BUSINESSS ANALYSIS BEING AN ANTREPRENOR IN THE DIGITAL INTEGRATED AUTOMATION FIELD

Mihai SINDILE[1]

Rezumat. *În această lucrare se prezintă o parte din rezultatele cercetării autorului în cadrul Programului "BeAntreprenor" al Universităţii Politehnica din Bucureşti. Interfeţele senzori-masini s-au abordat ca un sistem de sisteme şi ca proces integrat şi integral în scopul dezvoltării infrastructurii dedicate cercetării aplicative şi dezvoltării de tehnologii inovative. Se evidenţiază topul celor mai importanţi senzori utilizaţi în sistemele SCADA şi în general în domotică. Pandemia reprezintă simultan un risc şi o oportunitate pentru un inginer-antreprenor în domeniul automatizărilor total integrate.*

Abstract. *This paper presents some of the results of the author's research within the "BeAntrepreneur" Program of the Polytechnic University of Bucharest. The sensor-machine interfaces were approached as a system of systems and as an integrated and integral process in order to develop the infrastructure dedicated to applied research and the development of innovative technologies. The top of the most important sensors used in SCADA systems and in home automation in general is highlighted. The pandemic is both a risk and an opportunity for an engineer-entrepreneur in the field of fully integrated automation,*

Keywords: *BeAntreprenor Program, Sensors, Domotics, Pandemic*

1. Introduction

I participated, between September 2019 and January 2021, in the Polytechnic University of Bucharest Program, named "Scholarships for entrepreneurial education among doctoral students and postdoctoral researchers (Be Antreprenor!)". The purpose of this program was to provide to all the participants solid knowledge of management, to develop entrepreneurial skills, and to encourage them to create and develop their own businesses in their localities.

The information obtained was targeted onto the following fields: Setting the purpose and objectives of enterprises; management of operations and human resources; financial management; market and opportunities analysis; risk management; marketing and promotion strategies; development of innovative products / services; intellectual property protection; management of intangible assets and methods for evaluating innovative technologies; technology transfer

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[1]PhD, Eng., affiliation: Academy of Romanian Scientists, "Constantin Angelescu" Institute for Advanced Research (ICAI), Doctoral School of Industrial and Robotic Engineering - Politehnica University of Bucharest, Romania (e-mail: sindilems@yahoo.com).

and technology readiness level; the modeling business processes for different companies; valorization of research results, and the research ethics.

One of the fundamental themes of this program was the elaboration of a business plan for a newly established company, which would capitalize and materialize the studies and research carried out during my work as a postdoctoral researcher *"Sensor-machine interfaces in the context of integrated digital automation"*.

I've chosen to create a start-up that offers consulting services, design-execution-maintenance of gas thermal installations, with sensors and gas smart-meters adapted to a SCADA system to the future customers who want to connect to the gas network of a locality. The sensors, the smart meter and the thermostat will be chosen so that they adapt to a SCADA system that will be later implemented by the gas supply company.

Benefits of end customers: qualitative leap in living standards (social impact), stable solution and fast technical support, easy mode of operation. On the other hand, flexibility in the further development of a gas company SCADA system, with the possibility of remote control and monitoring.

2. SWOT analysis of the business

Internal Environment

Strengths

1. Technological knowledge (systems, networks, connectivity, programming and data management), marketing and market approach
2. Close relationships within the team and OK salary motivation of all staff
3. Experience in CAD design and the availability of a project database for gas thermal installations (IGT) make the design quick
4. The entrepreneur is known as a local man and keeps the image of his parents, giving seriousness and conscientiousness among fellow citizens)
5. The team consists of people with complementary skills (AutoCAD, databases, management, and experienced installers)
6. We are able to respond without delay.
7. We are flexible and can adapt quickly to new developments in the field
8. We are able to offer advice and enough time dedicated to clients.
9. We have good relations with software developers and companies like Siemens Romania.
10. In the event of a pandemic, key employees can work online to design facilities

Weaknesses

1. Lack of consistent own financing in the company
2. High costs for project implementation.
3. Lack of a brand because the business is in its infancy, have not a Power mark.
4. For starters, we have a small staff.
5. We are vulnerable if key-people get sick or leave for a more substantial income
6. Our cash flow will be unstable in the early stages.
7. Just a little market experience
8. In the event of a pandemic, the project implementation team in the field will encounter difficulties for interventions
9. Being at the beginning, the back-up solution for technological equipment is a problem
10. Labor volatility, the ability to keep key people in the business, if they find a much better paid job
11. Lack of a specialist in negotiations
12. Failure of technical equipment

External Environment

Opportunities

1. Opportunity window: Extension of the areas in a certain locality that will be connected to the gas network (North, Far East and extreme west of the locality), with potential new users (approx. 700)
2. Emergence of new customers: public awareness that heating gas is cheaper than solid fuel or electricity. In addition, gas smart-meters clearly indicate: You pay only what you consume, unlike solid fuel (wood, coal - very expensive plus "wood mafia" + "pinching" on the scales + wood or wet coal)
3. The lack of AutoCAD design specialists in the area, which gives the company a competitive advantage on the design side.
4. Possibility to provide logistical support to end customers via the Internet.
5. Our business sector is on an upward trend, with many future opportunities for localities within a 50 km radius.
6. The competitive business model does not take into account the development and implementation of a SCADA system of the gas distribution company.
7. Upward trend of introduction / implementation of SCADA systems, integrated automation and digitization approved and financed by European policies.
8. The emergence of numerous European funding programs (2021-2027) for infrastructure development, fully automated industrial engineering.

Threats

1. The local administration doesn't want to encourage business at the local level (Weak relations with the local administration).
2. Low level of technological education among future (new) users, high average age, non-use of internet facilities by residents in the area of expansion of the gas distribution network
3. Low purchasing power at city level (Disadvantaged area).
4. Environment affected by the risk of a pandemic or terrorism (extremely low risk, but still to be taken into account)
5 Legislation - we depend on ANRE decisions
6. A change in the concentration of a large competitor may suppress the position we are preparing in the market.
7. Fluctuation of the leu-euro ratio and inflation rate
8. Existence of similar consulting companies at regional level (Craiova, Tg. Jiu)
9. Delaying the deadline for the expansion of the gas pipeline infrastructure in the city.
10. Delay of equipment requested from suppliers.
11. Political instability.
12. Change of the main gas supplier at city level. For the perspective of developing and implementing a SCADA system, we depend on the decisions of the gas supplier
13. Instability of the number of customers. An oversupply can occur, much larger than the company's capacity
14. The competitors have more teams.
15. Competition allows its customers to pay in installments, which we cannot afford from the beginning.

The SWOT analysis reflects a combination of variables based on which the entrepreneur can choose the company's strategy. The SWOT interpretation explains the cost differentiation strategy.

Technological Flow technological flow for connecting a customer to the gas network will be highlighted in **figure 1,** on the next page.

3. Home automation sensors

In my studies on *"Sensor-machine interfaces in the context of integrated digital automation",* I approached the sensor-machine interfaces as a system of systems and as an integrated and integral process in order to develop the infrastructure dedicated to application research and the development of innovative technologies.

In one of the SCADA guides provided by DPS Telecom **[4],** the Top 10 SCADA Sensors are the following:

> **1. Temperature Sensors -** With the right SCADA system, you can use your analog readings to send alarms based on configurable thresholds. You can have different thresholds for low, critically low, high, and critically high.
> **2. Humidity Sensors -** humidity monitoring is one of the key environmental alarms to monitor in every unmanned remote site.
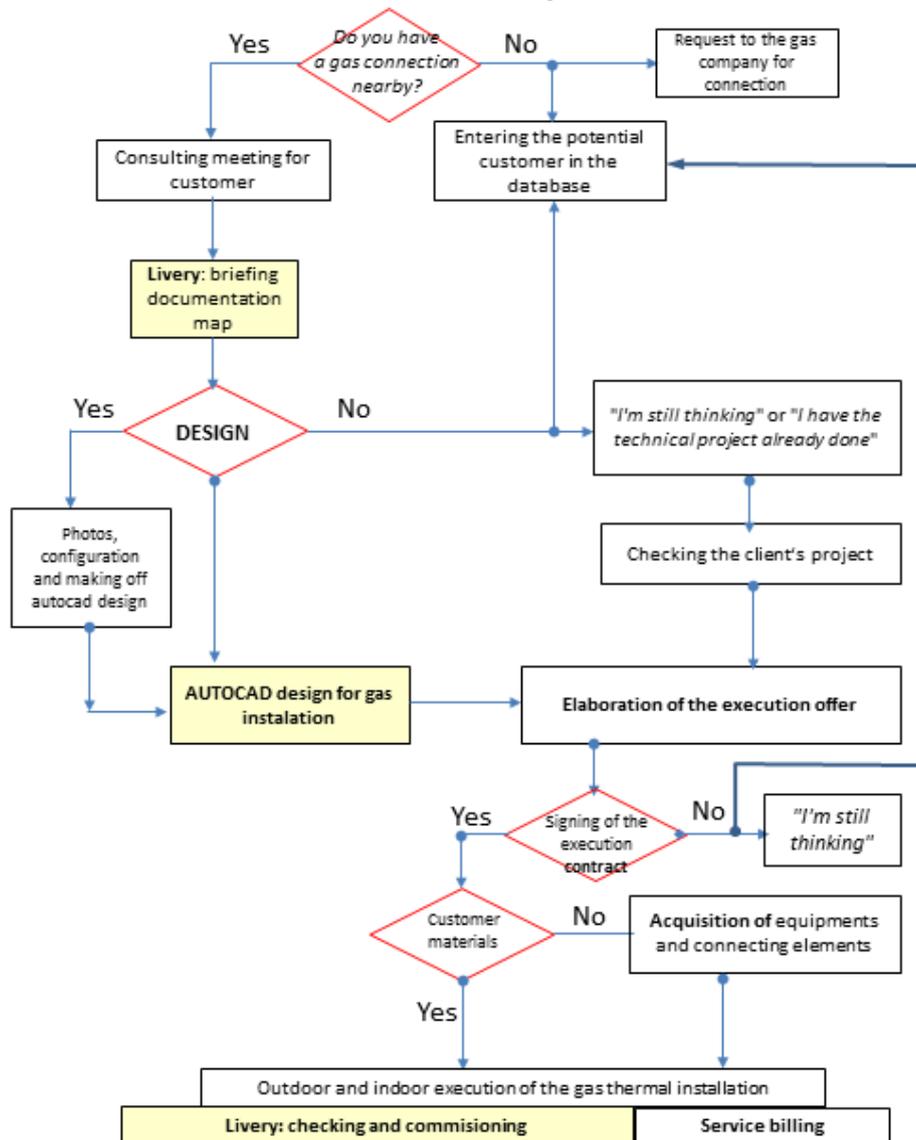
Fig. 1: Technological Flow technological flow for connecting a customer to the gas network

3. Motion Sensors - The most critical element of physical site security is being able to detect intruders and receive an immediate alert.

4. Liquid Level Sensors - can be used to monitor water towers and fuel tanks.

5. Water Flow Sensors - Using water flow sensors gives you an accurate picture of your fluid flow rates. At water treatment plant, water flow is one item on a long list of data that must be collected during the treatment process.

6. Smoke Sensors - Smoke sensors are critical safety devices needed in every home,.

7. Door Sensors - Whether or not you've already experienced theft or vandalism in your network, your unmanned sites are vulnerable.

8. Power Failure Sensors - A power failure sensor will send an alarm when power is disrupted. This is a discrete sensor that outputs a contact closure when power is not detected for a user-defined amount of time. Most users want to receive a critical alarm after any failure lasting more than a few seconds.

9. Current Sensors - are highly useful for motor drives, UPS systems, and battery supplies.

10. Propane Tank Sensors - Monitoring your propane tanks can save you from running out of fuel. Some propane sensors send an audible alert when they're running low.

Smart Home automation (*domotics*) consists in the integration of all the technologies that allow the functioning automation for the installations inside the buildings. The aim is to increase the safety and comfort of buildings, by equipping them with a simple, reliable, flexible and efficient control system. A home automation system allows us to have a single interface for the management and control of lighting and power installations, temperature control, alarm, video surveillance.

In order for smart objects in a house to communicate with each other, they must use a protocol, a standard through wireless technologies. The most important of them are: 1. Wi-Fi, 2. Z-Wav, 3. Zigbee, 4. Bluetooth **[7]**.

The criteria by which we evaluate these standards are: frequency, type of network, distance it covers (range). We can also look at the data transmission speed and the number of devices we can connect.

The following table shows the indicative numerical values for choosing one of the protocols (**Table no 1**).

Table 1) Number of connected devices **[7]**

	Wi-Fi	**Z-Wave**	**Zigbee**	**Bluetooth**
Frequency	2.4 GHz	868.42 MHz în Europe and 908.42 MHz în USA	2.4 GHz	2.4 GHz
Network type	Access Points	Mesh	Mesh	Star
Range (Gama)	46m indoor and 92m outdoor	30	10	100
Number of connected devices	250	232	65000	32000
Transmission speed	100 Mbs	9.6-100 kbps	40-250 kbps	1 Mbs

4. What an entrepreneur needs to do now

KEY Partners and Resources **[3]:** ■ Local procurement of materials with limited access to other companies ■ Use only local resources for sustainability and employment connected reasons ■ Procurement of sustainable materials and eco-friendly transportation ■ Development of partnerships with local suppliers

Consumer Relationships: ■ Bring value and quality to the customer relationship ■ Acquire perspective and direction from interacting with the customer base ■ Facilitate the ease of access to information and products for the consumer

Channels: ■ Develop the online platforms and delivering products, services and messages to the customer base ■ Develop relationships with different retailers, as well as second-hand and vintage shops, and off-prise retailers ■ Communicate simply and directly to the customer base ■ Develop strategies to acquire more market share through the use of technology and innovation

Conclusions

Conclusion (1). *Necessary skills of an entrepreneur in 2021:* ■ Leveraging artificial intelligence and Big Data to build a robust supply chain resilience platform ■ incorporating fiscal optimization in business activity ■ incorporating cost-of-service as a fundamental performance metric; ■ correcting the "make vs buy" mix ■ learning to prioritize solutions and decisions **[1]**

Conclusion (2). The 2020 Covid 19 pandemic has raised the alarm about the need for international cooperation **[1]**

Conclusion (3). My opinion is that the pandemic has generated an unprecedented crisis and is the first major real test of the information society. Moreover, for an automation engineering entrepreneur, it is an opportunity and at the same times a risk.

Acknowledgment

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