Artificial Intelligence: An Overview of European and Romanian Startups Landscape and the Factors that Determine their Success

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Abstract

Artificial Intelligence (AI) is integrated into many aspects of our lives; in the tech-driven era, businesses use AI to boost their productivity, to better understand consumer behavior, or to provide services through robots. Based on an online desk and pilot research made by Filip (2021) for the dissertation paper, the study offers an overview of the European and Romanian Startups landscape and the factors that determine their success as Product Development Core Team Expertise, Core Team Commitment, and Business Strategy. The study aims to create a framework for a further paper that will research in-depth the AI startup environment in Romania as the economical journals predict that the market will grow in the near future given the potential Romania has in this field and that is fuelled by the pool of talent in IT, technology and robotics.

Keywords

Artificial Intelligence; startups; success factors.

Introduction

General discussion on Artificial Intelligence

Artificial intelligence (AI) comes in many forms, from face detection and recognition systems, search and recommendation algorithms to even digital assistants, chatbots, or social media. Its complexity and dynamism are difficult to be synthesized in one definition (Zbuchea, Vidu, & Pinzaru, 2019).

According to statistics, the global artificial intelligence market is estimated to reach half a trillion U.S. dollars by 2024 (Statista, 2021a), with revenues for AI software markets anticipated at 327.5 billion U.S. dollars (Statista, 2021b). Although it seems to have had rapid growth and increased popularity in the past few years, artificial intelligence dates back to the 1950s, when the concept was born in the minds of scientists, mathematicians, and philosophers alike. One of the first extensive approaches to the topic was made by Alan Turing, who described in his paper "Computing Machinery and Intelligence" the term *artificial intelligence*, as well as its building and testing (Anyoha, 2017, p. 1). With the introduction of the Turing Test, he

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offers one of the first separations and definitions of what an intelligent artificial system is (Stanford, 2020), which is relevant and used as a benchmark to this day. With the continuously increasing interest in AI, as well as the creation of the first artificial intelligence program – Logic Theorist (Anyoha, 2017, p. 3), top researchers, such as John McCarthy and Marvin Minsky, came along in 1956 at the historic Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI) conference to discuss and initiate artificial intelligence as a research discipline (Moor, 2006). John McCarthy defined AI in his paper, titled "What is artificial intelligence?" (2004), as follows:

"It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable."

In the years to come, artificial intelligence has seen both challenges and opportunities. Now, with the development of technology, computer storage, and processing speed, artificial intelligence has the opportunity to access "big data" and provide an effective solution for any business (Batra et al., 2018). As AI shapes to some extent the success and profit of a company (McKinsey & Company 2020), it came to no surprise that the field attracted year-over-year record fundings (Statista, 2021c). According to Statista, in 2020 alone, "the global total corporate investment in AI reached almost 68 billion U.S. dollars" (2021d), while AI startups witnessed a surge of investments of 73.4 billion U.S. dollars, an increased number compared to the previous year (Private Equity Wire 2020).

With a high growth potential and continuous adoption, it is key to understand how the usability, functionality, and adaptability of AI respond to the businesses' needs, as well as how AI impacts a company's processes and procedures. Moreover, the interactivity between artificial intelligence and other companies, as well as the raising concerns around AI, such as privacy and decision-making are an additional point of discussion and controversial subject. Business ethics is a continuous concern for contemporary strategic management and responsible consumers, and AI development has brought to the front of the debates new critical aspect (Vidu, Zbuchea, Mocanu, & Pinzaru, 2020).

AI used in business

With its increased demand and accelerated implementation plan in business models, artificial intelligence is on the rise and here to stay. In the survey conducted by PricewaterhouseCoopers (PwC) it is mentioned that companies have seen an adoption increase of 18% since last year, with 54% of businesses soon to embrace AI as well (PwC, 2021).

