ISSN 1392 – 124X INFORMATION TECHNOLOGY AND CONTROL, 2008, Vol. 37, No. 2

APPLYING AGENT IN BUSINESS EVALUATION SYSTEMS

Eugenijus Mačikėnas, Rūta Makūnaitė

System Analysis Department, Kaunas University of Technology
Studentu St. 50, LT–51368 Kaunas, Lithuania

Abstract. Different statistics show quite a high failure rate for the start-ups (up to 50 percent). In order to decrease this rate, various business evaluation tools are used. Unfortunately, most of such tools have some drawbacks: they concentrate mostly on costs analysis only, they are oriented towards sophisticated users etc. In order to cope with these drawbacks, a structure of such system is suggested based on engaging multiagent systems that allow to have user friendly business evaluation tool while providing increased intelligence, extended access to information sources, enables easy updates and upgrades.

1. Introduction

High failure rate for the start-ups require an appropriate means to cope with this trend of the start-ups history. Different measures are undertaken for that, starting with business feasibility analysis using different business evaluation tools before the business is started, establishment of various business incubation entities afterwards and other means. Unfortunately, business evaluation tools available in the market have a number of shortcomings that confine the successful application of such tools, especially for SMEs. A bit different approach needs to be undertaken in order to have more effectiveness from the application of such tools.

2. Business feasibility analysis

New businesses by creating added value are the main driving force of any country‘s economy. Unfortunately, failure rate of start-ups is dangerously high [Pena, 2002]. Fifty percent of enterprises are forced to close down during the first five years of operation [Knaup, 2005]. Failure rate could be decreased significantly if before business is started, business feasibility analysis would be made.

Independently of the model chosen – business viability model [Thompson, 2003], Porters Five Forces model [Porter, 1979], PEST or SWOT analysis - they all require global business factors (technical feasibility, market situation, costs, even the business idea itself) to be examined. A summary of such factors is presented in Figure 1.

For successful analysis and decision making, it is necessary to know, what goals are expected to be achieved by starting up a business. Therefore, before performing analysis, goals have to be identified. It is important that goals would satisfy S.M.A.R.T model, i.e. they should be Specific, Measurable, Attainable, Realistic and Timely [Baxter, 2006]. For example, business is started only if there is a guarantee of 100 000 Euro profit during first three years of operation.

In order to perform a thorough analysis, in depth knowledge in marketing, economy, social and technological areas is necessary. Unfortunately, this is exactly what beginner businessmen do not have. Business evaluation consultants do contain the knowledge required, but their services are expensive and usually affordable for successful companies only. Thus, a person willing to start a business has to rely on his personal knowledge.

There are specialized business evaluation tools in the market (Business Evaluation Tool, ValueSource Business Evaluation Software, Interactive Business Planner), but for the most part they are designed for cost planning. Regrettably, cost evaluation is just one of five business evaluation factors. Such tools have another shortcoming – they are all created with sophisticated users, with deep economic knowledge in mind, therefore provide a little help to an inexperienced user.

In view of this situation, it would me meaningful to design a user-friendly business evaluation tool, which would allow a user to comfortably evaluate possibilities for a start-up business.

3. Functionality of Business Evaluation System

The purpose of Business Evaluation System is to help the user to make informed decisions related to business planned. Such a system would operate in three stages:

- assisting user to understand what is expected from the business – to help to set goals;
- assisting user to perform business feasibility analysis;
- outlining business analysis results in a business plan.

