

EXPERT SYSTEM PARAMETERS FOR EVALUATING REASONING OF SME'S ENTREPRENEUR

By

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ABSTRACT

Small and medium enterprises (SME) have remarkable role in social and economic development. SME's entrepreneurs use their reasoning and knowledge in evaluating opportunities; sometimes they face confusing situations between accepting and rejecting these opportunities.

Expert Systems (ESs) are used as computer system to mimic the human experts in solving complex problems in specific domains, these ESs acquire huge amount of knowledge and reasoning.

This paper aims at initiating some parameters of evaluating the reasoning of SME's entrepreneurs using ES. The knowledge base (KB) of the ES includes marketing strategy, marketing segmentation, pricing and promotion domains.

RATIONALE

Small and medium enterprises (SMEs) have remarkable role in social and economic development. The roles of SMEs in the social and economic development are respectively [5]: Raising productivity through technical, and other forms of innovation. Creating more jobs for the unemployed. Facilitating the transfer of technology. Commercializing new inventions and products. Restructuring and transforming the economies of the nation. Reducing the unprogressive social organizations. Making markets more competitive. Stimulating redistribution of wealth, income and political power within societies in ways that are economically positive and without being politically disruptive. Improving the premature talents of human resources. Creating new markets and facilitating their expansion into international markets. Performing these roles effectively is conditioned by entrepreneur's reasoning ability to explore and interpret opportunities.

INTRODUCTION

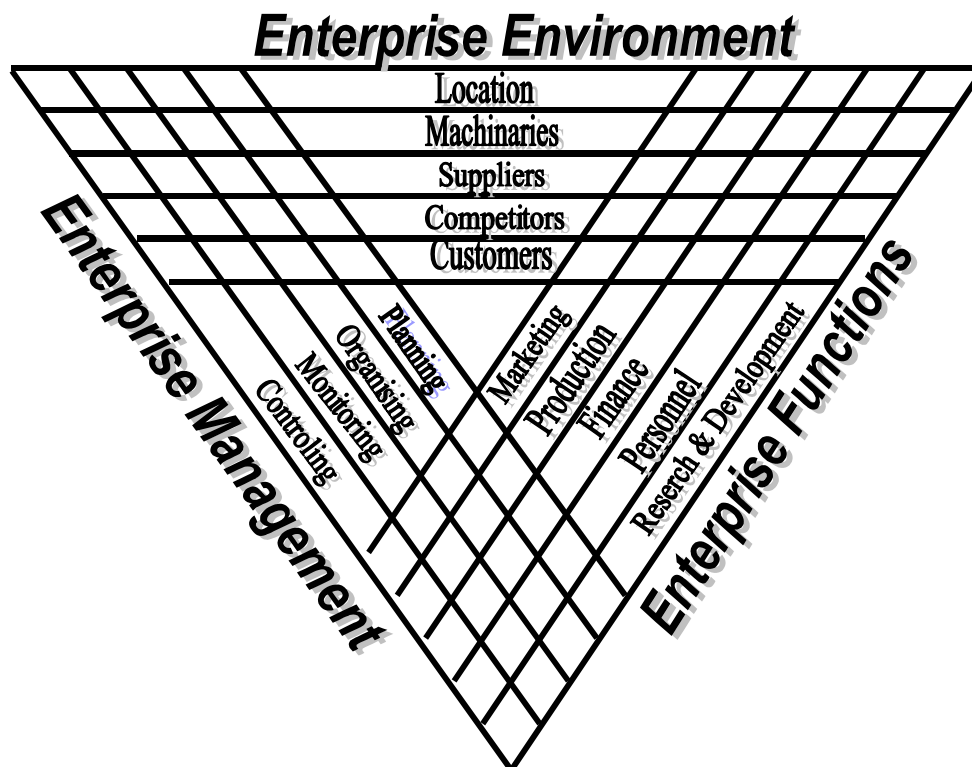
There are many definitions of SME; the definitions of SME cited in this paper are based on two sets of considerations. First set includes social and economic considerations; SME must be defined according to its expected role in the social and economic development. The second set of considerations include the enterprise ecology, i.e. SME's entities belong to large enterprise entities, in so far as its environment, management function, and enterprise functions.

Social and economic considerations:

The SME roles in the social and economic development can be performed if and only if entrepreneurs themselves manage SMEs.

Enterprise ecology considerations:

For all enterprises, they are composed of three main parts, enterprise environment, enterprise functions, and enterprise management. Enterprise environment, being a sub-environment of the general external environment, and the direct interface between enterprise and the external environment, consists of five entities: customers, suppliers, competitors, machinery, and location. Enterprise functions, which are the tools of interpreting the enterprise environment and transforming it into products or services, consist of five entities: marketing, production, finance, personnel, and R&D functions. Enterprise management, which is the brain of enterprise in achieving its objectives, consists of four entities: Planning, organizing, controlling, and monitoring functions. All these entities are interrelated and constitute the second set of considerations, as shown in Figure 1.



On the basis of the previous sets of considerations. The definition of Small Enterprise: "An enterprise owned by an entrepreneur, where all enterprise functions and

management are run by him". The definition of Medium enterprises: "An enterprise owned by an entrepreneur, where all enterprise functions, and management are mainly run by him with some other delegations". The definition of large enterprise: "An enterprise owned by stock holders, and is directed by a board of directors, where all enterprise functions, and management are run by specialized managers". Figure 2 represents the differences between small and large enterprises, where medium enterprises are a transition state between the small and large enterprises.

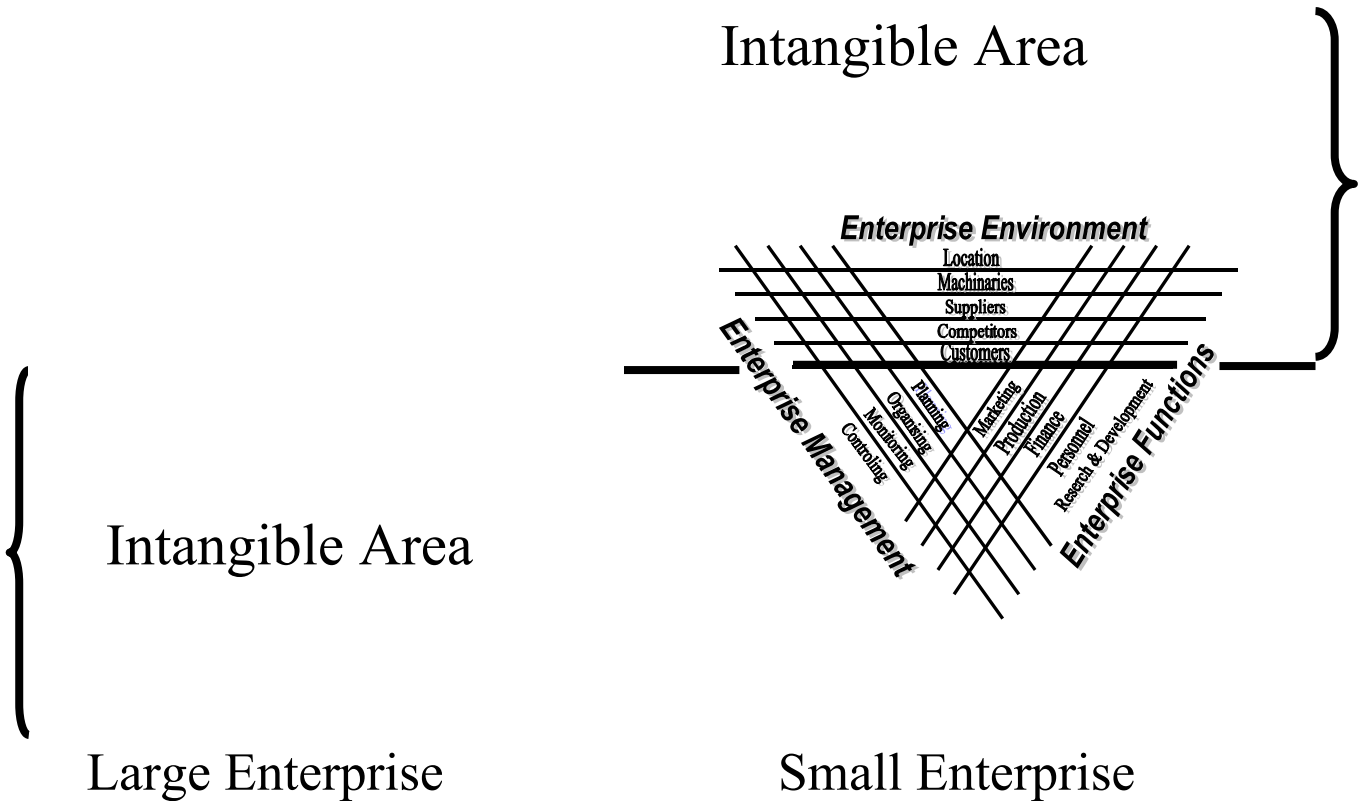


Figure-2

Expert system:

is a computer system used to mimic the human expert in solving a complex problem in a specific domain. ES is a branch of Artificial Intelligence (AI) [3]. ES is composed [1] of five parts, Knowledge Base, Inference Engine, User Interface, and Development Engine. Knowledge Base: contains all facts and their relations in a specific domain. Inference Engine: is the thinker of the system, which is able to think on the basis of the available knowledge included in the KB. User Interface: is the interface between the user and the ES, which has the ability to respond to the user in friendly interface, using the available knowledge and type of reasoning. Development Engine: is the tool used to develop the expert system by knowledge engineers and human experts.

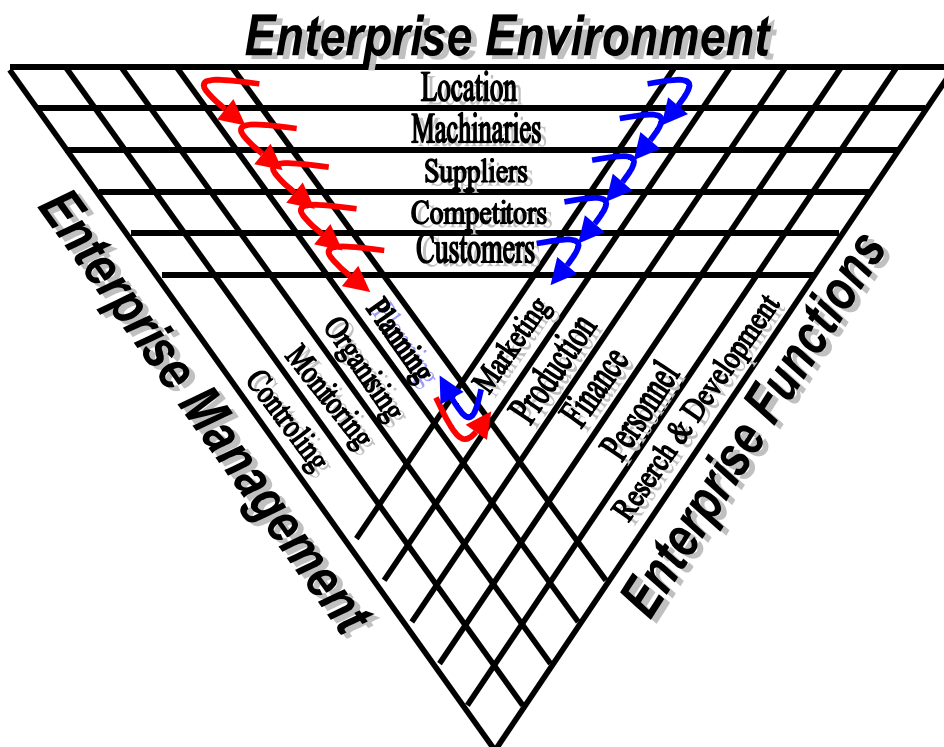
Expert system is developed through five steps. Step-1: identification and definition: At this step the domain problem will be defined. Step-2: Developing prototypes: Where the definition of the problem is completed, the ES developer should develop some prototypes to be sure that they get the right definition of the problem.

Step-3: According to the problem definition and the developed prototypes, ES developers will construct the ES using the available tools. Step-4: After constructing the ES, it should be tested by a set of human experts, providing that the results of this testing concludes that the ES and the human experts are agreed on 90%. Step-5: This is the last Sept and includes the ES maintenance and integration, where ES should be updated and integrated with whatever applications related to the same filed of interest.

At this paper, ES development will be confined to step2, where a prototype has been developed to investigate entrepreneurs' reasoning in assessing their business opportunities.

SME's environmental changes and reasoning:

Entrepreneurs' ability of adaptation depends on their capabilities of interpreting how to distinguish between opportunities and threats under environment changes. Opportunities are created if at least one entity of the enterprise environment changes from one state to another, as shown in red flow, Figure-3. Threats are created if at least one entity of the enterprise environment changes from one state to another, without adapting these changes by the enterprise functions, as shown in blue flow, Figure-3.



Problem domain:

Based on these definitions of SME, two of three parts of SME are hidden in entrepreneur's mind. Entrepreneur's decisions are taken on the basis of his/her faculty of previous

knowledge and reasoning. Reasoning is drawing conclusions from a set of facts [2], there are many types of reasoning used by entrepreneurs to solve their problems, such as spatial, memory-based, commonsense, default, causal, and case-based reasoning. There are many types of management problems, which face entrepreneurs during the enterprise life cycle, and they get used to solve these problems by reasoning. These problems are interpretation, diagnosis, debugging, prediction, planning, monitoring, and controlling problems. Problem domain will be confined to the interpretation problem.

Interpretation problem:

This type of problem occurs during explaining summarized results from enterprise environment changes. The explanation process is composed of two cycles. The first cycle of explanation: the enterprise management (planning entity) should transform the enterprise environment changes to opportunities, as shown in Figure 3, in red flow. The second cycle of explanation: the enterprise management (planning entity) should transform the enterprise environment changes to threats on its market situation if it failed to acquire the opportunities, as shown in Figure 3, blue flow.

Interpretation is a mental process, where entrepreneurs' decisions depend on their knowledge and some types of reasoning.

Interpretation problem is a function of time, where social needs changes by time, and also of the competition gape, as shown in Figure 4.

Interpretation of the social needs should be faster over time long. Otherwise the enterprise will lose its competitive advantage, which is the core of problem, where ES is used.

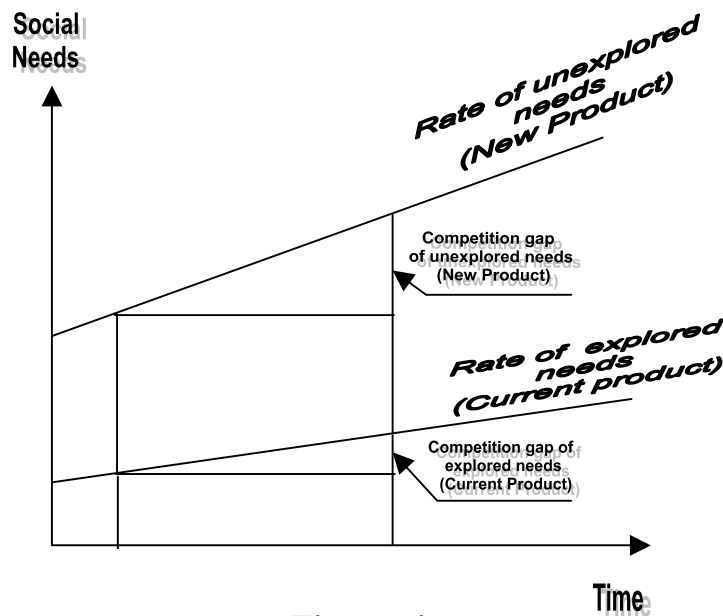


Figure-4

Expert system parameters:

The objective of these parameters is to explore the hidden domain of entrepreneur's reasoning in solving SME's problems in assessing opportunities. A prototype has been developed as a tool of investigating the interpretation of the entrepreneur's reasoning.

The parameters of ES for evaluating reasoning of SME's entrepreneurs of assessing opportunity will be confined to two types of SME's management problems: interpretation, and diagnosis problems, and to one type of entrepreneur's reasoning: case-based reasoning. The parameters of ES will consist of two parts: KB parameters, and User interface parameters.

KB parameters:

The knowledge domain used in the ES prototype consists of two types of knowledge [4]. The first type is marketing segmentation, which used as Knowledge Interpreter (KI) in interpreting the customers entity of the enterprise environment changes to a set of opportunities, as shown in class2, and class3, Figure 5. The second type of knowledge is marketing strategy, which used as KI to interpret the enterprise environment changes to threats on the marketing situation, as shown in class0, and class1, Figure 5.

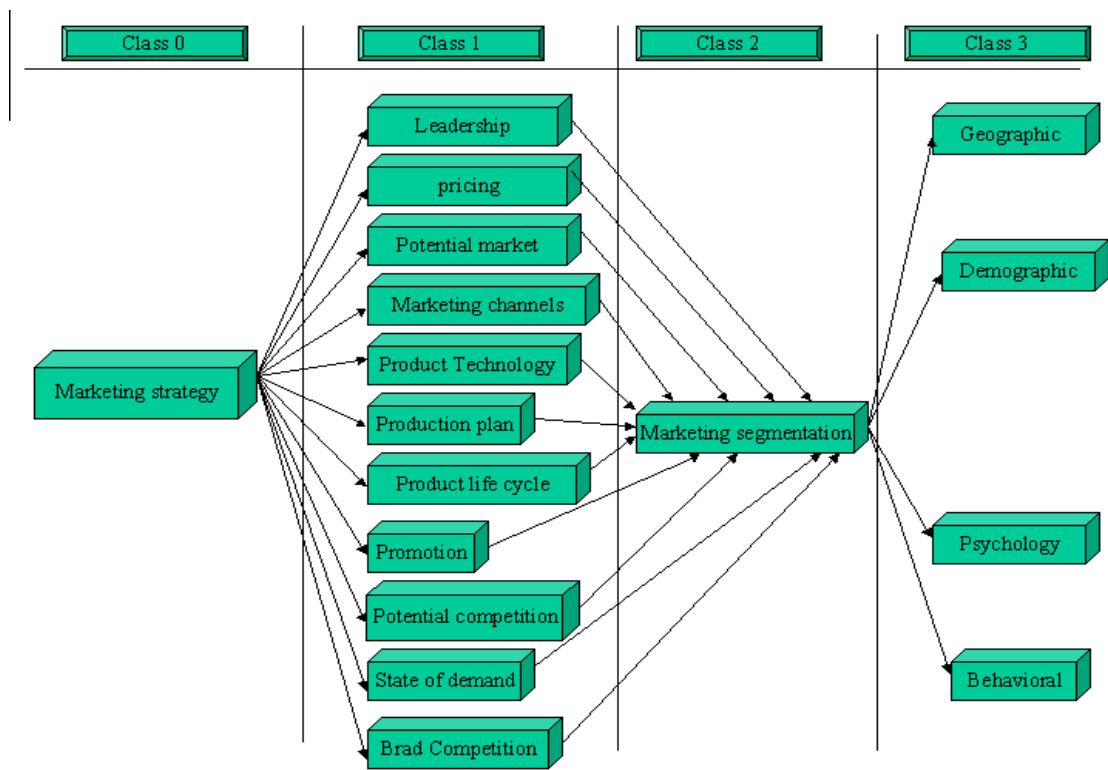


Figure 5

User

Interface parameters:

The interface used in the prototype is menu drive windows as shown in figures 6, 7, 8, 9, and 10 respectively

Marketing segmentation - Figure-6

SEGMENTATION VARIABLES FOR CONSUMER MARKETS		
AGE	OLDER FAMILY	OCCUPATION
<input type="checkbox"/> Under 6	<input type="checkbox"/> Married no kids	<input type="checkbox"/> Professional, technical
<input type="checkbox"/> 6-11	<input type="checkbox"/> Married kids <18 old	<input type="checkbox"/> Manager, officials
<input type="checkbox"/> 12-19	<input type="checkbox"/> Married kids >18 old	<input type="checkbox"/> Clerical, sales
<input type="checkbox"/> 20-34	ANNUAL INCOME	<input type="checkbox"/> Craftsmen, foremen
<input type="checkbox"/> 35-49	<input type="checkbox"/> Under LE 2500	<input type="checkbox"/> Operatives
<input type="checkbox"/> 50-64	<input type="checkbox"/> 2500 - 5000	<input type="checkbox"/> Farmers
<input type="checkbox"/> 65+	<input type="checkbox"/> 5000 - 7000	<input type="checkbox"/> Retired
SEX	<input type="checkbox"/> 7000 - 10000	<input type="checkbox"/> Students
<input type="checkbox"/> Male	<input type="checkbox"/> 10000 - 15000	<input type="checkbox"/> Housewives
<input type="checkbox"/> Female	<input type="checkbox"/> 15000 - 20000	<input type="checkbox"/> Unemployed
FAMILY SIZE	<input type="checkbox"/> 20000 - 30000	EDUCATION
<input type="checkbox"/> 1-2	<input type="checkbox"/> 30000 - 50000	<input type="checkbox"/> Grade school or less
<input type="checkbox"/> 3-4	<input type="checkbox"/> > 50000	<input type="checkbox"/> Some high school
<input type="checkbox"/> 5+	RELIGION	<input type="checkbox"/> High school graduate
YOUNG FAMILY	<input type="checkbox"/> Moslems	<input type="checkbox"/> Some college
<input type="checkbox"/> Single	<input type="checkbox"/> Catholic	<input type="checkbox"/> College graduate
<input type="checkbox"/> Married, no kids	<input type="checkbox"/> Protestant	NATIONALITY
<input type="checkbox"/> Married kids <6 old	<input type="checkbox"/> Jewish	<input type="checkbox"/> Egyptian
<input type="checkbox"/> Married kids >6 old	<input type="checkbox"/> Other	<input type="checkbox"/> Foreigner
F3-Sign F7-KI F8-Exit F9-CLS		

Marketing segmentation - Figure-7

SOME COMMON PROMOTION TOOLS		
ADVERTISING	SALES PROMOTION	PUBLICITY
<input type="checkbox"/> Print ads	<input type="checkbox"/> Contests	<input type="checkbox"/> Press kits
<input type="checkbox"/> Broadcast ads	<input type="checkbox"/> Games	<input type="checkbox"/> Speeches
<input type="checkbox"/> Packing-outer	<input type="checkbox"/> Sweepstakes	<input type="checkbox"/> Seminars
<input type="checkbox"/> Packing-inserts	<input type="checkbox"/> Lotteries	<input type="checkbox"/> Annual reports
<input type="checkbox"/> Mailings	<input type="checkbox"/> Premiums	<input type="checkbox"/> Charitable
<input type="checkbox"/> Catalogs	<input type="checkbox"/> Sampling	<input type="checkbox"/> Donations
<input type="checkbox"/> Motion pictures	<input type="checkbox"/> Fairs and trade shows	<input type="checkbox"/> Public relations
<input type="checkbox"/> House magazines	<input type="checkbox"/> Exhibits	PERSONAL SELLING
<input type="checkbox"/> Brochures, booklets	<input type="checkbox"/> Demonstrators	<input type="checkbox"/> Sales presentaion
<input type="checkbox"/> Posters	<input type="checkbox"/> Couponing	<input type="checkbox"/> Sales meetings
<input type="checkbox"/> Directories	<input type="checkbox"/> Rebates	<input type="checkbox"/> Telemarketing
<input type="checkbox"/> Reprints of ads	<input type="checkbox"/> Low-interest financing	<input type="checkbox"/> Incentive programs
<input type="checkbox"/> Billboards	<input type="checkbox"/> Entertainment	<input type="checkbox"/> Sales samples
<input type="checkbox"/> Display signs	<input type="checkbox"/> Trade-in allowances	
<input type="checkbox"/> Purchase displays	<input type="checkbox"/> Trading stamps	
<input type="checkbox"/> Audiovisual		
<input type="checkbox"/> Symbols, Logos		
F3-Sign F8-Exit F9-CLS		

Promotion tools - Figure-8

PSYCHOGRAPHIC & BEHAVIORAL SEGMENTATION		
SOCIAL CLASS	BENEFITS SOUGHT	Readiness stage
<input type="checkbox"/> Lower lowers	<input type="checkbox"/> Quality	<input type="checkbox"/> Unaware
<input type="checkbox"/> Upper lowers	<input type="checkbox"/> Service	<input type="checkbox"/> Aware
<input type="checkbox"/> Lower middles	<input type="checkbox"/> Economy	<input type="checkbox"/> Informed
<input type="checkbox"/> Upper middles	USER STATUS	<input type="checkbox"/> Interested
<input type="checkbox"/> Lower uppers	<input type="checkbox"/> Nonuser	<input type="checkbox"/> Desirous
<input type="checkbox"/> Upper uppers	<input type="checkbox"/> Ex-user	<input type="checkbox"/> Intenting to buy
lifestyle	<input type="checkbox"/> Potential user	ATTITUDE TOWARD PRODUCT
<input type="checkbox"/> Straights	<input type="checkbox"/> First-time user	<input type="checkbox"/> Enthusiastic
<input type="checkbox"/> Swingers	<input type="checkbox"/> Regular user	<input type="checkbox"/> Positive
<input type="checkbox"/> Longhairs	USAGE RATE	<input type="checkbox"/> Indifferent
PERSONALITY	<input type="checkbox"/> Light user	<input type="checkbox"/> Negative
<input type="checkbox"/> Compulsive	<input type="checkbox"/> Medium user	<input type="checkbox"/> Hostile
<input type="checkbox"/> Gregarious	<input type="checkbox"/> Heavy user	CITY
<input type="checkbox"/> ...	LOCALITY STATUS	<input type="checkbox"/> ...

Pricing method - Figure-9

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DIAGNOSTIC METHOD

CORE PRODUCT
[ ] Benefit
[ ] Service
TANGIBLE PRODUCT
[ ] Features
[ ] Packing
[ ] Brand name
[ ] Quality level
AUGMENTED PRODUCT
[ ] Installation
[ ] After sales services
[ ] Delivery
[ ] Credit
[ ] Warranty

F3-selection F8-Exit F9-CLS
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Figure-10 – Marketing strategy

RESULTS AND CONCLUSIONS

Results focus on two subjects. First, the effect of using KI in interpreting the enterprise environment changes to opportunities and threats. The second subject, observation on the entrepreneur's reasoning of interprets opportunities and threats.

RESULTS

1. The ES prototype interpretation on 24 cases of SMEs, shown that 95% of the ES conclusions are in agreement with the human experts.
2. The ES prototype assets 88% of SMEs in interpretation opportunities and threats.
3. Experimentation shows that the entrepreneurs are accustomed to use spatial and default reasoning in identifying enterprise opportunities and threats.
4. The tentative planning manner is used for the planning and follow-up of the SMEs, it assists in minimizing their risks, while it slows their potential growth rate.
5. The main functions of the entrepreneurs emphasize of using heuristic approach in solving their problems.
6. The developed ES prototype demonstrates that it can interact with the entrepreneur's marketing.

CONCLUSIONS

From the previous results of the ES prototype it is concluded that: The ES is considered as a reliable and efficient tool that could assist business incubators in achieving the followings:

- Assessing entrepreneur's reasoning in the domain of business opportunities.
- Approving the credibility of the SME to be granted loans.
- Training the new entrepreneurs in planning and follow-up of their enterprises.

FUTURE RESEARCH DIRECTION

Interpretation is not only the unique type of problem that faces Entrepreneurs while managing their SMEs, but also there are different types of them, such as diagnosis, debugging, prediction, planning, monitoring, and control reasoning. This type of reasoning should be taken into consideration in case of supporting entrepreneur in SME development.

Diagnosis problem: This type of problem occurs during identifying causes of given information about customers, suppliers, competitors, machinery, and location, in order to identify the appropriate strategy of marketing, production, financing, personnel, and R&D.

Debugging problem: This type of problem occurs during formulating strategies into the enterprise functions based on given constraints of customers, suppliers, competitors, machinery, and location.

Prediction problem: This type of problem occurs during inferring likely consequences of the hypothetical strategies of enterprise functions in a specific product or service.

Planning problem: This type of problem occurs during devising a method for making enterprise strategies achieve their objectives.

Monitoring problem: This type of problem occurs during comparing observations of the enterprise environment with established standards of enterprise function strategies.

Controlling problem: This type of problem occurs during guiding the enterprise function strategies, based on the enterprise environment.

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