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MASTER'S THESIS

In view of obtaining an academic Master's degree in
« Entrepreneurship and Project Management »

Catalyzing Entrepreneurial Ventures with Artificial Intelligence: Knowledge, Perception, and Implementation in Algerian Start-ups (Decree 1275).

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Abstract

The present study endeavoured to investigate the extent, interest, and motivations underpinning the incorporation of artificial intelligence (AI) and technological advancements into within the entrepreneurial ventures by Algerian project holders engaged in student's entrepreneurial initiatives under the ministerial decree 1275. A quantitative research approach was adopted, employing a questionnaire to survey 127 purposively selected project holders from universities and incubation centers across Algeria. A quantitative technique using IBM SPSS Statistics 25 has been employed to conduct the present research. Analysis includes both Chi-square test and ANOVA non-parametric test. The obtained results underscoring the importance of AI literacy and awareness of project holders among AI technologies integration.

The study revealed that entrepreneurs' knowledge and exposure to AI positively correlated with their intention to adopt AI solutions, eagerness for AI training, and securing implementation funds. Furthermore, AI awareness and capabilities showed positive links and impact to factors driving entrepreneurial success like operational efficiency, innovation, supply chain enhancement, and strategic decision-making. The Finding underscore AI's transformative potential for fostering entrepreneurial.

Key words: Artificial Intelligence (AI), entrepreneurial ventures, Algerian project holders, entrepreneurial success.

Résumé

L’objectif de cette étude est à explore l'ampleur, l'intérêt et les motivations qui poussent les porteurs de projets étudiants algériens, encadrés par le décret ministériel 1275, à intégrer l'intelligence artificielle (IA) et les progrès technologiques dans leurs initiatives entrepreneuriales. Un questionnaire a été soumis à 127 porteurs de projets sélectionnés dans des universités et centres d'incubation à travers l'Algérie. L'analyse via IBM SPSS Statistics 25 (test du Chi-carré et ANOVA non paramétrique) souligne l'importance de la connaissance et de la sensibilisation à l'IA pour son intégration.

L'étude révèle une corrélation positive entre la connaissance de l'IA et l'intention des entrepreneurs d'adopter des solutions d'IA, de se former et de lever des fonds pour leur mise en œuvre. De plus, la sensibilisation et les capacités en IA ont un impact positif sur des facteurs clés du succès entrepreneurial tels que l'efficacité opérationnelle, l'innovation, l'amélioration de la chaîne d'approvisionnement et la prise de décision stratégique. Ces résultats confirment le potentiel transformateur de l'IA pour stimuler la croissance et la compétitivité des entreprises entrepreneuriales dirigées par des étudiants Algériens.

Mots-clés : Intelligence Artificielle (IA), les entreprises entrepreneuriales, porteurs de projets algériens, succès entrepreneurial.

ملخص الدراسة

هذه الدراسة تسعى لإستكشاف مدى الاهتمام والدوافع التي تقف وراء ادراج الذكاء الاصطناعي والتطورات التكنولوجية في المشاريع الريادية التي ينشئها اصحاب المشاريع (الطلاب الجزائريين) بموجب المرسوم الوزاري رقم 1275. اعتمدت الدراسة على منهجية البحث الكمي باستخدام استبيان لاستطلاع آراء 127 حامل مشروع تم اختيارهم بشكل هادف من مختلف الجامعات ومراكز الحاضنات والمدارس على مستوى جميع التراب الوطني. تم استخدام التحليل الكمي من خلال برنامج IBM SPSS Statistics 25 لإجراء هذا البحث، وشمل التحليل اختبار مربع (Chi square) واختبار ANOVA غير المعلوماتي، أكدت النتائج التي تم الحصول عليها على اهمية معرفة الذكاء الاصطناعي، ووعي اصحاب المشاريع بتكنولوجيات الذكاء الاصطناعي.

كشفت الدراسة عن وجود علاقة ايجابية بين معرفة حاملين المشاريع الناشئة بالذكاء الاصطناعي وتعرضهم له وبين نيتهم للاعتماد على حلول الذكاء الاصطناعي ومدى اهتمامهم للحصول على حصص تدريبية فيما يخص تطبيقات الذكاء الاصطناعي وايضا تامين اموال التمويل علاوة على ذلك أظهر الوعي بالذكاء الاصطناعي وقدراته روابط ايجابية وتأثيرا ملحوظ فيما يخص نجاح المشاريع الريادية مثل الكفاءة التشغيلية والابتكار وتحسين سلسة التوريد واتخاذ القرارات الاستراتيجية. تؤكد النتائج على الإمكانيات التحويلية للذكاء الاصطناعي لتعزيز النمو الريادي والميزة التنافسية.

الكلمات المفتاحية: الذكاء الاصطناعي، المشاريع الريادية، حاملو المشاريع الجزائريون، النجاح الريادي.

APPRECIATION

The completion of this dissertation marks the culmination of an incredible journey filled with challenges, growth, and unwavering determination. As we reflect on this momentous achievement, we are overwhelmed with gratitude for the numerous individuals who have supported us throughout this arduous yet rewarding process.

First and foremost, we extend our heartfelt thanks to our dissertation supervisor Dr BOUCHETARA Mehdi for his invaluable guidance, insightful feedback, and unwavering belief in our abilities. His expertise, patience, and encouragement have been instrumental in shaping this work and pushing us to reach new intellectual heights.

We are deeply grateful to our families and friends, whose love, understanding, and constant support have been the foundation upon which this accomplishment rests. Their unwavering faith in us has been a source of strength, motivating us to persevere through the most daunting of obstacles.

To our colleagues and peers, we express our sincere appreciation for their thought-provoking discussions, constructive critiques, and collaborative spirit. Our shared passion for knowledge has fueled my drive and inspired me to explore uncharted territories within my field.

This dissertation represents not only our personal journey but also the collective efforts of all those who have contributed to its success. It is a testament to the power of collaboration, mentorship, and the pursuit of academic excellence.

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LIST OF ABBREVIATIONS

ABB	Asea brown Boveri
AI	Artificial intelligence
Anova	Analysis of variance
BA	Bachelor in Artificial Intelligence for Business
C4.5	Extension of Quinlan's earlier ID3 algorithm
CC	Customer collaboration
Chatgpt	Chat Generative Pre-Trained Transformer
Df	Degree of freedom
DL	Deep learning
DO	Delivery operations
El	Emotional intelligence
ENSM	Ecole National supérieure de Management
ENSSEA	Ecole Nationale Supérieure en Statistique et d'économie appliquée
GANS	Generative adversarial networks
GE	General electric company
GPS	Sophia generalized problem solver
GPT-3	Generative Pre-trained transformer 3
GPUs	Graphics processing units
IBM	International Business Machines Corporation
ICT	Information and communications technology
ID3	Iterative Dichotomiser 3
IT	Information technology
KMO	Kaiser-Meyer-Olkin
ML	Machine learning
MYCIN	Chemicals from fungus (or fungus-like bacteria).
NLP	Natural language processing
P1	Independent variables
P2	Dependent variables
PhD	Doctorate degree
P-VALUE	Probability value
ReLU	Rectified linear units
Sig	Significance level

SPSS	Statistical Package for the Social Sciences
SVMs	Support vector machines
VAES	Variational Autoencoders
XAI	Explainable artificial intelligence

INTRODUCTION

1.1 Background

In contemporary society, the proliferation of digital technologies has revolutionized numerous aspects of human life, profoundly impacting domains ranging from healthcare to finance and entertainment. Among the most transformative advancements in recent years is the advent of artificial intelligence (AI) and its subset. These technologies have permeated virtually every sector, promising unprecedented opportunities for innovation and optimization. Within the realm of enterpernership, (Abd Al-Halim, 2024).

Technologies, such as Chat Generative Pre-Trained Transformer (ChatGPT), are prime examples of Generative Artificial Intelligence (AI), which is a constantly evolving area. Start-ups particularly, can obtain a competitive edge, innovate their business models, gain business value, and undergo a digital transformation by implementing these technologies. Continuous but gradual experimentation with these technologies is the foundation for their adoption. The experience that comes from trying new technologies can help entrepreneurs adopt new technologies more strategically and experiment more with them. (Gupta, 2024).

To navigate concerns around user dependency on this technology, the researcher's suggestion is to view AI technologies not as a sole decision-making entity but rather as a knowledge collaborator. Entrepreneurs should utilize AI outputs as hypotheses, providing directions for further investigation, verification, and validation from diverse knowledge sources (including human expertise).

This approach aligns with the quest for more reliable business-related facts about, for instance, business model elements, enabling entrepreneurs to make informed and rational business decisions with ethical and appropriate integration of AI technologies with business operations, including, for instance, in market research. To accomplish this, it is important to develop a complete understanding of the technology's capabilities and its limitations, which is grounded in gaining an understanding of the technology's adoption factors. This helps entrepreneurs to obtain directions about how to enhance their understanding of the technology. (Bakri et al., 2024; Gupta, 2024, Abd Al-Halim, 2024; Felieri et al, 2021).

Many AI technologies are still in their early stage, and being exposed to them and being willing to adopt these disruptive technologies can help the entrepreneurial ventures (Start-ups) cultivate the habit of lifelong learning. To the point, the perfect storms are promising that AI will grow at an even faster rate in the future, thus entrepreneurs willing to gain the basic knowledge and those who follow newly trends in the field may have more chances to succeed and to

overcome possible difficulties and problems connected with the their start project innovations.(Gupta, 2024).

1.2 Problem discussion

The technological value of AI lies in its ability to meet business needs, to provide the benefits with minimal effort. Start-ups need to get a good grasp of what they require and what their chosen AI technologies can do to see if they match up well with their business activities. Even though these tools show off some pretty impressive skills they're not perfect and have their own set of problems. These limitations encompass inaccurate outcomes, biases, and the challenge of source traceability. This raises issues about the extent of entrepreneurs' dependence on ChatGPT for example, including full, partial, or no dependence at all. The perceived usefulness seems to be an important factor in deciding on adoption and dependency on the technology. However, the perceived ease of use element may still be crucial in adoption, as a technology's usefulness depends on users' ability to prompt it appropriately and easily. (Gupta, 2024; Abd Al-Halim, 2024; Morande et al., 2023)

Depending on the sector or market in which AI technologies will advance to the generative model, it is essential to analyse these issues and contribute to the development of the theoretical foundations and best practices of these remarkable tools. There is therefore a suggested need for scholars and practitioners to combine effort in the extensive explanation of the various dimensi²ons; defining and clarifying what may be good practices and bad practices; and the drawing up of best practices or guidelines that ought to guide the effective use of generative AI for entrepreneurial and business pursuits. (Bakri et al., 2024 ; Gupta, 2024 ; Morande et al.,2023 ; Abd Al-Halim, 2024)

This process requires identification of a team of multi-disciplinary experts that would include computer sciences; technicians, ethicist, legal consultant, business persons and social scientist and would incorporate understanding of the techno-ethical, legal and social implications involved in interacting with generative AI system. By working closely and on an equal footing with others, disciplinary and otherwise, knowledge is shared and coordinated so that start-ups and entrepreneurs are in a better position to manage the disruption that the said technologies bring with them to the optimal extent possible while at the same time avoiding as many negative aspects and detriments that they have as is possible. . (Bakri et al., 2024 ; Gupta, 2024 ; Abd Al-Halim, 2024 ; Morande et al., 2023).

1.3 Aim of the study

The purpose of this research is to find out how the implementation of AI technologies improves growth and business efficiency of entrepreneurs, especially start-ups established by student entrepreneurs under decree 1275 of the Ministry of Education. Specifically, the research aims to:

- Explore the motivations and factors influencing student entrepreneurs' adoption of AI technologies within their start-up projects.
- Assess the familiarity and exposure levels of student entrepreneurs with regards to AI technologies.
- Identify the perceived benefits and challenges associated with integrating AI technologies into entrepreneurial ventures from the perspective of student project holders.
- Examine how familiarity and knowledge of AI influence student entrepreneurs' beliefs about the ability of AI to improve various aspects of business operations, such as decision-making, risk management, marketing, and supply chain optimization.

Conclusively, applying the principles of this extensive analysis, the study aims to contribute to the development of an understanding of the contribution of AI to improving the chances of the success of entrepreneurial ventures particularly in the case of students. The conclusions could hopefully contribute to the improvement of the provision of education and training in AI as well as improving the support for the student-entrepreneurs to achieve the development of AI in business for the benefit of the desired business growth and innovation.

1.4 Research questions

The research was initiated in order to explore the relationship and the impact of artificial intelligence integration on the efficacy and operational success of entrepreneurial ventures: A study which holds student entrepreneurs' perspectives and experiences and that’s what truly leading us to ask this problematic which was based on authors work ((Bakri et al., 2024; Gupta, 2024, Abd Al-Halim, 2024; Felieri et al, 2021; Morande et al., 2023; Kang, Chaivirutnukul and Zeng, 2023; Sjodin, Parida, Palmi and Wincent, 2021; Chukwuka and Igweh, 2024; Shoushtari, Ghafourian and Talebi, 2021; Camacho, 2024; Tran et al., 2024) : **To what extent does the integration of artificial intelligence technologies enhance and build up the efficacy and operational success of entrepreneurial ventures?"**

Furthermore, to garner a comprehensive understanding of the phenomenon under investigation, the study will delve into the following subsidiary research questions:

- What motivates project holders to adopt AI technologies within their start-up projects?
- How proficient are student entrepreneurs in terms of their familiarity with AI technology, and what has been their level of exposure?
- What benefits do project holders perceive from integrating AI technologies, and what challenges do they face during its adoption?
- How much does familiarity with AI influence entrepreneurs' belief in its ability to improve business operations?

1.5 Hypotheses:

In the purpose of responding to the research question that mentioned before, and based on the academic literature that carried out the work of Gupta. (2024), Abd Al-Halim. (2024), Bakri, Defitri and Mu'min. (2024), Morande, Arshi, Gul and Amini. (2024), Felieri, D'Amico, Paolucci and Destefanis. (2021), Chaivirutnukul and Zeng. (2023), Sjodin, Parida, Palmi and Wincent. (2021), Kubatko, Ozims and Voronenko. (2024), Sixiao, Fang and Jabor. (2024), Chukwuka and Igweh. (2024), Abaku, Edunjobi and Odimarha. (2024), Shoushtari, Ghafourian and Talebi. (2021), Chukwu, Yufenyuy, Ejiofor, Ekweli, Ogunleye, Clement, Obunadike, Adeniji, and Elom. (2024), Camacho. (2024), Dash, Ansari, Sharma and Azad Ali. (2022), Akter, McCarthy, Sajib, Michael, Dwivedi, D'Ambra and Shen. (2021), Mikalef, Conboy, and Krogstie. (2021), Routray. (2024). Hypotheses are established as the following;

The main Hypothesis:

- Project holders involved in student entrepreneurial initiatives under ministerial decree 1275 who have greater knowledge and exposure to AI technologies will be more likely to adopt AI in their start-up projects and experience greater success.

The Sub-hypotheses:

H1: Higher levels of AI knowledge and exposure among project holders are positively associated with increased AI adoption intention, perceived benefits, and confidence in AI applications.

H2: Project holders with greater AI knowledge and exposure demonstrate enhanced operational efficiency, decision-making capabilities, and risk management across various business functions.

H3: Increased AI knowledge and exposure among project holders leads to improved market opportunity identification, innovative business model development, and more effective marketing strategies.

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Method

In the aim of responding to the research question, a ccurrent study is being carried out on the empirical analysis of a population of project holders. The survey unit represents the project holders framed by the presidential decree 1275, active in various sectors and industry all over the national Algerians scape (Gupta, 2024; 2024; Bakri et al., 2024; Felieri et al., 2021; Abd Al-Halim, 2024).

The impact of AI integration in project holders' entrepreneurial venture is measured by the AI knowledge and exposure and the project holder's entrepreneurial venture success, (Gupta, 2024; Abd Al-Halim, 2024; Bakri et al., 2024, Morande et al, 2024). the comparison criteria aimed to explaining the dependent variable of the study, which is represented by the project holders' decision and their intention to integrate AI technologies into their entrepreneurial ventures.

Furthermore, the analysis discriminates the project holders framed by the presidential decree 1275, based on their age, their educational level during the investigation, current university/higher school/incubator they are enrolled in, their motivation to start an entrepreneurial venture and their knowledge and exposure about the use of AI

Moreover, the dependent variables are evaluated in terms of their decision and the intention to integrate AI technologies in their entrepreneurial ventures and the perceived benefits of this integration Gupta, 2024; Abd Al-Halim, 2024; Bakri et al., 2024, Morande et al, 2024)

Nevertheless, the study analysis is based on a quantitative approach that is carried out through a survey. The statistical methods are implemented in order to establish the links between the explained variables, and the explanatory variables. Gupta, 2024 ; Abd Al-Halim, 2024 ; Bakri et al., 2024, Morande et al, 2024).

1.6 Limitations

The following were some serious limitations the research study experienced. First and foremost, the sample size was quite limited, as only a few project holders have successfully adopted the use of artificial intelligence technologies into their entrepreneurial venture. This somehow limits the generalizability of the study findings and an inability to make grand generalizations. The small sample might have been caused by either the recent adoption of AI technologies in entrepreneurial contexts or the difficulties in identifying and recruiting relevant ventures.

In addition, the integration of AI with an existing system, process, or business model was complex. The study may not have fully captured the intricate subtleties and multilateral

challenges, such as technical difficulty, or cultural barriers, which come with the integration of AI into a system, process, or business model. This might possibly result in an incomplete or oversimplified understanding of the AI integration process, further potentially not considering critical conditions that determine either success or failure.

Moreover, resource constraints proved a significant limiting factor. This could mean insufficient access to in-depth AI systems, special equipment, or computational resources that could challenge the depth or scope of the research. In addition, there were time constraints on the span or longitudinal feature of the study, which could have thus limited how dynamic and change-oriented a subject on AI integration under study is bound to be over a long period.

In addition, this would have been compounded by the fact that the research team had difficulties in recruiting and retaining adequate researchers or research assistants with the required knowledge of AI technologies. The shortage of such specialized personnel would have affected the capacity of the study to design, conduct, and interpret findings with accuracy.

Finally, the speed at which AI technologies change was a limitation placed on the research team when trying to remain current with advancements and developments. This could potentially have the effect that the study would not capture the latest emerging AI techniques, applications, and use-cases, potentially leaving the findings not current or incomplete.

1.7 Research outline

The study arranged in three main chapters that premised to provide clear understanding about the impact of AI integration in amplifying the effectiveness and operational achievements of ventures tend by entrepreneurs with reference to student entrepreneurship.

Chapter one outlines the theoretical framework and presents a critical discussion and analysis of a variety of studies related to the topic in question. It starts off with the-definition of AI, followed by characterization of its subfields and the multiple functionalities of AI across numerous fields. It would help to bring clarity in the basic definition of AI technology and the prevalence of related concepts.

Furthermore, Chapter one delves into the convergence of AI and entrepreneurship, exploring the intersection of these two realms. It examines the motivations and drivers that compel entrepreneurs to integrate AI technologies into their ventures, such as operational efficiency, data-driven decision-making. Additionally, this chapter investigates the perceived benefits associated with AI integration. Entrepreneurs' confidence and familiarity with AI

technologies are also discussed, providing insights into their readiness to embrace these technologies.

Transitioning to the practical aspects, Chapter one focuses on leveraging AI in entrepreneurial ventures. It presents techniques and strategies for effective AI integration, as well as the training and skill development required for entrepreneurs to capitalize on these technologies. Simultaneously, the chapter addresses the challenges and obstacles that entrepreneurs may encounter during AI adoption, Finally, it explores the impact of AI on various aspects of entrepreneurship, such as supply chain and logistics, risk management and cybersecurity, and decision-making and strategic planning.

Regarding Chapter two starts by outlining the research aim and objectives of the study and proceeds by giving a brief background of the research methodology that has been employed in the study. Then it identifies the sampling process and participant selection method more information on the participants especially project holders who fall under the Ministerial Decree 1275. The chapter then lays out the conceptualization and measurement of the variables employed, including dependent variables and independent variables.

Furthermore, Chapter two discusses the data collection methods, encompassing a quantitative method. It also outlines the data analysis techniques to be employed, including statistical tests and regression analysis for quantitative approach.

Eventually, Chapter three presents the results and discussion of the research findings. It begins with providing demographic and descriptive statistics related to the study participants. The chapter then delves into the findings and analysis, covering various aspects such as the motivations and drivers for AI adoption among entrepreneurs, their proficiency and exposure to AI technologies, the perceived benefits and challenges of AI integration, and the influence of AI familiarity on beliefs about business operations

Chapter 1: Theoritical Framework

Section 1: Conceptual framework.

Section 1 establishes the conceptual foundation by exploring artificial intelligence (AI), its subfields, evolution, and business applications. It also covers the concepts, pathways, types, characteristics, and dynamics of entrepreneurship and entrepreneurial ventures. This sets the stage for understanding the interplay between AI and entrepreneurial endeavors.

1.1 Artificial Intelligence and its subfields

Artificial Intelligence has become incredibly popular in today's world. AI is all about studying how. The human brain engages in thinking learning making decisions and functioning as it tackles problem-solving tasks. The aim of intelligence is to enhance the abilities of computers in areas linked to human understanding such as the skills of thinking, solving problems, understanding complex ideas talking and knowing things rest in a person's mind. (Mahato, 2022)

The Artificial intelligence has the advantages over the natural intelligence as it is more permanent, consistent, less expensive, has the ease of duplication and dissemination, can be documented and can perform certain tasks much faster and better than the human. The Turing Test Approach: The Turing test was proposed Alan Turing (1950). This test was designed to test that whether a particular machine can think or not. The test involves a human interrogator who interacts with a human and with a machine and has to tell who is human and which one is machine. The computer passes the test if an interrogator after posing some written questions, cannot tell whether the written response is coming from human or from the machine. (Pannu, 2015)

1.1.1 The concept of Artificial Intelligence:

Artificial Intelligence refers to the science and engineering used to make smart systems, in computer science domain which helping in technological advancements. It is the replica of how the human intelligence works but it does not deliver the methods that are biologically observable. Artificial Intelligence can be thought as a study which deals with the analytical and algorithmic aspect of problems, using the computational models. Artificial Intelligence is a field within computer science which tries to set up enhanced intelligence into various computer systems. (Mahato, 2022)

Moreover, Artificial intelligence can be described as the systems that display intelligent behaviour by analysing their environment and taking actions with some degree of autonomy to achieve specific goals. (Prins and Brom, 2023)

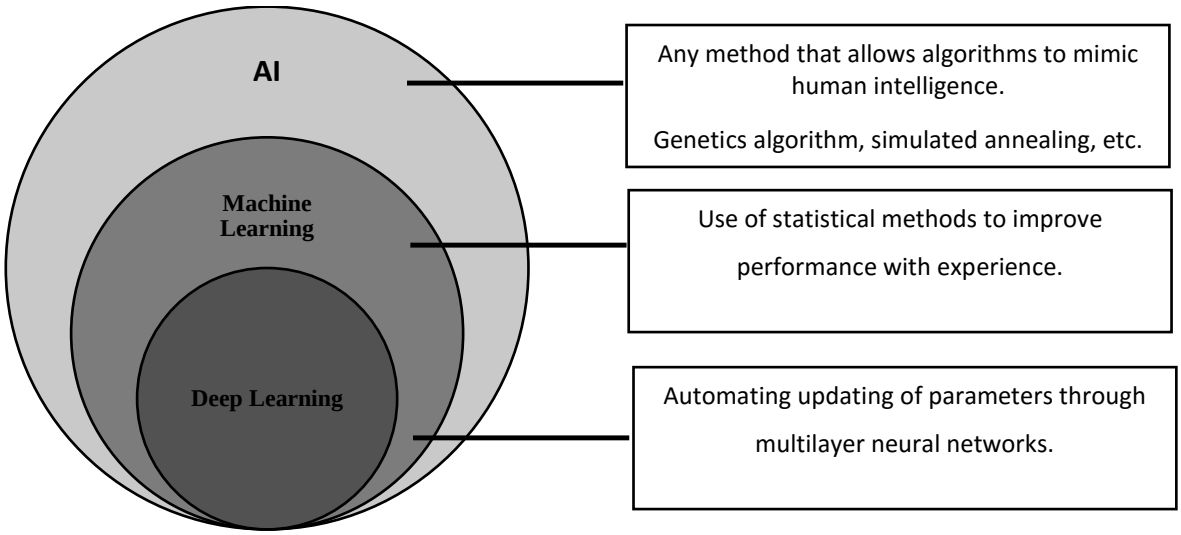
Furthermore, Artificial intelligence (AI) is a branch of computer science. It involves developing computer programs to complete tasks which would otherwise require human intelligence. AI algorithms can tackle learning, perception, problem-solving, language-understanding and/or logical reasoning. AI is used in many ways within the modern world, from personal assistants to self-driving car. Artificial intelligence (AI) is evolving rapidly. While science fiction every so often portraits AI as robots closely as possible to humans. (Mohammed, 2019)

The subject incorporates mathematical elements from several disciplines such as probability theory, optimization methods, traditional logic, decision theory and economics. There are agents like insects which only have percepts to follow while others use more sophisticated representations for instance; through the states of the world. An ideal intelligent agent is one that acts rationally given its percepts and knowledge. (Krafft et al., 2020)

1.1.2 Subfields of Artificial Intelligence:

Artificial intelligence (AI) is a broad field with many branches and sub-disciplines, but two of the most prominent and rapidly growing areas are machine learning and deep learning. (Mohri, Rostamizadeh and Talwalkar, 2019)

Figure 1: Artificial Intelligence, machine learning and deep learning.



Source: Shimizu, H., & Nakayama, K. I, (2020), Broad applications of artificial intelligence in oncology, p. 2.

As it can be seen in figure 01, machine learning is the part of Artificial Intelligence which is based on statistical methods and process to find the hidden patterns within data, However Deep

learning is a part of machine learning which uses domains of multi-layered networks to carry out operations. (Shimizu and Nakayma, 2020)

Machine learning is one sub field of AI. The core principle here is that machines take data and "learn" for themselves. It's currently the most promising tool in the AI kit for businesses. ML systems can quickly apply knowledge and training from large data sets to excel at facial recognition, speech recognition, object recognition, translation, and many other tasks. Unlike hand-coding a software program with specific instructions to complete a task, ML allows a system to learn to recognize patterns on its own and make predictions. (Reese, 2017)

Deep learning is a subset of ML. It uses some ML techniques to solve real-world problems by tapping into neural networks that simulate human decision-making. Deep learning can be expensive, and requires massive datasets to train itself on. That's because there are a huge number of parameters that need to be understood by a learning algorithm, which can initially produce a lot of false-positives. For instance, a deep learning algorithm could be instructed to "learn" what a cat looks like. It would take a very massive data set of images for it to understand the very minor details that distinguish a cat from, say, a cheetah or a panther or a fox (Reese, 2017)

There are several other important subfields that contribute to the overall goals and capabilities of artificial intelligence. These include NLP for Natural Language Processing is a discipline that focuses on the understanding, manipulation and generation of natural language by machines. Thus, NLP is really at the interface between computer science and linguistics. It is about the ability of the machine to interact directly with humans (Reese, 2017)

Moreover, we can distinguish two aspects that are essential to any NLP problem:

- The “linguistic” part, which consists in pre-processing and transforming the input information into a usable dataset.
- The “machine learning” or “data science” part, which consists in applying Machine Learning or Deep Learning models to this dataset.