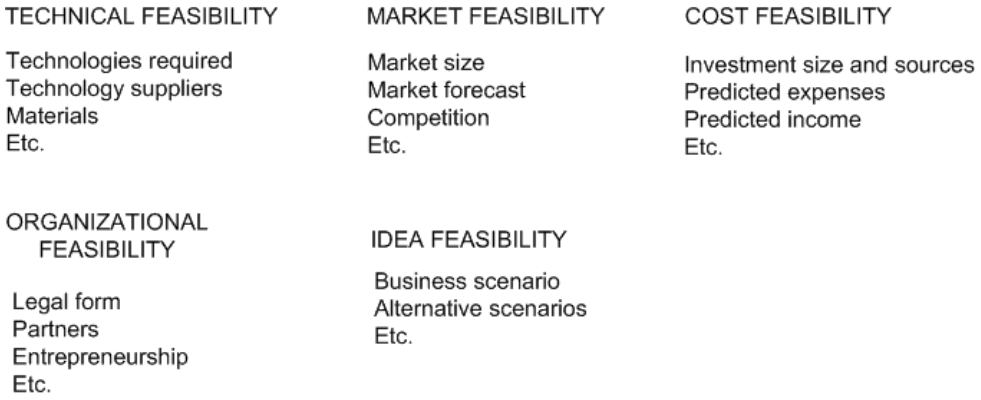

Figure 1. Global business factors

3.1. Setting goals

Since the system is intended to help user to make an objective decision, it is important that before making it, user would have all the required information. The system should help user to explain what is expected from the business, for example, making certain amount of money, acquiring certain skills or starting production of some new product.

In order for the system enquiries to be effective, the questions asked must be composed by a professional of that field. Furthermore, the answers have to be recorded and they also should influence follow-up questions. Therefore, questions have to be composed based on expert knowledge, also decisions on which questions are to be asked have to be made and also impact of answers has to be evaluated. Consequently, goal defining stage, usage of knowledge base and inference engine would be appropriate.

Once user inquiry is completed, the user is presented with finalized business goals. Based on these goals, user can develop comparison criteria to be used in late business analysis stages.

3.2. Business Analysis

Business analysis should be performed in consequent stages, which are depicted in Figure 2 [Baxter, 2006]. Evaluation results in every stage are compared to preset minimal criteria. Criteria are set based on earlier identified goals. For example, in evaluation of costs stage the criteria of business becoming profitable after five years of operation have to be met and in organizational evaluation stage, criteria of head manager being a person with entrepreneurial traits have to be satisfied. If minimal criteria are not met at least in one of the evaluation stages, the system makes a decision to terminate analysis and recommend user to abandon the business idea under consideration.

On the other hand, if evaluation results satisfy minimal criteria, the system carries on to the next evaluation stage. If all stages are passed successfully, user is informed about positive evaluation of the business plans.

3.2.1. Idea evaluation

If business idea evaluation is performed by its creator, it would be incorrect to expect for it to be objective and unbiased. To mitigate the influence of improper personal opinion, system has to ensure that the user is provided with as much information as possible. The user should be interviewed by using questions, prepared by professionals. Once the interview is over, user should be provided with his summarized answers which would allow comparing advantages and shortcomings of his ideas. The user is to decide whether to proceed to the next stage. Since for information acquisition expert knowledge is used and decisions on question sequence are made, it would be correct to use knowledge base and inference engine for idea evaluation.

3.2.2. Organizational feasibility

Analysis of organization feasibility comprises of:

- Identification of preferred business structure and evaluation of restrictions it imposes;
- Analysis of business partners and professionals involved;
- Analysis of entrepreneur qualities.

While evaluating organizational capabilities, user has to be helped in choosing the appropriate business structure and explained its benefits and constraints. For example, for starting up limited enterprise initial investment of 3000 Euro is required, also chief accountant has to be hired. At the same time for any mistakes that are made during operation of the company the responsibility of its owner is limited only by the capital authorized. In case user has decided to establish a private enterprise, user would be held responsible personally, therefore be in risk of loosing the own property.

