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COMPETING IN A SMART WORLD

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Summary: As the real and the digital worlds are converging and Big Data is flooding everywhere in business and society, new opportunities appear on the horizon of active and would-be entrepreneurs. Agile ventures may disrupt existing markets and can create new ones. Thanks to sensors, unlimited computing capacities, clever algorithms, machine intelligence and many other technical tools, smart systems are built everywhere. The related business opportunities can be identified and described by the help of an activity-sector matrix. The logic of this framework is to be explained, practical examples demonstrate how the smart ecosystem is evolving, and how small and medium-sized companies compete in this field. Business ventures must develop strategies for succeeding in the new digital and data-rich environment, must take care of their digital capabilities, and last but not least have to demonstrate strong leadership in planning and execution. Agriculture is also in digital transition, many companies invest in digital capabilities all over the world, representatives of smart or precision agriculture lead the transformation.

Keywords: smart systems, big data, strategy, entrepreneurship, information technology, smart agriculture

1. Introduction

Mu Sigma Inc. is one of the fastest growing companies of the world now. It was founded by the former consultant Dhiraj C. Rajara in 2004. The company's name is derived from the statistical symbols „Mu" (mean) and „Sigma" (standard deviation).
The name is a message for the market: the company is a master of data-driven analytics and related decision support systems. Mu Sigma, headquartered in Chicago and operating its main delivery center in Bangalore (India) works for many Fortune 500 companies nowadays. By the help of its analytical services, customers can make better predictions about future demand for their products, can increase the efficiency of their processes, the insight generated by data-based models help them to identify and manage risks, to implement growth strategies and to reduce costs. Mu Sigma is active in many industries including airline, entertainment, healthcare, retail, technology, telecom, etc. It managed to attract the interest of investors, raised its first institutional investment round of $30 million from FTVentures and the second one of $25 million from Sequoia Capital, the flagship venture fund of Silicon Valley.
Mu Sigma represents a new breed of knowledge-based private ventures of the fast developing *Big Data* world. 2004, the year when it was founded, closed the "nuclear winter" of the IT industry, a period after the dotcom crisis when many internet companies went bankrupt and technology investment hit the bottom. Fortunately technological progress did not stop in this period, technology entrepreneurs and investors learned a lot from the crisis and company failures (Bőgel, 2015: chapter 6). The widespread enthusiasm of the late nineties did not return, business thinking became more realistic and cautious, but pessimism gave way to optimism, and the vital role modern information technology and innovation may play in business strategy became really apparent for many decision makers.
The content of business strategies has also changed: as the economy has been moving out of the financial crisis by the end of the new century's first decade, the focus is no longer on cost

savings and economic efficiencies but rather on growth and technology's potential for business transformation (Davenport, 2014). Technology innovation, lessons learned during the crisis, and new growth opportunities - all these factors mixed together generate a fertile environment for SMEs.

2. Birth of the Big Data phenomenon

Some technologies have matured enough to enable traditional and new businesses in many areas. Let's see just a few examples. Computers are more powerful now, networking is global and ubiquitous. Companies, especially new ones do not have to build and maintain their own ICT infrastructure because cloud computing became an accepted platform. Instead of buying expensive server farms companies can simply rent computing and storing capacities from huge data centers and pay by usage. Capacity and service prices are decreasing continuously thanks to competitive forces. Service models combined with mobile tools increase business flexibility and adaptability. Digitization is a massive trend everywhere, more and more physical objects, tools, machines and other devices are equipped with electronics, computing and communication capabilities (Gleick, 2011). The "internet of things" is growing faster than the "internet of people", billions of cars, production tools, household devices, sensors, etc. will be connected to the network in the near future, connectivity and data will get cheap and globally accessible. Many organizations have already built their "digital nervous system", installed ERP, CRM, SCM and other company applications, streamlined their processes by digital transactions. Sensor and identification technology has developed a lot.
Datafication of the world is in progress, and this process looks to be unstoppable (Baker, 2008). Progress in infrastructure and software improved the ability to collect data throughout the enterprise and complex international supply chains. Virtually every part of modern organizations and their environment is open now to data collection. This almost unlimited availability of data has led to the so called *Big Data* phenomenon and raised the interest in methods for extracting useful information and knowledge from huge and permanently growing datasets of enormous volumes and high variety (Barabási, 2010).
Data became a key business asset; data management and analysis are business capabilities of high importance. Companies and other organizations try to exploit data for competitive advantage, better customer understanding, designing and launching new products and services. The data-centered convergence of important digital technologies has given rise to modern data science and powerful data-mining techniques (Fajszi, Cser and Fehér, 2010).
The main promise of the Big Data phenomenon is the ability to build *smart systems* everywhere (Mayer-Schönberg and Cukier, 2013). Smartness stems from a combination of comprehensive, relevant and real-time data, sophisticated analytical algorithms, efficient decision support, fast and effective execution. Cutting-edge smart systems are not only smart but capable for learning and self development. Smart systems pop up everywhere, more and more things get a "smart" prefix before their name: smart commerce, smart manufacturing, smart agriculture, smart town, smart commerce, etc.

