Critical mass measurement models for startups from agricultural business

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Abstract: The aim of this paper is to give an overview of the existing agent simulation models for measurement of the critical mass and its categorization.

Keywords: startups, critical mass, agricultural business.

1. Introduction

Today the term „startup" is used to describe young companies (less than 10 years), which focused on innovation and are growth oriented [GSA+14]. Innovations are always connected with high level of uncertainty which increases risk of failure. That is why the biggest problem which any startup, including startups from agricultural business, faces is a risk to fail. According to the different statistical sources only 2 to 3 startups out of 10 achieve [Oc12] a critical mass and survive on the market and become successful.

2. Definition of critical mass and categorization of its measurement models

In the economics term "critical mass" got popular due to the studies about the diffusion of innovations. There it was defined as "the minimal number of adopters of an interactive innovation for the further rate of adoption to be self-sustaining"[MR99]. To achieve critical mass several thresholds should be overcome. One of the thresholds is on the micro-level. This is an agent level and each agent has a certain personal threshold that determines a decision to adopt or not a new technology. On the meso-level communication between the neighborhood agents influence the decision to adopt. The macro-level represents a whole network. The structure of a network creates conditions for achievement of a threshold, particularly such parameters as a number of connections between the nodes, existence of hubs and type of the connection between the agents [K+12]. Bass model is a commonly used model for calculation of the innovation diffusion and it was one of the first models which included a contagious process [K+12]. The model consists out of two coefficients: innovators and interpersonal communication [MMB95].

The model was very simple and did not include such aspects as customer heterogeneity , competition and imitation effects beyond word of mouth and needed a market data for

calculation of a take-off moment [K+12]. Agent based models allow creating heterogeneous agents and different network structures. In the literature review of the last decade it is possible to determine four main categories of agent simulation models based on the Bass model. [K+12] For this categorization will be used a micro-level threshold. This level of decision making is the most difficult as it captures behavior of each agent. First category represents models which took into consideration only external factors influencing diffusion of innovations such as word of mouth, advertising, or imitational behavior of neighbors. (see Fig.1) In other three categories decision-making process has two components. One of the components is estimation of internal factors. These factors are based on individual perception of each innovation. Another component is external information about an innovation. Main difference in the following categories is in the internal component. Price percolation is a second category where internal component is based on the private estimation of the quality of innovation and reservation price, which an agent is ready to pay for it. In the utility category internal component is measured as benefits which could be not monetary and quality estimation of innovation. The rules of the last group for decision making based on the costs of using a new innovation and its profitability. On the contrary, to the price percolation where measurement of internal component is independent of the competition in the last group costs and profits of innovation are compared with existing technologies.

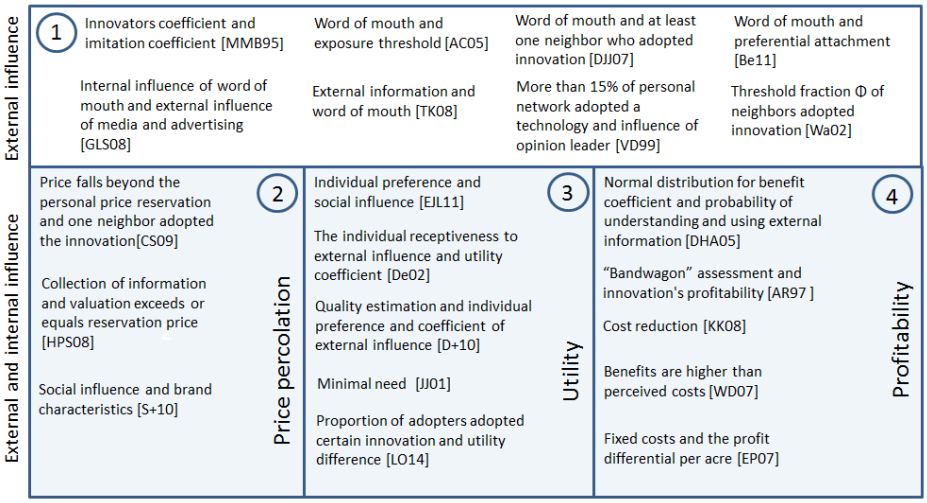

Fig.1 Innovation adoption rules on the agent level of different models

One of the biggest disadvantages of these models is that all coefficients were normally ranged from 0 to 1, for example for quality preferences, or individual estimations. To receive empirical data those coefficients should be operationalized. That is going to be next step in this research.

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