ICV scene understanding provides an overview about various object detection and fitting techniques that can produce accurate information for the digital twin (DT) generation of existing assets. The aim of this chapter is to acquire digital twins of existing infrastructure with the least amount of human intervention and give readers the appropriate tools to apply ICV scene understanding and fitting techniques for specific domain applications. (Brilakis and Haas, 2020)

As indicated by Niku. (2020) in his work "Introduction to Robotics", Robotics is the field of science, which is studied to design, construct, and operate robotic systems capable of doing complex real-life tasks by integrating various disciplines such as mechanical engineering, electrical engineering, computer science and others.

Besides, there are three more important areas of AI research which are planning and scheduling (for logic-based synthesis of plans), multi-agent systems (for coordinating actions of multiple autonomous agents) and knowledge representation and reasoning (for encoding knowledge in the machine-readable form). (Russell and Norvig, 2020)

Table 1: Core of AI subfields

Subfield	Description
Planning and scheduling	This aspect is about developing sequences of steps which would bring to target goals, while at the same time taking into account limits on resources and be optimal for different functions. It deals with topics that include planning algorithms of classical type, hierarchical task networks, scheduling of jobs, and temporal reasoning for planning over time.
Multiagent systems	It is in this area that the communication and collaboration between multiple autonomous agents take place, whether they are software systems or robot systems. Major topics consist of communication standards, multi-agent teamwork approaches, game theory for multi-agent interactions, multi-agent learning algorithms and collective behaviour studies.
Knowledge representation and reasoning	This consists of the mechanization of information by expressing it in man-understandable forms and the adoption of methods to logicize with it. It plans out a number of representation schemes in this regard such as connection tables, formal logic-based schemes, semantic networks, frames and ontologies. These machines are also equipped with some of the most advanced automated reasoning technologies including rule inference, theorem provers, and truth maintenance systems.

Source: Russell, S. J., & Norvig, P, (2020), Artificial Intelligence: A Modern Approach (4th ed.), Pearson, pp. 235-373, 375-459, 461-531.

1.2 The evolution of artificial intelligence

Artificial Intelligence has undergone a remarkable evolution, starting out as symbolic reasoning with expert systems and then progressing to the current age of machine learning and deep neural networks. As Nilsson (2009) stated, the evolution of AI has been a quest to "construct theoretical models and devise algorithms for simulating and analyzing intelligence by computational means "spanning decades of research and innovation.

1.2.1 Early Beginnings (1950s-1980s)

One of the works that set the AI on the path to its evolution is the paper "Computing Machinery and Intelligence" by Alan Turing (1950) where he proposed the Turing test as a way of evaluating machine intelligence (Ebrahimi et al., 2021).

Besides this Turing's talk about the computer's ability to think gave rise to the question of creating a machine that was able to think like humans. Then in 1956, John McCarthy, who was a computer scientist from Dartmouth College, gave a conference at Dartmouth where the word "artificial intelligence" firstly appeared (Ebrahimi et al., 2022).

The researchers in the beginning concentrated their efforts on creating symbolic reasoning systems which employed expert systems. These AI systems initially were built on the principles of hard-coded rules and knowledge bases with which to solve problems in particular domains. (Ebrahimi at al., 2022).

The Logic Theorist, developed by Allen Newell, John Shaw, and Herbert Simon in 1957, was an early computer program designed to prove mathematical theorems. It was one of the first programs to embody the idea of heuristic search - using a mixture of logical reasoning and rule-of-thumb strategies to find solutions, rather than exhaustively exploring all possibilities. The Logic Theorist was able to rediscover and formalize several of the theorems from the iconic Principia Mathematica by Russell and Whitehead, demonstrating the potential of computers to automate certain types of logical deduction. (Ebrahimi et al., 2022).

The GPS (Sophia Generalized Problem Solver), invented by Newell, Simon, and Shaw in 1959, was an early prototype of a general problem-solving system. Using an interface for GPS, the problem description and set of operators could be provided, and then means-ends analysis would be implemented. This will try to make a series of operators that would achieve the expected solution. Means -ends analysis derives from the fact that the differences between the current state and the goal state are detected and operations that can decrease the difference are found. GPS had been established as one of the building blocks of the quest to obtain general

purpose problem solvers, which did not depend on their subject area. (Newell, Shaw, and Simon, 1959)

Expert systems, such as MYCIN, was an early expert system develop in the mid-1970s at Stanford University under the direction of Edward Shortlife. It was designed to diagnose and recommend treatments for certain infectious blood diseases. (Van Melle, Buchanan and Shortliffe, 1984)

1.2.2 Emergence of Machine Learning (1980s - 2000s)

The restrictiveness of AI symbolic and AI experts' systems, which heavily relied on human-made rules and knowledge, was demonstrated as researchers tried to solve complex real-life problems. limitations of symbolic AI and expert systems revealed themselves as researchers tried to solve real complex problems. This laid the foundations for dimensional machine learning, which is an approach that relies on a computer system being able to learn from data and experience and not explicit programming of rules (Goodfellow, Bengio and Courville, 2016)

One tough technological feats of this time were the introduction of backpropagation algorithm in 1986. This method of training multi-layer network also has the advantage of being robust to error propagation as weights are adjusted based on the errors from the output layer. This shift towards understanding the underlying mechanisms of neural networks, which before faced challenging due to the absent of effective training algorithms, paved the way for the new resurgence in neural networks. (Goodfellow, Bengio and Courville, 2016)

Also, the inclusion of decision tree was another important change as it is a type of algorithm applying tree-like models in order to get solutions to any decision problems according to some selected features and their corresponding targets. Algorithms like ID3 and C4.5 were originated during this period and turned out to be the best bets for applications like classification and regression that always worked well for domains with the interpretable features. (Salzberg, 1994)

SVMs (Support Vector Machines), which were invented back in the 1990s became well-known method in the realm of pattern recognition for performing two different tasks, classification and regression SVMs function via the search of the hyperplane that has the biggest margin between various classes and generates the highest distance from the classes. It makes SVMs very effective for highly dimensional data as well as non-linear problems. (Cortes, Sànchez-Marrè and Ceccaroni, 2000).

Nevertheless, in spite of the fact of a variety of solutions made during the epoch, the computational issues related to limited power, size of datasets, and the complexity of algorithms themselves had not allowed machine learning systems to achieve high performance and scalability. (Goodfellow, Bengio and Courville, 2016)

1.2.3 Deep Learning Revolution (2000s – 2010s)

The notion of a deep learning revolution, as depicted by LeCun, Bengio, and Hinton (2015), has permanently transformed artificial intelligence and machine learning. In their paper "Deep Learning", the authors summarized the major developments and breakthroughs that have influenced this transformation.

The defining moment came through deep neural networks with multiple hidden layers that made it possible to establish nested interactions of such intricate patterns and hierarchical representations. The fact that pioneers of science such as (Hinton, Krizhevsky and Sutskever, 2017) had laid the ground works for this breakthrough should be acknowledged. Not only did they contribute significantly, for example, by employing rectified linear units (ReLU), others overcame the limitations and dependencies on specialized hardware that hampered deep learning for long.

Large-scale datasets and computational resources marked the other significant milestones. In particular, the rapid growth of increasingly powerful GPUs and distributed computing frameworks, as well as the inductive power of massive datasets, made it possible to obtain significant performance improvements based on massive deep neural networks training for the first time. (Coates et al., 2013).

In addition to this, the introduction of generative adversarial networks (GANs) (Goodfellow, 2014) and variational autoencoders (VAEs) revolutionized the field of generative modeling, allowing for the creation of realistic synthetic data and enabling new applications in domains such as image synthesis, data augmentation, and domain adaptation.

The deep learning revolution swept through the sectors of technology and transformed the way the different industries function; including the sectors of computer vision, natural language processing, speech recognition, robotics, and healthcare. This had led to brain imaging, speech recognition, object recognition, and medical image analysis to be improved in such a way (Litjens et al., 2017).

As it is mentioned by LeCun, Bengio, and Hinton (2015) the deep learning revolution is still in progress, and there are many areas, including unsupervised learning, transfer learning, and the

integration of deep learning with other techniques such as reinforcement learning and symbolic reasoning, that still require efforts for ongoing research.

As the domain expands, it becomes apparent that the artificial intelligence has a potential to provide new prospects and to result in the creation of revolutionary solutions to complex problems, to make the deep learning revolution be yet another defining event of the AI history (LeCun, Bengio and Hinton, 2015).

1.2.4 The Era of current developments (2010s – Present)

Application of AI across multiple industries that are experiencing integration of AI systems is taking place now, at the same time as the advancement of AI capabilities that tends to occur at the same time with other emerging technologies. This is the current phase of development, wherein importance is placed on responsible development and ethical implications.

Anthropic (2023) points out that some businesses are using large language models such as GPT-3 and ChatGPT to provide smart conversational interfaces and improve customer support excellence. These AI capable chatbots are able to converse freely in natural language and help users with many responsibilities.

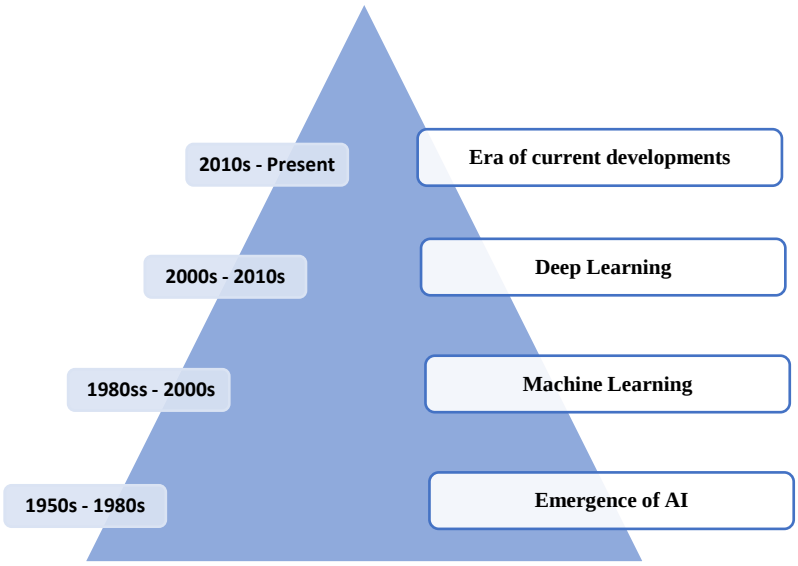
Besides, the combination of Artificial Intelligence with robotics, exemplified by Gemini system (Solomon et al., 2022), led to the creation of advanced autonomous systems which are able to work in complex, unstructured settings.

On the other hand, the rapid spread and power of AI has been the major proponent that focuses on responsible development and ethics as well. Cath et al. (2022) put a lot of weight on comprehensive governance frameworks and supervision mechanisms to make sure AI systems are conceived and applied in accordance with ethical principles and societal values. This entails resolving issues on partiality, transparency, and negative effects of AI on employment and human-AI relationships.

As an example, the AI community often chooses the "explainable AI" approach, which is based on making the decision-making process transparent and justifiable. In the paper, “Humans in the Loop: Explainable AI”, Gunning and Aha (2023) show that XAI methods, including feature importance analysis and human-understandable explanations, offer effectiveness in creating trust and accountability in the AI-based applications.

With the spreading adoption of AI and the consequent growth of its technologies, as well as the emergence of convergences with other evolving technologies, many people now acknowledge the need for ethical practices in AI development and deployment. (Cath et al., 2022).

Figure 2: The evolution of artificial intelligence over the time.



The revolution of aritificial intelligence from 1950s to nowdays

Source: Authors.

1.3 The application of artificial intelligence in businesses

The fact that AI can be integrated through several businesses underscores its versatility, and wide ranging application, according to a report by McKinsey & Company, "AI has the potential to create between $3.5 trillion and $5.8 trillion in annual value for companies across nine business functions in 19 industry sectors" (Bughin et al., 2018).

Besides, research from PWC demonstrates that the uprising of AI might boost the worldwide economy by $15.7 trillion come 2030 (PwC, 2017), also an interrogation by Deloitte uncovers that "63% of participators have commenced exploiting AI within their commerce activities, with top uses being enhancement of patron experiences, streamlining processes, and crafting novel merchandise" (Deloitte, 2021).

In accordance with another study by Harvard Business Review noted that "companies that have embraced AI across multiple business functions have seen a significant increase in their cash flow from operations compared to companies that have not adopted AI" (Davenport & Ronanki, 2018).

Table 2: AI Applications in different business areas.

Business Sector	AI applications
Retail & E-commerce	Personalized product recommendations, demand forcasting, chatbots for customer service, inventory optimisation.
Healthcare	Medical image analysis, drug discovery, patient data analysis, virtual assistance for diagnosis
Finance & Banking	Fraud detection, credit risk assessment, algorithmic trading, customer service chatbots
Manufacturing	Predictive maintenance, quality control, supply chain optimization, robotics.
Transportation & Logistics	Route optimization, autonomous vehicles, demand prediction, fleet management
Marketing & Advertising	Targeted advertising, customer behaviour analysis, content personalization.
Energy & Utilities	Predictive maintenance, demand forcasting, energy grid optimization
Entertainment & Media	Content recommendation, virtual assistants, Content creation (music, art, writing).

Source: Davenport, T. H., & Ronanki, R, (2018), Artificial intelligence for the real world. Harvard Business Review, 96(1), pp.108-116.

This table, adapted from the Harvard Business Review article by Davenport and Ronanki (2018) shows how AI is distributed throughout business sectors and demonstrates that the field of AI is diverse and multifaceted. High points made by authors are that business already uses AI technologies, such as machine learning, natural language processing, and computer vision, to enhance and improve operations, optimize processes, and make experiences more personalized in a number of sectors. As an example, AI-based predictive maintenance can help reduce equipment downtime and maintenance costs by up to 50% (Deloitte, 2017).

Additionally, AI-based recommendation engines and personalization algorithms are in use today to vastly improve customer experiences, increase engagement and accelerate revenue growth, with a recent study showing personalization leading to a 10% or greater sales lift

(Gallego-Gomez and De-Pablos-Heredero, 2020). While AI provides a variety of benefits, its implementation also leads to many ethical concerns, such as data privacy, algorithmic bias, and job loss that need to be resolved (Floridi, .2018)

As artificial intelligence technologies evolve, their use will spread rapidly into the business arena and possibly into other public sector operations as well. Task automation will increase process efficiency and optimization. AI may even lead to innovative new products and services. However, in order to ensure the effective use of artificial intelligence organizations need to take a strategic approach, carefully manage their data, and address challenges surrounding ethics and retaining the workforce to work alongside AI systems. (Davenport & Ronanki, 2018).

1.3.1 The inconvenient of applying AI in businesses

The implementing of an AI system in business organizations can be accompanied with a lot of inconveniences. One of the most notable problems is the cost of deployment. The hardware, software, and continuous support for AI technologies can be too expensive to afford, especially for small organizations (Bughin et al.,2018). This capital barrier may make it problematic for businesses to consider it as a reasonable investment, especially if the potential benefits are not consulted.

Additionally, Bughin et al., (2018) explains that the high degree of complexity in AI technologies and the need for companies to build required expertise in-house for successful management of these systems is a challenge. This lack of technical knowledge and experience can be a serious barrier to the successful implementation of AI, where enterprise lacks integration of the systems in their present processes and the infrastructure.

However, there is also the inconvenience that data should be of good quality and sufficient to provide an effective use of AI. Making sure the data is clean, well-structured and, in quantity, is enough may be challenging, lengthy, and expensive. Businesses should also take into account moral issues which can appear in the form of AI algorithms by discriminating against certain groups of people which eventually might lead to inequality. (Davenport & Ronanki, 2018).

According to Davenport and Ronanki (2018), another challenge of applying AI in businesses is the potential for ethical concerns, particularly around the issue of bias. Authors point out that the companies should be careful in considering the ethical aspect of AI systems and try to develop such systems that conforms their organizational values and which are acceptable to society. Therefore, it could be that setting up resistant governance structure, auditing AI models for bias, and ensuring the transparency of the decision-making processes should be done.

Such an ethical challenge is enormously complex and resource-consuming for firms. It should be known that such actions could lead to reputational damage, regulatory scrutiny and loss of confidence among employees, customers and stakeholders. (Davenport and Ronanki, 2018).

1.4 Understanding entrepreneurship: Concepts, pathways and types

This part will explore the multifaceted nature of entrepreneurship, delving into its conceptual underpinning, the various pathways it can take and the different types of entrepreneurship that it does exist in the business world.

1.4.1 Entrepreneurship in the modern concept

It has often been pointed out that entrepreneurship is one of the most important factors contributing to economic growth and delivering innovation. The scholars have focused on a key contribution that very entrepreneurs and entrepreneurial ventures make in the innovation, public competitiveness, and generation of jobs (Audretsch & Keilbach, 2004).

According to Kuratko and Morris (2018), entrepreneurship is a dynamic process that involves vision, change, and creation. The entrepreneurial process is a combination of energy and passion with which the creative ideas and solutions are developed and implemented
As time has gone on, new ideas and classifications have been added to the definition and assessment of entrepreneurship, the discipline's researchers contend that entrepreneurship is a complex phenomenon with a wide range of definitions and interpretations.

Davidsson (2003) posits that the multiplicity of definitions around entrepreneurship is associated with the concept's multifaceted nature, the phrases dispositions, or innate qualities of people behaviour, or the process of finding and seizing a profit opportunity and outcomes, or the success or failure of new businesses, have all been used to try to characterize entrepreneurship, besides, scholars have characterized entrepreneurship according to the economic realm, classifying it as either social or commercial (Estrin et al., 2016).

However, entrepreneurship nowadays means the extension of entrepreneurship beyond the traditional area of focus which is new venture creation This new context leads to viewing entrepreneurs as agents of change who leverage their creativity, risk-taking propensity, and capacity to deal with uncertainty to tackle the most complex issues and create value for various stakeholders (Kuratko & Morris, 2018)

1.4.2 Conceptual approaches of entrepreneurship

The three main approaches of entrepreneurship (shepherd, 2015):

- The opportunity-based approach, this concept of entrepreneurship is all about creating new products, services and business solutions that are directed by finding, evaluating and exploiting opportunities, Entrepreneurs are perceived as agents who can identify and capitalize on ideas or circumstances that others have neglected.
- According to resource-based view approach, entrepreneurship is the process of using resources at hand and mixing them with other resources that are not available to organise their use and create significance. The entrepreneurs are respected as people who have the ability to integrate resources, using their knowledge, skills and unique abilities to obtain superiority in the market.
- Behavioural/Psychological Approach This approach gives attention to the individual-level characteristics, motivations, and cognitive processes of entrepreneurs. Researchers scrutinize personality traits such as possible propensity to take risk, the need for achievement, and an ability to tolerate ambiguity which differentiate entrepreneurs from non-entrepreneurs.

1.4.3 Types of entrepreneurship

Entrepreneurship can take a variety of forms and a number of researchers have suggested that it is important to recognize different "types" of entrepreneurship when analyzing issues such as the characteristics of entrepreneurs, their motives for choosing entrepreneurship and the contributions of their entrepreneurial activities to economic development. Researchers acknowledged that entrepreneurship is a process that extends over multiple phases, thus allowing opportunities for assessing the state of entrepreneurship in a particular society at different phases, four of the phases are readily identifiable stages of the new venture formation process and each stage has its own "type" of entrepreneur (Kelley, Singer and Herrington, 2011).

According to Blundel, Lockett and Wang. (2018), Entrepreneurs are divided into:

Corporate entrepreneur/intrapreneur

These terms are both used to describe someone who acts entrepreneurially inside an existing organisation, which may range from a medium-sized firm to a large corporation, government agency, or charity. The constraint of operating from within an organisational hierarchy, rather than being free to act independently, is the key feature that distinguishes corporate entrepreneurs/intrapreneurs from other entrepreneurs.

E-preneur

This term has been derived from the wider use of the letter 'e' to refer to 'electronic' (as in 'email' and 'e-commerce) it is used to refer to the growing number of people who run businesses that depend entirely on the Internet, with the proliferation of Internet-based businesses, it now represents a very broad category, and could include anyone from the owner of a large online retailing empire to a self-employed person using an online shopping platform (such as eBay.com or Etsy.com) to sell specialist products from home.

Ecopreneur

This term has become popular as a way of describing entrepreneurs who establish ventures, or introduce new initiatives with the aim of tackling specific environmental problems. In practice, this can mean a wide variety of activities, ranging from a small, community-based enterprise selling organic fresh produce to a large commercial business operating in a low-carbon industry sector.

Lifestyle entrepreneur

This term is normally used to describe a person who has set up a small business in order to pursue a personal interest such as a craft (e.g. a pottery studio) or a sporting activity (e.g. horse-riding holidays). It is sometimes seen as a negative term, with the same kind of implied criticism as for 'hobby' farmers. The term refers to the idea that this type of entrepreneur prioritises quality of life over other common motivations for running a business. They might want to achieve a reasonable level of income from the venture, but are not actively pursuing purely commercial goals such as growing it into a much larger business.

Portfolio entrepreneur

This term refers to someone who operates several different ventures at the same time. There are different types of portfolio entrepreneur. They can range from extremely wealthy owners of multiple businesses to much less prosperous people, often based in remote rural areas, who engage in several different small enterprises in order to reduce risks and to maintain an income when local or economic conditions more generally, are uncertain.

Rural entrepreneur

This term refers to people who create or operate businesses in the countryside. It is sometimes used in a more restricted way to focus on the traditional rural industries, such as agriculture, forestry, food manufacturing, and rural crafts.

Social entrepreneur

This term is normally used to identify the founder(s) of a social venture, or someone who initiates a larger programme of social change. The distinctive feature of this type of entrepreneurship is that the primary purpose is to address social or environmental problems rather than simply to achieve commercial goals. This suggests a number of differences, including the values involved how people understand concepts such as entrepreneurial 'opportunity', and the way that organisations are run.

Technology entrepreneur

This term typically describes a person who has founded a new venture in order to develop some form of advanced technology, most commonly in industry sectors such as information and communications technology (ICT), biotechnology, nanotechnology, and other applied sciences. This kind of entrepreneurial activity is often very fast-moving, because of new scientific discoveries and often intensive international competition, and is associated with technological innovation.

1.5 Entrepreneurial ventures : Characteristics and dynamics

This part will examine the characteristics and dynamics of entrepreneurial ventures as it explores the particularity that distinguish new business ventures from the existing companies.

1.5.1 The concept of entrepreneurial ventures

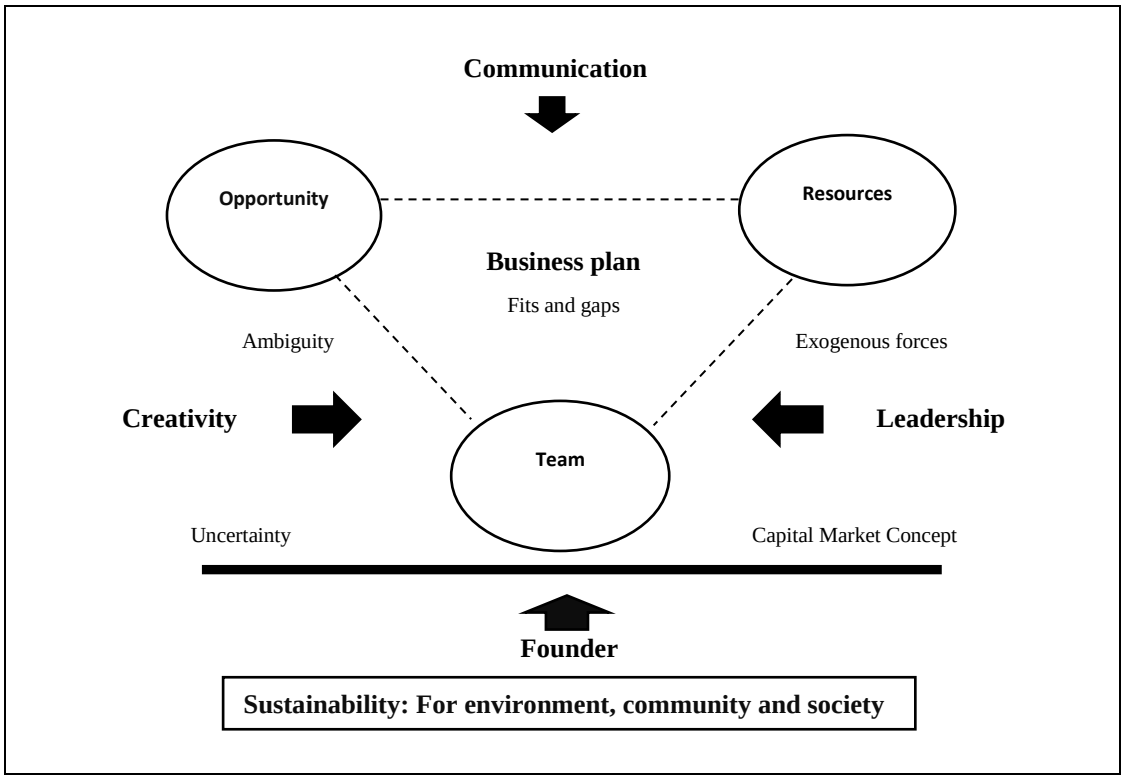
Entrepreneurial start-ups are studied as the core of modern entrepreneurship research recently, which means to say, those new business enterprises that are founded and undertaken by entrepreneurs serve as the manifestation of entrepreneurial activity in the marketplace (Brännback & Carsrud, 2017)

The process of creating entrepreneurial ventures involves managing the flow of financial, human and technological resources (Sirmon et al., 2007). Entrepreneurs must show that they can co-ordinate these resources in unique way to create an advantage and establish value for customers and stakeholders (Davidsson, 2015).

Entrepreneurial venture can be defined overall as an organisation that places innovation and opportunism at its heart in order to produce economic or social value. An entrepreneurial venture pursues opportunities, and it is characterized by innovative practices, and has value-creation and growth as its main goals. Consider companies like Apple, Facebook, Google,

jobber man etc as good examples of entrepreneurial ventures that have combined innovation and opportunity to provide values to people. (Iriobe, 2018).

Figure 3: Model of the entrepreneurial venture process



Source: Timmons, J. A., & Spinelli, S, (2009), The entrepreneurial process. In New venture creation: Entrepreneurship for the 21st century, 8th ed., Vol 1, pp. 85-90.

The following schema, provides a comprehensive perspective of the entrepreneurial venture process. It posits that successful new venture creation depends on the integration and fit between three key elements: the opportunity, the team and the ressources (Timmons & Spinelli, 2009).

The Opportunity element involves the search for an opportunity, which means that it is necessary to find and evaluate a viable business idea that can create value for customers. This step requires identifying the market needs, evaluating the competitive dynamics, and eventually ensuring the profitability of the venture (Barringer & Ireland, 2019).

The entrepreneurial team's characteristics, including leadership, commitment, motivation, and the ability to work together effectively, play a crucial role in the success of new ventures" (Timmons & Spinelli, 2009)

The Resources category includes all of the available resources that will be needed to pursue the opportunity, which include the necessary capital, human resources, contacts, and information and knowledge, (Timmons & Spinelli, 2009)

1.5.2 Characteristics of entrepreneurial ventures

Many people envision themselves becoming successful entrepreneurs but a successful enterprise requires a high degree of effort in an environment where consumers are becoming more difficult to satisfy. Nevertheless, entrepreneurial success is often highly correlated with entrepreneurial characteristics. These characteristics make up the various components that form an entrepreneurial venture. The serve as a common denominator found in most ventures. (Iriobe, 2018)

Below are some of the components that make an entrepreneurial venture (Iriobe, 2018):

- Adaptability

The business environment changes constantly and these changes provide opportunities for new businesses to grow. Entrepreneurial ventures take advantage of these changes to take a lead in the market. The ability to adapt to changes in business quickly, sustains an entrepreneurial venture over a long period of time.

