•	would function as an idea generator to allow an organization, as well as an individual, to create a truly new, original, venture.

•	would be flexible enough to be used for organizational self-assessment, perhaps using methods developed by Miller (1988).

•	would automate at least a portion of the labor-intensive task of creating and updating CSP with data available from on-line financial, government, bibliographic, and other database services.

- would offer an assessment of a user's preferred strategy for fostering innovation and recommend approaches tailored to the individual's style for handling the new venture challenges that lie ahead. Miller's (1989) "Innovation Styles Profile" is a candidate instrument for this possibility.
- would become useful as a planning game by adding elements of fun and challenge.

One of the lessons learned from this project, that has not changed since this work began, is that strategy formulation problems, remain a difficult area to model and implement. The problems are ill-structured and require a substantial knowledge base to be useful, even for tutorial-level systems.

When modeling a strategy formulation problem, objects hold more promise than sequential business rules, since objects provide not only a modeling method that closer approximates how a planner thinks in logic chunks, but also the structure to enable designing idea generation browsing capabilities that are observed to be essential in designing a strategy formulation support environment.

Developing an EKBS such as BPA has specific relevance in the new millenium; it has potential to provide substantial practical help for visionary people, who shun the corporate life in favor of entrepreneurship, but who lack experience and training in developing a systematic approach to creating a new venture. On a broader scale, it has the potential to be a foundation upon which to build more sophisticated EKBS to support the decision-making processes involved in strategy formulation and implementation planning.

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