Systematic assistance to start-ups using artificial intelligence and big data techniques: Theoretical documentation, tools and applications

Αθανάσιος Δαβαλάς

Υποψ. Διδάκτορας στο Τμήμα Μηχανικών Πληροφοριακών
και Επικοινωνιακών Συστημάτων του Πανεπιστημίου Αιγαίου
με επιβλέποντα καθηγητή τον Κο Γιάννη Χαραλαμπίδη

Περίληψη

Η τεχνητή νοημοσύνη (AI) και οι τεχνικές μεγάλων δεδομένων αναδιαμορφώνουν τις παγκόσμιες οικονομίες και υπόσχονται να βελτιώσουν την παραγωγικότητα, να ελαχιστοποιήσουν το κόστος των επιχειρήσεων και να προωθήσουν την αποδοτικότητα.

Αυτές οι τεχνολογίες συμβάλλουν ήδη σημαντικά στην καλύτερη ικανότητα λήψης αποφάσεων.

Αν και αυτές οι τεχνολογίες είναι σε πρώιμα στάδια, έχουν αποδειχθεί ότι έχουν σημαντικό αντίκτυπο στις επιχειρηματικές αποφάσεις.

Τα big data και η τεχνητή νοημοσύνη χρησιμοποιούνται ευρέως για την αντιμετώπιση παγκόσμιων προκλήσεων που αντιμετωπίζουν οι επιχειρήσεις εξαιτίας της μετασχηματιστικής δύναμης που αυτές περιέχουν.

> **Λέξεις κλειδιά**
> τεχνητή νοημοσύνη, μεγάλα δεδομένα, επιχειρηματική εκκίνηση, νεοφυής επιχείρηση, υποβοήθηση επιχειρηματικότητας, υποστήριξη επιχειρηματικών αποφάσεων

Οι νεοσύστατες επιχειρήσεις βασίζονται σε αυτές τις τεχνικές για την ενίσχυση της παραγωγικότητάς τους και για να προωθήσουν την ανάπτυξή τους σε έναν άκρως ανταγωνιστικό και δυναμικά εξελισσόμενο επιχειρηματικό κόσμο.

Αν και οι ψηφιακές αυτές τεχνολογίες προσφέρουν πολλά στην επιχειρησιακή λειτουργία, συνοδεύονται από πολλές προκλήσεις, συμπεριλαμβανομένων: της συγκέντρωσης δεδομένων στα χέρια λίγων, του ψηφιακού χάσματος που δημιουργεί η πρόσβαση ή μη σε αυτές, της παραβίασης της ιδιωτικής ζωής μέσω χρήσης των προσωπικών δεδομένων τους, της παραβίασης συναφών ανθρώπινων δικαιωμάτων και της επιβάρυνσης που προκαλούν στην κλιματική αλλαγή οι τεχνολογίες αυτές.

Η έρευνα που παρουσιάζεται σε αυτό το άρθρο έχει ως στόχο τη διερεύνηση, σχεδίαση, ανάπτυξη και πιλοτική εφαρμογή μιας ολοκληρωμένης, επεκτάσιμης διαδικτυακής πλατφόρμας δημοσίευσης, ανάκτησης, σύνθεσης, ενορχήστρωσης και παροχής ηλεκτρονικής προστιθέμενης αξίας υπηρεσιών, για την υποβοήθηση – αξιολόγηση μιας επιχειρηματικής εκκίνησης μιας start-up επιχείρησης, που βασίζεται στις προαναφερθείσες σύγχρονες τεχνολογίες και τεχνολογικά πρότυπα.

Το άρθρο αυτό συνδυάζει τα πεδία Software-as-a-Service και Enterprise Mashups, που τοποθετούνται κάτω από την «ομπρέλα» του Διαδικτύου των Υπηρεσιών, καθώς και την εταιρική διαλειτουργικότητα και την ενσωμάτωση Enterprise Application.

Εξήντα πέντε συμμετέχοντες ερωτήθηκαν, ώστε να γίνει κατανοητό πώς τα big data και η τεχνητή νοημοσύνη χρησιμοποιούνται από νεοσύστατες εταιρείες για την παροχή καλύτερων υπηρεσιών και την ενίσχυση της ανάπτυξης.

Τα ποσοστά εφαρμογής αυτών των τεχνολογιών κατατάχθηκαν όπως φαίνεται στον Πίνακα 1. Ο δείκτης x^2 χρησιμοποιήθηκε για την ανάλυση των αποτελεσμάτων.

Τα αποτελέσματα αυτής της έρευνας οδηγούν στο συμπέρασμα ότι η τεχνητή νοημοσύνη και τα big data analytics χρησιμοποιούνται από νεοφυείς επιχειρήσεις για την παροχή ηλεκτρονικών υπηρεσιών προστιθέμενης αξίας.

Συνιστάται η ανάπτυξη και χρήση big data και τεχνητής νοημοσύνης να καθοδηγείται από τη συνεργασία μεταξύ διεθνών οργανισμών και κυβερνήσεων για την επίτευξη του ευρύτερου καλού.