- Internal Locus of control

Entrepreneurial ventures have the belief that they can make things happen within their market. They believe that the future is within their control, and that they are responsible for their own success. This believe makes them challenge their ability in trying to determine the trend in their industry. Entrepreneurial ventures do not only have vision, but they also plan to achieve that vision believing that it is possible. Bill Gates understood the influence PCs and Windows operating system will have in the computer industry when he rejected an offer to be part of IBM.

- Product Driven

Aside meeting customer needs, entrepreneurial ventures are highly motivated in business because of the uniqueness of their products. Individuals who set-up innovative organisations are less concerned about what customers actually need, they spend more time developing their products because they are confident that consumers will buy. Their motivation in business comes from their product hence; they tend to focus so much on it. An example is Apple

Corporation, their unique products (iPhone, iPad, Mac etc) gives them the drive to remain in business.

- Opportunity Driven

Entrepreneurial ventures are driven by opportunities. They have been structured to recognize and pursue opportunities in their business environment. They don't continue on the same line of business for a long time, they always seek ways to expand their business scope. For instance, Google started as a search engine company, but today, they own YouTube, Android OS, web browser etc.

- Proactive

Entrepreneurial organisations don't wait for things to happen to them, they act in advance. This is one quality most small businesses lack. Small businesses often times react to market changes whereas entrepreneurial ventures learn to follow the trend, and deal with changes or difficulties as it happens or before it happens.

- Innovation -focused

What makes an entrepreneurial firm is not the ability to start a business, but the strength of its innovativeness. In our modern world, having sufficient capital for your business is not going to sustain you for a long. What sustains a business now is innovation. Entrepreneurial ventures are wired to create something new or revolutionize their business environment. Entrepreneurs are recognized because of their ability to innovate, and not just to run a business.

- Calculated risk-taker

Entrepreneurs are known to be risk takers. Risk is part of every business however, the level of risk taking differs from business to business, and from industry to industry. In the case of entrepreneurial firms, what makes their 'risks' noticeable is the fact that they have new ways of doing things, or they are introducing new products. It is riskier to introduce new methods or products into business than imitating an already existing business model or product. This is because when introducing an entirely new category of product or a new experience into the market, you don't know how customers will receive it. (Ofunre, 2018)

- Value creation

Value is an essential element in any business venture. The value created determines who will buy from your business, and to a large extent, it arouses the interest of those who may want to invest in your organisation. Value creation, according to valuebasedmanagement.net, is driven

by factors like “innovation, people, ideas and brand.” Jack Hughes in his article: ‘What value creation will look like in future’ made the following remark, “The value of products and services today is based more and more on creativity – the innovative ways that they take advantage of new material, technologies, and processes.

Section 2: Literature Review

This literature review will provide a comprehensive exploration of the pivotal role of Artificial Intelligence (AI) integration in enhancing the efficacy and operational success of entrepreneurial ventures, with a focus on entrepreneur's initiatives and their AI knowledge and capabilities. It will examine the motivations, perceived benefits, implementation strategies, and challenges associated with AI adoption by entrepreneurs.

Additionally, it will explore the multifaceted impact of AI on various aspects of entrepreneurship, including product and service innovation, marketing and customer engagement, supply chain and logistics, risk management, cybersecurity, and decision-making processes.

2.1 AI and entrepreneurial sector

The emergence of artificial intelligence (AI) in the early twenty-first century has triggered a discussion about its role in several sectors of the economy and society. AI is one of the most promising technologies of our time, which has developed dramatically due to the enhanced processing capacity of computers and the accumulation of data. Nowdays AI machines can perform intellectual activities that only human workers could complete and are already being used widely in many industries, including manufacturing, supply chain, health care and retailing (Felieri et al, 2021)

According to Abd Al-Halim (2024), numerous industries, are being transformed by artificial intelligence (AI). Near all types of sectors increasingly use AI applications to improve customer service, streamline operations, and speed up strategic decision-making. The simultaneous pursuit of opportunities and advantages is called strategic entrepreneurship (SE), which enhances corporate performance. Innovative use of technological opportunities, especially AI, could be the tool for better corporate work.

The immense potential of artificial intelligence in revealing insights and predicting outcomes has catalysed its integration across domains. The intersection of AI and entrepreneurship also offers an exciting new frontier for scholarship. By synthesizing the depth of multidimensional start up assessment frameworks with the predictive power of machine learning, more nuanced forecasting of entrepreneurial success may be enabled. However, while promising, incorporating AI warrants prudence. Several studies highlight the promise of AI techniques like

neural networks for predicting specific entrepreneurial outcomes like loan default rates, profitability metrics and bankruptcy likelihood (Morande et al., 2023)

Furthermore, Entrepreneurial ventures that strategically adopt AI technologies and engage in digital entrepreneurship practices exhibit heightened competitive advantage. The integration of AI enablers, such as ethics, with innovation and digital strategies significantly influences competitive advantage. This synergy between AI adoption and entrepreneurship not only fosters competitiveness but also underscores the transformative potential of technology-driven strategies in shaping start up landscape (Bakri et al., 2024).

Interdisciplinary studies have revealed that the nature and capacities of people and machines differ significantly, which is why most academics believe that people and robots have complementary roles (Abd Al-Halim 2024). So Generative AI technology adoption is very likely not going to replace humans, but it will empower them to focus on higher-value tasks that call for creativity, analytical thinking, and emotional intelligence. Technology, for example, will encourage human resources to acquire new competencies, such as identifying the beneficial applications of technology and verifying AI results, emphasizing the significance of upskilling and adapting to effectively utilize AI. (Gupta, 2024)

2.2 Why do entrepreneurs use AI

In today's digital age, the entrepreneurial ecosystem is more dynamic and competitive than ever, while innovation, grit, and a strategic mindset remain cornerstones of success, there's one scarce commodity that every entrepreneur wishes they had more of time. (Degrande 2023).

Entrepreneurs think that Generative AI technologies may effectively address them needs and solve problems in a way that is comparable to that of humans. This impact their perception of technology’s usefulness. The ability of technology to communicate with humans allow them to engage with it more instinctively and naturally. This positively impacts their perception of ease of use. It can also increase perceived enjoyment because entrepreneurs would feel more satisfied dealing with a system that they think is more relevant and human-like in its reactions (Gupta, 2024)

Entrepreneurs are applying artificial intelligence, particularly machine learning, natural language processing, and predictive analytics to level up the playing field in today’s modern market environment. New awareness of how AI can be useful and actual examples of such solutions are stimulating the founders of start-ups to investigate and implement AI. They see how AI is changing the world through attending conferences, following other personalities, and

understanding that it can be a significant competitive advantage. Additionally, the availability of the resources, which are open-source libraries, cloud services, and AI creation without coding have made the use of AI solutions more accessible to entrepreneurs without the need for advanced technical skills and high funding. (Bakri et al., 2024)

Research shows that integrating AI into start-up operations can lead to various competitive advantages, such as increased operational efficiency, better decision-making capabilities, and the capacity to innovate products and services. However, there are challenges in effectively integrating and leveraging AI technologies in business, with organisations often struggling to understand the value creation process of AI and how to incorporate it efficiently. Despite these challenges, AI-based solutions have shown promise in improving customer satisfaction and loyalty by providing personalised experiences and value-added services. Therefore, start-ups that successfully adopt AI can not only streamline processes and gain insights, but also improve customer experience, ultimately contributing to their competitive position in the market. Thus, it is evident that AI technology adoption plays a crucial role in shaping the competitive landscape for start-ups. (Bakri et al., 2024)

The increasing familiarity and knowledge of entrepreneurs with AI technologies play an important role in boosting their confidence and willingness to integrate AI into their start-ups. As they gain a deeper understanding of AI's capabilities, potential applications, and success stories, entrepreneurs become more confident in navigating the challenges and complexities associated with AI adoption. This confidence stems from a better grasp of how AI can create value, streamline processes, and drive innovation within their specific business domains. (Gupta, 2024)

In addition to this, entrepreneurs embarking on Generative AI adoption can strategically enhance their journey by intertwining key practical implications derived from the research findings. Actively participating in collaborative ecosystems, such as accelerators and chambers of commerce, opens avenues for networking, mentorship, and affordable training. Concurrently, leveraging support from foreign embassies and innovation ecosystems offer valuable guidance and motivation throughout the adoption process. (Gupta, 2024)

Most people are familiar with the basic algorithms that were used to modify social media and other content platforms, as the operator, AI instantly produces results and adapts to the demands of contemporary business, AI is already being used in numerous locations and is changing business in a wide range of other countries, artificial intelligence (AI) has the ability to identify and stop risks and vulnerabilities within businesses, which might lead to changes and

improvements in a variety of sectors, according to 79% of CEOs, investing in AI greatly improves corporate productivity, now that AI-powered connections are available, businesses may investigate them to improve operations and embrace intellectual advantages, with little work, it guarantees stricter cyber security and privacy laws, in many aspects, AI can make humans function more like super humans, it enables a continuous learning methodology to achieve results at a rate that surprises no one (Cuizon, 2023).

2.3 The importance of incorporating AI in entrepreneurship

In order to find out whether incorporating AI technologies has a critical importance for entrepreneurs, A research was conducted by Tran, Vo, Tran and Duong. (2024) through a qualitative approach, highlighting some significant findings:

It is important to notice that, there are countless ways in which AI could be applied to other fields of entrepreneurship, and there is still so much more to explore in terms of what this technology can do. At the moment, entrepreneurs' primary focus can be AI: chatbots, in order to improve customer support; machine learning, in order to give customers personalized experiences; and automating their services, as did the companies discussed, in order to speed up and scale their processes. However, as we advance further into the era of innovation, it is expected that attention will gradually start to turn towards different types of AI technology and their applications. Fostering AI awareness and familiarity among entrepreneurs is crucial to facilitate this transition and unlock the full potential of AI integration. By developing a fundamental understanding of AI's capabilities, subfields, and applications, entrepreneurs can better identify opportunities to leverage this technology and make informed decisions about its implementation within their businesses. (Tran et al., 2024)

For instance, given the huge amount of data generated by businesses using technology in the modern world, the application of AI to big data analysis could well create new ways to leverage this data and find market insights. Alternatively, the development of AI in the field of cybersecurity could benefit start-ups looking to secure their technology and customer data from digital threats. Also, that, what truly worth mentioning that despite the enormous potential AI offers to entrepreneurs, there is still a substantial amount of technical and computing knowledge required to leverage this technology effectively. (Tran et al., 2024)

Furthermore, the professionalization of AI services will certainly mitigate this issue, but, for the moment, it is likely that only businesses with access to educated professionals in the technology sector will be able to make the most of AI. This could create a gap in the business world between those companies who can afford to make use of this advanced technology and

those who cannot, ultimately serving to reinforce the positions of the biggest players in any given industry. (Tran et al., 2024)

Moreover, as with any emerging technology, there is always the possibility that innovation in the field of artificial intelligence could raise legal and ethical questions in the future. It is not difficult to imagine that adaptations of Alan Turing's famous thought experiment, in which participants interact with an AI and evaluate whether they can tell it's a machine, could become part of endeavors to legislate for AI rights in a world where these systems are embraced by the mainstream. (Tran et al., 2024)

Nevertheless, the future prosperity and growth of entrepreneurship through AI will be closely connected with the development of regulations and standards to guide the responsible use of this technology, and also provide suitable protection for rights. However, in the grand scheme of things, the possibilities offered by integrating AI into business strategy, as outlined in the case studies, represent an exciting and distinctive prospect for entrepreneurs. AI has the capacity to exponentially transform how businesses operate and compete in the business landscape, providing advantages which range from improving decision-making accuracy and speed, to enhancing revenue, productivity and customer satisfaction. (Tran et al., 2024)

For instance, Grubhub, a food delivery start-up, implemented an AI-powered system to optimize delivery routes based on real-time traffic data. This resulted in a 15% reduction in delivery time and a significant decrease in fuel cost. Also, Hilton Hotels deployed AI-powered chatbots to provide 24/7 customer support and personalized recommendations for hotel amenities and local attractions. This resulted in a 30% increase in customer satisfaction ratings. (Tran et al., 2024)

2.4 How entrepreneurs are using AI into their businesses based on their AI capabilities and experience.

It has been observed that the leading trend-setters within the business environment are already starting to adopt artificial intelligence or AI as a weapon to out-compete their rivals. It’s important to understand that AI technologies are applicable in numerous spheres including, predictive modeling, various process automation, as well as customer-oriented interactions. One of the most promising areas of AI application is the use for the purposes like business analysis as well as lead generation, and even in such fields as rapid prototyping of new offerings. Yet, to unlock AI’s potential, a proper implementation plan has to be put in place to focus on areas like data access, AI skills development in the organization, and AI business ethics that can include bias and data privacy (Dwivedi et al., 2022). When used selectively, AI

can lead to increased innovative processes, improve business responsiveness, and increase the level of customer engagement for entrepreneurial ventures.

Strategies that should be used in application of AI in entrepreneurship should aim at acknowledging that, while it is a powerful tool, it can never replace human creativeness. Combining use of human values, appreciation of intuitions and good judgement together with AI's ability to analyse leads to better balance of a strategy that can deliver unique, innovative, and personalized solutions. It is vital for entrepreneurs to keep updating themselves with knowledge on what AI is capable of and also what it cannot do, the big data analytics, algorithms and other related technologies and must actively learn how to integrate it into their business without obstructing its creativity (Chukwuka and Igweh,2024).

To sponsor an environment that supports the adoption of AI for entrepreneurial activity, it is necessary that there is a spirit of cooperation that involves the institutions that formulate policies, academic institutions and the business community. This includes setting up hubs for the creation of AI products, products for start-ups, sound legislation of data protection, MWRs to spread knowledge on AI, and promote AI capabilities to educate the programmes. By nurturing such an environment, new opportunities can be introduced and the imagination of an entrepreneur can run wild, complementarity of creativity and intelligence of the machinery. Albeit the application of AI and entrepreneurship has exposed prospects for a world where humans and AI operate concurrently signifying continuous learning and resourcefulness. (Chukwuka and Igweh,2024).

Furthermore, entrepreneurs ought to participate actively in cooperative environments, such as chambers of commerce, accelerators, foreign embassies, libraries, and incubators. In addition to networking opportunities, these platforms provide mentorship, affordable training programs, and a friendly atmosphere that can assist entrepreneurs in exploring technology and overcoming their resource constraints, it is also important to mention that the innovation ecosystem provides opportunities for open innovation by offering guidance, expertise, and motivation for entrepreneurs in the adoption process of AI technologies. For instance, they could offer training support to entrepreneurs to help them trigger ChatGPT with better prompts. This also helps entrepreneurs to evaluate the technology's quality from functional and non-functional perspectives. (Gupta, 2024).

Despite all the benefits that AI can contribute to the entrepreneurial ventures, entrepreneurs face challenges in implementing AI solutions, such as high implementation costs, access to expertise and data infrastructure, job displacement concerns, and ethical considerations. Cost

and expertise are significant challenges for entrepreneurs, who must invest in AI software and hardware and allocate budget for maintenance and IT support. Access to AI talent is also a prevalent issue. Entrepreneurs need large datasets to train AI algorithms, but many lack the necessary technical infrastructure. Job displacement and ethical implications of AI are concerns, as AI algorithms lack transparency and can introduce bias. Entrepreneurs must consider the potential impact on employees and address issues of unfair bias (Tran et al.,2024). These obstacles are explained as the following:

Firstly, the cost of implementing AI in businesses can be a significant barrier. Factors include the need for infrastructure and hardware updates, costs related to energy, maintenance, and storage, and investment in employees with expertise. Companies typically spend at least $1 million on implementing AI solutions. Changing existing processes and retraining employees also incur additional costs. Cloud-based AI services offered by big tech companies can reduce the financial barrier, but subscription costs can add up. Despite the cost, AI can save money in the long run through increased efficiency and smarter decision-making. AI also offers the advantage of working 24/7 without fatigue.

In addition to this, the greatest challenges for entrepreneurs in AI are the need for specialized technical talent and access to the right data and computing infrastructure. There is a shortage of AI experts in the private sector, driving up salaries. Cloud computing offers opportunities for start-ups to access computing resources and AI software. However, small businesses struggle with data storage compliance. The reduced significance of technical infrastructure allows AI to be a mobile and global service. This opens up new markets for entrepreneurial solutions, but requires access to the right digital tools and platforms.

It is also critical to mention that addressing concerns about job displacement due to automation is important. While automation leads to job displacement, not adapting to new technologies will lead to a worse situation. It's important to be proactive and help policy makers and companies think about how automation will change society and the business landscape. Cutting-edge solutions like artificial intelligence create more jobs than they displace. Employees can find new jobs through specific training programs. The uneven distribution of benefits and costs raises concerns about wealth inequality. Policies should be in place to ease the transition. Companies like Amazon are providing programs to develop employees' skill sets. The government should take a leadership role in mitigating economic disparity. China is unique as the government is promoting automation and investing in it across various industries.

Regarding the ethical considerations, at the start of machine learning, humans determine how the AI will learn and what it will be tested against. These decisions can introduce human bias, including cultural, ideological, and epistemological bias. Intentional bias may come from developers with a specific vision, while unintentional bias can arise from personal biases. Furthermore, bias in AI has become a significant issue, highlighted by instances of programming bias in popular culture. It raises the question of whether machines using AI should have rights recognized by the law. Currently, there is a consensus to establish the ability to recognize rights and duties in AI systems. However, addressing bias and ignorance in machine learning is crucial to fulfil emerging ethical obligations

2.4.1 AI for addressing new Opportunity recognition:

To investigate the importance and the role of AI technologies in addressing and identifying new opportunity recognition within the entrepreneurial ventures, a quantitative research was conducted by Kang, Chaivirutnukul and Zeng. (2023). the study highlights some interesting findings by utilizing the regression analysis in SPSS version 25, which revealed a positive and statistically significant relationships between opportunity recognition and AI utilization with entrepreneurial knowledge, the results indicate positive associations between opportunity recognition and AI utilization, also Showed up that, context the findings provide important insights into the elements that impacting opportunity recognition and the function of entrepreneurial expertise as a mediator. The study shows that both entrepreneurial bricolage and the use of artificial intelligence have a favourable impact on opportunity recognition.

Additionally, entrepreneurs who use resource restriction techniques and AI technologies to identify and pursue new company possibilities have a better chance of success. Furthermore, entrepreneurial knowledge serves as a mediator, bridging the effects of bricolage and AI utilization to improve opportunity recognition capacities. The study's practical implications help entrepreneurs use resources more effectively, adopt AI technologies, and enhance, entrepreneurial skills to better opportunity recognition. Policymakers may create programs to encourage bricolage methods, ease Al adoption. and develop knowledge-sharing platforms. allowing entrepreneurs to improve their opportunity recognition ability and drive economic growth. (Kang, Chaivirutnukul and Zeng, 2023).

To conclude. The study of Kang, Chaivirutnukul and Zeng. (2023) adds to theoretical frameworks in entrepreneurship research and emphasizes the need to take into account the interaction between bricolage, AI utilization, and entrepreneurial expertise, entrepreneurial

knowledge as a moderator in the correlations between bricolage/AI utilization and opportunity recognition.

2.4.2 AI in Evaluating Business Ideas and Transforming Business Models

Manufacturing firms nowadays are expected to experience a revolution in the ways they generate, deliver and capture value through artifical intelligence. However, AI integration in an organization's business model and processes often remain challenging for many manufacturers in a sustainable manner. The emerging AI technologies offer the potential of enhancing the creativity of product and service development, driving top-line transformation, altering the innovation processes, and changing the very nature of business activities in industrial ecosystems that adopt the concept of digital servitization. (Sjodin, Parida, Palmi and Wincent, 2021).

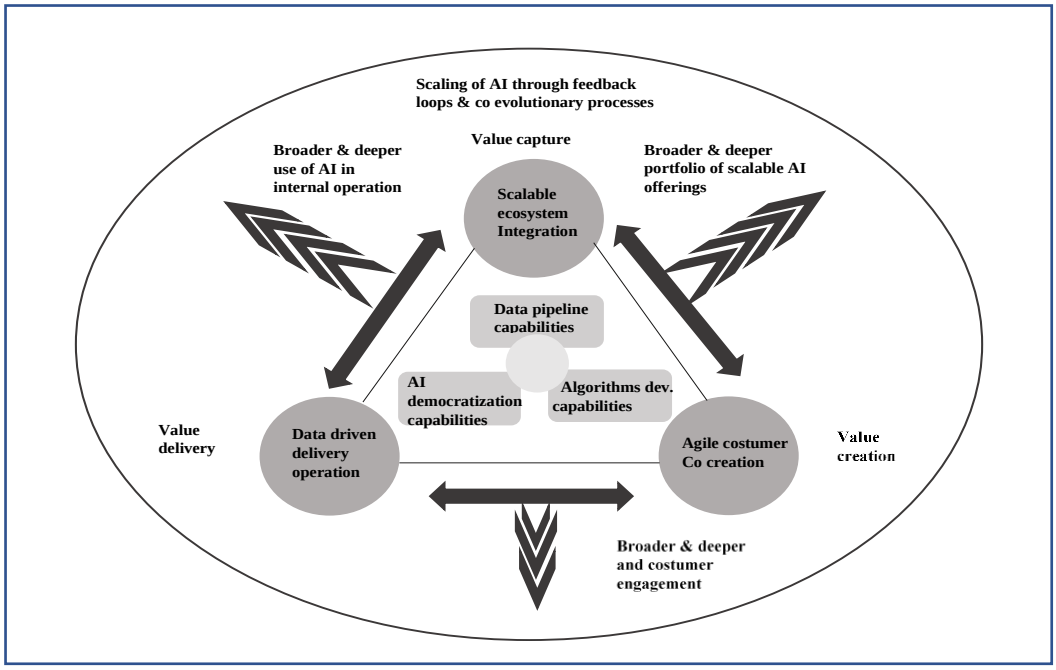
For example, investment in AI technologies has enabled providers such as GE, Siemens, and ABB to offer enhanced digital customer services such as fleet management and site optimization by monitoring, analyzing, controlling, and automating the performance of connected equipment Yet, succeeding with such offerings is far from automatic, and many firms, in setting up business models, fail to realize increased value creation and capture from AI. (Sjodin, Parida, Palmi and Wincent, 2021).

According to the findings of the study (Sjodin, Parida, Palmi and Wincent, 2021) one of the most important suggestions given by the respondents of this research was the call for identifying the guidelines regarding the organizational change processes that an organization would require in the context of the creation of AI business models in the context of digital servitization. This somehow contributes to identifying effective ways of using AI capabilities, which is significant. For example, developing algorithms is useful in creating valuable information from the customer database and useful customer predictions, but if these facilities are not used within the ongoing business and real customer stimulating/serving activities and customer services, then again, the worth is only on paper. The data reveals three key principles that are central to AI business model innovation: CC as customer involvement or customer collaboration in value creation, DO as efficient delivery operations based on data and, EI as the ability to integrate with other ecosystem partners to capture the value., each principle is prototypically aligned toward one of the value creation, delivery, and capture business model components. It can be concluded from the results given that using an effective AI capability and having a specific knowledge with AI can promote and enhance the business models innovation in the context of digital servitization.

Based on Sjödin, Parida, Palmié and Wincent. (2021) work, the following diagram depicts a co-evolution of the layer model and the business model to scale the AI capabilities. The overarching concept is 'Scalable ecosystem integration,' This forms the foundation for engaging feedback mechanisms and evolutionary processes to align and enhance AI integration in different organisational units.

The framework describes a continuous value creation, consisting of value capture, portfolio growth, data pipeline optimization, algorithm innovation, artificial intelligence for all, data-oriented activities, customer-centric development with speed and intensity, and customer base multiplication. More specifically, this co-evolution strategy is designed to create a virtuous cycle wherein the advancement of AI remains as strength for organizations to extend and upgrade existing business models by integrating AI into organizational processes, products, and services, and customer engagements for long-run and incremental value creation.

Figure 4: A co-evolutionary framework for scaling AI capabilities through business model innovation



Source: Sjödin, D., Parida, V., Palmié, M., & Wincent, J. (2021). *How AI capabilities enable business model innovation: Scaling AI through Co-evolutionary processes and feedback loops*. Journal of Business Research, *134*, p. 583.

2.4.3 AI for boosting Entrepreneurial Decision-Making

In order to investigate the influence of artificial intelligence on business decision-making a study was released by Kubatko, Ozims and Voronenko (2024), through a quantitative approach,

this research came with some crucial results. Most of the respondents of the conducted survey believe that AI has a role in improving the accuracy of decision-making processes within their start up project. Moreover. 24% of the respondents neither agree nor disagree with the statement that Al contributes to the accuracy of business decisions; the neutrality suggests a segment of respondents who may be undecided or require evidence that is more concrete or experience to form a strong opinion about the impact of AI on decision accuracy. Based on the findings in this study, it can be concluded that the gender and age distribution of respondents influence the perception and use of AI in business decision-making. The study also concluded that AI-driven decisions are dominant in the Healthcare sector.

Furthermore, based on the findings, the authors came to an end that AI awareness and implementation indicated a generally positive outlook, with a significant level of acknowledgment and familiarity among respondents. Also, there is positive perception of AI making decisions faster with a positive contribution to the accuracy of business decisions. However, there is a record of some biases in AI-driven decision-making. This highlights a significant concern in the fair and equitable application of AI algorithms. This shows the importance of addressing bases to ensure ethical decision-making.

Another research study was conducted by Sixiao, Fang and Jabor. (2024) to analyze the impact of AI technologies on entrepreneurship, the authors thought that AI has the potential to assist entrepreneurs in converting accessible data into precise forecasts during the decision-making process. Both humans and machines possess distinct advantages and limitations. Human performance is enhanced in situations with limited data, whereas machines tend to be more efficient in scenarios with enough data for analysis. Thus, during this stage, the entrepreneur can make optimal judgments, owing to the implementation of artificial intelligence.

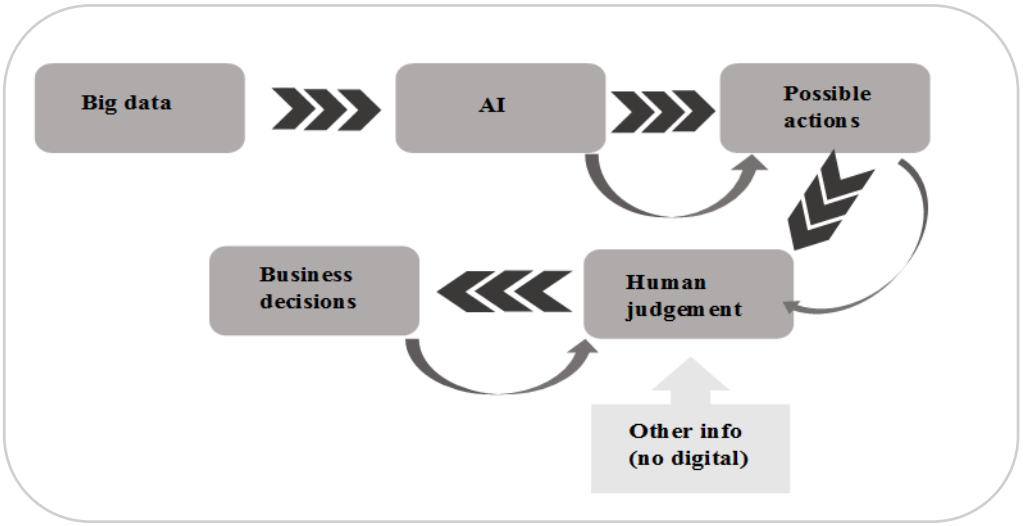
This modern data tools can enhance the comprehension of crucial decisions made by entrepreneurs, such as entrepreneurial decisions, as well as those made by others that directly impact entrepreneurs, such as investment decisions. Social signal processing, a burgeoning field including several cutting-edge technologies employing artificial intelligence, has the capacity to automatically recognize and analyze signals exchanged during interpersonal interactions. (Sixiao, Fang and Jabor, 2024)

The ability to make decisions in situations of uncertainty is crucial to the entrepreneurial process, since one of the reasons why many skilled individuals hesitate to start new enterprises is due to the unpredictable nature of their surroundings. To tackle this issue, one might utilize uncertainties along with pertinent data sets to forecast the prospective success of a perceived

opportunity through the application of data analysis tools during the prestart up period. This kind of evaluation allows the decision-maker to pinpoint the uncertainties that have a significant impact on the final result, enabling them to effectively allocate resources. (Sixiao, Fang and Jabor, 2024)

AI is the most potent translator of data, which has emerged as the new currency of the digital era. Nowadays, a plethora of data, ranging from industry trends to customer behavior, is available to entrepreneurs. Real-time processing and analysis of this data by AI-driven analytics can yield useful insights that direct strategic decision-making. Entrepreneurs may utilize artificial intelligence (AI) to make well-informed decisions, spot new possibilities, and streamline operations through data-driven insights (Chukwuka and Igweh,2024).

