

Information System for Forecasting the Success of Bulgarian Start-up Companies

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Abstract. An Information System (IS) for predicting the success of Bulgarian start-up companies has been designed and developed. The IS is based on a model for success prediction derived from a quantitative research of 137 Bulgarian start-up companies. Entrepreneurs fill in a survey and based on a prediction model the IS estimates the chances of success of their start-up and shows a graphical decision tree with the factors that led to the result.

Keywords: technology entrepreneurship, start-up companies, new ventures, modeling, prediction software, NVP

1 Introduction

Predicting the success of new companies increases the efficiency of the venture creation process, minimizes the risks and resources spent and increases the returns. Unfortunately there are no success prediction models and software tools developed for the specifics of the Bulgarian start-up companies [1].

An Information system (IS) for forecasting the success of Bulgarian start-up companies would be useful to entrepreneurs, business owners, business incubators, university start-up centers, business consultants, venture capitalists and investors to predict the success probability for the new companies and to identify the possible strengths and weaknesses.

1.1 Theoretical Model for New Venture Success Prediction

After an analysis of 42 success prediction models [1], a pattern introduced by Sandberg in 1986 [2] has been identified. It has been adopted and improved in later models. Previous studies of Bulgarian start-ups success factors and business models have been examined [3, 4]. An improved and adapted for Bulgarian companies venture success prediction model has been proposed by the author [5]. The model is presented with the formula:

$$NVP = f(E, IS, BS, R),$$

where NVP is the new venture performance, E is the entrepreneur, IS is the industry structure, BS is the business strategy and R represents the available

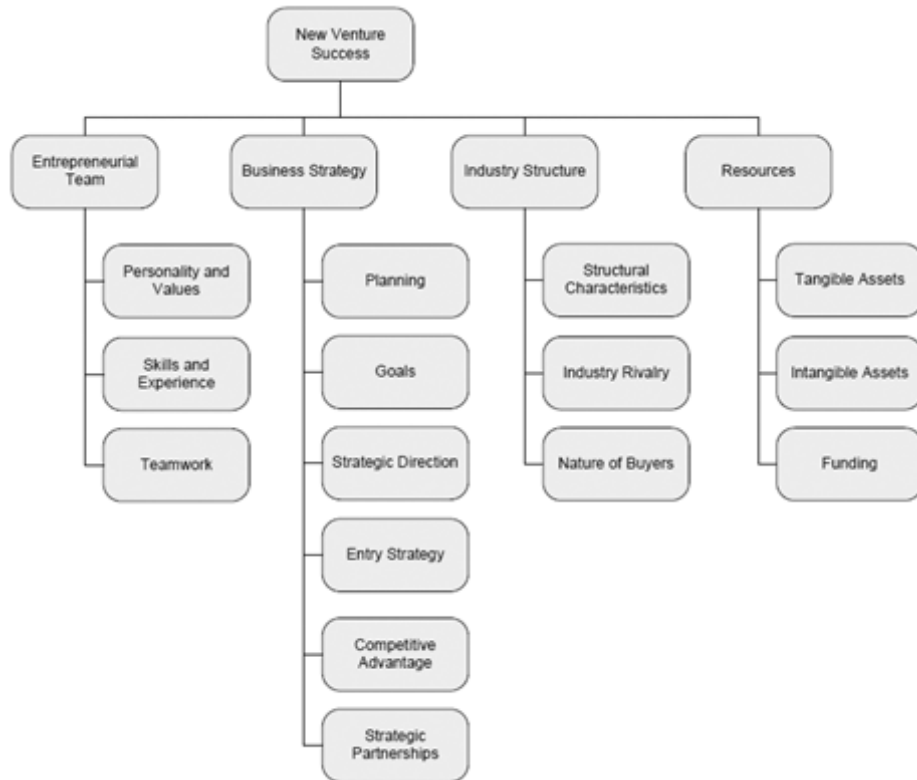


Fig. 1. New venture success prediction model proposed by the author

resources. Each of the main categories in the company success prediction model is decomposed into subcategories [5] as it is shown in Fig. 1.

1.2 Quantitative Research and Modeling

The new venture success prediction model has been validated with the help of a quantitative research [6] in the form of in-depth inquiries of 137 start-up companies in Bulgaria. The quantitative research is based on the CRISP-DM [7] methodology for data mining projects using the IBM SPSS Modeler [8] and WEKA software products. The software products generate start-up company success models in the form of decision trees based on the theoretical model and dataset.