Abstract

Artificial Intelligence (AI) and big data techniques are reshaping global economies, promising to enhance productivity, minimize costs of business, and promote efficiency. These technologies have contributed to the achievement of better lives and better decision-making skill. Although these technologies are in their infancy stages, they have proven to have significant impact in people's lives. Big data techniques and artificial intelligence are being used to address global challenges facing businesses because of their transformational power. Start-up businesses rely on these techniques to enhance their productivity and foster growth in the highly competitive and dynamic business world. Although they have improved business operations, digital technologies are faced by numerous challenges, including market concentration, digital divide, violation of privacy, infringement of human rights, and climate change. The research presented in this paper was aimed at investigating, designing, developing, and piloting an integrated, scalable online platform for publishing, retrieving, synthesizing, orchestrating and providing value-added electronic services for a start-up based on modern technologies and technological standards. The research paper combines the fields of Software-as-a-Service and Enterprise Mashups placed under the "umbrella" of the Internet of Services, as well as and Enterprise Interoperability and Enterprise Application integration. Sixty-five participants were surveyed to understand how big data techniques and AI are being used by start-ups to provide better services and enhance growth. The rates of application of these technologies were ranked as shown in table one. The chi-square measure was used to analyse the results. The results of this research revealed that AI and big data analytics are being used by start-ups to provide value added electronic services. It is recommended that the development and use of big data techniques and AI should be guided by cooperation between international organizations and governments for the greater good.

1. Introduction

1.1. Statement of problem

For venture capital investors valuing innovative start-ups is often difficult as traditional valuation methods cannot be applied with satisfactory results (Berkus Method, Risk Factor Summation Method, Scorecard Valuation Method, Comparable Transactions Method, Book Value Method, Liquidation Value Method, Discounted Cash Flow Method, Venture Capital Method, First Chicago Method) (Davalas, 2018).

Before the introduction of Artificial Intelligence (AI) and big data analytics in the world of business, people through mentorship programs, incubators, and accelerators assisted start-up businesses (Harrison, 2018). However, because of rapidly developing technologies in the business world, start-ups have been able to use digital technologies like AI and big data techniques, which have added advantages compared to the traditional methods used to assist start-ups. The use of traditional approaches to help start-ups has experienced numerous challenges, including high costs, low productivity, lower quality of products and services, time consuming, and lack of better business skills. Different business operations like company valuations, screening of start-up ideas, and evaluation of start-up operations have been inhibited by the usage of traditional approaches. These challenges are highly experienced in developing economies in Africa and Asia, where penetration of new technologies has been a challenge.

To ensure that these challenges are addressed and business operations enhanced, start-ups in developing countries have become aware of these new techniques, which when incorporated to business operations, improve productivity, minimize costs of operation, improve quality of products and services, and save time.

1.2. Solution idea

The use of digital technologies like big data analytics and AI has been a common trend, especially in start-ups, where they are being used for systematic assistance and provision of value-added electronic services. The landscape for digital technologies has evolved over the years with machine learning being a significant breakthrough in 2011. These expansions have led to the rapid expansion of start-ups globally. An AI system is a machine-based system that is developed to help in provision of recommendations, predictions, and decisions based on their environment. This system uses a combination of human and machine-based inputs to gather, analyse, and synthesize information (OECD, 2019). An

AI system lifecycle has different phases, i.e., (a) planning and design, gathering and of information, building a framework; (b) verification and validation; (c) deployment; and (d) operation and monitoring (OECD, 2019). Big data analytics, on the other hand is a process used to examine large volumes of varied data to find hidden patterns, market trends, and consumer information that can be used by companies to make informed decisions (Chen & Chun-Yang, 2014).

AI and big data analytics play an essential role in start-ups, including improvement of productivity, providing solutions to complex organizational problems, provide effective marketing strategies, improve operational efficiency, foster achievement of competitive advantages, offer better consumer services, and provide revenue opportunities. These advantages have prompted start-ups to invest millions of dollars in new technologies. In addition to start-ups, these technologies have found applications in healthcare, criminal justice, scientific research, transportation, and telecommunication services. This research provides an in-depth understand of how big data techniques and AI can be used to enhance electronic service provision in start-ups.

The purpose of the present research is to investigate, design, develop and pilot an integrated, scalable online platform for publishing, retrieving, synthesizing, orchestrating and providing value-added electronic services for a start-up based on modern technologies and technological standards. The proposal combines the fields of Software-as-a-Service and Enterprise Mashups placed under the "umbrella" of the Internet of Services, as well as and Enterprise Interoperability and Enterprise Application integration.

1.2.1. *Objectives*
1. Develop our own methodology for systematically assisting smart businesses through original digital services.
2. Utilizing big data from sources such as Google Trends, Google Analytics, Google n-Grams, Facebook Analytics, Twitter, as well as specific business databases.
3. Evaluate, assist, and provide a more systematic guidance to start-ups, especially in the IT sector if required.
4. Analyse and utilize the knowledge of experts, as well as techniques and tools of artificial intelligence.
5. Pilot implementation by developing and leveraging an appropriate online platform.