Figure 5: Data driven decision making



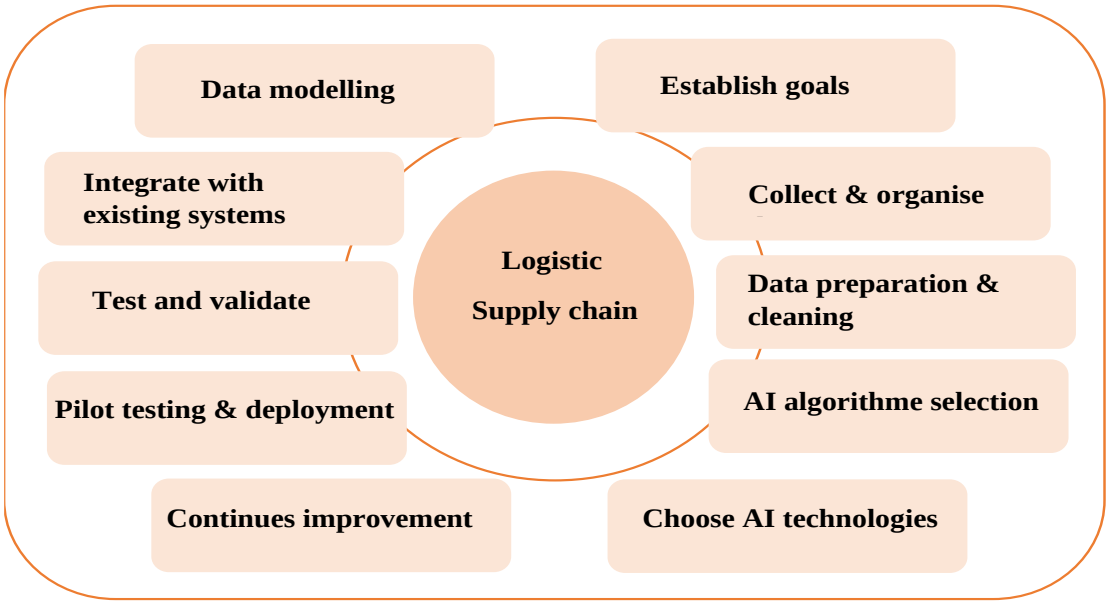
Source: Barber, O., (2023). How artificial intelligence will change decision-making, Retrieved from. https://indatalabs.com/blog/artificial-intelligence-decision-making

2.4.4 AI for Agile and Resilient Entrepreneurial Supply Chain Management

Multiple AI techniques offer promising solutions for enhancing optimization performance in supply chain management. By leveraging the strengths of different AI techniques, such as machine learning, evolutionary algorithms, reinforcement learning, and ensemble learning, businesses can develop more versatile and effective optimization solutions that can handle the complexities and uncertainties of real-world supply chain operations (Abaku, Edunjobi and Odimarha, 2024)

The following figure shows the overview of the necessary steps to implement Artificial intelligence (AI) in Supply Chain, as explained by Sharma et al., (2022). Long-term goals are set first, then specific aims and objectives are defined together with data modelling, collection and preparation. Next, they select and introduce necessary AI algorithms and technologies to the existing frameworks. The solution is then evaluated for its correctness and reliability and the actual pilot testing is repeated. Sustaining the quality is described as a never-ending process which is continuous and takes into consideration the principle of the need to adapt and integrate the AI solution into the new business conditions and supply chain technology trends.

Figure 6: Steps to optimize AI in supply chain



Source: Sharma, R., Shishodia, A., Gunasekaran, A., Min, H., & Munim, Z. H. (2022). The role of artificial intelligence in supply chain management: Mapping the territory. International Journal of Production Research, 60(24), pp. 7527-7550

It can be noticed that incorporating AI practices in the company, it would help in precise forecasting of the demand by using past sales data and other market factors as predictors. For instance, Walmart integrates AI solutions to make demand forecasting to be at the store level. This makes it easy for them to ensure that the right stock balance is placed in the right stores in order to avoid out-of-stock incidences and thereby increase customer loyalty; AI can also be utilized in tracking the real time inventory levels and then give considerations on the appropriate levels of stock to be placed. This is useful as it will help the companies to cut down on the costs of carrying out activities and also provide better customer care.

For instance, in the case of Amazon, AI is used in ordering and controlling its stocks in products. This means that they can be able to monitor on the stock of millions of products and monitor whether they have enough stocks in the correct distribution centres. It also enables them to minimize holding costs and to optimize the ways of processing orders so as to enable them be processed in the shortest time possible**.** There is also transportation, AI can be effectively applied to solve such common problems as choosing the best ways to get from one place to another and the best time to do this. This may assist firms in cutting down transportation expenses and at the same time enhance the delivery elapsed times. For instance, UPS applies the fourth advancement in AI to enhance its transport system. This assists them in identifying a number of optimal routes for use when making the deliveries to customers, a move that aids in cutting down fuel expenses as well as simplifying delivery time. (Shoushtari, Ghafourian and Talebi, 2021)

A quantitative research study was conducted by Chukwu, Yufenyuy, Ejiofor, Ekweli, Ogunleye, Clement, Obunadike, Adeniji, S., and Elom. (2024), talking about" AI-Enhanced Supply Chain Security and Efficiency Integration", the most important findings of this research indicated positive perception of the role of AI in addressing key challenges in the supply chain industry, Most of respondents who had enough knowledge about AI capabilities believed that AI technologies can boost the supply chain management and it may help to solve many encountered problems, particularly in areas such as demand forecasting, risk management, and inventory management. These findings suggest that there is a growing recognition of the potential benefits of AI in enhancing supply chain operations and driving efficiency and competitiveness in the industry.

To conclude, AI's strategic implementation for optimising supply chain performance demonstrates several advantages for diverse organizations. The use of AI technologies in organizations helps in cost optimization, enhancing speed, better accuracy in forecasting, supply chain agility, improvement in service delivery, and sustainability. These objectives can result in increased; Sales, operational efficiency, customer satisfaction and reduction of the impact on the environment. However, it is crucial to take into account that such ratios are subjected to change concerning the specific concrete implementation and the environment that includes industry type, organizational settings, data quality, and levels of AI incorporation. Still, the adoption of artificial intelligence in supply chain management bolsters organizations' competitive edge in a growing and fast-changing world (Shoushtari, Ghafourian and Talebi, 2021)

2.4.5 AI for Cyber security & risk management

Technological advancement specifically in the area of data security has been greatly boosted by adoption of artificial intelligence to combat cyber threats. Application of Artificial Intelligence which includes Machine learning, NLP, BA, and DL also aids in threat-detection and response, better and optimized vulnerability management along with strong compliance and governance. (Camacho, 2024)

Through the decisiveness and constant analysis of huge amounts of information, AI helps protect an organization against many types of cyber threats like malware, phishing and insider threats Thus, AI's application in cybersecurity entails helping organizations to have early detection of incidents and improve overall response power and efficiency of the cybersecurity measure, the development of plans on how to improve on the power of the measures used to fight cyber threats. Yet, it is crucial to mention that AI is not the end all be all solution which should be further applied as an additional layer of protection along with utilizing other preventive measures in an emerging world of threats, collaboration, advanced technology, and user awareness are crucial for achieving success in preventing cyber threats. (Camacho, 2024)

Furthermore, Machine learning technology in AI has also promoted the inclusion of AI in cybersecurity. Machine learning is an integral part of AI technology. The technology includes learning ability in AI systems. These technologies are essential when developing a high-end cybersecurity system. Developing strategies that can learn in run time is considered a practical approach due to the speed needed in defending against attacks. Machine learning technology ensures that a defense system has studied the attacker's methods and engages newer approaches to defend against these attacks. Engaging in such solutions provides that the attacker is unsuccessful in completing any attacks they have on an organization or company. (Dash, Ansari, Sharma and Azad Ali, 2022)

More schools have been seen to include AI training across their institutions. The need for AI specialists has increased over the past decade due to their rising applications. Cybersecurity specialists are also urged to engage in skills in AI. Each of these factors indicates the future of AI in cybersecurity is growing. Increased awareness promotes the development of AI defenses across cybersecurity. These approaches will ensure cybersecurity defenses have become wholly automated shortly. Eventually, the authors came to an end that increasing awareness of AI capabilities and development promotes and ensure an affective cybersecurity. (Dash, Ansari, Sharma and Azad Ali, 2022) entrepreneurs' increasing awareness and familiarity with AI can

positively influence the adoption and effective utilization of AI in improving supply chain management.

2.4.6 AI in boosting marketing and branding identity

As entrepreneurs become more familiar with artificial intelligence (AI), they can leverage its capabilities for effective, personalized, and inclusive marketing, customer personalization, and branding strategies. AI familiarity enables data-driven decisions, personalized recommendations, and bias management in marketing (Akter et al., 2021).

A mixed-method study by Akter et al. (2021) revealed that data bias management capability significantly impacts model bias management and deployment bias management capability, highlighting the critical role of complete, well-formatted, and accurate data in developing reliable, flexible AI models that serve customers effectively.

Moreover, increased familiarity with AI capabilities, data availability, advanced analytics techniques, and cost-effectiveness has driven adoption in business-to-business (B2B) marketing for innovation and fostering customer relationships (Mikalef, Conboy, & Krogstie, 2021; MIT Technology Review Insights, 2018).

In branding, AI presents challenges around intellectual property and liability as familiarity with generative AI tools enables easier plagiarism and unauthorized use of brand assets (Routray, 2024). However, ethical and responsible use of generative AI can benefit branding and advertising, allowing faster iteration of ideas and content with tools like GPT-3 (Routray, 2024).

Familiarity with democratized access to AI design tools can help small brands afford quality aesthetics, while responsibly deployed systems can monitor for harmful biases and promote diversity in generated content (Routray, 2024). A study by Akter et al. (2023) utilized biometrics analytics to examine AI's impact on branding, finding that AI facilitates understanding real-time market scenarios, strategic planning, product development, pricing, and distribution channels. Additionally, AI familiarity enables customized products and services based on brand choices in social media and online forums, enhancing customer engagement and brand image (Akter et al., 2023). AI also identifies customer preferences through voice recognition, social media interactions, body gestures, and facial expressions, enabling emotional branding and effective segmentation, targeting, and positioning based on customer heterogeneity (Akter et al., 2023).

2.5 Synthesis of literature review

In conclusion, this comprehensive literature review has synthesized existing research and theoretical frameworks to provide a holistic understanding of the integration of Artificial Intelligence (AI) technologies within entrepreneurial ventures, particularly those led by entrepreneurs. The review has highlighted the motivations driving entrepreneurs to adopt AI solution and how their familiarity with AI technologies can build up their willingness to adopt and integrate AI. (Gupta, 2024; Abd Al-Halim, 2024),

It has also explored the perceived benefits of AI integration, such as improved business processes, enhanced customer experiences, and opportunities for innovation and new product development. However, the literature has also revealed the challenges and obstacles that entrepreneurs may face during the AI adoption process, including technical barriers, organizational resistance, ethical concerns, and regulatory issues. (Tran et al.,2024; Gupta, 2024; Chukwuka and Igweh,2024; Dwivedi et al., 2022; Cuizon, 2023).

Furthermore, the review has analyzed the impact of AI integration that entrepreneurs are willing to apply based on their AI knowledge and experience on various aspects of entrepreneurship, such as product and service innovation, marketing and customer engagement, supply chain optimization, risk management, cybersecurity, and strategic decision-making processes. (Chaivirutnukul and Zeng, 2023; Sjodin, Parida, Palmi and Wincent, 2021; Kubatko, Ozims and Voronenko, 2024; Sixiao, Fang and Jabor, 2024; Chukwuka and Igweh, 2024; Abaku, Edunjobi and Odimarha, 2024; Shoushtari, Ghafourian and Talebi, 2021; Chukwu, Yufenyuy, Ejiofor, Ekweli, Ogunleye, Clement, Obunadike, Adeniji, and Elom 2024; Camacho, 2024; ,Dash, Ansari, Sharma and Azad Ali, 2022; Akter, McCarthy, Sajib, Michael, Dwivedi, D'Ambra and Shen , 2021; Mikalef, Conboy, and Krogstie, 2021; Routray, 2024).

Collectively, the synthesis of the literature has demonstrated the transformative potential of AI technologies in promoting entrepreneurial success. The findings underscore the importance of developing strategies and support mechanisms to empower the next generation of entrepreneurs in leveraging the capabilities of AI effectively.

Chapter 2: Data and method

1. Research design

To investigate the research questions of our dissertation a survey was conducted with the project holders under the new ministerial decree 1275 that states valuing the projects accomplished by students through the mechanism of a start-up certificate or a patent certificate.

This ministerial decree 1275 of the 27th of September 2022, sets out how university students can write a dissertation that leads up to a university- start-up degree in article 1 of the decree, and that aims to create a generation of entrepreneurial students with the ability and desire to move towards innovative entrepreneurship, job creation and wealth in the second article. This article deems startups to be a comfortable business based on the foundations and pillars of innovation and technology, and that works to find a technical, technological or digital solution for existing or autonomous corporations.

The students involved in our research study are the project holders all over the national Algerian scape, that are going to graduate or already graduated under the ministerial decree 1275.

The following parts will provide further detailed explanations of the various elements of the research design, including the research method, data collection with ethical considerations, and data analysis.

2. Research method

A quantitative research approach has been chosen for this research; the use of this approach allowed for a deeper exploration of how artificial intelligence can improve and promote each step of the entrepreneurial venture process, from a discovery of an opportunity to its development and exploitation. (Gupta, 2024; Abd Al-Halim, 2024) .The focus was to gain insights by addressing a questionnaire to a sample of start-up holders operating under the ministerial decree 1275, and analyse their willingness to adopt, leverage AI while examining their perspectives on how AI can actually promote and facilitate AI growth and dynamics. Eliciting such perspectives from respondents helped to ensure that the data collected is representative.

2.1 Sample data

This research study uses purposeful sampling, which is a non-probabilistic sampling technique. The samples came from extended network in, universities, accelerators, incubators, and other comparable establishments. (Gupta, 2024; Abd Al-Halim, 2024; Bakri et al., 2024). The sample comprises project holders who have either utilized Generative AI technologies in the past or are actively considering their implementation. These individuals possess first-hand experience

with various types of Generative AI technologies, including but not limited to ChatGPT, Gemini, Blackbox, and others. Their practical exposure to these cutting-edge AI solutions enables them to provide valuable insights into how AI is empowering entrepreneurial ventures, particularly start-ups.

The start-up holders operating under the ministerial decree 1275 were specifically chosen as the target population for this research due to their relevance to the topic of AI integration in entrepreneurial ventures. Being engaged in academic and research-oriented activities, this population is likely to have exposure to and experiences with cutting-edge technologies like AI. Additionally, their alignment with the research objectives of understanding willingness to adopt AI and examining perspectives on how AI can facilitate start-up growth made them an ideal sample

By including project holders who are using or intend to use artificial intelligence technology, this research study can provide insight into their early impressions and level of willingness to integrate AI technology. These people probably have ideas and insights regarding how AI might be incorporated into the business's operations, and they can offer helpful details about
the expected advantages and difficulties. Project holders who are currently utilizing AI offer a first-hand knowledge and practical insights into incorporating and implementing this generative AI technology into day to day operations. Their opinions can provide insightful viewpoints on the real advantages, difficulties faced, and overall effects on productivity and workflow. By including these two categories of project holders, this study pulls on the real-world experiences of those who have used AI technology, as well as those who have been motivated to give technology a try, thereby leading to rigorous and scientific evaluation of Start up dynamics (Gupta, 2024).

2.2 Survey development

The construction of this survey was based on the 5 stars selected articles released by Gupta (2024), Bakri et al. (2024) Morande et al., (2023), Abd Al-Halim. (2024) Felieri et al. (2021) to ensure alignment with the latest and most relevant literature in the field. These papers were chosen because they provide a comprehensive and up-to-date understanding of the research topic, which is essential for developing a well-informed and purposeful survey.
In order to get a purposeful questionnaire that aligns perfectly with the literature review, the questions were built as a pyramid, starting with closed questions then going up to unique and multiple choices question, in addition, the participants were asked to rate their level of agreement or disagreement on a 5-point Likert scale, enabling a nuanced assessment of their

perspectives. (Abd Al-Halim, 2024), to guarantee the work flow of the questionnaire one filter question was made in the first section in order to qualify the project holders to go on the rest questions and eliminate the non-project holders.

The survey used in the research consisted of 19 questions, structured in 2 sections, the first section consists of the different demographic information and whether the participants are among the project holders or not. As for the second section, it is structured as follows:

- The different motivations for starting an entrepreneurial venture.
- AI Awareness and Adoption.
- Perceived benefits and inspirations of integrating AI technology.
- Challenges and barriers.
- Facilitating future intentions of AI integration.

The questionnaire aimed to gather comprehensive data from project holders which will provide valuable insights into the current state of AI adoption within the entrepreneurial ecosystem (Gupta, 2024; Tawfik & Abd Al-Halim, 2024). The findings from this questionnaire will contribute to a better understanding of how AI technologies are being leveraged by entrepreneurial ventures, the potential benefits they offer, and the obstacles that need to be addressed to facilitate effective AI integration.

2.3 Variables operationalization

The survey is based on a set of variables expressed in the questionnaire. These variables are constructed based on the literature review (Gupta, 2024; Felieri et al, 2021). In the first hand, there are the dependent variables that consist of two principle concepts, initiating with the intention & decision of the project holders to integrate AI technologies into their entrepreneurial ventures which can be measured by the number of AI applications, & AI adoption, or the investment in AI technologies. Furthermore, the second concept of the dependent variables is illustrated by the perceived benefits of AI integration, which could be measured by the responses to the questions about the expected benefits of AI for operational efficiency, customer experience, competitive advantage, and so on (Table 03).

In the other hand, control variables (independent variables) are grouped into factors related to project holders background (age, gender, educational level etc..), motivation for starting entrepreneurial venture, AI knowledge and exposure etc. (Table 04)

Table 3: Dependent variables

Variables	**Description**
1. The intention & decision of the project holders to integrate AI technologies into their entrepreneurial ventures	Motivations behind start-up's AI integration.
	Primary funding for AI integration.
	Confidence level in leveraging AI effectively.
	Biggest obstacles to utilizing AI.
	Importance of AI for future entrepreneurial success (scale of 1-10).
2. The perceived benefits of AI integration	Identification of most beneficial AI capabilities for
	Interest level in AI training/mentorship
	Agreement ratings on statements that explore the perceived advantages and potential benefits that the integration of artificial intelligence technologies could bring to start-up ventures

Source: Adopted from the work of Gupta, 2024; Felieri et al., 2021

Table 4: Control variables

Variables	**Description**
Gender	Female
	Male
Age	20 – 22 years old
	23 – 25 years old
	More than 26 years old
Higher education	University
	Higher school
Educational level	Bachelor's degree
	Master's degree
	PhD's degree
Project holder	Yes-No
Venture characteristics	Motivations for starting the start up
AI knowledge and exposure	Familiarity with generative AI technology
	Familiarity with different types of AI
	Business areas for AI application.
	AI tools/solutions currently utilized
	AI technologies employed. AI technologies intended for future use.

Source: Adopted from the work of Gupta, 2024; Felieri et al., 2021

2.4 Data collection procedure

The data collection extended over a period of 11 days from 3 may 2024 to 19 may 2024.As a per, a total of 127 responses from students (project holders) were collected on google form within 37 universities all over the national Algerian scape, 21 of the responses were eliminated

due to the non-qualification of some students who weren't considered as project holders which means that only 106 responses were analysable.

The construction of the survey was released in Google Form and it was published in the different start up groups in social media that were created to support and assist the project holders under the decree of 1275,furtheremore the survey questionnaire was sent and shared with different incubator universities including Kolea university Center, ,university of science and technology houari Boumediene, university of economics, commercial sciences and management sciences of Algiers etc, using an appropriate sampling method which is purposeful sampling procedure.

Non probabilistic purposeful sampling technique has a several notable limitations, one of these important limitations faced are the lack of random selection means that the sample may not be representative of the entire population, leading to potential basis and limiting the generalizability of the result. (Gupta, 2024).

2.5 Data Analysis procedure

This quantitative approach used a survey questionnaire and statistical analysis. The data collected were coded numerically for statistical analysis using the Statistical Package for the Social Sciences (SPSS ver. 25.0).

To examine this data, a series of tests were conducted. Initially, descriptive statistics were generated to summarize and explore the main features of the dataset. Furthermore, reliability statistics were employed to ensure the trustworthiness of the data in this study including the Kaiser-Meyer-Olkin (KMO) measure, Bartlett's test and Cronbach's Alpha. Additionally, an examination of validity was used for correlation analysis, the tests employed in this phase are Pearson's r.

Moreover, Regression analysis was applied to examine whether the relationship between the dependent and the independent variables is assumed to be linear and also determine the impact of one more independent variable on the probability of the dependent variable taking on a particular category.

Chapter 3: Results and discussion

1. Results

1.1 Demographic sample

In this section, we present the demographic characteristics of the sample population used in the study. The following table and figures provide a comprehensive overview of the demographic profile of the respondents, including their age, gender, educational background and whether they are project holders or not.

Open delving into the statistics, it is important to consider the demographic profile of the respondents. Analyzing these demographic variables can provide a valuable insight into AI adoption and benefits within the start-up projects. Predominantly, most of the respondent's age is around 20 – 26 years old which represents a very youthful demographic. Additionally, the frequency analysis highlights that 47.2% of the survey respondents identified as male in the other hand there is a slight female bias with 52.8% identifying as female.

Moreover, the frequency distribution of the universities or higher educational institutions provide insights into the diversity of them. The most frequent institution is ENSM which represents 17.2%, followed by the university of Boumerdes (INH) with 7.9% continued respectively with ENSSEA and the university of Houari Boumediene with a percentage of 5.5%, coming to the university of Algiers 3 that represents 11% of the population. Several other universities such as the faculty of medicine, university of hydrocarbon Ouargla, university of Oran and others are represented with a smaller frequency ranging from 1 to 5 respondents

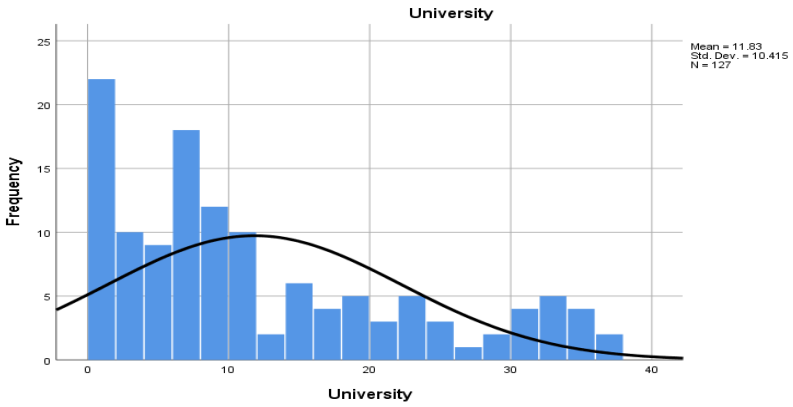
Educationally, the sample is highly educated, with 15.7% holding Bachelor's degrees, 78.7% with Master's degrees, and 5.5% with Doctoral degrees. Furthermore, out of the total 127 respondents, a majority of 106 (83.5%) answered "Yes", indicating that they are qualified as project holders. The remaining 21 (16.5%) respondents responded with "No», signifying that they do not hold a project.

Table 5: Demographic profile of respondents.

Variables	Items	Frequency	Percentage %
Gender	Male	60	47.2
	Female	67	52.8
Age	20 – 22 years old	50	39.4
	23 – 26 years old	48	37.8
	More than 26 years old	29	22.8
University/ School	ENSM	22	17.3
	University of Daly Brahim (Algiers 3)	14	11.0
	University of Boumerdes (INH)	10	7.9
	ENSSEA	7	5.5
	University of Houari Boumediene	7	5.5
	Others	67	52.8
Educational background	Bachelor's degree	20	15.7
	Master's degree	100	78.7
	PhD's degree	7	5.5
Project holder's status	Yes	106	83.5
	No	21	16.5

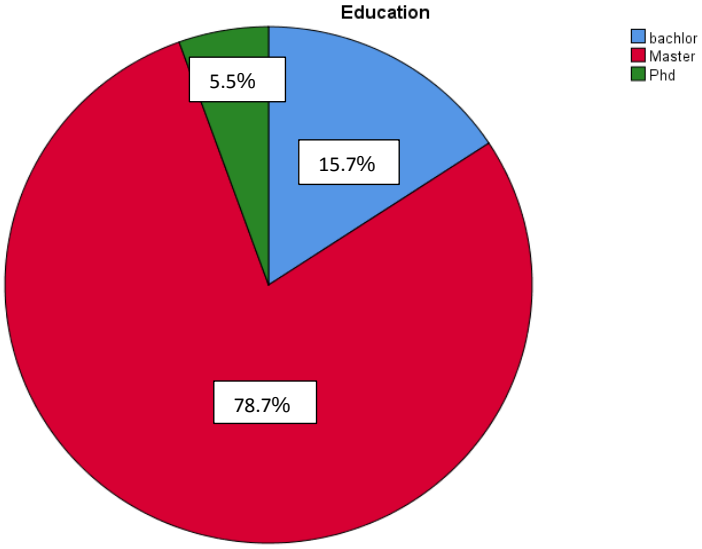
Source: IBM SPSS Statistics 25

Figure 7 Distribution of the sample according to the university/ school variable



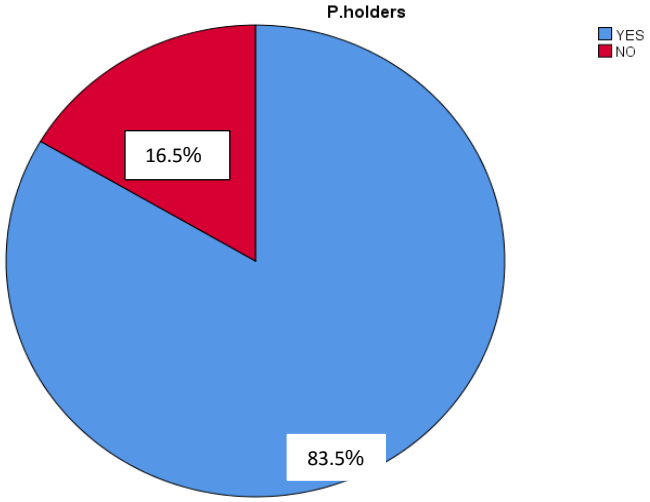
Source: IBM SPSS Statistics 25

Figure 8: Distribution of the sample according to the educational level variable.