The decision trees start with the most important success predictors and split the cases into groups (represented by nodes) depending on the responses. The process continues until the case reaches an end (leaf) node which indicates the predicted value of the target – the company success. Based on the generation and validation setting of the tree generation algorithms, the successfully recog-

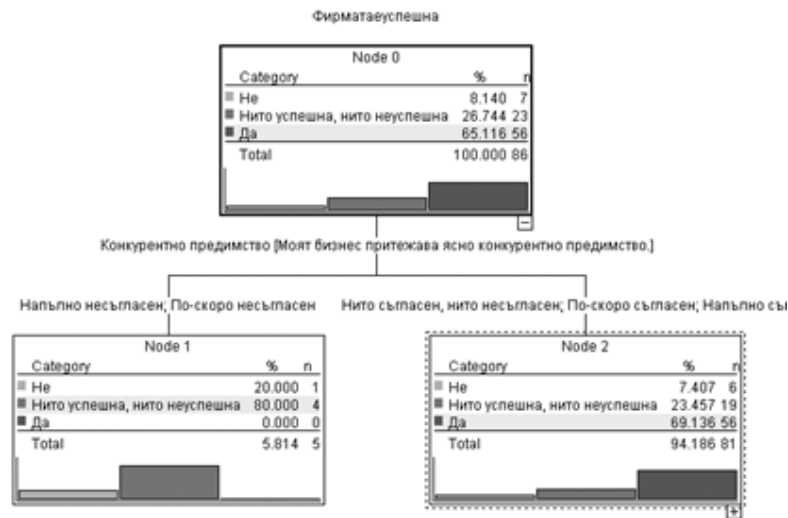


Fig. 2. Nodes from a generated decision tree using IBM SPSS Modeler

nized cases vary from 75% to 91.86%. A part of a generated decision tree using IBM SPSS Modeler is shown in Fig. 2. The figure indicates that the most important predictor for the company success is the presence of a clear competitive advantage.

2 Existing Software Applications for Success Prediction of Start-up Companies

Based on internet research, three similar tools for evaluation of the chances of success or failure of a start-up company has been identified. The tools rely on input data from a survey.

The most advanced tool is called “Odds of Success Calculator” [9] and was created by the “StartupNation” company. The purpose of this calculator is to determine the chances of success of companies. The tool is a web application and is freely accessible on the Internet. It works by assessing eight key factors about the company:

1. About how much debt and equity capital has been provided to your business?
2. How long do you think it would take to obtain additional funding for your business?
3. How often do you evaluate your cash flow status or plan?
4. What is your degree of business planning?
5. What is the approximate annual growth rate of your market?
6. How many years of management experience do you or your team have?



Fig. 3. Odds of Success Calculator Results

7. How many years of industry experience do you or your team have?
8. Over what timeframe do you want to know your chances of survival?

The main advantage of this tool is that it is open and easy to use due to the few factors used to assess the success (Fig. 3). On the other hand, due to the little information that the user must enter to describe their business, creating an accurate forecast does not seem very reliable. The results are not based on a scientific research but on data about businesses from North America provided by the EquityNet Crowdfunding Platform.

Another application for predicting the success of start-up found in the study is the “Startup Compass” [10]. The application assesses technology start-up companies. It uses a questionnaire and produces an evaluation of the company according to its type and stage of development (Fig. 4). The results are displayed as various graphics evaluating the current company on the basis of other companies using the tool. The idea of the creators of this app is to serve as a personal assessment of a business and use it to more easily detect potential problems, clarify priorities, to support the process of shaping the entrepreneurial team and to easily measure the progress of a company.

The assessment criteria of Startup Compass are based on a research of over 600 start-up companies from the Silicon Valley. The main factors are:

- customers,
- product/service,
- management team,
- business model,
- funding sources.

The software uses data from various Internet resources: Quickbooks, Salesforce.com, Stripe, etc.

The last application that will be discussed is called “Blueprint start-up success calculator” [11]. The application was created by the Australian company “Think Blueprint” and it is meant to be a tool for complete business planning,

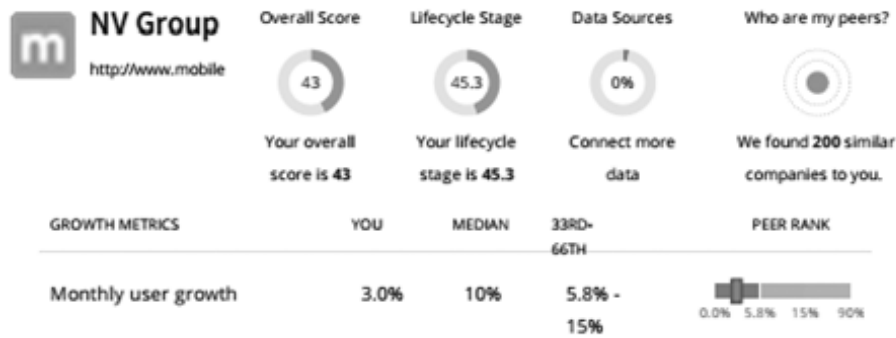


Fig. 4. Startup Compass Results



Fig. 5. Blueprint Start-up Success Calculator Results

including tools for creating business plans, risk assessment and outlining the main activities in the creation of a new company. Some of its features are free to use. The software uses a brief questionnaire to obtain data about the start-up company. The results for the chances of success are sent via email as it is shown in Fig. 5.

The workflow of the application cannot be traced and no details are given about the calculated score. This application has the most basic functionality among all examined in the study.

3 Information System for Forecasting the Success of Bulgarian Start-up Companies

3.1 Forecasting Algorithm

The main objective of the IS is to automatically predict the chances of success of start-ups. The data flow of the IS is illustrated in Fig. 6. The prediction is done in four steps, assuming that the IS will be used by a company owner with the help of a business consultant who will guide him through the process and will help him interpret the results and take actions:

1. Company owner fills in a survey in Google Drive.
2. Business consultant start the IS.

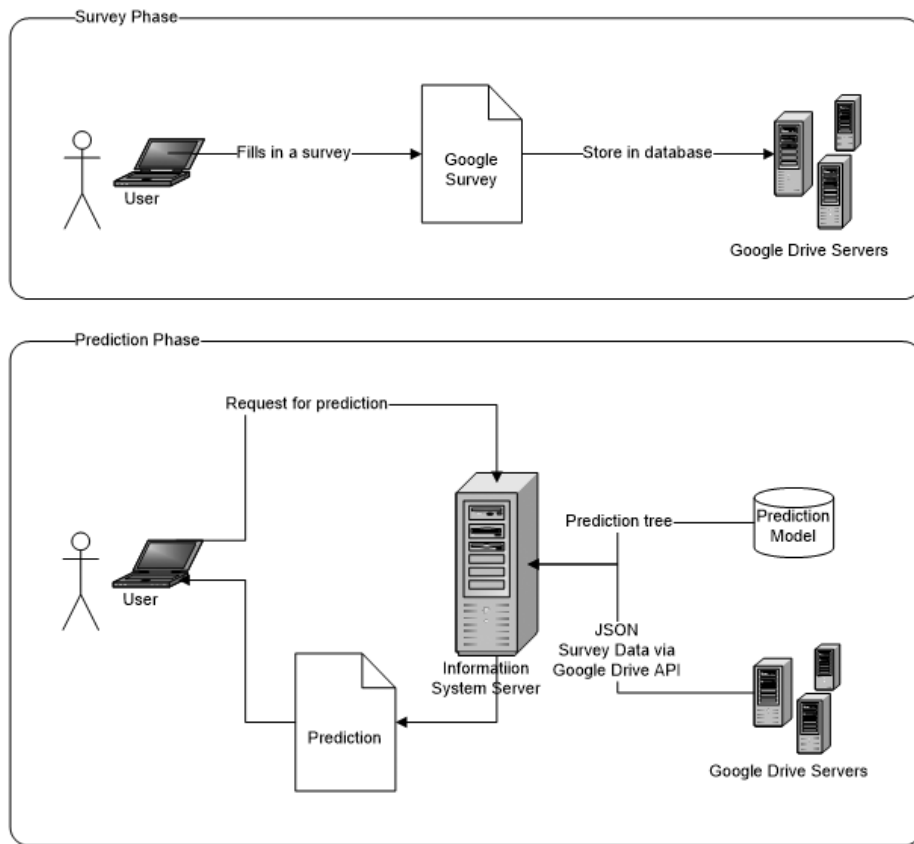


Fig. 6. Data Flow Diagram of the IS

3. In the IS, the business consultant selects the survey data and a prediction model and starts the prediction.
4. The business consultant and the company owner analyze the prediction result and the success factors.

After the users of the IS fill in a survey, the IS reads the survey data with the help of Google APIs and prepares the data. The IS also reads the prediction model which is a decision tree. Then the survey data is interpreted as nodes of the decision tree. The rules from the decision tree are applied consequently to generate a success prediction result. The result is in the form of a success probability rate and a graphic of a personalized tree which illustrates the success factors compared with the user data and the success probability of each node (Fig. 7).

The IS will evolve as more companies use it and the database grows. It supports various decision tree models from IBM SPSS Modeler and WEKA.

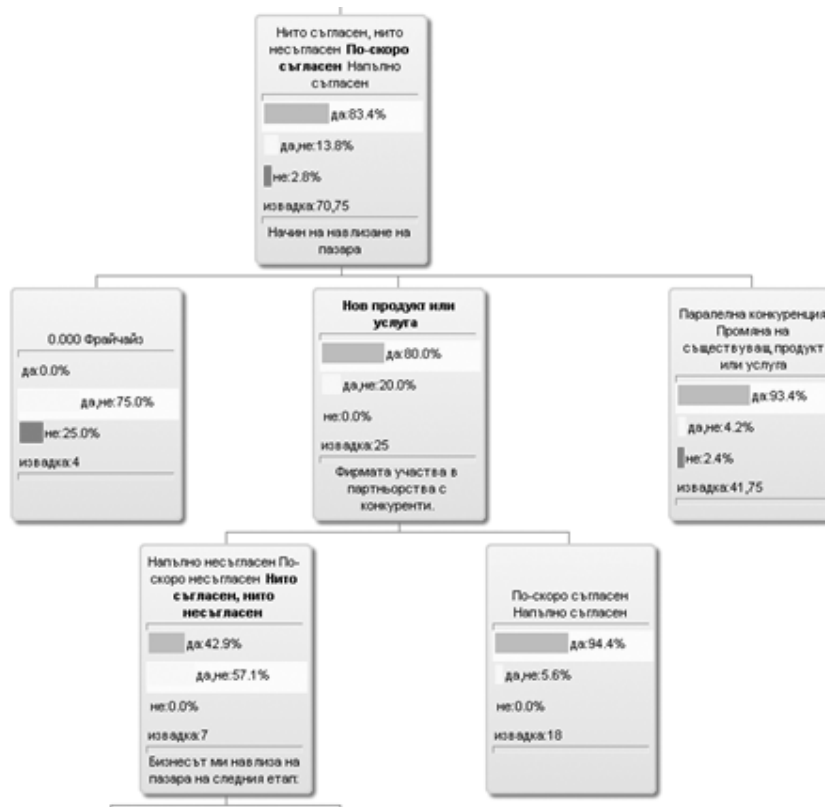


Fig. 7. Example of a Personalized Decision Tree

3.2 Technologies

The IS was developed using the principles of OOP in PHP programming language [12] and MySQL database. The Smarty framework is used to separate the logic layer from the presentation layer. The application is browser-based and the front-end is developed in xHTML, CSS and JavaScript. The IS needs several third party libraries and APIs for login, access to the survey data, visualization, AJAX calls, etc.:

- Google Disk API – used to access survey data on Google Drive,
- Google Spreadsheet API – used to access, sort, group and paginate survey data on Google Drive,
- Google Visualization API – used to visualize the decision trees,
- Smarty – a PHP template engine,
- jQuery – a JavaScript library.

4 Conclusion and Future Work

Interviews with five Bulgarian company owners indicate that they would use the IS for predicting the success of their companies and for indicating possibilities for improvement. Most of them would trust the prediction result because it is rationalized with a decision tree. Although they are not ready to pay for using the software, they would try it if it was free.

The IS predicts the success of Bulgarian start-up companies with the accuracy of the prediction model. The model is based on a qualitative research of 137 companies. The prediction accuracy would increase if more companies used the IS and the database increases. This is an opportunity for constructing better prediction models. The IS is designed to work with any decision tree classification model, which opens the possibility to extend the success predictions to companies outside Bulgaria.

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