1.3. Literature Review

This chapter reviews the literature of how start-up businesses in developing countries are using artificial intelligence and big data techniques to enhance their productivity.

1.3.1. Introduction

Numerous researches have been conducted over the years to understand the impact of integrating AI with big data technologies in businesses. Due to emergence of new techniques and rapid acceleration in terms of implementation, the business landscape has significantly changed as well. Today, most of the world's fastest growing companies have been able to integrate AI in their core business strategies, which in turn, has led to realization of new revenue opportunities, achievement of competitive advantages, and organizational goals (Chen et al., 2016). The tremendous productivity in these companies is attributable to the use of machine learning that supports implementation of AI in transportation, healthcare, and cybersecurity among others.

Today's business environment is characterized by rapid competition and changes. Therefore, it is important for business leaders to develop strategies that can help them achieve rapid growth and a competitive advantage. Start-up businesses face the challenges of addressing a dynamic business environment. These businesses need to be designed to face these extreme changes. In order to address these challenges, new businesses need to employ digital technologies, including AI and big data analytics. These techniques are essential because they help leaders gather and analyse vast volumes of information within seconds. With such technological advancements, start-ups can be in a better position to achieve competitive advantages, rapid growth, and new revenue opportunities.

1.3.2. Methodology for systematically assisting start-ups

Considering the advent of new technologies in different fronts globally, start-up companies have developed a mastery of the point where AI and big data analytics intersect. One of the most critical developments that are shaping how future companies improve their businesses' value from information and analytics capabilities is the integration of AI and big data analytics. Employing tech perceptive staff members is a major requirement to ensure that companies understand how AI capabilities can be harnessed to help in analysis of data and making informed decisions (Andoni et al., 2019).

The volume of data being contributed at different levels continues to increase daily. Research has shown that it is estimated that by 2020 every person

will generate approximately 1.7 MBs of data per second (Seuba, Christophe & Julien, 2018). Considering these vast volumes of data, it is important for firms to understand different approaches to unlock this data, which in turn helps in making informed decisions and solving some of the world's complex business problems. Integrating AI and big data techniques is also important because the presence of large data sets allows AI applications to identify differences and patterns, thus being able to understand the finest details. As mentioned previously, massive data sets are being generated every second. With the capabilities of AI, companies are able to arrange data into rows and columns, which aids in deducing relationships between data sets (Mozur, 2019).

1.3.3. Artificial Intelligence (AI)

Over the past few decades, the availability of cloud computing, internet of things (IoT), big data analytics, and the development of machine learning have led to a significant increase in the growth, influence, and power of AI. Continued technological progress has also led to the development of better sensors and other electronic equipment that can be used to aid in data collection. According to OECD (2019), AI is a branch of science that focuses on the development of machines that have the ability to learn, reason, and act in an intelligent manner to aid in the decision-making process. The simulation of human intelligence processes, including learning, reasoning, gathering information, and deduction of viable decision by machines has become a common trend in start-up businesses. This is attributable to the benefits of integrating AI and big data.

1.3.4. Big data analytics

The volume of data being released per second continues to increase because of increased technical advancements. As a result, companies have been able to develop sensors and actuators, which are capable of handling massive volumes of data without any challenges. Big data analytics is the process of analysing varied data sets to identify patterns, relationships, and differences existing between them (Labbe, Martinek & Stedman, 2019). Big data analytics focuses on using techniques like what-if-analysis, statistical algorithms, descriptive analysis, and prescriptive analysis. In order to analyse the ever-increasing volumes of information, data analysts and professionals rely on big data techniques because of the ear of conventional approaches becoming obsolete (Xiaofeng & Chi, 2013).

1.3.5. Big data technologies and tools

Conventional approaches of data analysis are becoming obsolete because of the increasing volumes of data that organizations address daily. In order to handle these vast volumes of data and frequently or continually update

this information, big data techniques and tools need to be employed. Some of the most common tools are YARN, MapReduce, Spark, HBase, Kafka, and Pig (Labbe et al., 2019). These tools have been used to help in the development of architectures that are capable of analysing data, partition it based in its content, and extract its contents. The presence of these tools is essential because it helps in data mining to ascertain patterns and relationships in datasets, prediction of consumer behaviours that can be used to develop preferred services and products, machine learning, and deep learning (IBM, 2019).

The presence of these tools and techniques has made it easy for start-ups to gather vast volumes of data from Google Trends, Google Analytics, Google n-Grams, Facebook Analytics, Twitter, and other business databases. Data gathered from these sources is used to help these businesses understand the business environment better, customer preferences and behaviours, and make informed decisions, which in turn, aid in company growth and career development for employees.

Combining AI and data analytic technologies will have a critical impact because it will enable future entrepreneurs learn from experience, promote innovation and creativity, understand how to make better relationships, promote sales and marketing, strategic planning and human resource planning.