Source: IBM SPSS Statistics 25

Figure 9: Distribution of the sample according to the project holder's status.



Source: IBM SPSS Statistics 25.

1.2 Antecedents of the willingness to start an entrepreneurial venture

The following table represents various factors/motivation that could potentially influence projects holders' intentions and willingness behind their decision in starting a venture.

In light of all factors, the overwhelming majority of respondents (between approximately 57% and 75%) rank each factor as a primary motivation or major precursor to their entrepreneurial intentions or willingness to start a venture. This makes these factors important in effecting the

entrepreneurial aspirations and inclinations. Additionally, a large share of respondents (ranging from 18% to 33%) are aware that these factors can be a possible reason or partial influence on their entrepreneurial intention. Thus, it can be inferred that even though such factors do not reign as headliners they still have some relevance or impact on decision-making process at large.

In addition, only a small minority of respondents (from 5% to 13%) come into the category who thinks that any of the mentioned factors was instrumental at all in their making a decision about starting a venture. It is interesting to observe that this latter group, albeit small in number, seems to have been driven by different sets of motivations or circumstances.

Table 6: Project holder's aspirations for starting a venture.

Variables	Valid	Frequency	Percentage %
A: Perusing a new opportunity	Not a reason at all	A = 11	8.7
		B = 14	11
B: Solve a problem		C = 8	6.3
		D = 24	18.9
C: Gain a financial independence		E = 5	3.9
	It might be a reason	A = 35	27.6
		B = 28	22
D: Turn a passion/hobby into a professional activity		C = 19	15
		D = 30	23.6
		E = 27	21.3
E: To have a positive impact on society/the environment	A primary reason	A = 60	47.2
		B = 64	50.4
		C = 79	62.2
		D = 52	40.9
		E = 74	58.3

Source: IBM SPSS Statistics 25.

1.3 AI knowledge and exposure

This part will explore the AI knowledge and exposure of project holder’s decision and intention among AI technologies integration.

1.3.1 A Review of Project Holders' Familiarity with Different Types of Artificial Intelligence

The given tables and figures demonstrate the project holders' level of knowledge with (AI) and their familiarity with the various kinds of AI technologies. Moreover, the table is crucial since it shows how different the target group's degree of knowledge are and how prevalent particular AI technologies are.

The majority of respondents or 50%, strongly indicated that they were familiar with the usage of AI technologies by picking the opinion "Yes I do." This implies that a substantial portion of the population studied has been exposed to and has expertise with artificial intelligence technologies. Moreover, in close succession, 47.2 percent of the participants selected the response option "Not that much" indicating a moderate or partial degree of knowledge with the application of AI.

It is noteworthy to bring out that a constant portion of participants (16.5%) didn't reply, leaving the 21 non project holders with missing data. The table also shows how familiar project holders are with different types of AI, with machine learning being the highest at 25.6%. After that, the familiarity rate for deep learning is 20.5%, which indicates a considerable degree of experience with advanced AI tools a moderate understanding of AI's role in interpreting visual data and human language is demonstrated by the recognition rates for computer vision and natural language processing, which are 17.1% and 13.9%, respectively.

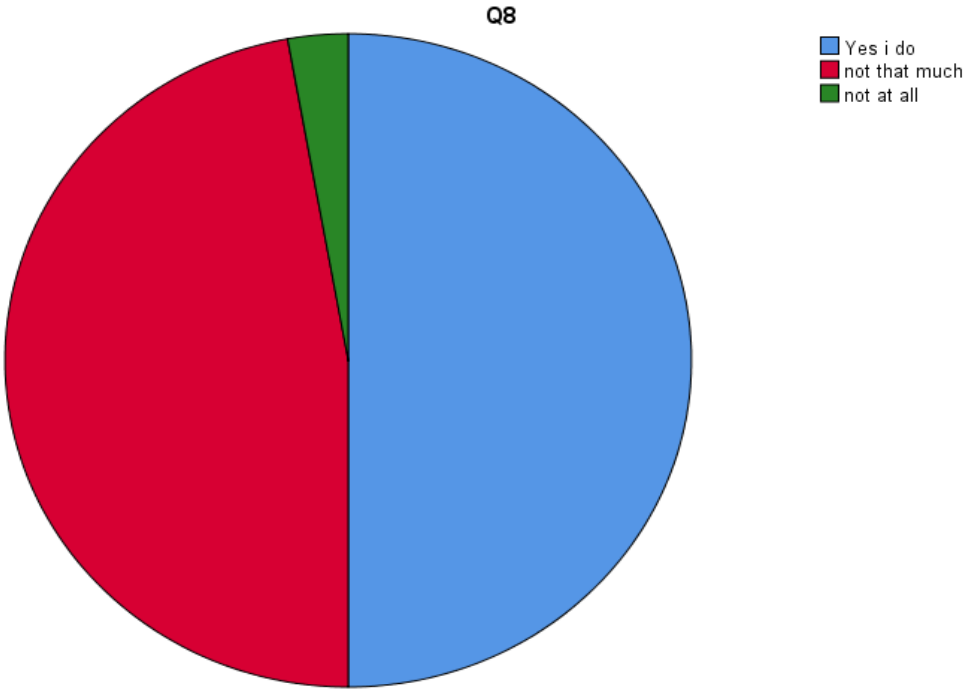
In addition, the least familiar kind is explainable AI, at 10.1%, while awareness of robotics science is somewhat lower at 12.8%. Also, this spread of familiarity and knowledge not only reflects the diverse applications of AI but also highlights where further education and resource investments could be advantageous

Table 7: Project Holders' Familiarity with AI Utilization and Types

Variables	Items	Percentage%
Project holder's familiarity with the use of AI	Yes, I do	41.7
	Not that much	39.4
	Not at all	2.4
Project holder's familiarity with the type of AI.	Machine learning	25.6
	Deep learning	20.5
	Computer vision	17.1
	Natural language processing	13.9
	Robotics science	12.8
	Explainable AI	10.1

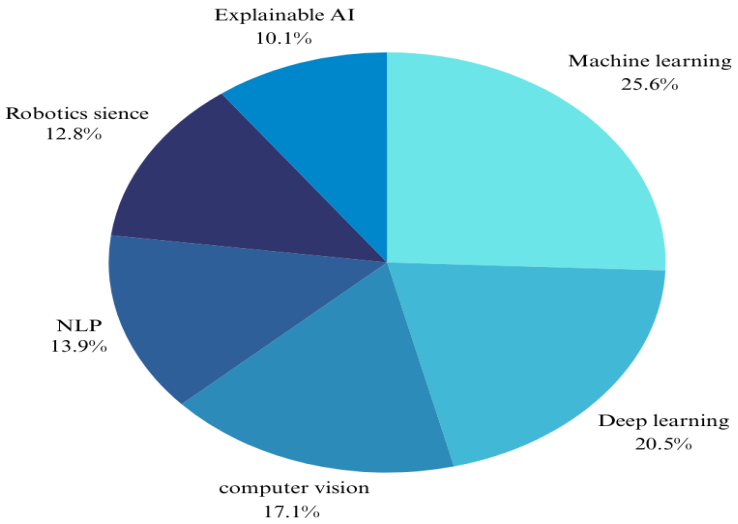
Source: IBM SPSS Statistics 25

Figure 10: AI use distribution among project holders



Source: IBM SPSS Statistics 25

Figure 11: Distribution of AI Types Familiarity Among Project Holders.



Source: Data from IBM SPSS Statistics 25.

1.3.2 Business areas for AI application

The given table indicates the data of different business areas that can be used with the help of (AI) technology; it shows how many respondents have said “Yes” and “No” to each business area.

Marketing and Sales: It was found that 49.6% of respondents considered Marketing and Sales as a potential application for AI, but there were also those who disagreed, this option was not appropriate for 33.9% of the respondents.

Finance and Accounting: Only 32.3% of respondents viewed Finance and Accounting as an arena where AI could be applied in their opinion. This is compared to the majority (51.2%) of the respondents arguing that Finance and Accounting is not good place for integrating AI

Logistic services: Few respondents representing only 26.8% felt Logistic Services could benefit from AI applications, unlike most of them (56.7%) who argued that Logistic Services was not an appropriate place to integrate this technology.

Customer Service: Customer Service was regarded as one of prospective directions for using AI by just 38.6%. Nonetheless, a bit more than this proportion (44.9%) did not see it as fit for such integration with AI at all.

Product Development: 32.3% of respondents perceived product development as a potential area for AI application, a majority (51.2%) of respondents suggested that they do not consider product development as a suitable area for AI integration.

Nevertheless, the data reveals that marketing and sales is perceived as the potential area for AI application among the respondents, followed by customer service. However, a majority of respondents saw logistic services and product development as less suitable areas for AI integration. Finance and accounting also had a higher percentage of respondents who did not consider it as a potential area for AI application.

Table 8: The various business areas for AI application selected by the Project holders

Items	Yes			No		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage %
- Marketing and sales	63	49.6	59.4	43	33.9	40.6
- Finance and Accounting	41	32.3	38.7	65	51.2	61.3
- Logistic services	34	26.8	32.1	72	56.7	67.9
- Customer service	49	38.6	46.2	57	44.9	53.8
- Product development	41	32.3	38.7	65	51.2	61.3

Source: IBM SPSS Statistics 2

1.3.3 Project holder's statement regarding the utilization of any current AI tools

The following table come out with data on the utilization of artificial intelligence (AI) tools and solutions among project holders, the data is presented in the form of frequency counts and percentages for the "Yes" and "No" responses.

72 respondents (56.7%) answered "Yes," indicating that they are currently utilize AI tools and its solutions, 34 respondents (26.8%) respond "No," it means that they do not use currently any AI tools or technological solutions.

Moreover, this information shows fifty-six-point seven percent (56.7%) as the proportion of those who are using AI technology among the respondents or project holders, meaning that most companies or individuals are applying these techniques in their businesses (operations).

In fact, it denotes that AI technologies have gained significant traction among stakeholders. Nonetheless, one thing quite remarkable is that twenty-six-point eight percent (26.8%) among project holders or respondents still do not employ any AI solutions at present. These might

range from lack of knowledge on them, inadequate resources or low applicability according to individual fields or undertakings.

Table 9: The utilization of current AI tools and solutions.

Items	Yes			No		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage %
- Utilization of artificial intelligence Tools and Solutions.	72	56.7	67.9	34	26.8	32.1

Source: IBM SPSS Statistics 25

1.4 Reliability statistics

Reliability statistics were utilized to ensure that the data in this research was dependable. Rigorous testing was done on all of them. The table contains the results of Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity tests which are widely recognized measures of sample adequacy for statistical analysis in academic research. KMO test determines suitability of dataset for factor analysis by looking at case-to-variable ratio.

Typically, a KMO value between 0 and 1 is considered acceptable, and in this study, a KMO value of 0.847 was obtained, indicating a good level of adequacy. Moreover, global index surpasses the recommended threshold of 0.6, thus affirming the availability of the data for analysis. Besides KMO test, Bartlett's Test of Sphericity was performed to show if any significance would exist between the questions and the problem under investigation.

For example, most researchers require a significance level below 0.05 to justify factor analysis application as it is usually done. Surprisingly however, this test gave a significance value less than 0.001 implying that it is well below the threshold hence optimum conditions for analysis.

Based on both KMO and Bartlett’s Test of Sphericity these findings reveal how strong and robust this research’s used data were. Also, there is high KMO value along with p-value extremely lower providing powerful evidence

Table 10: The measure of Sampling Adequacy.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.613
Bartlett's Test of Sphericity	Approx. Chi-Square	442.458
	df	153
	Sig.	.000

Source: IBM SPSS Statistics 25.

The number of extracted factors gives the eigenvalue. It is necessary that the sum of these factors be equal to the number of data being factored. This list indicates those analysis components and their corresponding eigenvalues.

In this study, only Initial Eigenvalues and Extracted Sums of Squared Loadings were considered. Factors with eigenvalues greater than 1 were used in identifying the factors and selected variables. For example, in Table below, the first, second, third, fourth, fifth, sixth and seventh components had eigenvalues of 3.782, 1.729,1.627, 1.331, 1.263, 1.144 and 1.038 respectively.

All these values are larger than one thus indicating that there are seven components among the set of 18 variables. Moreover, extracted sum of squared loading as a percentage variance was used to identify each factor's position within total variance accounted for by it.

So, the first factor explains observed variance on a scale of (21%) twenty-one percent while second factor explains (9%) nine percent; third factor explains (9%) nine percent; fourth factor explains (7%) seven percent; fifth factor explains (7%) seven per cent; sixth equals seventh with both accounting five point eight three percent

Consequently, these seven components reveal all characteristics or elements indicated by these eighteen variables.

Table 11: Loadings extractions of the required variables for data evaluation

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.782	21.011	21.011	3.782	21.011	21.011
2	1.729	9.603	30.614	1.729	9.603	30.614
3	1.627	9.037	39.652	1.627	9.037	39.652
4	1.331	7.396	47.048	1.331	7.396	47.048
5	1.263	7.018	54.067	1.263	7.018	54.067
6	1.144	7.018	60.422	1.144	6.356	60.422
7	1.038	5.766	66.189	1.038	5.766	66.189
8	.943	5.239	71.428			
9	.903	5.017	76.445			
10	.752	4.179	80.623			
11	.684	3.799	84.422			
12	.568	3.154	87.576			
13	.531	2.951	90.527			
14	.493	2.739	93.267			
15	.367	2.040	95.306			
16	.334	1.854	97.160			
17	.271	1.507	98.667			
18	.240	1.333	100.000			

Source: IBM SPSS Statistics 25.

Mainly, Cronbach's Alpha was used to evaluate the reliability of the measurement ability. The table below shows that the analysis yielded a Cronbach's Alpha coefficient of .759 for all 18 items in the scale, which is an acceptable level of reliability. Such values further support the reliability of skill as they suggest that all items within a scale actually measure a similar underlying construct

Table 12: Sample's Reliability

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of items
.758	.750	18

Source: IBM SPSS Statistics 25

1.5 Normality test

In this part, the following table and figures show the test statistics degree of freedom (df), and significance value (sig) for normality test.

The normality tests in this study are used to check how the intention and decision of project holders to adopt AI technologies, as well as their perceived benefits from using AI (P2), are distributed across the surveyed population. These dependent variables are essential to the study because they indicate how likely individuals are to use AI and what advantages they think AI can bring to their projects.

For these dependent variables, The Kolmogorov-Smirnov test gives a statistic of 0.075 with a significance value of 0.106 in the other hand, The Shapiro-Wilk test shows a statistic of 0.980 and a significance value of 0.114.

In both tests, the significance value is used to determine whether the data differs from a normal distribution. The significance values are more than 0.05 (which is a common cut-off point), so for both tests, the higher significance values suggest that there's no strong evidence to say our data isn't normal. This means that the way project holders feel about AI tends to follow a normal distribution in the group that was studied.

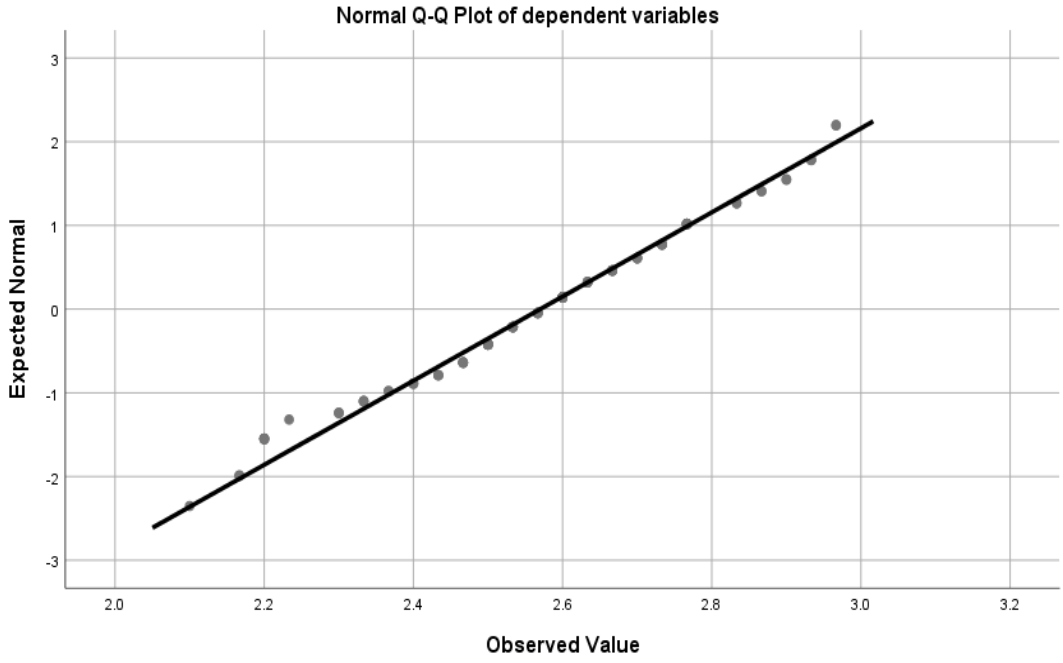
Understanding the distribution of these dependent variables is important since it affects how the data is analyzed, especially when comparing it to the independent variables in the study, which are factors like age, gender, education level, and the status of the project holder. The normality of the dependent variables ensures that it is possible to use a common statistical test to see if there's any connection between these personal characteristics (the independent variables) and how project holders view or choose to use AI in their work.

Table 12: Normality test for the data related to the intention and the decision of project holders to integrate and adopt AI technologies and the perceived benefits of this integration.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
P2	.075	106	.168	.980	106	.114
a. Lilliefors Significance Correction						

Source: IBM SPSS Statistics 25

Figure 12: The normal distribution of P2 (dependent variables).



Source: IBM SPSS Statistics 25

1.6 A comprehensive analysis of project holders' motivations, confidence, and perceived benefits in integrating ai technologies within entrepreneurial ventures

This section will provide a comprehensive analysis of project holders' motivations, confidence levels, and perceived benefits associated with integrating AI technologies within their entrepreneurial ventures. It will examine the relationships between project holders' AI knowledge and exposure, and their rationales for leveraging AI technologies, their confidence in doing so, and their perceptions of the potential benefits.

By exploring these factors, this section aims to shed light on the critical considerations and dynamics that shape project holders' decisions to embrace AI in their entrepreneurial endeavors.

1.6.1 A review of project holders' motivations behind their decision for integrating AI technologies in their entrepreneurial venture.

The following table and figures represent a descriptive analysis of project holder's motivations for integrating AI technologies into their business ventures. The responses are categorized into four motivational levels: "Not at all motivated," "Slightly motivated," "Motivated," and "Highly motivated."

For improving operational efficiency and productivity, none of the respondents were actually " not motivated at all" A small percentage (6.3% of the overall sample) were "Slightly motivated." A majority were at least "Motivated" (36.2% of the overall) or "Highly motivated" (40.9% of the overall).

Looking at how AI might elevate customer experience and engagement, only a minor faction (2.4%) reported a lack of motivation. A somewhat larger group (11.8%) showed slight motivation, however, the aggregate attitude is decidedly affirmative, with 32.3% of respondents being motivated, and an impressive 37% reporting high motivation, suggesting a strategic focus on AI to sophisticate customer interaction and satisfaction.

With respect to gaining a competitive advantage via data-driven insights, the data revealed a small disinterest at just 8%. A modest proportion (9.4%) possess some motivation, while a meaningful majority of respondents are either motivated (28.3%) or highly motivated (44.9%), manifesting a prevailing recognition of AI as an important competitive tool in analyzing data effectively.

Regarding the optimization of repetitive tasks to free up human resources, the distribution of enthusiasm is compelling: around 3.1% reported a total absence of motivation, and 11% indicated slight motivation, contrasted against a significant majority who are more meaningfully engaged—33.1% motivated and 36.2% highly motivated—reflecting a clear support of AI in streamlining operations and elevating workforce efficiency.

Lastly, for the pursuit of more innovative and viable business models, a small percentage (2.4%) demonstrated no motivation. A small proportion of 6.3% were slightly motivated to integrate AI.
A majority were at least "Motivated" (29.9% of the overall) or "Highly motivated" (44.9 of the overall) For "Improving operational efficiency and productivity" and "Gaining a competitive advantage through data-driven insights," more than 80% of respondents are motivated, indicating these are urgent and significant considerations. Similarly, the drive to "Boost customer experience and engagement" is a priority with over 70% indicating they are "Motivated" or "Highly motivated." Furthermore, the optimization of repetitive tasks to free human resources and the desire to foster innovative business models are also recognized as compelling factors for AI adoption, with approximately 75% of respondents being at least "Motivated" by these prospects.

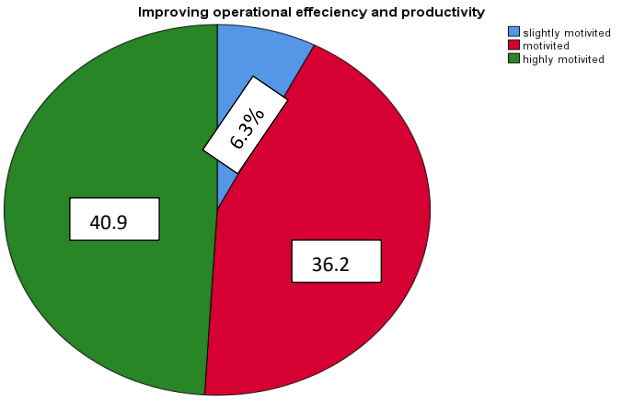
Overall, this demonstrates that AI technology is perceived not just as a novel tool, but as a strategic imperative for businesses looking to achieve efficiency, innovation, and competitive differentiation. Project holders are evidently aware of the transformative potential of AI and are highly excited to harness its capabilities within their business models.

Table 13: Project holders' motivations for integrating AI technologies in their start up projects.

Items	Not at all motivated			Slightly Motivated			Motivated			Highly motivated		
Descriptive analysis	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid Percentage%
Improving operational efficiency and productivity	0	0	0	8	6.3	7.5	46	36;.2	43.4	50	40.9	49.1
Boosting the customer experience and engagement	3	2.4	2.8	15	11.8	14.2	41	32.3	38.7	47	37	44.3
Gaining a competitive advantage through data driven insights	1	8	9	12	9.4	11.3	36	28.3	34	57	44.9	53.8
Optimizing the pace of repetitive tasks and freeing up human resources	4	3.1	3.8	14	11	13.2	42	33.1	39.6	46	36.2	43.4
Developing more innovative and viable business models	3	2.4	2.8	8	6.3	7.5	38	29.9	35.8	57	44.9	53.8

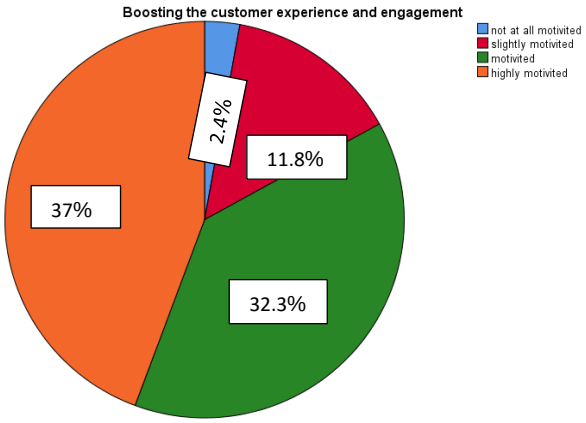
Source: IBM SPSS Statistics 25

Figure 13: Distribution of project holder's motivations according to improving operational efficiency and productivity.



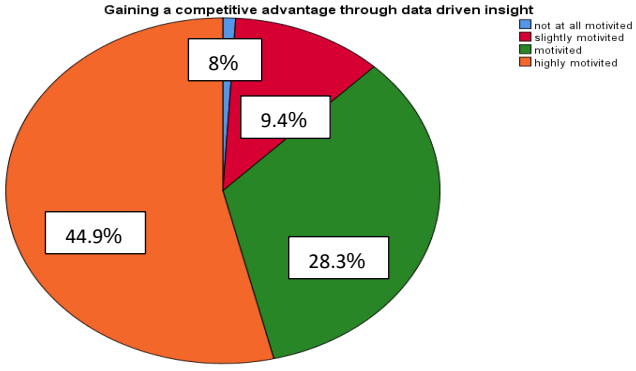
Source: IBM SPSS Statistics 25

Figure 14 Distribution of project holder's motivations according to boosting customer experience and engagement.



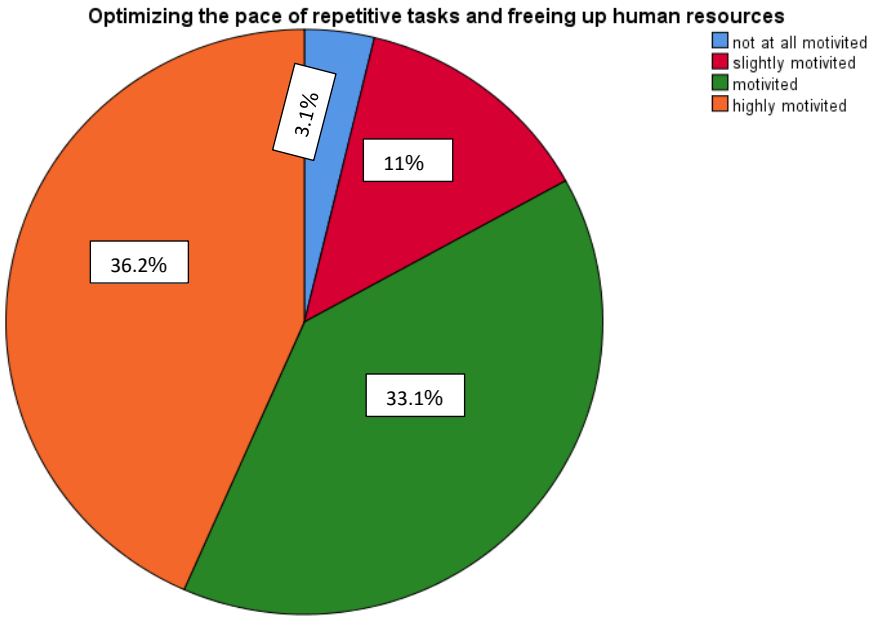
Source: IBM SPSS Statistics

Figure 15 Distribution of project holder's motivations according to boosting customer experience and engagement.