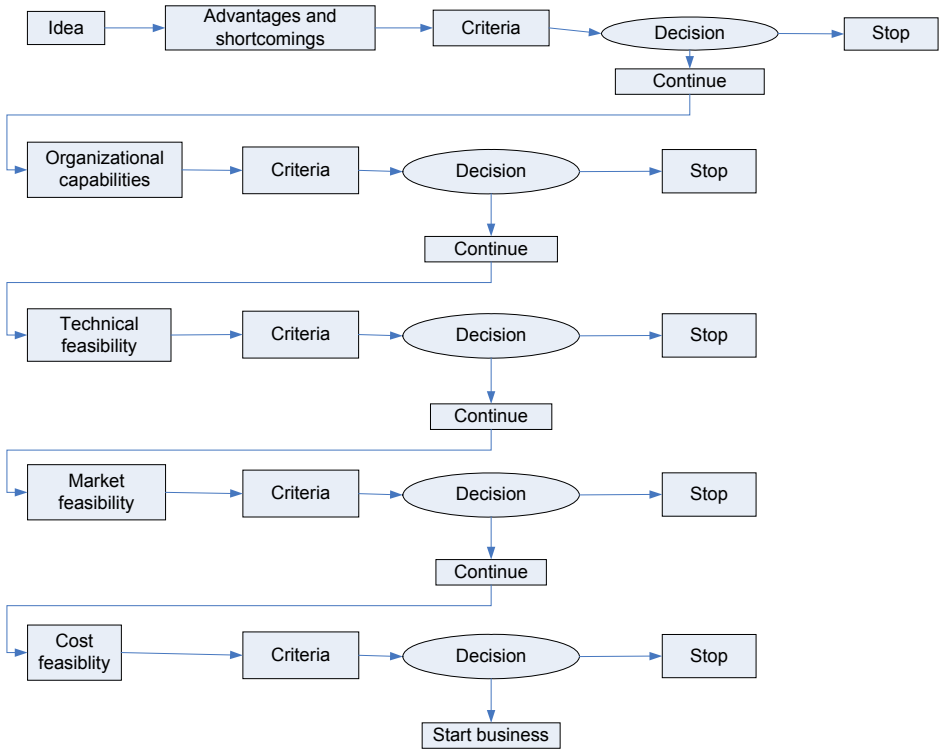

Figure 2. Business analysis stages

The user has to decide whether his business needs partners, whether he has anyone available in mind and evaluate their reliability. It is equally important to identify what kind of professionals are required for business in mind and whether they are easy to hire.

Results of multiple studies have shown that the key to a business success is if its founder possess entrepreneur characteristics [Reilly, 1996]. Therefore, an effective business evaluation system must have a feature which would allow evaluating head managers entrepreneurial traits. Evaluation could be done by performing various psychological tests, digitized with a help of professionals.

3.2.3. Technical feasibility

The first goal of technical feasibility analysis is to determine whether it is possible to start a business in mind. It is necessary to identify what kind of equipment is required and if they need special conditions or materials. Furthermore, it is important to investigate technology's reliability, constraints and competitiveness. In the same stage the location of the business planned has to be evaluated, taking into account the possibility of the logistics problems, as well as labor market, legal and environmental issues.

The user might not have knowledge about required technical means, therefore the system should be able to provide information about manufacturing processes, equipment, materials and property.

3.2.4. Cost evaluation

Cost evaluation models already have been successfully implemented in a form of business evaluation tools, thus for this part of the system, existing algorithms can be used with an addition of knowledge base containing possible resources or credits.

Cost evaluation consists of:

- Calculation of capital required – it is necessary to calculate capital of what size is necessary to start up a business, to buy equipment, to hire people. Furthermore, the size of revolving capital has to be estimated. After these steps are done, it is important to assess possible problems, for example, the delay of construction works.
- Calculation of credit required – it is important to calculate what portion of capital has to be borrowed, what sources of loans are available and what terms and conditions these loans are available.
- Budget calculations – in this stage estimated income and expenses are calculated, cash flow diagram is formed.

3.3. Summary of business analysis

Upon successful completion of business evaluation stages, the system should generate extensive business plan, which would not only contain business plan itself, but also contact information of possible partners, business advisors, material suppliers.

4. Architecture of Business Evaluation System

Business evaluation system can be easily divided into separate modules designed to perform certain

tasks: interact with the user, set goals, look for information sources, acquire information, summarize information and others. Moreover, since for a successful functionality system has to incorporate expert knowledge, it has to have at least a knowledge base – in other words, there is a need in certain degree of intelligence. Furthermore, due to constantly changing business environment, system has to be often updated and upgraded.

With the latter aspects in mind, it would be appropriate to construct a business evaluation system as a component system with a certain degree of intelligence and autonomy.

All of those requirements are met in agent systems. Even though, there is no unified agent definition, researchers increasingly agree that following definition is the most suitable: agent – is a software unit, capable of constantly operating in a certain environment, which might contain other agents and processes [Shoham, 1997].

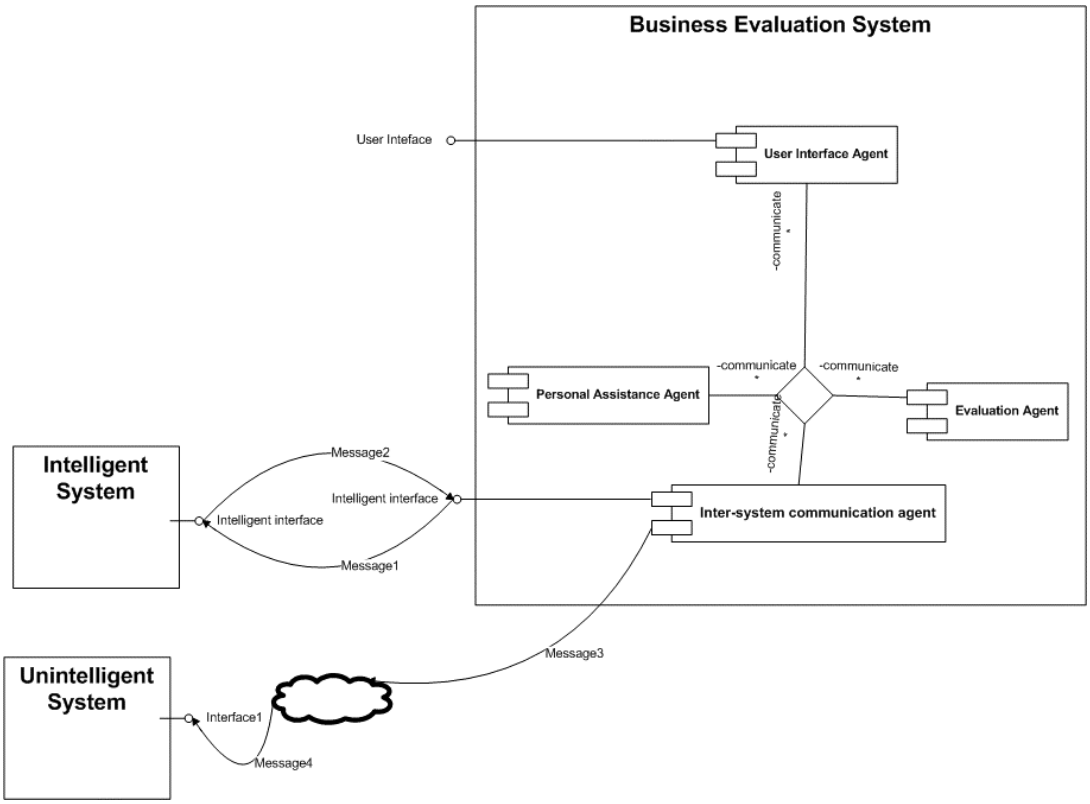

Figure 3. Architecture of Business Evaluation System

The following attributes are relevant to every agent in some way [Etzioni, 1995, Franklin, 1996]:

- Reactivity – ability to sense and act.
- Autonomy – ability to reach goal independently.
- Collaboration – ability to incorporate other agents in goal pursuit.
- Adaptability – ability to learn from experience.
- Mobility – ability to migrate from one platform to another.

In order to increase the functionality of agent systems, more agents are implemented, but the complexity of agents and their interfaces remains unchanged.

The system calls only agents which are required to perform the task at hand. Because agents are proactive, they can decide when they are needed and offer situation appropriate services.

An example of agent based business evaluation system is depicted in Figure 3. Here agent A1 is an agent, assisting user in usage of the system – explains functions, helps select desired information. Agent A2 controls system's interface – alters it, or feeds data into it. Agents A3, A4 and A5 autonomously perform tasks while collaborating with each other. An example of such agent could be business idea evaluation agent. Business idea evaluation agent concept diagram is presented in Figure 4.

Such an agent consists of:

- Agent itself – an aggregating and communicating component, which allows other agents to use information it has and also able to request information from other agents;
- Inference engine and rules which allow selecting appropriate data fragments;
- Behavior – agent's capability to detect inquires and act on them;
- Knowledge about data, described in ontology. This is required, so that agent would know what kind of data he has and what is its relationship to other data without analyzing the data available.