2.   Method

2.1. Gathering of start-up related big data

The approach employed in the present research involves quantitative research methods. This research will collect data in statistical form, which will address consumer trends in the internet and forecasts of trends in products and services through sources such as Facebook, Twitter, Google Trends, and Google analytics. AI and big data tools will be used to gather information from online sources to understand how start-up businesses have been able to utilize these technologies to enhance their electronic service provisions to their consumers. Relevant literature was also reviewed to help understand the scope of AI and big data technologies. In designing a research methodology, it is important to address research philosophy because it clarifies the research design, helps in the development of viable research design, and understand the circumstances under which the research design operates (Easterby-Smith et al., 2002).

2.2. Modelling existing knowledge for start-up idea screening, evaluation, and valuation

A literature review was conducted with information sourced from journals, books, dissertation, internet resources, and government websites. The research instrument used for the research was an online questionnaire with different items and a rating scale. The questionnaire was developed based on the use of AI and big data techniques by start-ups. Sixty-five participants were randomly selected from diverse backgrounds and were determines based on their willingness to participate, cost, and time. Participants in the research were consumers from diverse backgrounds. After collection of data from the questionnaires, analysis was conducted using the ordinal and interval measurement scales. The median, mode, and frequency were used for variability.

2.3. Study of AI systems in companies

Different companies across the world have been able to incorporate digital technologies in their operations, which have led to increased productivity and achievement of a competitive advantage. An excellent example is Amazon.inc., which has used technologies to enhance its operations globally. With more than 300 million active users and 100 million subscribers, the company has been able to remain competitive (Salem, 2012).

AI and big data analytics are being used in the company to predict consumer behaviours, which in turn, are used to help in development of quality products and services. In addition, using these technologies, Amazon is able to open up new markets thus, maximizing on productivity.

2.4. Development of knowledge-based approaches

Knowledge based approaches are easily understandable and comfortable to adopt, particularly by start-ups because they ensure that goals and objectives are well formulated, policies are implemented, and all stakeholders put into consideration in the process of decision-making (Scarso & Ettore, 2010).

The knowledge of experts plays an essential role in business. It focuses on the application of different strategies like consolidation of knowledge to offer an opportunity to continuous development of ideas, expansion of technological knowledge, exploitation of new technologies, and using existing technologies to explore newer technologies.

The following questionnaire (Appendix 1) is addressed to founders of start-up companies and is about their self-evaluation in regards to the founding, the operation, the performance and the strategy development of a start-up company.

The final score is the sum of the grades of each reply. Based on that score, we can draw conclusions that highlight the quality of the start-up company and therefore what needs to be modified, in order to further optimize it.

The questions are categorized into the following categories. 1) Introductory elements. 2) Summary. 3) Market analysis. 4) Business analysis. 5) Setting goals. 6) Products and services. 7) Marketing strategy. 8) Sales strategy. 9) Development strategy. 10) Human Resources Strategy. 11) Economics-action plan (Questions -> Appendix 1).

2.5. Development of machine learning approaches

Machine learning approaches are being used by start-up businesses to ensure that business operations are enhanced. Different start-ups have been employing different learning tools and neural networks to achieve higher productivity. Some of the AI technologies being used by start-ups are Apache systemML, OpenNN, Neuroph, Deeplearning4j, and Apache Mahout.

2.6. Pilot application and evaluation of the approaches

AI systems and knowledge-based approaches being used by start-ups are proving useful in terms of improving productivity, minimizing costs, and enhancing quality. These approaches focus on the application of strategies, including consolidation, expansion, exploitation, and exploration.

To understand how start-ups have employed the use of technologies, four questions assessing the essence of IT technologies were designed as shown in Table 1.
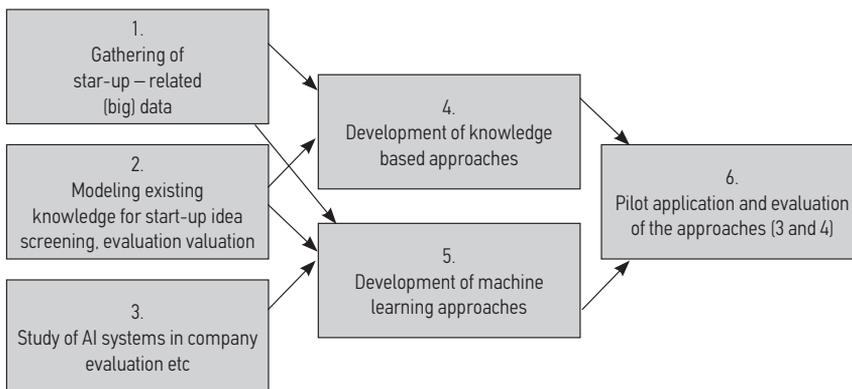
3.   Results and discussions. Current status

3.1. Measuring innovation

The following index categories related to measuring innovation, can be found in bibliography

Input indexes (inputs): Input indexes measure mainly the input provided in the process of innovation. Those inputs include resources, such as intellectual, human and technological capital.