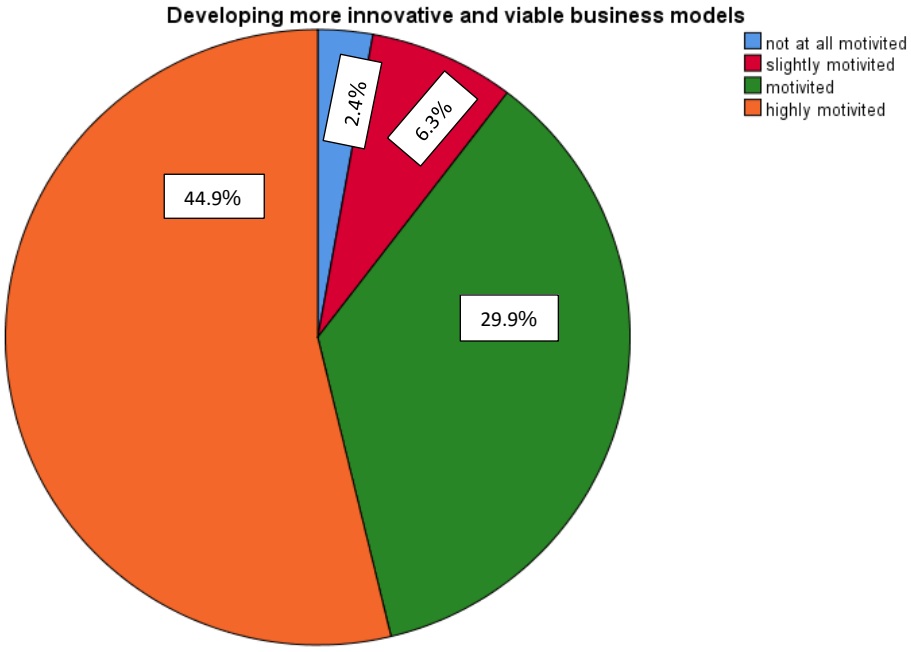
Source: IBM SPSS Statistics

Figure 16: Distribution of project holder's motivations according to optimizing the pace of repetitive tasks and freeing up human resources.



Source: IBM SPSS Statistics

Figure 17: Distribution of project holder's motivations according to developing more innovative and viable business models



Source: IBM SPSS Statistics

1.6.2 Analysing project holder's confidence in integrating AI technologies within the entrepreneurial venture

The following table and figures represent the varying levels of confidence among project holders in their capacity to effectively utilize and integrate AI technologies within their business activities. The data is categorized into different levels of self-assessed confidence: "Not at all confident," "Slightly motivated," "Confident," "Very confident," and "Extremely confident."

A minority of project holders report a lack of confidence in their ability to leverage and integrate AI effectively, represented by 3.1% of respondents. A slightly larger group at 4.7% feels somewhat confident, signalling that while there is some initial confidence, it remains modest for this sample.

In contrast, many project holders 19.7%, feel fairly confident in integrating and leveraging AI technology in the other hand a large number, around 30.7%, feel extremely confident with AI technologies. This shows that a meaningful amount of project holders believe they are highly skilled in using AI.

The "Extremely confident" category comprises around 25.2% of the surveyed group, revealing that a substantial portion of project holders have a deep understanding of artificial intelligence and its potential applications. These individuals not only grasp the theoretical importance of AI but also feel highly skilled at practically implementing AI solutions within the core operations of their ventures. With a strong grasp of AI capabilities and a clear vision for integration, this segment is poised to be early adopters, leveraging AI to drive innovation and efficiencies across various business functions.

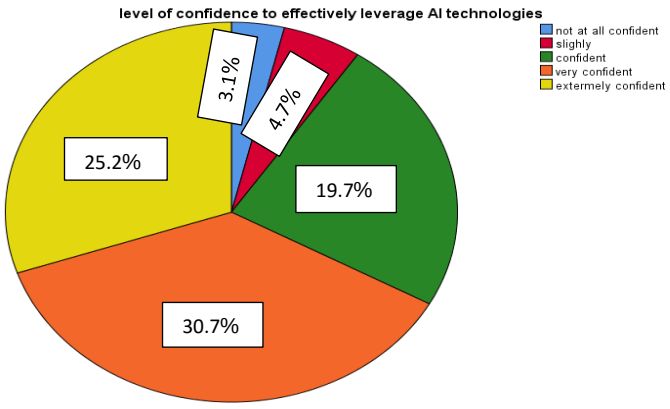
In summary, despite a subset of project holders expressing some hesitation or uncertainty around AI adoption, the overall trend reflects a broad base of confidence within the entrepreneurial community. With a combined majority feeling either confident or extremely confident in their ability to successfully integrate and manage AI technologies in their business operations, this paints a picture of a community that recognizes the transformative potential of AI. Rather than shying away, entrepreneurs appear ready to proactively embrace AI as an integral part of their growth strategy, seeking to harness its power to gain a competitive edge, optimize processes, and unlock new realms of value creation within their startups.

Table 14: Confidence level of integrating and leveraging AI within the entrepreneurial venture.

Items	Not at all confident			Slightly motivated			Confident			Very confident			Extremely confident		
Descriptive analysis	Frequencies	Percentage%	Valid percentage %	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid Percentage%	Frequencies	Percentage%	Valid percentage%
Level of confidence to effectively leverage AI technologies within the entrepreneurial activity.	4	3.1	3.8	6	4.7	5.7	25	19.7	23.6	39	30.7	36.8	32	25.2	30.2

Source: IBM SPSS Statistics

Figure 18: Distribution of project holder's confidence in integrating and leveraging AI



Source: IBM SPSS Statistics

1.6.3 A review of project holder's perceived benefits for integrating AI within the entrepreneurial venture

The following table presents data on the perceived benefits of integrating AI within entrepreneurial ventures. The graph illustrates the distribution of the responses as to whether respondents agree with more or disagree with more of the AI concepts by expressing this in terms of the frequency and the percentage of 'yes' and 'no' answers.

For the statement "Automating repetitive tasks", a majority of 55.45% agreed that AI integration offers this benefit. However, 44. 45% said no, partly showing us the percentage of respondents who, despite the encouraging reliability of AI in accomplishing particular tasks, still have their skepticism or struggle to implement AI for such automation within their start up.

Regarding "Generating new business ideas or opportunities", 53.95% agreed, while a nearly equal proportion of 46.05% disagreed. This split response suggests a division in perceptions among project holders about AI's role in encouraging innovation and identifying new business opportunities.

The potential benefit of "Optimizing marketing and sales strategies" received a relatively not bad view, with 52.35% agreeing and 47.65% disagreeing. This indicates that the perceived advantages of AI in strategic areas like marketing and sales may vary based on specific organizational factors or competencies

Relating to "Improving operational efficiency", responses were divided, with a slight majority of 52.35% disagreeing, and 47.65% agreeing. This division reflects mixed perspectives or experiences among project holders regarding AI's capability to enhance operational efficiency within their ventures.

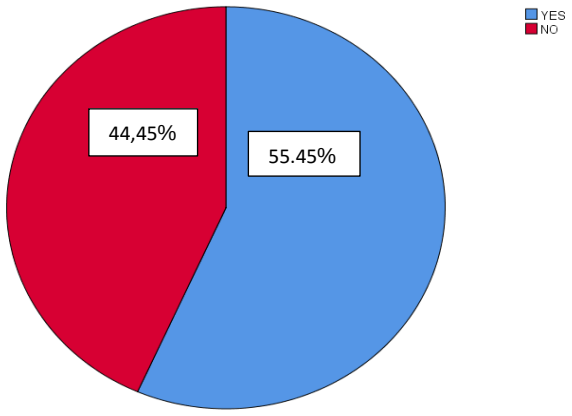
Lastly, for "Boosting customer experience and engagement", 53.15%) agreed, while 46.85% disagreed. This difference suggests that while some project holders recognize AI's potential in improving customer relations, a notable portion remains unconvinced of its benefits in this area.

Table 15: Perceived benefits for integrating AI within the entrepreneurial venture

Items	Yes			No		
Descriptive analysis	Frequencies	Percentage%	Valid percentage%	Frequencies	Percentage%	Valid percentage%
Automating repetitive tasks	60	55.45	56.6	46	44.45	43.4
Generating new business ideas or opportunities	58	53.95	54.7	48	46.05	45.3
Optimizing marketing and sales strategies	56	52.35	52.8	50	47.65	47.2
Improving operational efficiency	50	47.65	47.2	56	52.35	52.8
Boosting customer experience and engagement	57	53.15	38.6	49	46.85	46.2

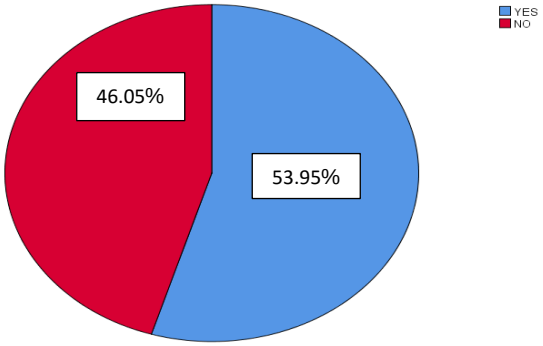
Source: IBM SPSS Statistics 25

Figure 19: Distribution of project holder's agreement/disagreement regarding automating repetitive tasks.



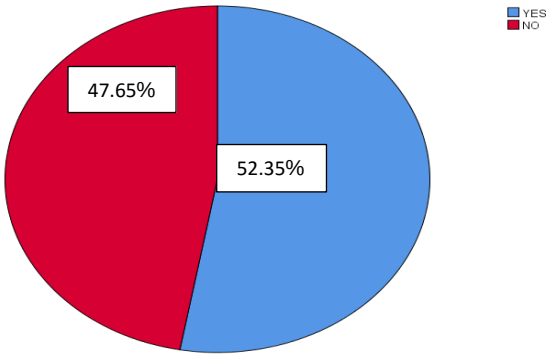
Source; IBM SPSS Statistics 25

Figure 20: Distribution of project holder's agreement/disagreement regarding generating new business ideas or opportunities.



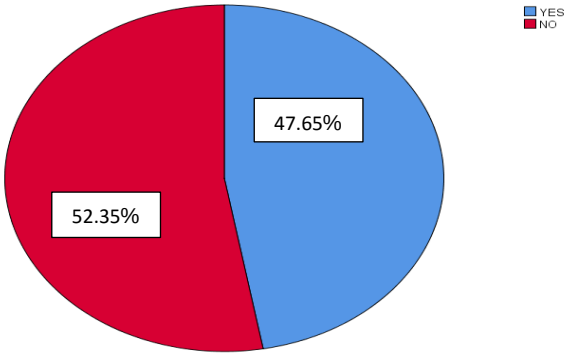
Source: IBM SPSS Statistics 25

Figure 21: Distribution of project holder's agreement/disagreement regarding optimizing marketing and sales strategies



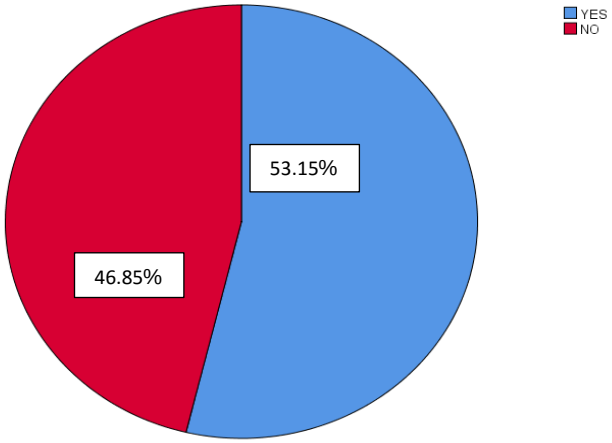
Source: IBM SPSS Statistics 25

Figure 22: Distribution of project holder's agreement/disagreement regarding improving operational efficiency.



Source: IBM SPSS Statistics 25

Figure 23: Distribution of project holder's agreement/disagreement regarding boosting customer segment and engagement.



Source: IBM SPSS Statistics 25

1.6.4 Analysing the relationship between AI knowledge and exposure of project holders and their motivations behind their decision for integrating AI technologies.

The following tables represent and explain the relationship between AI knowledge and exposure and the motivations of integrating AI within the entrepreneurial venture.

It is critical to consider that the Chi-Square test is a statistical technique which helps to know if there is a significant relationship between the two categorical variables. When the Asymptotic Significance (2-sided) value also known as "p-value" is less than the commonly acceptable 0.05, we can wind up that the association between those variables is statistically significant. Therefore, it signifies that patterns observed in data are not likely to happen by chance.
Pearson Chi-Square test gives the statistics 439.941 on significance level of 0.001 which is much lower than commonly used value of 0.05, so it can be concluded that there is a statistically significant correlation between the AI knowledge level and project holders' exposure to this technology and their motivation to integrate it. The strength of this correlation was further assessed by the study using Cramer's V statistic which equals to 0.544 and represents moderate to strong relationship between these two variables, meaning that with increasing knowledge and exposure to AI, motivation of implementing AI into projects grows.

Table 16: Chi square test of the relationship between AI knowledge and experience and the motivations behind the decision of integrating AI technologies.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	439.941[a]	350	.001
Likelihood Ratio	231.198	350	1.000
Linear-by-Linear Association	19.049	1	.000
N of Valid Cases	106		

Source: IBM SPSS Statistics 25

Table 17: Cramer test for measuring the relationship strength between AI familiarity and experience and the motivations behind the decision of integrating AI technologies

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	2.037	.001
	Cramer's V	.544	.001
N of Valid Cases		106	

Source: IBM SPSS Statistics 25

1.6.5 Analysing the relationship between AI knowledge and exposure of project holders and their confidence level in leveraging and integrating AI technologies.

The following tables explain the way that AI knowledge and exposure of the project holders are impacting their level of confidence in integrating AI technologies within their start up project, using Pearson Chi-square and Cramer's V tests.

This result is reflected by the analysis with a Pearson Chi-Square value of 194.401 and p-value of 0.009 that certifies a statistically significant relationship. The said fact is demonstrated by the Cramer's V value of 0.553, which shows an order of relative strength in line with AI

knowledge and exposure influencing project holders' confidence in application and integration of AI technologies.

Table 18: Chi square test of the relationship between AI knowledge and experience and the confidence level in leveraging and integrating AI technologies.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	194.401[a]	150	.009
Likelihood Ratio	119.727	150	.967
Linear-by-Linear Association	.291	1	.589
N of Valid Cases	106		

Source: IBM SPSS Statistics 25.

Table 19: Cramer test for measuring the relationship strength between AI familiarity and experience and the confidence level in leveraging and integrating AI.

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	1.354	.009
	Cramer's V	.553	.009
N of Valid Cases		106	

Source: IBM SPSS Statistics 25

1.6.6 Analysing the relationship between AI knowledge and exposure of project holders and their perceived benefits of integrating AI technologies

The two following tables indicates the correlation between AI knowledge and experience of project holders and their perceived benefits for incorporating AI technologies, using Chi-square and Crammer tests

Statistical analysis identifies a strong connection between project holder's awareness level of AI and their attitude towards AI in terms of beneficence. The fact is illustrated by a Pearson

Chi-Square value of 242.761 and a p-value of 0.021. The Cramer's V is equal to 0.535, which shows the relationship is from moderate to strong one. explaining that project holders with more AI knowledge are likely to perceive higher benefits from AI technology incorporation.

Table 20: Chi square test of the relationship between AI knowledge and experience and the perceived benefits of integrating AI technologies.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	242.761[a]	200	.021
Likelihood Ratio	148.562	200	.997
Linear-by-Linear Association	6.255	1	.012
N of Valid Cases	106		

Source: IBM SPSS Statistics 25

Table 21: Cramer test for measuring the relationship strength between AI familiarity and experience and the perceived benefits of integrating AI technologies.

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	1.513	.021
	Cramer's V	.535	.021
N of Valid Cases		106	

Source: IBM SPSS Statistics 25

1.7 Funding Sources, Obstacles, and Training Needs for AI Integration

This section will explore the various funding sources utilized by project holders for integrating AI technologies, as well as the obstacles they face in this process. It will also examine project holders' interest in AI training courses. Additionally, the section will analyze the relationships between project holders' familiarity and exposure to AI, their primary funding sources for AI incorporation, the biggest obstacles they encounter in utilizing AI, and their level of interest in AI training courses.

By investigating these factors, this section aims to provide insights into the financial, practical, and educational aspects of AI integration, and how they relate to project holders' AI knowledge and experience.

1.7.1 A review of project holders funding sources for integrating AI technologies.

The given table demonstrates the frequencies and percentages of project holders who intend to employ different funding sources to integrate AI technologies into their start up project.

Significantly, a proportion of 58.5% of respondents identified reinvesting profits as a funding source while 41.5% did not choose this alternative. Meanwhile, just 27.4% preferred to attract venture capital investments while 72.6% avoided it. For that matter, government grants or subsidies were chosen by only 49.1% of project holders while the rest did not use them at all.

There also existed crowdfunding firms which had been employed by only a mere 29.2%, whereas, majority (70.8%) did not wish to finance through this way too much of risks could accompany it for them. Lastly, about 30.2% took bank loans or other debt financing whereas almost seventy percent did not.

Based on the survey findings, it becomes evident that the primary source of funding that project holders tend to seek more frequently is reinvesting the profits that have been accumulated over time through their business operations. Additionally, other potential avenues that are commonly explored include government funding in the form of grants or subsidies aimed at supporting entrepreneurial endeavors. These options emerge as the more widely implemented and preferred approaches within this particular field or industry sector.

On the other hand, the data suggests that the act of approaching venture capitalists or other private equity firms for funding purposes, or the pursuit of bank loans or debt financing instruments, appears to be a less frequent occurrence among the surveyed project holders. This observation implies that such external investment channels or the use of financial debt products are seemingly less likely to be utilized by this entrepreneurial community. This trend is consistent with the overall understanding that project holders may generally prefer to rely on personal income generation models and the utilization of public support tools, rather than seeking external investment or taking on significant financial obligations through debt.

Table 22: Project holder's funding sources for incorporating AI.

items	Yes			No		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage %
- Reinvesting profits	62	48.8	58.5	44	34.6	41.5
- Seeking venture capital	29	22.8	27.4	77	60.6	72.6
- Appling for government grants or subsides	52	40.9	49.1	54	42.5	50.9
- Crowd funding companies	31	24.4	29.2	75	59.1	70
- Obtaining bank loans or another debit financing	32	25.2	30.2	74	58.3	69.8

Source: IBM SPSS Statistics 25

1.7.2 The biggest obstacle faced by the project holders in integrating AI technologies

The table throws light on the challenges that project holders face when trying to incorporate AI technology into the projects.

The most important barrier was the high cost of implementation and maintenance of AI which recorded by 74.5 % respondents. Secondly, lack of expertise in AI by a team was another major obstacle as indicated by 64.2% of project holders; while about 53.8% raised concerns regarding privacy and security issues, and almost half had difficulty identifying the suitable AI solution for their start-up's requirements, with close to forty percent experiencing resistance from their employees or customers as the least significant challenge according to project owners among other challenges.

To conclude, the major stumbling blocks in integrating AI technologies for project holders were highest expenses of AI implementation and maintenance, coupled with insufficient knowledge and expertise on AI within the team.

Table 23: Project holder's obstacles in incorporating AI within their start up projects.

Items	Yes			No		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage %
- Lack of ai expertise and skills within the team	68	53.5	64.2	38	39.9	35.8
- High costs of AI implementation and maintenance	79	62.2	74.5	27	21.3	25.5
- Concerns about privacy and security	57	44.9	53.8	49	36.6	46.2
- Difficulty in identifying the right AI solution for the start-up's need	52	49.9	49.1	54	42.5	50.9
- Resistance to change from employees to customers	41	32.3	38.7	65	51.2	61.3

Source: IBM SPSS Statistics 25

1.7.3 A review of project holder's interest in AI training courses.

The following table and figure describe the project holders' degree of interest in workshops, mentorships, and AI training programs for incorporating AI technologies in their ventures.

Remarkably, 72.6% of respondents said they would be interested in these kinds of training programs. Nevertheless, none of the project holders stated that they were not interested at all, while 27.4% expressed mostly a passing interest.

To conclude, most project holders indicated that they would be interested in attending workshops, mentorships or training courses that talks about AI, indicating an important willingness to know more about this developed domain

Table 24: Interest level of project holders in AI training courses.

items	not interested at all			Kind of interested			Interested		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%
Interest level in AI training, mentorships/ workshops	0	0	0	29	22.8	27.4	77	60.6	72.6

Source: IBM SPSS Statistics 25

1.7.4 Analysing the relationship between AI familiarity and exposure of project holders and the primary funding of AI incorporation

The given tables demonstrate the association and the connection between AI familiarity and exposure of project holders and the primary funding of AI incorporation into their start up project.

After holding out a statistical analysis using the Pearson Chi-Square test, it was found that the value was 211.334 at 175 degrees of freedom with a significance level of 0.032. This conclusion

points to a meaningful statistical connection between project holder's awareness about AI and their capacity to gain initial financial support for AI integration.

The strength of this connection, as expressed by Cramer's V, equals 0.534 so that it is identified as moderate-strong association. This implies that people who are more familiar with AI and have more exposure to AI are likely to get funded for their AI start up projects. Showing up the importance of AI knowledge in securing financial resources.

Table 25: Chi-Square test of the relationship between AI familiarity and exposure and the primary funding of AI incorporation.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	211.334[a]	175	.032
Likelihood Ratio	169.759	175	.598
Linear-by-Linear Association	1.306	1	.253
N of Valid Cases	106		

Source: IBM SPSS Statistics 25

Table 26: Cramer test for measuring the strength association between AI familiarity and exposure and the primary funding of AI association.

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	1.412	.032
	Cramer's V	.534	.032
N of Valid Cases		106	

Source: IBM SPSS Statistics 25

1.7.5 Analysing the association between AI familiarity and knowledge of project holders and the biggest obstacles faced to utilizing AI.

The given tables describe and represent the association level between AI familiarity and experience and their biggest obstacles faced to utilizing AI within the ventures.

The Pearson Chi-Square analysis presented a value of 343.144 with 325 degrees of freedom (df) with a significance level of 0.234, which is further up than the usual significance level of 0.05. Moreover, this showed up that there is no statistical relationship between the level of AI knowledge that project holders possess and the challenges they experience in AI utilization.

Table 27: Chi-Square test of the relationship between AI familiarity and exposure and the biggest obstacles faced to utilizing AI.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	343.144[a]	325	.234
Likelihood Ratio	180.932	325	1.000
Linear-by-Linear Association	.499	1	.480
N of Valid Cases	106		

Source: IBM SPSS Statistics 25

1.7.6 Investigating the association between AI familiarity and experience of project holders and their interest level in AI training courses.

The given tables describe and explains the relationship level between two variables which are: the AI familiarity and exposure of project holders and their interest level in AI training.
Exploring the bond of AI familiarity and the willingness to take part in AI training courses, Pearson Chi-Square was calculated as 407.557 on 350 degrees of freedom with significance level of 0.018, indicating a notable connection between these two variables. In accordance with Cramer's V (0.524), the strength of association is medium to high. It can be derived from this result that project holders who have more acquaintance and experience in AI are inclined to a greater extent in the area of further artificial intelligence education, thus suggesting a connection between having been exposed to AI and aspiration for skill upgrading through training opportunities available there.

Table 28: Chi-Square test of the association between AI familiarity and exposure and the interest level of AI training courses.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	407.557[a]	350	.018
Likelihood Ratio	157.673	350	1.000
Linear-by-Linear Association	4.965	1	.026
N of Valid Cases	106		

Source: IBM SPSS Statistics 25

Table 29: Cramer test for measuring the association strength between AI familiarity and exposure and the interest level of AI training courses.

Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Phi	1.961	.018
	Cramer's V	.524	.018
N of Valid Cases		106	

Source: IBM SPSS Statistics 25

1.8 Exploring the impact of AI knowledge and exposure in shaping perceptions of ai's advantages for entrepreneurial ventures: An analysis of key factors.

This section will explore the impact of project holders' AI knowledge and exposure on their perceptions of the advantages of incorporating Artificial Intelligence (AI) into their entrepreneurial ventures. It will analyze the tabulated data presenting project holders' views on various factors, measured on a Likert scale, that are linked to the potential benefits of AI for entrepreneurial ventures.

1.8.1 Perceptions of the advantages of artificial intelligence for entrepreneurial ventures.

The tabulated data presents results obtained from project holders about their views of advantages of incorporating Artificial Intelligence (AI) into their start up projects. Its goal was

to measure their level of disagreement or agreement with some statements (factors) on Likert scale, that linked to the potential benefits of AI for entrepreneurial ventures.

There is an interpretation of findings for each factor:

Factor 1: Incorporating AI capabilities improves the operational efficiency and productivity of entrepreneurial ventures.

The incorporation of AI capabilities leads to a significant increase in operational efficiency and productivity among entrepreneurial ventures. A majority (58.5% agreed; 29.2% strongly agreed) of the project holders had a positive perception regarding the role artificial intelligence can play in improving operational efficiency and productivity in their entrepreneurial ventures. Only a small percentage (2.8% strongly disagreed; 1.9% disagreed) had a negative perception towards this factor.

Factor 2: The application of AI improves the ability to identify and evaluate novel market opportunities.

Application of AI significantly improve ability to recognize and evaluate new market opportunities. Similarly, many respondents also thought that AI could greatly encourage their ability to identify and evaluate new market opportunities (50.9% agreed, 23.6%% strongly agreed). Notably though, 20.8% took no position on this factor as evidenced by its neutral weightage suggesting that it may need more evidence or clarification.

Factor 3: AI technologies integration drives development of entrepreneurial ventures to more innovative and financially viable business models.

Based on the data, project holders are seriously positive about the impact of AI Technologies for innovation and financial viability in business models of start-ups and entrepreneurial firms. This was supported by a large majority, i.e. 83% (54.7% were in agreement and 28.3% strongly agreed). Only a mere 2.8% were against it while 11% remained indifferent. This shows that project holders are aware that AI technologies have the potential to drive business model innovation and improve financial sustainability, which are key to successful entrepreneurship venture creation. Employing artificial intelligence to create inventive and fiscally steady business models can be used as a weapon by those seeking a competitive edge in today's volatile economy.

Factor 4: Technological AI implementation improves the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures.

This factor's response indicates that project holders are hopeful about the influence of technologies based on AI to their supply chain operations in their entrepreneurial ventures. The

combination of 72.7% participants (42.5% agreed, 30.2% strongly agreed) acknowledged how these technologies can improve relevance, efficiency as well as stability throughout a supply chain system. But it is important to bear in mind that a considerable number of respondents (20.8%) opted for 'neither agree nor disagree' under this item indicating possibly some lack of enough proof and/or clarity on exactly how AI tools and technologies will enable better supply chains. Moreover, there were a few people (5.7%) who didn't believe it implying that some project holders might be doubtful regarding these systems' competency or potential to carry out business activities as others perceive obstacles or problems in their operationalization in supply chains.

Factor 5: AI systems offer the advantage of enhanced accuracy and consistency and business decision making.

Predominantly, the project holders had recognized that business decision making offered by AI systems is important for anticipating and responding to market trends and customer demands with 49.1% of them agreeing and 31.1 % strongly agreeing. However, a significant percentage (13.2%) remained indifferent to this factor.

Factor 6: Start-ups are highly confident that AI-powered risk management and cyber-security systems can detect, prevent or respond to risks.

There was a split response on this factor whereby combined percentages representing confidence in AI-powered risk management and cyber-security systems reached 91.5% (50.9% agreed, while 40.6% strongly agreed) as ways of identifying threats as well as their mitigation. A small fraction however (3.8% strongly disagreed, while 2.8% disagreed) expressed lack of confidence in this regard.

Factor 7: AI-boosted marketing and customer features encourage the ability of the venture's entrepreneurs to create an efficient specific-marketing operation and set up a strong brand identity.

Synthetic intelligence (AI) based utilization for advertising as well as buyer categorization were considered by a significant proportion of project holders to be beneficial in developing efficient targeted commercial functioning and creating good brand identity (45.3% agreed, 37.7% strongly agreed). On the other hand, this factor remained neutral among 12.3%. Summarily, project holders generally have a positive perspective on the benefits of integrating Artificial Intelligence into different aspects of their business ventures.

Summarily, project holders generally have a positive perspective on the benefits of integrating Artificial Intelligence into different aspects of their business ventures.

