A Web-Based Hybrid System for International Marketing Planning

Shuliang Li
Westminster Business School, University of Westminster
35 Marylebone Road, London NW1 5LS
United Kingdom
E-mail: lish@wmin.ac.uk

Jim Zheng Li
Department of Computing, Imperial College London
180 Queen's Gate, South Kensington campus, London SW7 2AZ
United Kingdom

Abstract: This paper deals with the issues of combining Web-based decision aid techniques and technologies for international marketing planning and investigating the value of such integration. Firstly, a Web-enabled hybrid intelligent software system integrating Web-based knowledge automation, fuzzy logic and online databases for international marketing decision making is presented. Secondly, the evaluation procedure and findings on the system's overall value are reported. Our testing results with involved managers show the efficiency and effectiveness of this Web-based approach.

Key-words: international marketing decision making; World Wide Web; Web knowledge automation; expert system; fuzzy logic; Web-based hybrid intelligent system

1 Introduction

There have been considerable attempts on developing and applying various decision aid and artificial intelligence techniques and technologies in support of general marketing planning in the past years. A summary of typical work may be found in [14, 15, 16]. With regard to the specific field of international marketing decision making, however, much less attention has been paid to develop state-of-the-art computerised support. Cavusgil, Mitri and Evirgen [2] designed an expert system as a decision support tool for doing business with Eastern bloc countries in Central and Eastern Europe, including target market evaluation and selection. Cavusgil and Evirgen [1] demonstrated an expert system for international co-operative venture partner selection. Mitri, Karimalis, Cannon and Yaparak [22] presented a market access planning system (MAPS), an expert system developed for market entry mode selection on the basis of SWOT analysis and assessment of the company, target market, and product and marketing characteristics. Levy and Yoon [11] proposed a fuzzy logic approach towards country risk assessment and go vs. no go decision marking for global market entry.

While previous systems for international marketing decision making have set up a foundation for further research on related topics, they are in the main restricted to the use of single individual technique or technology, for example, traditional expert systems. Although fuzzy logic has been attempted [11], the reported research work deals only with on go vs. no go decisions. Further, most previous systems are stand-alone applications. These systems embody very limited number of analytical models and are only concerned with a particular problem of international marketing decision making, such as choosing an international co-operative venture partner or selecting a market entry mode.

Research and development towards deploying ESs over the Internet and attaching ESs to Web sites is progressing. The fast growth of the Internet and the World Wide Web has offered exciting opportunities for designing, developing, delivering and deploying decision support models and tools to users across Internet, intranets or extranets [13]. Li [13]’s work on Web-enabled support, nonetheless, is client-side implementation without online database and fuzzy logic applications. It is also restricted to the formulation of general marketing strategies and associated Internet strategies.

The purpose of this article is to examine the hybridisation of Web knowledge automation, fuzzy logic and on-line databases for aiding the different
The stages of international marketing decision making. This is the first attempt to develop such Web-based software integration and evaluate its effects.

The remainder of the paper is structured as follows. Firstly, a Web-based hybrid system, called WebInternational (developed by the authors), is presented and described. The results of the system evaluation are then reported. The final section closes the paper by presenting concluding remarks and future directions.

2 A Web-based hybrid system for international marketing planning

International marketing decision making processes have been emphasized by different authors [3, 4, 9, 24]. It is argued that the process involves extensive domain expertise [18], uncertainty and ambiguity [11, 16], and decision makers’ judgement [13, 16, 20, 21]. This study will focus on the three key stages: go vs. no go decisions, entry mode selection, and marketing strategy development.

We define a Web-enable d knowledge automation expert system as an interactive Web-based intelligent software system that captures, stores and delivers domain expertise and decision support models, automates intelligent reasoning and produces advice or recommendations to users via the Internet, extranets or intranets.

On the basis of previous definitions for hybrid intelligent systems provided by Goonatilake and Khebbal [6] and Li and Li [15], we define a Web-based hybrid intelligent system as a Web-enabled software system that is composed of different interacting functional elements and integrates the strengths of various techniques and/or technologies including artificial intelligence technologies, for the purpose of improving the effectiveness and efficiency of decision-making or problem-solving. A Web-enabled hybrid system developed to assist semi-structured or non-structured managerial decision-making can be called as a Web-based hybrid decision support system.

Our hybrid system, entitled WebInternational, employs Web-based knowledge automation for capturing domain expertise, performing intelligent reasoning and delivering reasoned advice or recommendations over the Internet; incorporates fuzzy logic for modelling and coping with uncertainty and ambiguity related to the factors and options/alternatives for international marketing planning; and utilises on-line databases for storing and retrieving relevant data for the decision making process.

The system is based upon Server-side implementation architecture. It is created through using such open source tools as PHP (Hypertext Preprocessor), Ajax, JavaScript and MySQL. The architecture of the system is illustrated in Fig. 1.
The user makes requests for analytical models and intelligent advice through using a Web browser such as Mozilla Firefox. The server then responds or returns information or reasoned intelligent recommendations to the user over the Internet, intranets or extranets.