Process indexes (processes): Process indexes reflect the organizational systems and the systems of managing processes of innovation. Furthermore, they embed the plan of a company's system of innovation, as well as it's innovation.

Output indexes (outputs): Output indexes define the results of the organizational innovation and represent the realized success of the innovative action. Those indexes measure the number of patents, the patent references, the number of new products/services, profit margins or market share of a company, medium term and long term etc (Kriemadis, 2012).

3.2. Evaluating innovation based on big data and AI technologies

From the literature review, ten questions addressing integration of AI and big data technologies by start-ups were drafted. The questions were further reduced to four to ensure that they were within the scope of the current study. Descriptive statistics, including standard deviation, mean, p-value, and t-value were presented as shown in Table 1.

Table 1. Questionnaire questions and descriptive statistics.

Rank	Questionnaire questions	Mean	Standard deviation	t-value	p-value
1	Has integration of AI and big data helped startups navigate the dynamic business environment?	4.5	0.81	8.67	0.00*
2	Do start-ups understand the importance of new technologies?	3.69	0.73	8.49	0.00*
3	Is the IT sector in start-ups well developed?	3.86	1.02	8.11	0.00*
4	Have AI and big data technologies enabled start-ups gather valuable information about consumers?	4.19	0.97	7.91	0.00*

Critical value of t at a degree of freedom = N - 1; = 65 - 1 = 64
p > 0.001 = 0.000*.
Probability level 0.05 = 0.86.

The results indicated that application of AI and big data technologies by start-ups has led to significant achievements in terms of growth, productivity, decision-making, and operating in the competitive edge. Harnessing these technologies is essential because it helps start-ups integrate AI and big data techniques to understand relationships and differences in information, which in turn, is used to make informed decisions. Start-ups have been able to integrate AI and big data technologies and tools in the process of addressing the dynamic nature of the business environment. This was ranked in the first position with a t-value of 8.67 and a p-value of 0.00*. This result is an indication that start-ups have understood the benefits of integrating these technologies. In addition, it is consistent with the findings of Press (2019) that integration of AI and big data analytics has led to the provision of a more comprehensive analytics solutions to address consumer problems and foster organizational development.

Start-ups have shown an understanding of new technologies with a t-value of 8.49 and a p-value of 0.00*. According to OECD (2019), application of AI and big data analytics has gained significant improvement since its first inception in the 1950s. Another result is that the IT sector in start-up business has witnessed growth attributable to increased ability to analyze massive volumes of data within a short time. With the volumes of data estimated to rise to approximately 1.7MB/s by 2020 (Labbe et al., 2019), these companies have focused on advancing new technologies, i.e., developing powerful sensors and actuators which are smaller and more effective. Through these technologies, start-ups have been able to gather valuable information about consumers. Being able to predict consumer behaviors is important because it gives them an opportunity to understand consumer preferences, thus developing excellent products and services. This result was ranked the fourth with a t-value of 7.91 and a p-value of 0.00*. This result is consistent with the findings of Andoni et al. (2019).

3.3. Current status

With the questions listed in Appendix 1 there has been created an online scoring card (startupevaluator.gr) in which the respondent start-up entrepreneur act on a self-evaluation of their endeavor noting the strong and the weak their points.

The final result based on their answers, divided into 3 possible always closed type answers, gives a first overview and guides them to their further actions.

In the same form and considering the comments that they can leave on each question the experts come in a second phase to evaluatethe comments of the startuppers and comment backon these comments.

This creates a feedback that not only encompasses the result of the scoring card but also gives experts the opportunity to provide consulting services to them and generate an average of their ratings. It remains to determine the specific weight in the rating of each answer that will be the subject of a questionnaire sent to specialists.

The API connection via google trends has been partially completed forstartuppers who lack of specialized technical knowledge have access in information such as:

- Look at the popularity of your product/service by discovering how many people have searched for products or services similar to their own and identifying the behavior of the trend on the one hand and on the other hand whether the market trend is rising or decreasing over time.
- To see similar trends and how they evolved over time.
- It tells them in which geographic locations their product or service is popular and desired.
- Find the most popular seasons for their product or service but also the perfect time to launch it.
- They can see how their competitors are doing as innovation is not just about new products and services but also about transforming existing ones.

Following is the API with the Google Consumer Barometer Tool. Provides startuppers with reliable and extremely useful data in respect of the internet usage such as:

- The buying habits of users in different areas, such as: mobile, video etc.
- Information on how user's research – accomplish their online shopping.
- The differences between online behaviors of different generations.
- A battery of technical data on software and hardware-level technologies used by consumers online in order to reach their products and services.

The Google Consumer Barometer lets you filter all this and also choose from 46 countries, 4 different demographics, and 10 business fields creating different reports based on them.

While these two tools are certainly not as powerful as conducting market research on their target customers does not require the time money and any specialized knowledge to create an API on their part.

It's a great starting point for start-ups with small budgets but also for entrepreneurs who have received feedback from the scoring card and the expert's advice to review – forge a new path in their endeavor.

3.4. Challenges that had to be overcome

Facebook and Google make their analytical tools through services like https: // analytics.facebook.com/and https: //cloud.google.com/ & https: //trends.google. com/. Rich sources of insights into consumers sentiments and behaviors.

There, along with text data, you can find a significant amount of unstructured visual data like photos and videos who can't be analyzed and offer a new set of challenges for us.

Another challenge, as for most data scientists, is to deal with the effects of the privacy regulations contained within the General Data Protection Regulation/GDPR.

Finally, we must overcome technical details. After Cambridge Analytica debacle, Facebook revised its Graph API and eventually released Graph API v3.0 on May 1, 2018. Despite the data we try to collect being characterized as "publicly accessible data" now you have to get users to install an app cause for some data now you need the consent of the end user.

Google same way set the protection of Personally Identifiable Information (PII) with strong regulations to follow in terms of data protection and security making identifying and masking sensitive parts in unstructured data is not always a straight forward case.

Despite what the answers to the questions in Appendix 1 may suggest, we must remember that a start-up at the beginning is nothing more than a model imprinted on a paper. A start-up should spot where it stands in the current moment, deal with the disadvantages of this spot and experiment in finding new ways to make the numbers fit to those stated in the business plan.

Most products have positive results, growth and are addressed to a number of buyers. Therefore, businessmen and their employees should not let their optimism fool them. Perseverance may become dangerous if they keep on going with ideas that were proven to be wrong. They should keep in mind that the examples of entrepreneurs who triumphed despite the adversity are a tiny sample compared with those who persevered for too long and failed. (Ries, 2015).

4.   Conclusions and further research

With the Start-up Self-screening questionnaire and Start-up evaluation complete, the two web applications (php-mysql based) are still in their development stages.

The information pertaining the web applications has been collected and reviewed. The sitemap and wireframe for the two websites has been developed. Also complete are the design of the web applications. The web layout, review and approval cycle has been achieved. Writing of the websites content has been done and currently the written content is being assembled and reviewed for rectification. After assembling and reviewing, the codes to create the web applications will be written. The web applications will be tested, reviewed launched upon completion of coding. A monitoring framework will be developed to monitor its performance.

Our Start-up Evaluator intends to be a quick and efficient online tool for non-professional early stage investors with no specific expertise about start-ups and private equity but also for professional who have little time and want a way to calculate the pre-money valuations of the start-ups to rank projects and make the first screening. A tool also for investors who want to focus just on the higher potential ones and to organize personal interviews with founders.

An Online Lean Canvas Data Visualization tool that will be used to provide graphs and charts for fast and easy reading – comparing of data that will be imported. The difference with our online Lean Canvas is that along with the data entry there will be a theme rating system by one or more online reviewers showing average in cases with more than one reviewer. The entire system will be supported by a system of members as well as administrators who will be able to influence critical variables of the system while it will be storing the data so that it can be referenced and redesigned and re-evaluated.

There will also be a Predictive analytics tools, an online Scoring Card with a scoring process, in addition to Online Lean Canvas, which will be broken down into different categories that will vary depending on if it is a start-up business or a company that is already in operation. Final goal is to produce a single result which summarizes more than 50 inputs data, comprehending start-ups' specific characteristics (both qualitative and quantitative).

A suggestion for future research is based on how the scientific community is quickly moving forward to adopt the use of big data in their daily decision-making process. Currently, there is rapid movement of open data. Many data are being collected today and analysed using different tools with the goal of understanding nature and responding to questions raised on nature. Big data is also being used in prediction of future occurrences that is useful for the community. However, the question remains on the community role in adopting the big data and the knowledge that is obtained from the analysis of the data.

References

Merlinda, A. et al. (2009). "Blockchain technology in the energy sector: A systematic review of challenges and opportunities", *Renewable and Sustainable Energy Reviews* 100, pp. 143-174.

Chen, C. L., Philip & Chun-Yang Zhang (2018). "Data-intensive applications, challenges, techniques and technologies: A survey on Big Data", *Information Sciences* 275, pp. 314-347.

Davalas, A. (2018). *StartUps 9 Valuation Methods. A first approach.* (Available in: https: //www.academia.edu/38326679/StartUps_9_Valuation_Methods._A_first_approach).

Easterby-Smith, M., Thorpe, R. R. & Lowe, A. (2002). *Management Research: An introduction*, p. 342.

Harrison, K. (2018). *New study reveals entrepreneurs need more mentoring.* (Available in: https: //www.forbes.com/sites/kateharrison/2018/10/30/new-study-reveals-entrepreneurs-need-more-mentoring/amp/).

IBM (2019). *Big data analytics.* (Retrieved from https: //www.ibm.com/analytics/hadoop/big-data-analytics#324371).

Kriemadis, T. (2012). "Innovation in small businesses'', *Economical Library*, p. 27.

Labbe, M., Martinek, L. & Stedman, C. (2019). *Big data analytics.* (Available in: https: //www.searcbusinessanalytics.techtarget.com/definition/big-data-analytics%3famp=1).

Marr, B., *Big Data in Practice.* Wiley, pp. 246-248, 264.

Mozur, P. (2019). *One Month, 500,000 Face Scans: How China is Using AI to Profile a Minority.* (Available in: https://www.nytimes.com/2019/04/14/technology/china-surveillance-artificial-intelligence-racial-profiling.amp.html).

OECD (2019). *Artificial Intelligence in Society.* OECD Publishing, Paris. (Available in: https: //doi.org/10.1787/eedfee77-en).

Press, G. (2019). *Big Data is dead. Long Live Big Data AI.* (Retrieved from https: //www.forbes.com/sites/gilpress/2019/07/01/big-data-is-dead-long-live-big-data-ai/amp/).

Ries, E. (2013). *Lean Startup*, Livanis Publications, pp. 146-147.

Salem, K. A. (2012). "Mission, purpose, and ambition: redefining the mission statement'', *Journal of Strategy and Management*, 5 (3), pp. 236-251.

Seuba, X., Geiger, C. & Penin, J. (2018). *Intellectual Property and Digital Trade in the Age of Artificial Intelligence and Big Data.*

Scarso, E. & Bolisani, E. (2010). "Knowledge-Based Strategies for Knowledge Intensive Business Service: A Multiple Case-study of Computer Service Companies", *Electronic Journal of Knowledge Management* 8.1.

Xiaofeng, M. & Chi Xiang (2013). "Big data management: concepts, techniques, and challenges [JJ", *Journal of computer research and development* 1.98, pp. 146-169.

APPENDIX 1

Question	R1	R2	R3
Cat 1: How many people are you on the founding team?	<3	3	> 3
Cat 1: Does the business operate for more than one year?	Yes		No
Cat 1: Did this business start with your own funds entirely?	Yes	Partially	No
Cat 1: How long have you been working in the field?	<3	> 3	Not at all
Cat 1: Did you use surveys before you create your business?	Yes	Partially	No
Cat 2: How many employees do you have?	<5	5	> 5
Cat 2: How many customers do you have?	<100	100	> 100
Cat 2: Over the last 12 months, our profitability has increased.	Yes	Stable	No
Cat 2: I would like tips/help to further develop my business.	Yes	Maybe	No
Cat 2: I would like financial help to further grow my business.	Yes	Maybe	No
Cat 3: The company operates in the country of its founding members.	Yes	Some	No
Cat 3: The country you are in is developing.	Yes	Small	No
Cat 3: Your customers are businesses.	Yes	Both	No
Cat 3: Do you think your product/service is innovative?	Yes	Maybe	No
Cat 3: The competition in the market you are active in is great.	Yes	Maybe	No
Cat 3: It is difficult to enter this market.	Yes	Maybe	No
Cat 3: The bargaining power of your suppliers is great.	Yes	Maybe	No
Cat 3: The bargaining power of your customers is great.	Yes	Maybe	No
Cat 3: I have fully defined and analyzed my clients goals.	Yes	Maybe	No
Cat 3: I have fully defined and analyzed my competitors.	Yes	Maybe	No
Cat 4: Do you manage your own business?	Yes	Maybe	No
Cat 4: Is your business medium-sized to large?	Yes	Maybe	No
Cat 4: Is your business generating profits?	Yes	Stable	No
Cat 4: Is your business in a location of interest?	Yes	Maybe	No
Cat 4: Does your business meet all the equipment requirements for product/service development?	Yes	Maybe	No
Cat 4: Does your business constantly updating due to the technology environment you operate in?	Yes	Maybe	No
Cat 4: Does your business have a structured chart?	Yes	Maybe	No
Cat 4: Do you have patents, trade secrets to protect your business from competition?	Yes	Maybe	No
Cat 4: Is the legal-economic framework in your country of business stable?	Yes	Maybe	No
Cat 4: Do you have a reputation in your field of development?	Yes	Maybe	No
Cat 5: Do you have a defined vision for your business?	Yes	Maybe	No
Cat 5: I believe that the goals I set represent reality.	Yes	Maybe	No
Cat 5: Do you have your vision and goals communicated to your employees?	Yes	Maybe	No
Cat 5: Do you have 3-year goals set for your business?	Yes	Maybe	No
Cat 5: Have you reached the growth goals you have set so far?	Yes	Maybe	No
Cat 5: Have you reached your financial goals so far?	Yes	Partly	No
Cat 5: Have you planned your resources for these goals?	Yes	Partly	No

APPENDIX 1 (continue)

Question	R1	R2	R3
Cat 5: Have you analyzed the gap between where you are now and where you want to go?	Yes	Partly	No
Cat 5: How many times do you check the efficiency of your goals per year?	None	1	> 1
Cat 5: Do you have alternatives if a goal is not achieved?	Yes	Maybe	No
Cat 6: Do you think your product meets a basic need?	Yes	Partly	No
Cat 6: Do you think the product gives value to your customer?	Yes	Maybe	No
Cat 6: How do you think your service is easily accessible to the customer?	Yes	Maybe	No
Cat 6: Is there any difference in the product/service you provide in regard to your competitor's?	Yes	Maybe	No
Cat 6: Are you constantly developing or improving your products/services to keep up with the times?	Yes	Maybe	No
Cat 6: Is your product/service in line with the rules/laws in each country?	Yes	Partly	No
Cat 6: I believe in quality over quantity in my products/services.	Yes	Maybe	No
Cat 6: Do you ensure the quality of the product before their delivery?	Yes	Maybe	No
Cat 6: Do you have an alternative plan in case of failure of your product/service?	Yes	Maybe	No
Cat 6: Is there a Complaints Management Department for your product/service in your company?	Yes	Maybe	No
Cat 7: Do you have a defined marketing strategy for your business?	Yes	Maybe	No
Cat 7: Would your marketing strategy be targeted?	Yes	Maybe	No
Cat 7: Would you use external marketing partners?	Yes	Maybe	No
Cat 7: Do you think marketing is one of the most important parts of a business?	Yes	Maybe	No
Cat 7: Is the marketing department of your business within your company?	Yes	Partly	No
Cat 7: Do you invest more than 25% of your business turnover in marketing?	Yes	Maybe	No
Cat 7: In order for marketing expenses to be successful, a minimum of 1: 3 must be achieved. Does that apply to you?	Yes	Maybe	No
Cat 7: Do you regularly redefine your business marketing?	Yes	Maybe	No
Cat 7: Does marketing in your business follows the new trends?	Yes	Maybe	No
Cat 7: Does online marketing play an important role in your business?	Yes	Maybe	No
Cat 8: Do you have a defined sales strategy?	Yes	Maybe	No
Cat 8: Customers come to you, not the other way around.	Yes	Maybe	No
Cat 8: Is there a qualified sales department in your business?	Yes	Maybe	No
Cat 8: Is there a sales target for your business?	Yes	Maybe	No
Cat 8: Do you have the sales department within your business?	Yes	Partly	No
Cat 8: Do you give sales bonuses to your employees?	Yes	Maybe	No
Cat 8: Maintain relationships with your customers on a regular basis.	Yes	Maybe	No
Cat 8: Do you receive ongoing feedback from customers about your product/service?	Yes	Maybe	No
Cat 8: Do you provide after-sales support?	Yes	Partly	No
Cat 8: Do you communicate your business to your customers?	Yes	Partly	No

APPENDIX 1 (continue)

Question	R1	R2	R3
Cat 9: Do you have a defined growth strategy for your company?	Yes	Partly	No
Cat 9: Are your development strategies based on the personal criteria of the founders?	Yes	Partly	No
Cat 9: Is your growth strategy based on market demand eg yahoo?	Yes	Partly	No
Cat 9: Does your development strategy include crisis management?	Yes	Partly	No
Cat 9: Would you consult someone with more experience for your business strategy?	Yes	Maybe	No
Cat 9: Is your company's growth strategy aimed at the global market?	Yes	Maybe	No
Cat 9: Is your company specialized in the market you are active in?	Yes	Maybe	No
Cat 9: Do you think your company growth is based on demand?	Yes	Maybe	No
Cat 9: Would you ever work with any of your competitors in order to grow your company?	Yes	Maybe	No
Cat 9: Is finding investors a key goal for growing your business?	Yes	Maybe	No
Cat 10: Do you occupy your human resources in your business?	Yes	Partly	No
Cat 10: Do you use external partners for work that your company can't do?	Yes	Partly	No
Cat 10: Do you think a happy human resource is the best advertisement?	Yes	Maybe	No
Cat 10: Over 75% of your human resources are university education?	Yes	Maybe	No
Cat 10: Is over 50% of your human resources stable?	Yes	Maybe	No
Cat 10: Do you often train your human resources?	Yes	Maybe	No
Cat 10: Do you provide your employees with a pleasant work environment?	Yes	Maybe	No
Cat 10: Do you provide your employees with competitive remuneration?	Yes	Maybe	No
Cat 10: Do you give employees space for suggestions and improvements for your business?	Yes	Partly	No
Cat 10: Do you hire new business in order of your business to grow on a regular basis?	Yes	Maybe	No
Cat 11: Is the financial management of your company from the founding members?	Yes	Partly	No
Cat 11: Would you say that your company's financial policy is conservative?	Yes	Maybe	No
Cat 11: Would you say that your company's financial policy is aggressive?	Yes	Partly	No
Cat 11: Is your company's overall profit rate above 35%?	Yes	Maybe	No
Cat 11: Is the market that your company is active more than 1000 million?	Yes	Maybe	No
Cat 11: Is your target customer's purchasing power higher than average?	Yes	Maybe	No
Cat 11: Is your product / service in line with the financial situation in the country of operation?	Yes	Maybe	No
Cat 11: Does debt play an important role in running and growing your business?	Yes	Maybe	No
Cat 11: Would you rely on state financial programs to finance your business?	Yes	Maybe	No
Cat 11: Would you say that you reinvest the biggest profit of your business?	Yes	Partly	No