Table 30: Level of agreement and disagreement regarding AI advantages.

Items	Strongly disagree			Disagree			Neutral			Agree			Strongly agree		
Descriptive analysis	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%	Frequencies	Percentage %	Valid percentage%
Factor 1	3	2.4	2.8	2	1.6	1.9	8	6.3	7.5	62	48.8	58.5	31	24.4	29.2
Factor 2	2	1.6	1.9	3	2.4	2.8	22	17.7	20.8	54	42.5	50.9	25	19.7	23.6
Factor 3	1	8	9	3	2.4	2.8	14	11	20.8	58	45.7	54.7	30	23.6	28.3
Factor 4	1	8	9	6	4.7	5.7	22	17.3	20.8	45	35.4	42.5	32	25.2	30.2
Factor 5	2	1.6	1.9	5	3.9	4.7	14	11	13.2	52	40.9	49.1	33	26	31.1
Factor 6	4	3.1	3.8	3	2.4	2.8	2	1.6	1.9	54	42.5	50.9	43	33.9	40.6
Factor 7	2	1.6	1.9	3	2.4	2.8	13	10.2	12.3	48	37.8	45.3	40	31.5	37.7

Source: IBM SPSS Statistiics25

1.8.2 The impact of AI knowledge and exposure of project holders on factor 1

The given tables explain and describe the association between dependent and independent variables which are: AI knowledge and experience of project holders and factor 1 that signifies to the statement incorporating AI capabilities improves the operational efficiency and productivity of entrepreneurial ventures.

This relationship between the two variables is studied to know whether the familiarity with the use of AI and project holders experience effect or not on the fact that AI Incorporation leads to improve the operational efficiency and productivity of start-ups. This study is exanimated by using linear regression (ANOVA) and correlation test (Pearson)

Table 31: Anova test for investigating the impact of AI familiarity and experience of project holders on Factor 1.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.111	1	4.111	5.309	.023[b]
	Residual	80.531	104	.774		
	Total	84.642	105			

Source: IBM SPSS Statistics 25

The analysis of variance ANOVA table summarizes the results of a regression analysis to ascertain the significance of relationship between dependent variable, which represented by incorporating AI capabilities improving the operational efficiency and productivity of entrepreneurial ventures and independent variables both possibly AI familiarity and knowledge of project holders.

In this context, Regression analysis row indicates how much variability in dependent variable is explained by independent variables, while, Residuals represents unexplained variance. With an F-statistic 4.111 having a p-value 0.023, it can be concluded that it exists a statistically significant relationship among dependent and independent variables at 0.05 level.

Moreover, this denotes that AI exposure and knowledge are significantly contributing to explaining variation in the AI incorporation capabilities improving the operational efficiency and productivity of entrepreneurial venture

Table 32: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and Factor 1.

Correlations			
		F1	AI
F1	Pearson Correlation	1	.220*
	Sig. (2-tailed)		.023
	N	106	106
AI	Pearson Correlation	.220*	1
	Sig. (2-tailed)	.023	
	N	106	106

Source: IBM SPSS Statistics 25

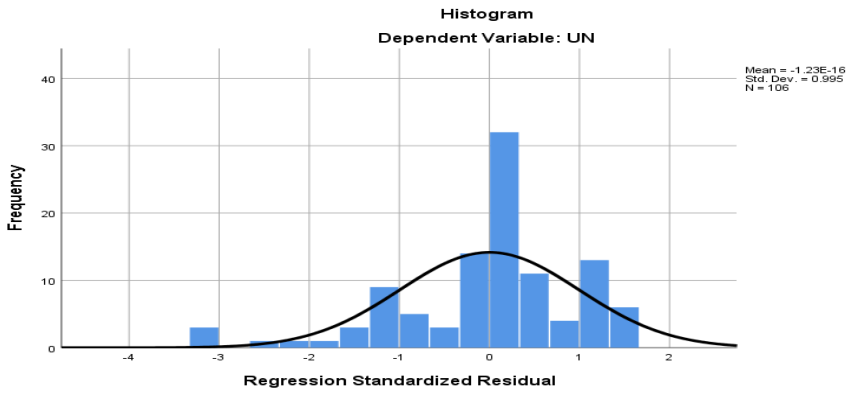
The table below shows up, the correlation matrix that presents the Pearson correlation coefficients between the two variables (dependent/independent), the dependent variables are the incorporating AI capabilities improving the operational efficiency and productivity of entrepreneurial ventures and the independent variables are represented by AI knowledge, exposure of project holders, this study investigating the impact of AI familiarity and knowledge on the incorporating AI capabilities improving the operational efficiency and productivity of entrepreneurial ventures.

The correlation coefficient of 0.220 between the incorporating AI capabilities improving the operational efficiency and productivity of entrepreneurial ventures and AI knowledge and exposure is statistically significant at 0.05 level ($p = 0.023$). This positive correlation coefficient suggests a weak positive linear relationship between these variables. Additionally, as value for the incorporating AI capabilities improving the operational efficiency and productivity of entrepreneurial ventures increases, value for Al knowledge and exposure also tends to increase; vice versa. After that, magnitude of this correlation coefficient indicates relatively poor relationship between these two variables.

Nevertheless, the correlation analysis explains a weak positive association between the two variables, implying that as entrepreneur's familiarity with AI increases, their capabilities to improve the operational efficiency and productivity of entrepreneurial ventures; also tend to

increase, albeit with a relatively small effect size. In the other hand, the ANOVA come out with results that suggest that the independent variables in the regression model, which include AI familiarity and knowledge exposure, have a statistically significant impact on the dependent variables, the incorporating AI capabilities improves the operational efficiency and productivity of entrepreneurial ventures. This finding credence to the alternative hypotheses indicating that the proposed effect is statistically significant and approved.

Figure 24: The impact of AI knowledge and exposure on factor 1



Source: IBM SPSS Statistics 25

1.8.3 The impact of AI familiarity and exposure of project holders on factor 2.

The same way as it is mentioned before, the following tables indicate whether AI familiarity and experience of project holders has an impact on factor 2 which is the application of AI improves the ability to identify and evaluate novel market opportunities.

Table 33: Anova test for examining the impact of AI familiarity and experience of project holders on Factor 2

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.031	1	4.031	4.769	.031[b]
	Residual	87.903	104	.845		
	Total	91.934	105			

Source: IBM SPSS Statistics 25.

With an F-statistic 4.031 having a p-value 0.031, it can be terminated that there is a statistically significant relationship among dependent and independent variables at 0.05 level. Moreover, this denotes that AI exposure and knowledge are significantly contributing to explaining variation in the application of AI improving the ability to identify and evaluate novel market opportunities.

Table 34: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and Factor 2.

Correlations			
		AI	F2
AI	Pearson Correlation	1	.209*
	Sig. (2-tailed)		.031
	N	106	106
F2	Pearson Correlation	.209*	1
	Sig. (2-tailed)	.031	
	N	106	106

Source: IBM SPSS Statistics 25

The correlation coefficient of 0.209 between AI application improving the ability to identify and evaluate novel market opportunities and AI knowledge and exposure is statistically significant at 0.05 level (p = 0.031)

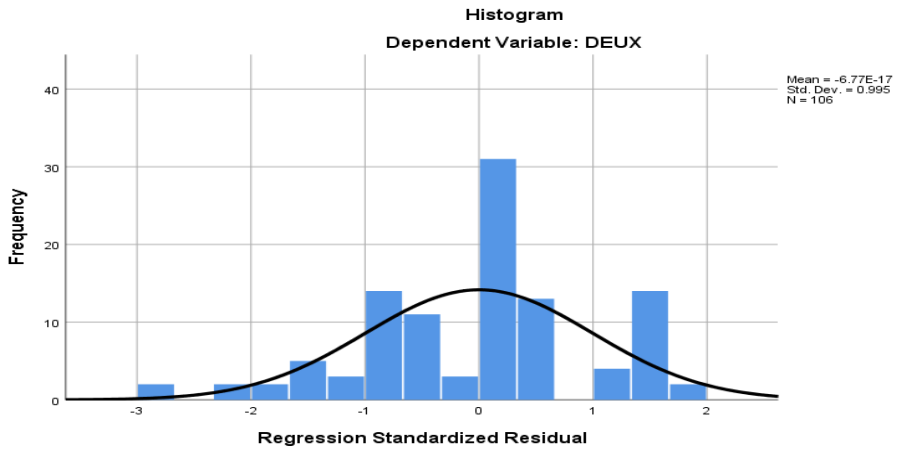
This positive correlation coefficient suggests a weak positive linear relationship between these variables. Additionally, as value for between the AI application improving the ability to identify and evaluate novel market opportunities increases, value for Al knowledge and exposure also tends to increase; vice versa. Nonetheless, magnitude of this correlation coefficient indicates relatively poor relationship between these two variables.

Finally, the correlation analysis reveals a weak positive association between the two variables, implying that as project holder's familiarity and use with AI increases, their ability to identify and evaluate novel market opportunities; also tend to increase, even though with a relatively small effect size. In the other hand, the ANOVA come out with results that suggest that the independent variables in the regression model, which include AI familiarity and knowledge

exposure, have a statistically significant impact on the dependent variables, the application of AI improves the ability to identify and evaluate novel market opportunities.

The data offer a robust imperial support for alternative hypothesis, confirming a positive impact hypothesis.

Figure 25: The impact of AI knowledge and exposure on factor 2



Source: IBM SPSS Statistics 25

1.8.4 The impact of AI exposure and experience of project holders on Factor 3.

The given tables describe the association and the impact of AI familiarity use of project holders on Factor 3 which signifies to AI technologies integration driving development of entrepreneurial ventures to more innovative and financially viable business models. Linear regression (ANOVA) and correlation test (Pearson) has been used to confirm the hypothesis.

Table 35: Anova test for investigating the impact of AI familiarity and experience of project holders on Factor 3

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.192	1	5.192	7.145	.009[b]
	Residual	75.572	104	.727		
	Total	80.764	105			

Source: IBM SPSS Statistics 25

With an F-statistic 4.192 having a p-value 0.009, it can be said that there is a statistically significant relationship among dependent and independent variables at 0.05 level. Moreover, this denotes that AI exposure and knowledge are significantly contributing to explaining variation of AI technologies integration driving development of entrepreneurial ventures to more innovative and financially viable business models.

Table 36: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and Factor 3

Correlations			
		AI	F3
AI	Pearson Correlation	1	.254**
	Sig. (2-tailed)		.009
	N	106	106
F3	Pearson Correlation	.254**	1
	Sig. (2-tailed)	.009	
	N	106	106

Source: IBM SPSS Statistics 25

The correlation coefficient of 0.254 AI technologies integration driving development of entrepreneurial ventures to more innovative and financially viable business models. and AI knowledge and exposure is statistically significant at 0.05 level ($p = 0.009$)

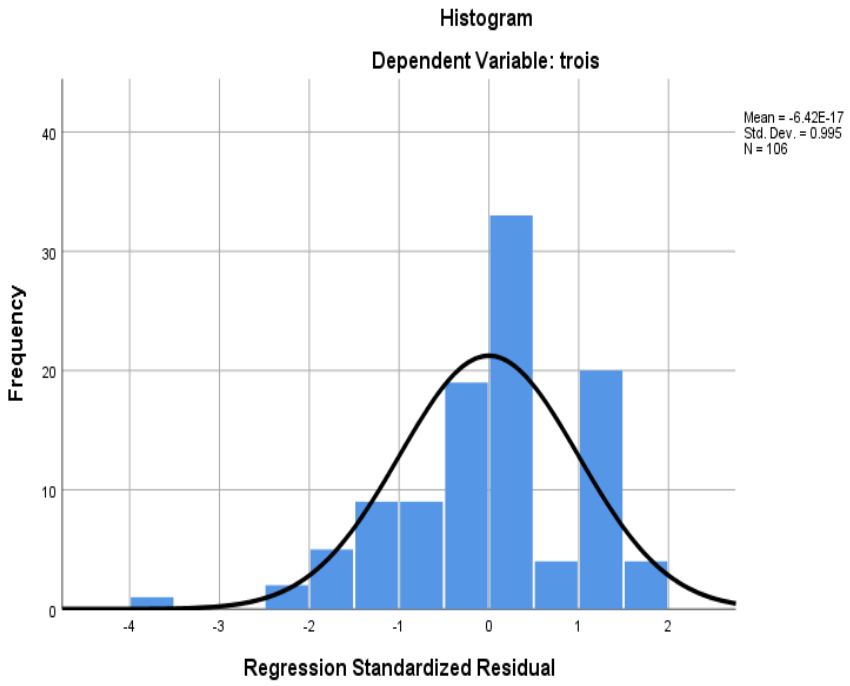
This positive correlation coefficient suggests a weak to moderate positive linear relationship between these variables. Additionally, as value for AI technologies integration drives development of entrepreneurial ventures to more innovative and financially viable business models increase, value for Al knowledge and exposure also tends to increase; vice versa. Nonetheless, magnitude of this correlation coefficient indicates relatively poor to moderate relationship between these two variables.

The correlation analysis shows a weak to moderate positive association between the two variables, implying that as project holder's familiarity with AI increases AI technologies integration driving development of entrepreneurial ventures to more innovative and financially

viable business models, also tend to increase, though with a relatively small effect. In the other hand, the ANOVA come out with results that suggest that the independent variables in the regression model, which include AI familiarity and knowledge exposure, have a statistically significant impact on the dependent variables, AI technologies integration driving development of entrepreneurial ventures to more innovative and financially viable business models.

This finding corresponds to the alternative hypotheses indicating that the proposed effect is statistically significant and validated.

Figure 26: The impact of AI knowledge and exposure on factor3



Source: IBM SPSS Statistics 25

1.8.5 The impact of AI knowledge and experience of project holders on Factor 4.

The following tables illustrate and describe the relationship between AI familiarity and experience of project holders, and factor 4 - the extent to which technological AI implementation can improve the efficiency, adaptability, and stability of supply chain operations within entrepreneurial ventures. The data provides insights into whether a higher level of AI knowledge and hands-on experience among project holders correlates with their perception of AI's ability to enhance supply chain performance.

Table 37: Anova test for investigating the impact of AI familiarity and experience of project holders on Factor 4

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.996	1	3.996	5.236	.024[b]
	Residual	79.363	104	.763		
	Total	83.358	105			

Source: IBM SPSS Statistics 25

With an F-statistic 4.996 having a p-value 0.024, we can see that there is a statistically significant relationship among dependent and independent variables at 0.05 level. Furthermore, this explains that AI exposure and knowledge are significantly contributing to explaining variation in technological AI implementation improving the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures.

Table 38: Pearson test for examining the association strength between AI familiarity and experience of project holders and Factor 4.

Correlations			
		AI	F4
AI	Pearson Correlation	1	.219*
	Sig. (2-tailed)		.024
	N	106	106
F4	Pearson Correlation	.219*	1
	Sig. (2-tailed)	.024	
	N	106	106

Source: IBM SPSS Statistics 25

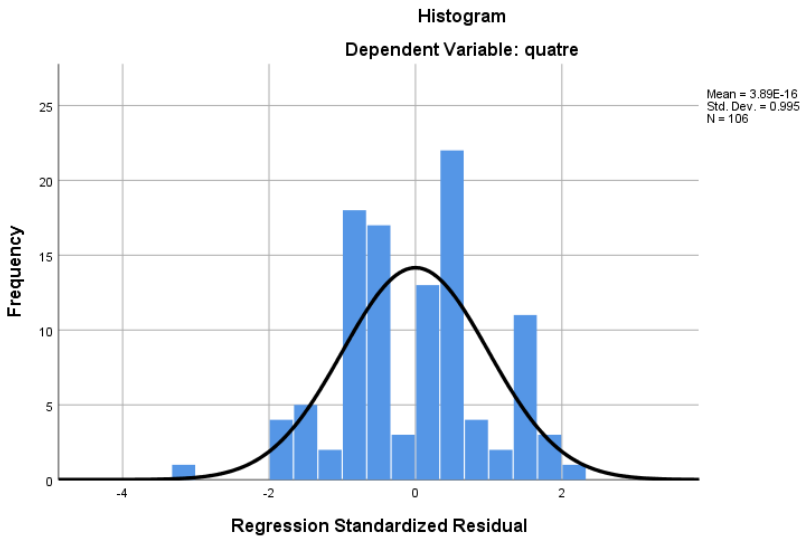
The correlation coefficient of 0.219 between technological AI implementation improving the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures and AI familiarity and exposure is statistically significant at 0.05 level (p = 0.031)

This positive correlation coefficient shows a weak positive linear relationship between these variables. Additionally, as value for technological AI implementation improving the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures increases, value for Al knowledge and exposure also tends to increase; vice versa. So, magnitude of this correlation coefficient indicates relatively poor association between these two variables.

To conclude, the correlation analysis shows a weak positive association between the two variables, implying that as entrepreneur's familiarity with AI increases technological AI implementation improving the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures also tend to increase. In the other hand, the ANOVA come out with results that indicates that the independent variables in the regression model, which include AI familiarity and knowledge exposure, have a statistically significant impact on the dependent variables, technological AI implementation improving the efficiency, adaptability and stability of supply chain operations of entrepreneurial ventures.

This finding correlate to the alternative hypotheses and the previous studies indicating that the proposed effect is statistically significant and validated.

Figure 27: The impact of AI knowledge and exposure on factor 4



Source: IBM SPSS Statistics 25

1.8.6 The impact of AI knowledge and exposure on Factor 5

The given tables describe the association and the impact of AI familiarity use of project holders on Factor 3 which signifies to AI systems offering the advantage of enhanced accuracy and consistency and business decision making.

Table 39: Anova test for examining the impact of AI familiarity and experience of project holders on Factor 5

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.824	1	4.824	4.408	.038[b]
	Residual	112.738	103	1.095		
	Total	117.562	104			

Source: IBM SPSS Statistics 25

With an F-statistic 4.824 having a p-value 0.038, it can be said that it exists a statistically significant relationship among dependent and independent variables at 0.05 level. So, this denotes that AI exposure and knowledge are significantly contributing to explaining variation in AI systems offering the advantage of enhanced accuracy and business decision making.

Table 40: Pearson test for examining the association strength between AI familiarity and experience of project holders and Factor 5.

Correlations			
		AI	F5
AI	Pearson Correlation	1	.203*
	Sig. (2-tailed)		.038
	N	106	105
F5	Pearson Correlation	.203*	1
	Sig. (2-tailed)	.038	
	N	105	105

Source: IBM SPSS Statistics 25

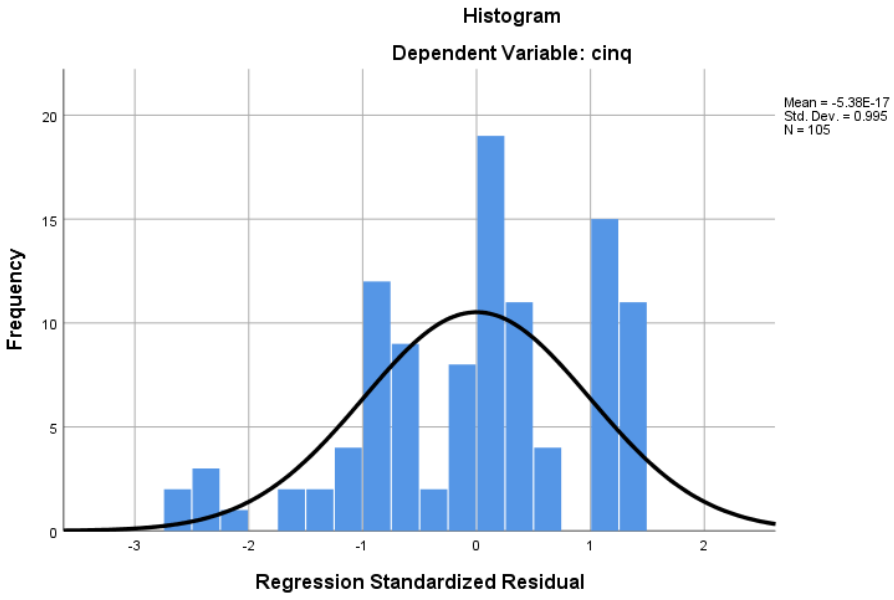
The correlation coefficient of 0.203 between AI systems offering the advantage of enhanced accuracy and consistency and business decision making and AI knowledge and exposure is statistically significant at 0.05 level (p = 0.038)

This positive correlation coefficient suggests a weak positive linear association between these variables. Additionally, as value for AI systems offering the advantage of enhanced accuracy and consistency and business decision making increases, value for Al knowledge and exposure also tends to increase; vice versa. Then, nature of this correlation coefficient indicates relatively poor relationship between these two variables.

Nevertheless, the correlation analysis indicates a weak positive association between the two variables, implying that as entrepreneur's familiarity with AI increases, AI systems offering the advantage of enhanced accuracy and consistency and business decision making also increases. In the other hand, the ANOVA appears with results that suggest tt the independent variables in the regression model, which include AI familiarity and knowledge exposure, have a statistically significant impact on the dependent variables, AI systems offering the advantage of enhanced accuracy and consistency and business decision making.

This finding corresponds to the alternative hypotheses and the previous studies indicating that the proposed effect is statistically significant and validated

Figure 28: The impact of AI knowledge and exposure on factor 5



Source: IBM SPSS Statistics 25

1.8.7 The impact of AI knowledge and experience of project holders on factor 6.

The following tables aim to describe the association and examine the impact of project holders' AI familiarity and usage on Factor 6, which specifically focuses on start-ups' confidence in the ability of AI-powered risk management and cyber-security systems to effectively detect, prevent, or respond to potential risks. To validate the findings and allow for comparison with previous studies in this domain, two statistical tests have been meticulously applied to confirm the hypothesis and ensure the robustness of the analysis.

Table 41: Anova test for investigating the impact of AI familiarity and experience of project holders on Factor 6.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.721	1	6.721	4.656	.033[b]
	Residual	150.119	104	1.443		
	Total	156.840	105			

Source: IBM SPSS Statistics 25

The results obtained from these tests yield an F-statistic value of 4.656, accompanied by a corresponding p-value of 0.033. This outcome holds significant implications, as it allows us to conclude that there exists a statistically significant relationship between the dependent and independent variables under investigation, at the widely accepted 0.05 significance level. Moreover, this statistic demonstrates that the level of AI exposure and knowledge among project holders is a critical factor that significantly contributes to explaining the variation observed in start-ups' confidence regarding the capabilities of AI-powered risk management and cyber-security systems to effectively detect, prevent, or respond to potential risks.

This finding highlights the pivotal role that AI familiarity plays in shaping the perceptions and attitudes of entrepreneurial ventures towards the adoption and implementation of AI-driven risk mitigation strategies.

Table 42: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and Factor 6.

Correlations			
		AI	F6
AI	Pearson Correlation	1	.207*
	Sig. (2-tailed)		.033
	N	106	106
F6	Pearson Correlation	.207*	1
	Sig. (2-tailed)	.033	
	N	106	106

Source: IBM SPSS Statistics 25

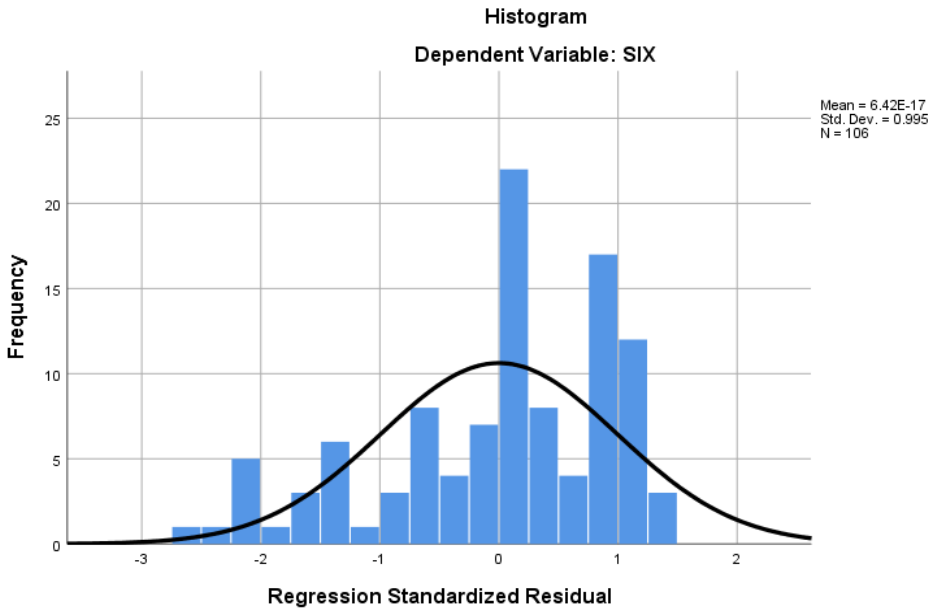
The correlation coefficient of 0.207 between Start-ups confidence that AI-powered risk management and cyber-security systems can detect, prevent or respond to risks and AI knowledge and exposure is statistically significant at 0.05 level (p = 0.038)

This positive correlation coefficient indicates s a weak positive linear association between these variables. Additionally, as value for Start-ups confidence that AI-powered risk management and cyber-security systems can detect, prevent or respond to risks increases, value for Al knowledge and exposure also tends to increase; vice versa. Then, nature of this correlation coefficient shows relatively poor relationship between these two variables.

To conclude, the correlation analysis shows a weak positive association between the two variables, implying that as project holder's knowledge with AI increases, start-ups confidence that AI-powered risk management and cyber-security systems can detect, prevent or respond to risks also increases. In the other hand, the ANOVA appears with results that explains that the independent variables in the regression model, which include AI familiarity and knowledge exposure, have a statistically significant impact on the dependent variables.

This finding corresponds to the alternative hypotheses and previous studies indicating that the proposed effect is statistically significant and validated.

Figure 29: The impact of AI knowledge and exposure on factor 6



Source: IBM SPSS Statistics

1.8.8 The impact of AI knowledge and exposure of project holders on Factor 7.

The following tables indicate and describe whether AI familiarity and experience of project holders has an impact on factor 7 which is AI-boosted marketing and customer features encouraging the ability of the venture's entrepreneurs to create an efficient specific-marketing operation and set up a strong brand identity.

Table 43: Anova test for investigating the impact of AI familiarity and experience of project holders on Factor 7.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.469	1	5.469	4.881	.029[b]
	Residual	116.540	104	1.121		
	Total	122.009	105			

Source: IBM SPSS Statistics 25

With an F-statistic 4.881 having a p-value 0.029, it can be concluded that it exists a statistically significant relationship among dependent and independent variables at 0.05 level. Moreover, this denotes that AI exposure and knowledge are significantly contributing to explaining variation of AI-boosted marketing and customer features encouraging the ability of the venture's project holders to create an efficient specific-marketing operation and set up a strong brand identity.

Table 44: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and Factor 6

Correlations			
		AI	F7
AI	Pearson Correlation	1	.212*
	Sig. (2-tailed)		.029
	N	106	106
F7	Pearson Correlation	.212*	1
	Sig. (2-tailed)	.029	
	N	106	106

Source: IBM SPSS Statistics 25

The correlation coefficient of 0.212 between AI-boosted marketing and customer features encouraging the ability of the venture's entrepreneurs to create an efficient specific-marketing operation and set up a strong brand identity and AI knowledge and exposure is statistically significant at 0.05 level ($p = 0.029$)

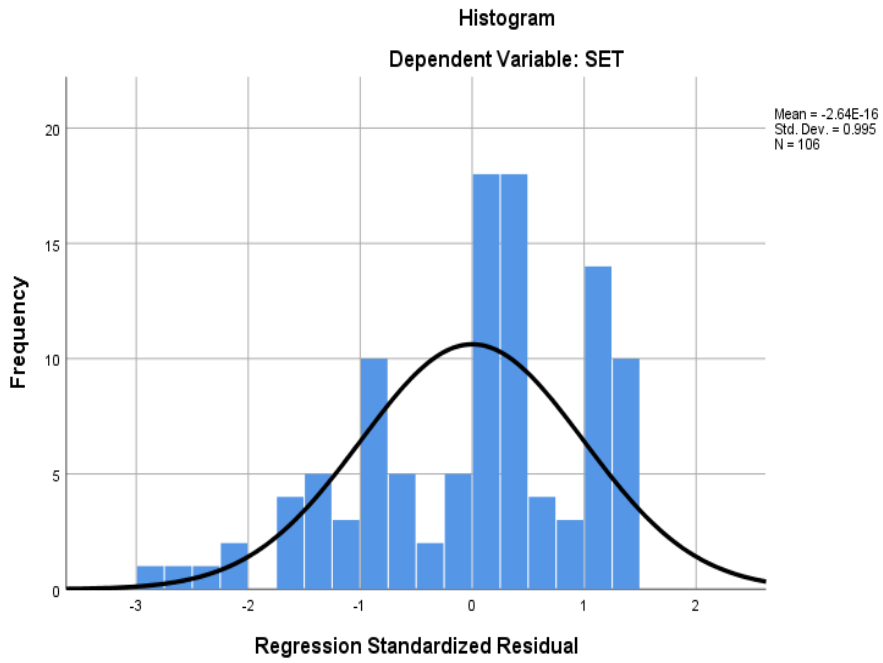
This positive correlation coefficient suggests a weak positive linear relationship between these variables. Additionally, as value for AI-boosted marketing and customer features encouraging the ability of the venture's project holders to create an efficient specific-marketing operation and set up a strong brand identity increases, value for Al knowledge and exposure also tends to increase; vice versa. So, the nature of this correlation coefficient is relatively poor relationship between these two variables.

Finally, the correlation analysis explains a weak positive association between the two variables, implying that as project holders' familiarity with AI increases, AI-boosted marketing and

customer features encouraging the ability of the venture's entrepreneurs to create an efficient specific-marketing operation and set up a strong brand identity also raises. In the other hand, the ANOVA indicates results that indicate the independent variables in the regression model, which include AI familiarity and knowledge exposure, has a statistically significant impact on the dependent variables, AI-boosted marketing and customer features encouraging the ability of the venture's entrepreneurs to create an efficient specific-marketing operation and set up a strong brand identity.

This finding correlate to the competing hypotheses and previous studies indicating that the proposed effect is statistically significant and validated.

Figure 30: The impact of AI knowledge and exposure on factor 7



Source: IBM SPSS Statistics 25

1.8.9 The impact of AI knowledge and experience of project holders on the entrepreneurial success of start-ups.

The given tables represent both relationship and impact between AI knowledge and experience of project holders and the entrepreneurial success of start-up projects.

The study investigates whether the AI knowledge and familiarity use of AI of the project holders really impact the entrepreneurial success of start-up projects. Linear regression and correlation tests have been used to confirm or reject the hypothesis.

Table 45: ANOVA test for investigating the impact of AI knowledge and experience of project holders on the entrepreneurial success of start-ups.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.948	1	.948	4.233	.042[b]
	Residual	23.286	104	.224		
	Total	24.234	105			

Source: IBM SPSS Statistics 25

With an F-statistic 4.233 having a p-value 0.042, It can conclude that there is a statistically significant relationship among dependent and independent variables at 0.05 level. Moreover, this denotes that AI exposure and knowledge are significantly contributing to explaining variation in the future success of project holders through AI adoption.

Table 46: Pearson test for investigating the relationship strength between AI familiarity and experience of project holders and the entrepreneurial success of start-ups.

Correlations			
		Imp	AI
Imp	Pearson Correlation	1	.198*
	Sig. (2-tailed)		.042
	N	106	106
AI	Pearson Correlation	.198*	1
	Sig. (2-tailed)	.042	
	N	106	106

Source: IBM SPSS Statistics 25

The table below shows up, the correlation matrix that presents the Pearson correlation coefficients between the two variables (dependent/independent), the dependent variables are

represented by the future success of entrepreneurs by the integration of AI technologies and the independent variables are represented by AI knowledge, exposure this study investigating the impact of AI familiarity and knowledge on the future success of entrepreneurs by integration of AI technologies.

The correlation coefficient of 0.198 between future success of entrepreneurs by integration of AI technologies and AI knowledge and exposure is statistically significant at 0.05 level ($p = 0.042$)

This positive correlation coefficient suggests a kind of weak positive linear relationship between these variables. Additionally, as value for future success of entrepreneurs by integration with AI technology increases, value for Al knowledge and exposure also tends to increase. Nonetheless, nature of this correlation coefficient indicates relatively poor relationship between these two variables.

Depending on the findings presented, this chapter can be summarized as follows:

The study explored how managerial project holders understood different forms of artificial intelligence (AI) technologies. A fair proportion of respondents provided a firm ‘yes’ to their awareness of the use of AI, with a similar percentage admitting to being rather familiar with the concept. When it comes to explaining the specific forms of Artificial Intelligence explained in the survey, the Machine Learning and Deep Learning received the highest levels of recognition and familiarity.

Regarding potential business domains suitable for AI application, respondents identified marketing, sales, and customer service as promising areas. However, they perceived logistics services and product development as less conducive to AI integration. Notably, a majority of project holders reported actively utilizing AI tools and solutions within their entrepreneurial endeavors.

Statistical measures of sampling adequacy and sphericity provided therefore emphasised the reliable and valid nature of the data that were obtained. Also, the results from the normality tests showed that the projected intentions and perceived benefits from the project holders concerning the use of AI in their projects were normal for the overall population being studied.

Furthermore, the study aims to establish the reasons that project holders have to incorporate AI technologies in their business ventures. Such motivators were to increase operational effectiveness and efficiency, engage the customer base, obtain competitive edges through analytical data, minimize time-consuming manual processes to allow human capital utilization, and encourage novel operational approaches in business settings. The respondents manifested various levels of confidence and about 16% of them stated high confidence they can effectively apply AI at work while 29% admitted lesser confidence which implies that they deem it necessary to acquire more skills in this area. The passed benefits of AI integration included automating processes, exploring new opportunities for selling, enhancing marketing and sales approaches, and increasing satisfaction with customer interaction.

Regarding funding sources for AI integration initiatives, project holders commonly relied on reinvesting profits and applying for government grants or subsidies, on the other hand the most formidable obstacles hindering AI adoption were the high costs of implementation and maintenance, coupled with a lack of AI expertise within project teams.

Notably, a substantial majority of project holders expressed keen interest in attending AI training programs, mentorships, or workshops, reflecting a strong desire to enhance their knowledge and capabilities in this rapidly evolving domain.

Statistical analyses revealed significant positive correlations between project holders' familiarity and exposure to AI technologies and various factors, including their motivations for integration, confidence levels, perceived benefits, ability to secure funding, and interest in AI training. Crucially, increased AI knowledge and experience positively influenced project holders' prospects for entrepreneurial success through effective AI adoption.

In summary, while acknowledging the challenges and obstacles, the results demonstrated considerable interest and optimism among project holders regarding the transformative potential of AI technologies. They recognized AI as a strategic imperative for driving innovation, operational efficiency, competitiveness, and overall business success within their entrepreneurial ventures.

2. Discussion:

This present research set out to determine the extent, interest, and reasons of project holders involved in students' entrepreneurial initiatives under ministerial decree 1275 to incorporate AI technological advancement in their start-up projects. It was an explorative research that used a keen quantitative approach of surveying the project holders by administration of questionnaires among the 127 purposively selected holders of projects in universities and incubation centres of Algeria.

Based on the results in Chapters 3, there are a number of significant findings and insights to be discussed and analyzed further. The discussion will be based on the major areas in the research such as; demographic profile of respondents, motivation for starting entrepreneurial ventures, familiarity with AI technology and exposure to it, perceived benefits from integrating AI among others, challenges faced in adoption of AI and effect of knowledge about AI on several factors connected to success for entrepreneurship.

2.1 Demographic profile and project holder status

The demographic profile of the respondents indicates that most respondents were young people aged between 20-26 years old. This youthful demographic underscores the potential for innovation as well as entrepreneurship among young people. Further, there was a slight bias towards female respondents implying an increased involvement by females in entrepreneurship activities. Importantly, a significant majority (83.5%) identified themselves as project holders thus validating the appropriateness of this study population.

2.2 Motivations for starting entrepreneurial ventures

The research showed that the primary reason given for starting a business was financial, but the second was the desire to realise positive impact, whether to individuals, society, or the environment. These results are quite consistent with the general perspective in which entrepreneurship means seeking economic success so as to help solve social problems and cultivate the welfare of the community. More specifically, a significant percentage of the respondents also reported that the creation of new opportunities, as well as the continuation of once-pleasurable activities as paid work, are important reasons motivating entrepreneurship and underlining the heterogeneity of the goals that prompt people to become entrepreneurs.

2.3 Familiarity and exposure to AI technologies:

Here, a roughly equal number of the respondents (50%) stated that they had prior exposure to AI technologies, which is expected due to the increasing prevalence of AI in the entrepreneurial

spaces. But at the same time, there were differences in the awareness levels of various categories of AI; while 81% of the respondents knew about machine learning and 77% recognized deep learning, only 22% were familiar with explainable AI, and 15% knew about robotic science. This need calls for proper sensitization and awareness creation so as to get better understanding about the different AI applications and how such applications can be of significant value to the organizations. The present findings are consistent with the work of Gupta (2024), Cuizon. (2023), Kubatko, Ozims and Voronenko. (2024), Abd El Halim. (2024)

2.4 Perceived benefits of AI integration

The survey on the opinion of project holders on the impact of applying artificial intelligence in entrepreneurial ventures established a generally positive perception. Most of the respondents endorsed the proposition that AI can enhance operations, workforce output, and understanding of new business opportunities in new markets. Also, all the respondents acknowledged the possibility of AI technology in the changing of business models, the revolutions of supply chain, and the improvement of business decisions. These results offer support to the existing literature that emphasises the changes that AI can make in different spheres of business activity. The current observations find parallels in the research persued by Gupta (2024), Bakri, ZM, Defitri and Mu'min. (2024). Even though the work of Tran, Vo, Tran and Duong. (2024), had a qualitative approach, their findings aligned perfectly with the study's results.

2.5 Challenges in AI adoption:

According to the study, there are barriers that project holders encounter when implementing AI technologies: Concerning the level of impact, anti-phishing implementation and maintenance costs became the major concern, secondly, the lack of expertise and skills in the team. Other concerns raised included issues to do with privacy and security, and others' hesitance to select an appropriate AI solution provider. These conclusions indicate the importance of oriented actions aimed at meeting these challenges – the availability of funding and training to successfully undergo the AI transition process and the lack of expertise and information concerning which AI solutions are suitable for the business. These findings align with the work of Tran, Vo, Tran and Duong. (2024), who likely identified similar obstacles in their research, emphasizing the need for organizations to carefully assess the financial implications of AI adoption and allocate adequate resources for successful implementation and ongoing maintenance, as well as the importance of building the necessary competencies and knowledge within organizations to effectively leverage AI technologies. Furthermore, as highlighted by Gupta (2024), providing comprehensive training and upskilling opportunities to develop the

necessary skills and knowledge to work with AI systems effectively is crucial for addressing the lack of expertise.

2.6 Impact of AI knowledge and exposure on different factors.

Many hypotheses were tested in the present research, and it was conducted that the knowledge about AI and exposure to AI among the project holders was statistically significantly and positively related to their motivations for adopting AI in their projects, confidence levels regarding use of AI and perceived benefits of using AI. That is why AI literacy and awareness among project holders should be further promoted to enhance their desires to implement AI and their capacity to grasp the opportunities it may bring to their ventures. These results align exactly with the work of Gupta (2024), Bakri, ZM, Defitri and Mu'min (2024). Their studies also found that increased knowledge and awareness about AI led to higher confidence levels and stronger motivations among entrepreneurs to adopt and implement AI solutions. Furthermore, they point up the importance of promoting AI literacy and awareness to facilitate the successful integration of AI technologies across various domains.

Furthermore, the study found a statistically significant impact of AI knowledge and exposure on various factors related to entrepreneurial success, they are cited as follows:

2.6.1 Impact on Operational Efficiency and Productivity

The study identified that there is high statistical significance and positive correlation between the amount of AI knowledge of the project holders and how frequently exposed they are, to AI capabilities the belief that implementation of AI capabilities can enhance efficiency and productivity in their entrepreneurial operation. Simple correlation results indicated a small positive relationship between the two variables ($r = 0.220$, $p = 0.023$) meaning that as project holders familiarize themselves with AI, their use of AI to improve operation efficiency and productivity will also augment with a small magnitude. This finding is supported by numerous studies, such as Gupta (2024), Bakri, ZM, Defitri and Mu'min (2024), Kang, Chaivirutnukul and Zeng (2023), Sjodin, Parida, Palmi, and Wincent (2021), Abaku, Edunjobi & Odimarha (2024), Shoushtari, Ghafourian & Talebi (2021), Kubatko, ChOzims and Voronenko (2024), and Camacho (2024). These works consistently demonstrate that increased familiarity and capabilities of AI technologies among entrepreneurs and project holders positively correlates with their willingness to implement AI solutions to enhance operational efficiency and productivity within their ventures, albeit with varying effect sizes.

2.6.2 Impact on Identifying and Evaluating Novel Market Opportunities

This study shows that there is a significant correlation between the amount of knowledge and exposure that people have toward artificial intelligence and their beliefs that they think it can enhance their capability of identifying and evaluating every new opportunity in the marketplace (r = 0. 209, p = 0. 031). Albeit the point estimate is relatively low, consequently presenting an insight into the potential improvement in the ability of project holders capable of identifying and exploiting new opportunities in the emergent markets with higher levels of AI familiarity and experience. This result was supported by Kang, Chaivirutnukul and Zeng. (2023).

2.6.3 Impact on Business Model Innovation and Financial Viability

Basic knowledge and awareness of AI had a weak to moderate positive correlation (r = 0. 254**, p = 0. 009) with the likelihood of seeing AI technologies as spearheading the progression of new and profitable business models for new commercial ventures. This proof is in further support of the capability of AI in the advancement of business model innovation as well as support of the financial viability, which is a core requirement for business ventures. The work of Sjodin, Parida, Palmi, and Wincent (2021) aligns with these results to some extent. Their study explored the role of AI in business model innovation and found that organizations with a better understanding of AI were more likely to leverage its capabilities in developing new and innovative business models that could drive profitability and competitive advantage.

2.6.4 Impact on Supply Chain Optimization

The exploratory findings conducted in this analysis established a statistically meaningful correlation between the familiarity of AI and the likelihood of supporting technological implementation of AI in supply chains to enhance the probability of productivity, flexibility, and reliability of the supply chain (Pearson's r = 0.219, Sig = 0.024). While the effect size was relatively small and the correlation, while positive, not exceedingly strong, this examination provided evidence of a positive relationship between AI knowledge and supply chain management in entrepreneurial ventures. The results are supported by Abaku, Edunjobi & Odimarha. (2024), Shoushtari, Ghafourian & Talebi. (2021), and Chukwu, Yufenyuy, Ejiofor, Ekweli, Ogunleye, Clement, Obunadike, Adeniji, and Elom. (2024), which found that greater AI capabilities correlated with increased willingness to implement AI in supply chains for improved efficiency, resilience, and optimization.

2.6.5 Impact on Business Decision-Making

Consequently, the findings showed a stipulated and moderate positive correlation between AI knowledge and exposure, and the perceived idea that incorporation of AI into the business decision-making processes can provide improved accuracy as well as objectivity. However, continuous retailing is alert to this: This creating underline the possibility of AI in looking for the coupled data that allowance for analytical decision-making, which is construe necessary for sensing the competitive environment and grasping the timely opportunities. This association was justified by a significant influence of AI on decision making by Kubatko, ChOzims and Voronenko. (2024), Sixiao, Fang and Jabor. (2024), Chukwuka and Igweh. (2024).

2.6.6 Impact on Risk Management and Cybersecurity

A related sample analysis produced a moderately positive but statistically significant correlation between AI familiarity and the belief in the ability of AI-managed risk management and cybersecurity systems to detect or prevent risks or respond to them. The above research proposition indicates that as the AI awareness and engagement rise in the entrepreneurial domain, ventures can benefit from such advancements in terms of optimizing risk management and cybersecurity. These findings are in line with those of Camacho. (2024) who had a qualitative approach and Dash, Ansari, Sharma, and Azad Ali. (2022) which also found a positive relationship between AI capabilities of entrepreneurs and the adoption of AI-powered risk management and cybersecurity solutions in entrepreneurial ventures.

2.6.7 Impact on Marketing and Branding

The cross-tabulation performance showed a slight positive correlation between knowledge/exposure of AI ($r = 0.212$, $p = / 0.029$), which implies that the respondents' notion of marketing features and customer targeting enhanced by AI can facilitate the ability of an entrepreneur to develop effective marketing operations and achieve brand recognition. This kind of discovery shows that with the help of AI, it is indeed possible to make marketing strategies better, as well as establish a powerful brand for an entrepreneurial venture – aspects which are vital in today's competitive business environment. These findings are corroborated and validated by Akter, Sultana, Mariani, and Spanaki. (2021), Mikalef, Conboy and Krogstie. (2021) and Routray. (2024).

Collectively, the findings of the current research contribute to the existing literature by showing the degree of AI implementation in entrepreneurial ecosystem, the perceived advantages and disadvantages of AI, and the effects of AI literacy on different factors of success in

entrepreneurship. In doing so, the study aims to fill the identified gap in the literature by providing insights into these main factors and their implications for the advancement of AI technologies and the configuration of entrepreneurial value creation (start-ups).

CONCLUSION

The research investigates the integration of Artificial Intelligence (AI) in entrepreneurial ventures, highlighting the impact of this technological advancement. The results indicate a keen interest among project holders to incorporate AI into their start-up initiatives, as evidenced by the survey conducted on 127 purposively selected project holders from Algerian universities and incubation centers.

Furthermore, the research question seems to combine between the AI knowledge and exposure and the intention and the decision of project holders to integrate AI and the perceived benefits of this integration.

In order to respond to the research question, the study adopts a post-positivist analysis approach. The results obtained cannot be generalized. They nevertheless make it possible to verify the hypotheses made. To do this, the analysis model brings an arrangement between the Artificial intelligence integration and its impact on the project holders' entrepreneurial venture;

The case study was based on quantitative analysis to provide valuable insights into the extent and reasons behind this trend, offering a comprehensive understanding of the phenomenon. However, the study's focus on a specific geographic region and the purposive sampling method employed may limit the generalizability of the findings to a broader context. Nevertheless, the exploration of AI integration in entrepreneurial ventures contributes to a better understanding of the intersection between technology and entrepreneurship, paving the way for further research in this dynamic field.

For the first axis of the analysis, the findings demonstrate that there is a moderate positive correlation, it results that AI knowledge and exposure has statistically significant positive relation with the project holder's decision, intention and willingness to integrate AI technologies within their entrepreneurial ventures.

For the second axis of the analysis, the results indicate that there is a strong and positive correlation, the findings proved that AI familiarity and experience of project holders has a statistical significant relationship with their interest level in AI training courses and that they are more likely to get funded for their AI implementation.

For the third axis of the analysis, the study findings showed up a positive correlation, which indicate that the results provide that AI knowledge and exposure of the project holders has a statistically significant and positive impact on the various factors related to entrepreneurial success and granites the continuous development and improvement which validate the hypotheses presented in the research study.

Moreover, the results of this research indicate a strong interest among project holders in incorporating AI advancements into their start-up initiatives. With 127 project holders surveyed across universities and incubation centers in Algeria, the study provides valuable insights into the extent and reasons for AI integration in entrepreneurial endeavors. This widespread interest highlights the recognition of AI's transformative capabilities in driving innovation and optimizing business processes. Furthermore, the findings suggest that project holders view AI as a strategic asset that can confer a competitive edge, enabling them to streamline operations, enhance decision-making, and deliver superior products or services. By leveraging AI's analytical and predictive capabilities, entrepreneurs can gain a deeper understanding of market trends, customer preferences, and operational inefficiencies, thereby positioning their ventures for long-term success. Ultimately, the seamless integration of AI technologies can serve as a catalyst for entrepreneurial growth, fostering an environment that encourages innovation, adaptability, and sustained competitive advantage

Nevertheless, the main hypothesis which hold that, the Project holders involved in student entrepreneurial initiatives under ministerial decree 1275 who have greater knowledge and exposure to AI technologies will be more likely to adopt AI in their start-up projects and experience greater success is supported by the results provided by the previous axis. The same goes for the sub hypotheses that were confirmed based on the presented results.

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APPENDIX NO. 1: QUESTIONNAIRE

Dear project holders under the decree (1275)

In the context of our academic research as a 2nd year master's student majoring in Entrepreneurship and Project Management at the National Higher School of Management, we would like to invite you to participate in a study that discusses the topic of Al empowering the entrepreneurial ventures (start-ups).

Completing this questionnaire will take around 7/8 minutes of your time. Please note that all data collected will remain confidential and will be processed anonymously for academic purposes.

Best regards.

1. Participants background

A. What's your gender?

Only one response is possible

□ Male

□ Female

B. What's your age?

Only one response is possible

□ 20 – 22 years old

□ 23 – 26 years old

□ More than 26 years old.

C. At which university or higher educational school at the national level did you study or are you currently studying?

An open question

□ ……

D. What academic university degree are you enrolled in or have you been enrolled in?

Only one response is possible

□ Bachelor's degree

□ Master's degree

□ PhD degree

E. Are you a project holder?

Only one response is possible

□ Yes *Proceed to the next section*

□ No *Finish*

2. Motivations for starting a start up

A. Please classify the following reasons for which you decided to start an entrepreneurial venture (start-up).

Choosing one response for each item.

Items	Not a reason at all	It might be one of the reasons	Primary reason
Persuing a new opportunity			
Solve a problem			
Gain a financial independence			
Turn a passion/hobby into a professional activity			
To have a positive impact on society/the environment			

3. AI knowledge and exposure

A. Are you familiar with the use of artificial intelligence?

Only one response is possible

□ Yes, I do

□ Not that much.

□ Not at all.

B. If yes, which type of artificial intelligence are you familiar with?

Multiple choices are possible.

□ Machine learning

□ Deep learning

□ Computer vision

□ Natural language processing

□ Robotics science

□ Explainable AI

C. In which areas of your business are you or planning to apply AI?

Multiple choices are possible

□ Marketing and sales

□ Finance and accounting

□ Logistic services

□ Customer Service

□ Product development

D. Are you currently using any AI powered tools or solutions in your entrepreneurial ventures?

Only one response is possible

□ Yes

□ No

E. Which of the following AI technologies are you currently using or planning to use in your entrepreneurial activities?

Multiple choices are possible

□ Deep learning

□ Machine learning

□ Natural language processing

□ Computer vision

□ Robotics science

4. The intention and the decision of project holders for integrating AI technologies.

A. Please evaluate the following motivations behind your start-up's decision to integrate artificial intelligence (AI) technologies

Choosing one response for each item.

Items	Not at all motivated	Slightly motivated	Motivated	Highly motivated
Improving operational efficiency and productivity				
Boosting the customer experience and engagement				
Gaining a competitive advantage through data driven insights				
Optimizing the pace of repetitive tasks and freeing up human resources				
Developing more innovative and viable business models				

B. How do you primary fund the integration of AI technologies within your entrepreneurial venture?

Multiple choices are possible.

□ Reinvesting profits

□ Seeking venture capital

□ Applying for government garant or subsides

□ Crowd funding companies

□ Obtaining bank loans or another debit financing

C. Please rate your level of confidence in your ability to effectively leverage AI technologies within your entrepreneurial activity.

Only one response is possible

□ Not at all confident

□ Slightly confident

□ Confident

□ Very confident

□ Extremely confident

D. What are the biggest obstacles that prevent you from effectively utilizing artificial intelligence in your entrepreneurial project? (Choose top 3)

Multiple choices are possible

□ Lack of AI expertise and skills within the team

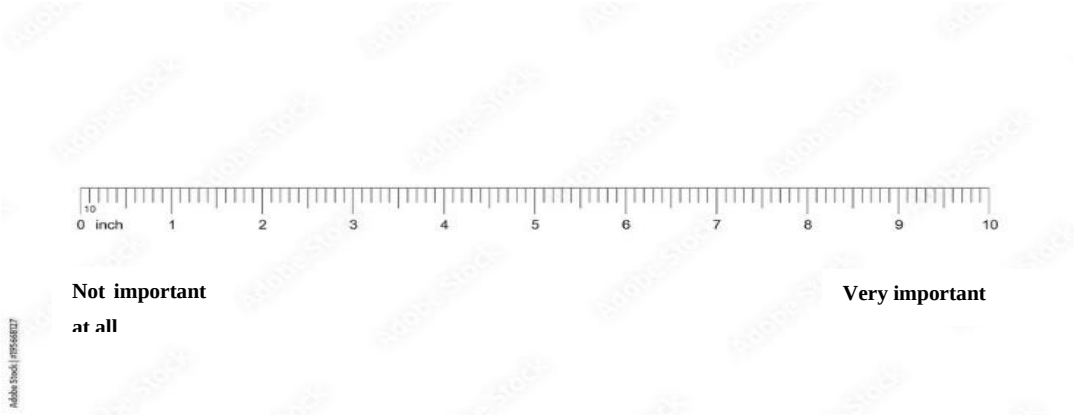
□ High costs of AI implementation and maintenance

□ Concerns about data privacy and security

□ Difficulty in identifying the right AI solution for the start-up’s needs

□ Resistance to change from employees to customers

E. On a scale of 1 to 10, how important do you think AI will be for the future success of entrepreneurial ventures?



5. Perceived benefits of AI integration

A. Which of the following AI powered capabilities have been or will be most beneficial to your entrepreneurial activity?

Multiple choices are possible

□ Automating repetitive tasks

□ Generating new business ideas or opportunities

□ Optimizing marketing and sales strategies

□ Improving operational efficiency

□ Boosting customer experience and engagement.

B. How interested would you be in participating in training, workshops or mentorship to learn more about using AI in entrepreneurial venture?

Only one response is possible

□ Not at all interested

□ Kind of interested

□ Interested

C. For each sentence, please rate your degree of agreement or disagreement about the benefits of AI for entrepreneurial ventures *

Choosing one response for each item.

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly disagree
Factor 1					
Factor 2					
Factor 3					
Factor 4					
Factor 5					
Factor 6					
Factor 7					

Factor 1: Incorporating AI capabilities significantly improves the operational efficiency and productivity of entrepreneurial ventures

Factor 2: The application of AI dramatically improves the ability to identify and evaluate novel market opportunities

Factor 3: The integration of AI technologies enables entrepreneurial ventures (start-ups) to develop more innovative and financially viable business models.

Factor 4: The implementation of AI-powered technologies boosts the efficiency, adaptability, and stability of entrepreneurial ventures' supply chain operations

Factor 5: AI systems offer the advantage of enhanced accuracy and consistency and business decision making.

Factor 6: Start-ups have a high degree of confidence in the ability of AI powered risk management and cyber-security systems to identify and mitigate and respond to potential threads

Factor 7: The incorporation of AI-powered marketing and customer segmentation capabilities markedly improves the entrepreneurial venture's ability to develop an effective, targeted marketing campaign and build a strong brand identity