3. New entrepreneurial space

The potential for designing and building smart systems opens a new entrepreneurial space. Many of these opportunities will be spotted and utilized by new ventures which will start to compete with industry incumbents. Smartness, namely the ability to collect and digest Big Data for insight, prediction, innovation and improvement may have a transformative impact on many sectors, may change the nature of competition and even disrupt some industries.

The aforementioned company, Mu Sigma is focusing on statistical analysis and modelling, as key components of this new entrepreneurial space. Its fast growth properly illustrates the market's potential. This opening and growing space can be described as a two dimensional matrix of activities and sectors.

The first dimension represents the following logically ordered imbedded activities of functioning smart systems:

- Selecting a subject and identifying its problems or needs for improvement
- Translating the problems to the language of data science
- Collecting relevant data on the system and its environment
- Mixing the collected data with other accessible relevant and valuable data
- Transferring the data to a place where the necessary computing power, storage capacity and data management knowledge is available
- Analyzing the data, building decision-support models
- Operating the models for insight and decision support, presenting findings and recommendations to decision makers.
- Implement the decisions, changing and developing the selected system, measuring and evaluating the results.
- Closing the loop, using the acquired experience for learning, improving the activities listed above.

The second dimension is for the sectors which may benefit from the development and spreading of smart technologies: trade, manufacturing, finances, government, healthcare, agriculture, education, marketing, etc. Mu Sigma concentrates on data analytics and modelling, but otherwise it is sector-free that is it may serve anybody who has a problem which can be approached with data analytics tools (Provost and Fawcett 2013).

Let's take another example from agriculture what is a vertical sector of the entrepreneurial space outlined above. The Hungarian QuantisLabs' SmartVineyard system is predicting grape diseases with modern tools of data collection and data-based decision support. The system captures real-time microclimatic data with a set of sensors. The data is transferred to the cloud where smart, scientifically tested algorithms calculate the probability and the intensity of local grape diseases, then properly visualized real-time forecasts and alerts are presented to vine-growers, who can expect higher productivity and lower costs. Human decision-making and intervention (e.g. spraying chemicals) is an integral part of this system, but data collection, transfer and analytics is automated.

Big incumbents like IBM try to cover almost all the horizontal (activities) and vertical (sectors) parts of the entrepreneurial space of smart systems. Some of them design and build complete smart towns with many modern data-based services. One of the leading examples is Santander, a Spanish coastal town where thousands of installed sensors feed the smart algorithms providing support to the city's inhabitants. The systems' main designer and operator is Telefónica, a Spanish broadband and telecommunications provider with a global presence. In Hungary, the large ICT incumbent Hungarian Telkom is building the infrastructure for smart town services in Szolnok and Nyíregyháza.

Small and medium-sized companies, and especially startups try to focus on specific activities or vertical subsectors. Let's stay in agriculture for another example. Blue River Technology, established by a group of university students developed and integrated and automated machine for lettuce thinning. The machine, moving rather fast over straight rows of small lettuce plants collects data via digital photographs, then a smart algorithms decides what to keep and what to cut. Execution is also automated: unnecessary plant are killed with precisely aimed shots of fertilizers.

Because of the complexity of smart systems, design, implementation and operation is typically done in partnerships. The network of cooperating partners may be very colorful.

Customers of Airinov, a French venture founded in 2010, a remote sensing pioneer use a drone for collecting real-time high resolution data about their crops, while the results of the analysis is fed into the computer of their multipurpose John Deere tractors for direct execution. This combination of agricultural an information technology, hardware and software, sensors, drones and tractors is a good example for a fast growing area called precision or smart agriculture. It a growing and dynamic sector, booming worldwide but still in its infancy: contributors must do a lot for integration, joint platforms must be built, key standards have to be accepted and disseminated.

4. The evolution of the new entrepreneurial space

What can we expect for the future? Here are a few points for consideration:

- The development of information and communication technologies in general, and the Big Data phenomenon in particular open a new entrepreneurial space in the economy. The evolution of fundamental technologies (sensors, internet of things, cloud computing, machine learning, artificial intelligence, etc.) is very fast. New opportunities appear everywhere, while old sectors and companies may be disrupted.
- Old and new companies must compete in an emerging smart world where Big Data is a decisive asset, sophisticated algorithms support decisions, and execution is increasingly automated.
- This new environment provides unique opportunities for new ventures and SMEs. Organizations try to find their niche in the entrepreneurial space and concentrate on some components. Permanent innovation and integration into bigger smart ecosystem are key success factors.
- The best ventures may raise the attention of venture investors. Capital is needed for scaling up and going international. The evolution of smart system is an important factor behind the present "startup fever".
- Companies need vision and leadership for competing successfully in the rising smart world (Brynjolfsson and McAfee, 2014). Decision makers and entrepreneurs must learn how to manage their organization's data assets professionally, how to launch new data-based products and services. A growing number of organizations of different size will employ data experts, data scientists or will buy data-related services from specialists.

The evolution of smart agriculture may be slower than that of other sectors, but the number of experiments and promising examples is growing. Hungary's agricultural capabilities and traditions mixed with modern information technology may provide fertile soil for innovative and entrepreneurial companies.

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