The WebInternational system consists of the following components.

The Web-based user interface

The user interface component is designed for interactions and communications between the user and the system. WebInternational asks the user to provide answers and judgemental inputs to various questions, factors or criteria that affect international marketing decision making. The system then takes inputs from users, executes reasoning and generates intelligent advice on go vs. no go decisions, entry modes, and marketing strategies.

The Web-based database element

The on-line database elements are implemented using MySQL. It enables the users to save, retrieve and recover their judgemental entries to different types and different levels of decision making factors, and their choices for related options and alternatives, throughout the decision making process.

The knowledge base

The knowledge base is created to embody “if … then …” rules and fuzzy rules with certain degrees of confidence, which command the use of knowledge to go vs. no go decisions, entry mode selection, guidelines generation and marketing strategy formulation. All the fuzzy rules are based up trapezoidal membership functions [11, 12, 15, 27] that help work out the level of certainty for different alternatives. In particular, Fuzzy logic [27] is programmed to model uncertainty and different levels of confidence on decision making criteria at the go vs. no go step and various alternatives or options in the strategy formation stage.

Within the knowledge base, the “go” or “no go” factors or criteria are organised in different categories and at different hierarchies. For strategic intention, entry pressure (growth of global market, competitive global entry, and long-term corporate commitment) and resource availability (financial resources, and capacity utilization) are taken into account. For market opportunity, expected sales potential (GDP (Gross Domestic Product) level, GDP growth rate, and competition) and expected profit potential (production cost advantage, and marketing cost advantage) are included. For payback risk, non-economic risk (political risk, and social risk) and economic risk (foreign exchange rate, and trade balance) are covered. For synergy effects, product synergy (R&D/engineering synergy, manufacturing synergy, and logistics synergy) and global business synergy (management experience, and marketing experience) are considered [9, 11, 24].

The entry modes are represented in line with the levels of risk and control [3, 4]: Indirect exporting, direct exporting, foreign manufacturing, assembly operations, contract manufacturing, licensing operations, joint ventures, strategic alliances, wholly owned subsidiary.

Moreover, Web-enabled knowledge automation for strategy formulation covers the following analytical models and guidelines: McDonald [19]’s four-box directional policy matrix for setting marketing strategies, Harrell and Kiefer [7]’s work on global strategy formulation, Watson and Zinkhan [26]’s four-cell matrix for developing Internet strategies, Ho and Choi [8]’s framework for formulating winning strategies through Sun Tze’s Art of War guidelines, Porter [23]’s generic competitive strategy model, and Martin & Larsen [17]’s key success factors for trade with China.

The Web-based inference component

The inference engine element, as the “brain” of the Web-based knowledge automation, employs forward-chaining methodology for reasoning and applying information, rules and fuzzy rules in the knowledge base. The procedure of this type of intelligent reasoning is data and human inputs-driven. In this way, the system generates advice on go vs. no go, entry modes, and marketing and competitive strategies.

Human judgement and creativity

Following Keen and Scott Morton [10]’s description of computer-based support, our WebInternational system is designed to support decision makers in the international marketing planning process, rather than replace their judgement and creativity. The decision maker provides judgemental inputs to decision making criteria or factors by scoring their values and assigning weights to them. The user may use an external analytic hierarchy process (AHP) software tool to make pair-
wise comparisons for deciding the relative importance of relevant variables influencing the generation of various alternatives [15]. The Web-based system then executes calculations, aggregates human inputs for the analytical models, performs intelligent reasoning and produces options, advice and guidelines.

For analytical decision makers, they may review the system’s outputs, intelligent advice and various alternatives and assess their overall viability. They should also judge which alternative most suits the global contexts and make the right choice. In this case, the user’s inputs to the system, the system’s outputs, and human judgement and creativity should be linked together to reach a final decision. Here, a combined use of the Web-based analytical models and domain expertise, together with the decision-maker’s specific knowledge about their company, products, markets, competitors and customers is strongly recommended.

For proficient and intuitive decision-makers, nonetheless, they may not like using computer-based support. They may make decisions based upon their own experience, judgement and personal vision, probably with some references to pertinent documents, databases and Internet information resources. In this case, the WebInternational system can be utilised to check, validate and supplement their decision-making.

3 Empirical investigation procedure and findings

The main objective of the empirical evaluation study is to investigate the overall value of the Web-based hybrid approach. The overall value is measured on the basis of effectiveness and efficiency.

The efficiency is assessed in terms of helping overcome time zone problems and geographical barriers [13], and the speed of decision-making [13, 25]. The effectiveness is appraised in terms of the performance of the decision activity [12], helping understand relevant factors affecting decision making [12], providing domain expertise and analytical models [13, 18], dealing with uncertainty [11, 16], helping supplement or complement human judgment [13, 14], helping strategic analysis [12], helping couple strategic analysis with human judgement and intuition [20, 21], helping generate relevant options or alternatives [5], helping build up decision confidence [5], helping improve the quality of decision-making [13] and user satisfaction [25].