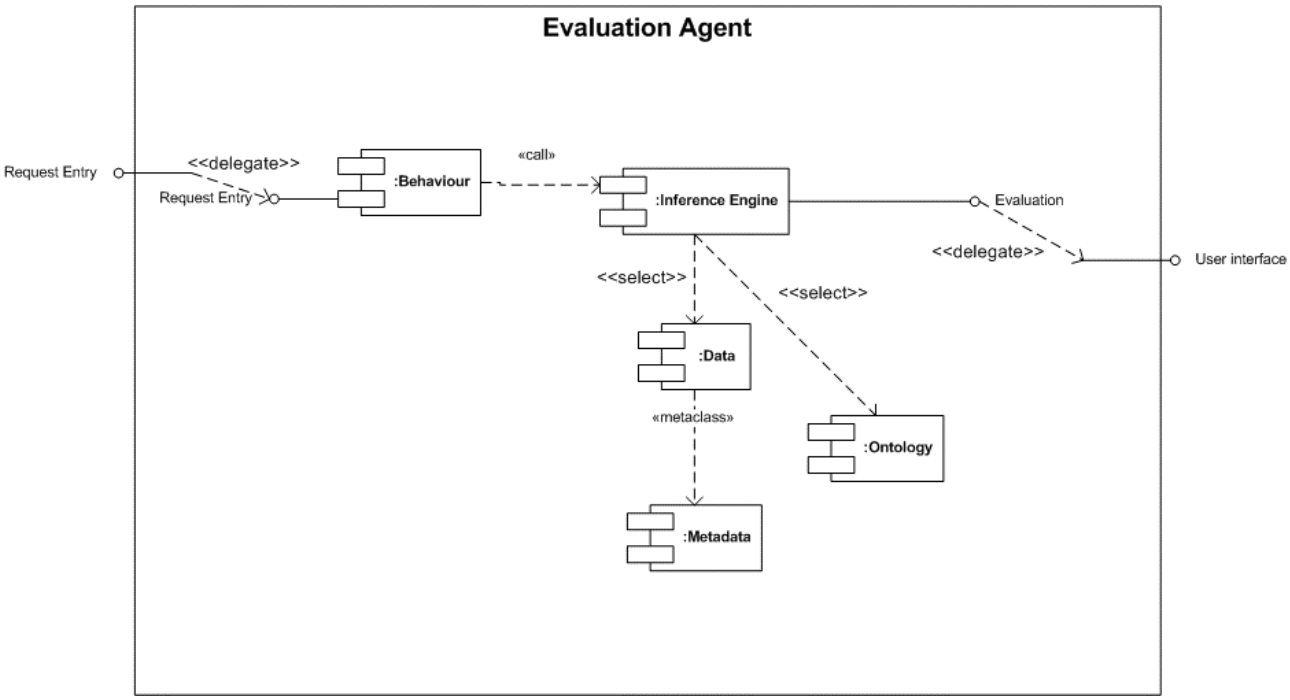

Figure 4. Concept Diagram of an Idea Evaluation Agent

5. Conclusion

Even though Business Evaluation Systems, based on multiagent systems, provide increased intelligence, extended access to various information sources and enable easy updates and upgrades, means of communication with unintelligent components and systems have yet to be determined.

References

[1] **I. Peña**. Intellectual capital and business start-up success. *Journal of Intellectual Capital*, 2002, *Vol*.3, *Issue* 2, 102-108.

[2] **A.E. Knaup**. Survival and longevity in the Business Employment Dynamics data. *Monthly Labor review*, 2005, *Vol*.128, *Issue* 5.

[3] **A. Thompson**. Overview of Business Plan. *Murdoch Business School*, 2003.

[4] **M.E. Porter**. How competitive forces shape strategy. *Harvard Business Review*, 1979, *March*.

[5] **B. Baxter**. Evaluating the feasibility of business opportunities. *Ontario Fact Sheet*, 2006, *March*.

[6] **M.D**. **Reilly**. Starting a small business: the feasibility analysis. *"MONTGUIDE"*. *Montana State University*, 1996, *August*.

[7] **Y**. **Shoham.** An Overview of Agent-Oriented Programming. *Software Agents*. *Bradshaw, J. AAAI Press, Cambridge, USA*.

[8] **O. Etzioni, D.S. Weld**. Intelligent agents on the Internet: Fact, Fiction, and Forecast. *IEEE Expert*, 10(4), *August* 1995.

[9] **F. Stan**. Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents. *Proceedings of the Third International Workshop on Agent Theories, Architectures, and Languages, Springer-Verlag*, 1996.

Received February 2008.