AI can be used either as a software, in the form of search engines, data analytics, speech and face recognition systems, or virtual assistants, or as an "embodied" AI, such as robots or autonomous cars (European Parliament, 2021, p. 3). It allows companies to enhance their productivity, accelerate innovation, drive improved customer experience and augment the human workforce (IDC, 2020), which results in a more efficient allocation of resources and an increase in profit of almost 60% (Accenture,

2021, p. 5). Artificial intelligence is heavily used in tech and telecom-driven companies (Statista, 2021e), being also a disruptor in industries such as healthcare, retail, financial services, education, and transportation (Takyar, 2021). When it comes to new ventures, AI predominantly falls into these main industries presented in Table 1 below.

Industry	Percentage of share
General/Cross-Sectoral (B2B services)	25%
Communication (B2B services)	14%
Sales/Marketing (B2B services)	12%
Healthcare/BioTech	9%
Other	7%
Defense/Security (B2B services)	6%
FinTech	6%
Human Resources (B2B services)	3%
Entertainment	3%
Transportation	3%
Education	2%

 Table 1. Share of AI startups worldwide (with over 1%) by industry in 2018

Statista, 2020

Innovation and entrepreneurial activities around AI have sparked primarily in the United States, which according to the research conducted by Roland Berger and Asgard – Human Venture Capital accounts for nearly 40% of AI startups, followed by Europe with 22% and China with 11% (Roland Berger & Asgard – Human Venture Capital, 2018, p. 7). The same study also points out that the leading countries with AI startups are France and Germany – MMC Ventures' research also mentions the United Kingdom as being the first in AI ranking (MMC Ventures, 2019, p. 12).

The race for AI adoption has begun, with more and more companies adhering to AIdriven "business applications, including automation, data analytics, and natural language processing" (Bakken, 2019, p. 4). Therefore, it is important to understand factors that can have an impact on the development, adoption, and implementation of artificial intelligence, from environment or culture to available resources and limitations. Focusing on AI startups from Europe, further on from Romania, can provide key insights into local influential factors, as well as points of improvement and recommendations.

Only a few studies are documenting the relationships between AI and business in Romania. For instance, Micu et al. (2021) investigate the AI algorithms in e-commerce documenting a significant interest at a top-management level for implementing AI in online shops, but the actual adoption of AI is low currently. Mosteanu (2020) observes that "*It can be stated that many large Romanian companies are constantly investing in platforms, systems, projects and ideas, based on artificial intelligence*". To summarize, we observe an interest in AI in Romania and a wide recognition of its potential, but AI development is rather slow, compared to other European countries in various fields, including in business (Cojocaru, Gaindric, & Verlan, 2021, pp. 99-100). Still, Romania

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might be a favorable environment for AI development in a business context (Mosteanu, 2020).

AI Startups environment

Entrepreneurship is a key factor that drives the economic growth and innovation of a country and helps deliver new opportunities for all its citizens (Geibel & Manickam, 2015). The study Trends in European Clusters (2019) reveals ten megatrends to take into consideration for economic development as seen in the figure below.

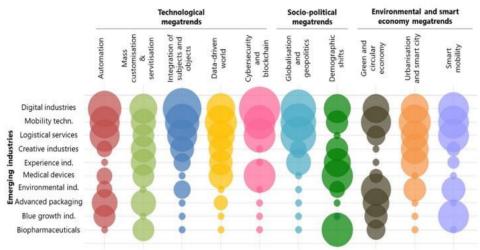


Figure 1: Global Megatrends, 2019 (European Cluster and Industrial Transformation Trends Report, 2019)

Artificial Intelligence is part of the most mentioned trends as the data-driven world, environmentally-friendly ships (in Amsterdam, for example, the Big Data company Xomnia has built the first self-driving boat that works entirely on artificial intelligence), connected trucks (in the future, artificial intelligence alone could control trucks and ships), medical robotics (artificial intelligence and robotics are changing the healthcare sector, robotics experts believe that autonomous robots could soon be regular members of hospital medical staff) (European Cluster and Industrial Transformation Trends Report, 2019).

A critical challenge AI addresses is climate change, in the near future AI will be one of the major enablers at the core of climate change technologies. Forecasting the supply and the demand of power for the national grid, predicting traffic to optimize the commercial transportation, monitoring crop yields to reduce the excess of chemicals and water, controlling the heating and cooling of the building, are only a few examples of how AI can improve the climate change and lots of startups are involved in developing solutions based on AI to reduce the impact of the climate change (Forbes, 2021).

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AI Startups in Europe

The dissertation paper "Critical success factors and innovative approaches for European AI Startups" (Filip, 2021) resumes an overview of the European AI startups look: in Europe the AI entrepreneurial culture has been supported by various educational institutions, local initiatives, and international programs. Innovation, entrepreneurship, and economic development in the AI business field have seen an increased interest in the past decades (Hisrich & O'Cinneide, 1996), leading to a higher maturity of the European AI start-up ecosystem. Artificial intelligence is a key element of future business, with one in 12 new European startups having it as their core value proposition (Kelnar, 2019). There are more than 1.600 early-stage AI software companies (Kelnar, 2019), and in 2020, 8.9 billion dollars were invested in new ventures with such deep technology at its core (Guemouri & Wehmeier, 2020). According to the report led by MMC Ventures (2019), from the 1.600 AI startups, nearly 500 are located in the United Kingdom (479), followed by France (217) and Germany (196), Spain (166), Netherlands (103), Ireland (75), Sweden (73), Italy (66), Finland (49), Portugal (45), Austria (43), Denmark (36) and Norway (32). The report also indicates that the AI startups activate in sectors such as health and healthcare and wellbeing (21%), finance (18%), media and entertainment (12%), retail (11%), transport and travel (8%), infrastructure and utilities (8%), education (6%) and agriculture (5%) (Filip, 2021).

AI Startups in Romania

According to the estimates of the management consulting firm Horvath & Partners, the investments in the Romanian AI startups will reach by 2025 50 million euros. In the last quarter of 2019, the AI startups in Romania amounted to around 20 million euros, this is a good predictor of the evolution of this market in Romania (Vrînceanu, 2020).

Looking at the entrepreneurial environment in Romania, in 2019 there were more than 116,000 new registered companies (National Trade Register Office). The most popular domains were: retail, constructions, transportation, scientific and technical activities.

In a recent study conducted by Techcelearator (2021) a number of 117 AI startups were showcased. These companies with private capital have their headquarters or significant development activity in Romania or have Romanian founders. In Figures 2 and 3 below the companies showcased in the study are grouped by their activity domain as follows: finance and insurance, healthcare, cybersecurity, retail and eCommerce, marketing and advertising, enterprise tech, industry agnostic, mobility and logistics, and emerging verticals.

To have a better understanding of what these companies are developing, the authors selected from each domain an example:

- an artificial intelligence platform in nutrition for overweight kids, which uses personalized plans, food maps, and games to inspire towards a more active lifestyle;
- factoring platform providing liquidity to small entrepreneurs in a maximum of 24h, powered by robo-underwriting and developing machine learning-based credit risk algorithms;
- provides a biometric payment point-of-sale platform that also incorporates an out-of-home digital signage advertising network. Its solutions are tailored for clients who want to reach a captive audience right when the consumer is finalizing a retail purchase transaction;
- a mobile app that enables its users to learn more about their mental health conditions. It offers solutions personalized for their problems and connects them to the appropriate specialist. Also, the application uses a chatbot trained in Cognitive Behavioral Therapy, Big Data, and AI to achieve these and supports the users through a difficult time with guidance and advice; a startup that protects governments and businesses from cyber threats by integrating intelligence, event monitoring, analytics and incident response with ML and automation orchestration to detect targeted cyberattacks;
- AI-as-a-platform that focuses on e-commerce personalization, predicting user behavior through a range of ready to use AI applications: user intent prediction, next shopping stage prediction, churn prediction;
- one-stop shop for producing high-quality media at scale using AI. With this app you can also express and monetize your Digital Genome to take charge of the data you share online and scale your talents for unlimited professional collaborations;
- leader in conversational AI designed for enterprise productivity, saving time and money by automating repetitive tasks, while boosting user experience (Techcelerator, 2021);

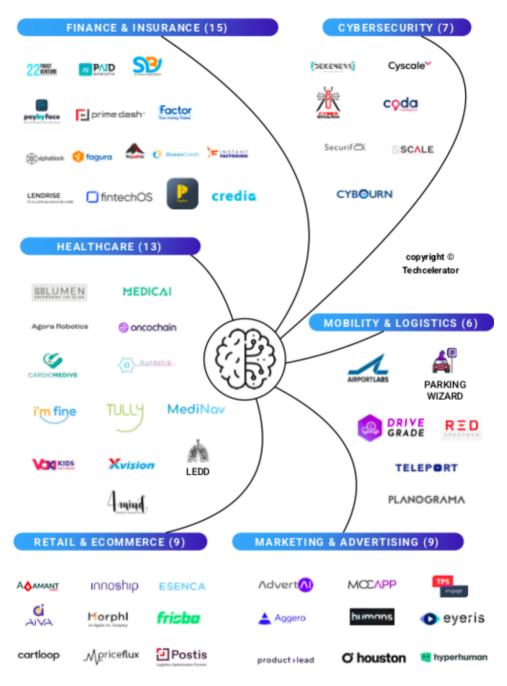
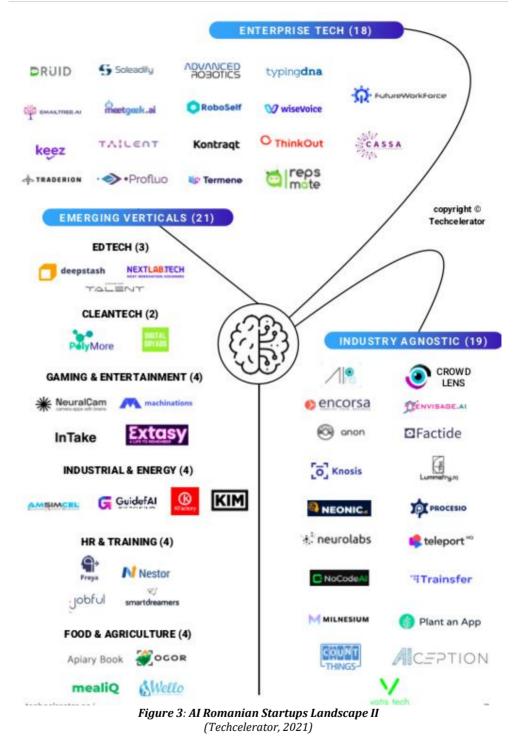


Figure 2: AI Romanian Startups Landscape I (Techcelerator, 2021)





Nowadays it is difficult to find one industry across the world that has not adopted Artificial Intelligence, especially for its functionalities to boost productivity and to ensure higher customer engagement. The Artificial Intelligence market size is expected to reach US\$266.92 billion by 2027 (Analyticsinsight.net, 2021) so taking into consideration this growth is important to know which are the critical success factors for the European AI Startups.

In the dissertation paper "Critical success factors and innovative approaches for European AI Startups" by Filip (2021) pilot research was conducted among 10 AI European companies. The design of the research considered the CSF Model proposed by Chorev and Anderson (2006), as seen in Figure 4 below.

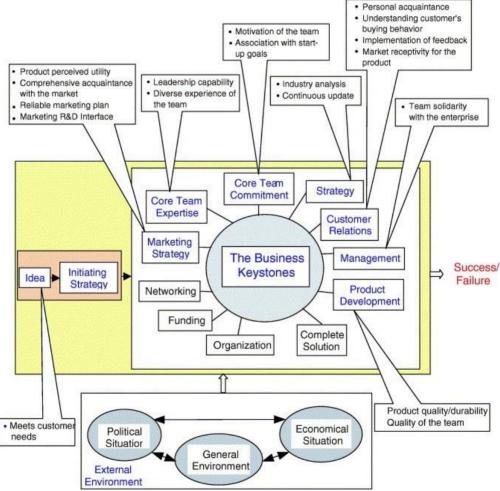


Figure 4: CSF Model proposed by Chorev and Anderson (2006)

This model consists of external and internal criteria influencing the success or failure of a new venture, as well as the topics deemed to be critical for success. The internal and external CSFs presented in the model have an incremental nature and will adjust based on the businesses' growth, market share, or new competitors. Organizations, ranging from startups to small, medium, or large enterprises can present common factors, but also specific ones based on their evolution stage, growth, industry, etc. Despite potential differences in factors though, the purpose is the same: to lead the business to the accomplishment of its goals and missions (Filip, 2021).

The research aimed to identify critical success factors applying to European AI startups across various industries. To conduct a significant study and present valuable results, the pilot research considered first-hand the eligibility of its candidates, by assessing them under the following criteria: Location (of business): Europe and Romania; Business type: Startup; Business core value or product/solution offered: AI; Target group: Business owners, entrepreneurs, and employees of a new AI venture.

The results indicate that on average Product Development (4,75), Core Team Expertise (4,625), as well as Core Team Commitment, and Business Strategy (with an average of 4,5 each) are determining factors when it comes to the success of the business. On the other end, according to respondents, Funding and Organization (average of 3,875 each) are less determining factors that affect the success of a business. When asked about the influence of external factors, the 1 to 5 scale responses suggest that Regulations, General Environment, and Competition have a stronger influence on the success of their business (average of 3,875 each) than the Economical Situation (3,75) and the Political Situation (2,75).

If observed in comparison, internal factors seem to be more definitory to the success of a business than external factors, which was also the conclusion drawn in the study performed by Chorev and Anderson on high-tech startups from Israel (2006).

Conclusions

In the business landscape, it is said that nowadays it is difficult to have long-term strategies as technological development revolutionizes daily different industries. Artificial Intelligence is a great tool used together with machine learning algorithms to provide accurate predictions and insights to understand customers and to react rapidly and gain market share globally.

Europe has a great opportunity to unleash its entrepreneurial and innovative talent to become a leader in the AI sector. Considering that Romania has more than 100 companies with Artificial Intelligence as the core business is encouraging for the development of the industry in Eastern Europe. At a governmental level is important to develop the AI strategy for the next years according to the European AI strategy and to foster a predictable framework for the company that wants to extend its operations in the AI field. Besides this AI used in government is offering lots of opportunities, for example, governments can use AI technologies to improve the quality of their services, generate accurate forecasts, or foster citizens' trust (Zuiderwijka, Chen, & Salem, 2021).

Although AI is not a new technology, startups using it in their business model is still considered an innovative approach therefore relevant for them to establish the success factors to achieve their objectives and become sustainable.

The metrics of success are essential for a business to achieve its mission (Caralli et al., 2004, p. 2). As they can appear in the various operating environments, Rockhart and Bullen (1981, pp. 14-15) established five types of sources:

- Industry factors consider industry-specific characteristics which support the competitive drive;
- Environmental factors are affected by the economic and professional macroenvironment change, trends, local limitations, and competitive landscape (can be identified through analysis such as PESTLE or SWOT);
- Strategic factors are linked to competitive strategy, as well as competitive business approach on the market;
- Temporal factors usually delimited to critical, not foreseen circumstances (ex: internal changes, crises), they will be followed only for a limited time in the activity of a business (such areas are not commonly generators of Critical Success Factors);
- Managerial factors focusing on the function and responsibilities of management layers (Filip 2021)

The pilot research results show that Product Development, Core Team Expertise, Core Team Commitment, and Business Strategy are determining factors when it comes to the success of the business in the AI industry. Taking this into consideration and the domains where AI is most used we can state that is plenty of space to develop business in the AI industry, for example, Education is still undeveloped with only 2% or Transportation, Entertainment, and Human Resources with 3% of AI business in this field.

The paper provides a better understanding of aspects surrounding European AI Startups, making it a solid starting point for further research. The authors will conduct further research having a solid base of data collection to provide relevant results to support the AI entrepreneurs in developing their business strategy.

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