The Web-based hybrid system was evaluated by carrying out field studies in the Autumn and Winter of 2008 with ten managers in London including one company marketing director, two company managing directors, one system manager, one company analyst, and five university course leaders/managers. The participants were asked to apply the WebInternational system to make international marketing decisions such as go vs. no go decisions, entry mode selection, and marketing and competitive strategy formulation in the global contexts for their products, services or university courses using their own inputs for their own cases. They then answered an evaluation questionnaire that contained both close-ended questions and open-ended questions.

Answers to the thirteen close-ended questions are very positive and encouraging. The ten involved managers assess WebInternational system as very or extremely efficient with regard to the following items: helping overcome the time zone problem; helping overcome the geographical location barrier; and helping improve the speed of decision-making.

The participants also rate the system as moderately, very or extremely effective in terms of the following measures: helping understand the factors that affect decision making; helping decision-making by providing relevant knowledge, analytical models and guidelines; helping strategic analysis; helping couple analysis with judgment, intuition and creativity; helping supplement judgment and intuition; helping deal with uncertainty in the process of decision making; helping generate relevant alternatives or options in the process of decision-making; helping improve the quality of decision-making; improving performance of the decision activity; confidence about the advice or recommendations generated by the system; and user satisfaction about the system and its advice or recommendations.

Responses to the open-ended questions are presented below.

Support for the process of international marketing decision making is perceived as:

“The system can assist greatly by providing advice using different strategies from various authors. It is convenient to have quite a few different points of views to compare with the analysis.” “Provides a structure to work through the process but more help is needed in defining certain statements.” “The process is good.” “Gets you thinking about a more structured approach to decision making.” “Easy to use and intuitive.” “The Web-based system is more user friendly and
easier to access.” “It helps to reinforce what I have been considering and have decided.” “Reviewing the issues, providing focus on key questions, encouraging different thinking.”

The output, advice or recommendations produced by the system are described as:
“I feel that once the user gets to know the system, they can make the most out of it.” “Very comprehensive advice including risk factors.” “Shows a clearly aligned strategy.” “Comprehensive and very helpful in terms of covering areas that I may not have considered.” “Aids wider thinking on the issue / consequences.”

Improvements on the outcomes of international marketing planning are reported as:
“I find it very useful. Having different strategies at hand to learn from can be a good thing.” “It is a tool to reassure/double check research.” “It will complement decision making.” “Gives alternative strategies.” “By trying different level of entry, we can test the different outcomes, especially related to the risk.” “It is very helpful.”

The changes that the participants would like to be made:
“The only changes I would make to it is presentation related, perhaps using different backgrounds / images / results.” “The user input need to be given more weight.” “Possibly organise text better using hyperlinks to hide details.” “More help in describing the different factors.” “Guidance on terms.” “More specific.” “Clear definitions of criteria/factors.”

4 Concluding remarks and future research directions

The main purpose of this study has been to examine the use of Web-based hybrid system in support of international marketing decision making. In this study, we have proposed and established a Web-based hybrid intelligent approach with its overall value evaluated.

One advantage of the Web-based hybrid approach is to integrate the powers of Web enabled knowledge automation, on-line databases and fuzzy logic for international marketing planning. The second strength is to link human judgement with Web-based analytical models and knowledge bases. The third benefit is to support the three main stages of international marketing decision making. This is the first study to create such Web-enabled hybridisation and test its efficiency and effectiveness.

The WebInternational system is rated as very or extremely efficient with regard to: helping overcome the time zone problem; helping overcome the geographical location barrier; and improving the speed of decision-making. The ten managers involved in the evaluation studies also assess the system as moderately, very or extremely effective in supporting the decision making process and improving its outcomes.

The Web-based hybrid software system and associated evaluation findings provide a sound basis for further investigation on this topic. Future work will be undertaken: to provide on-line help and guide on technical jargons and about how to use the Web based support system; to cover and include more analytical models for international marketing decision making; and to evaluate the improved system with more industrial users.

Acknowledgements

The authors wish to thank the following people for their participation in evaluating the intelligent decision support systems for international marketing decision making in the Autumn and Winter of 2008: Mr. Clive Spenser, Marketing Director, LPA Ltd., London, UK; Mr. Gabriel Wanschelbaum, business analyst, CIT International Ltd., London, UK; Ms. Jean Dong, Managing Director, China Factor Ltd., London, UK; Mr. Rav Ubhi, Systems Manager, WSP group, London, UK; Mr. Grozdyu Evgeniev Grozdev, Director, GSATV Ltd, London; Ms. Rachel Lander, joint course leader/manager of MSc Digital Enterprise Management, University of Westminster, UK; Mr. Haik Richards, joint course leader of MSc Digital Enterprise Management, University of Westminster, UK; Mr. Brian Heagney, course leader of MA Management Studies, University of Westminster, UK; Mr. Mark Pilkington, course leader of MSc International Finance, University of Westminster, UK; Keith Patrick, course leader of MSc Information Management & Finance, University of Westminster, UK.

References:


