AI-Powered Entrepreneurial Education: using AI to Train Future Entrepreneurs at Vienna University of Technology

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Abstract— The rapid advancement and integration of artificial intelligence technologies in business and society demand a complete reimagining of how we train future entrepreneurs. Currently, the educational support offered to the business sector focuses more on recognizing and exploring key technologies, including predictive and generative AI, alongside their implications and ethical concerns. Therefore, the separation between the two domains hinders the strategic implementation of AI technologies in this field and delays decision-making. A new approach to entrepreneurial education could facilitate skills-building to bridge this gap. This article focuses on identifying the state of the art for using artificial intelligence tools in entrepreneurial education by studying use cases, specifically the entrepreneurial education offered at Vienna University of Technology and the use of AI tools in this process.

Index Terms— entrepreneurial education, artificial intelligence, business informatics, entrepreneurship, business development.

I. INTRODUCTION

Modern healthcare has been playing an As Europe embraced the Industrial Revolution, a new educational paradigm emerged: entrepreneurial education. Traditional universities needed a different approach to forge a new generation of engineers and innovators capable of bridging the gap between theoretical breakthroughs and practical industrial applications. In response, France pioneered this movement with the establishment of ´Ecole Polytechnique and ´Ecole Centrale, Germany developed its network of Technische Hochschulen, Austria contributed to this educational renaissance with the Imperial & Royal Polytechnic Institute of Vienna[1] and in the USA, MIT was established under the motto Mens et Manus ("mind and hand" in Latin) to promote the progress, growth, and real-world utilization of science in conjunction with the arts, agriculture, industry, and trade[2].

Nowadays, entrepreneurial education is not only seen as critical for starting a business and economical strengthening of the ecosystem [3], it is applied to various majors and minors across university campuses, and it's role in the tech world and beyond is to equip students with the ability to be adaptable, flexible, creative, resourceful and innovative, qualities that are direly needed to thrive in today's rapidly changing industries.

However, as we entered a new era shaped by artificial intelligence (AI) where many countries worldwide have implemented national artificial intelligence policies, and the competition surrounding this emerging technology has become a key catalyst for industrial growth [4], the field of entrepreneurial education is yet to face a drastic reconfiguration. The rapid advancement and integration of artificial intelligence technologies in business and society demand a complete reimagining of how we train future entrepreneurs. Li Chen et. al. set out to identify the status quo of the adoption of AI in education through a scoping review conducted using six inclusive and exclusive criteria: the definition of intelligent technology, research question, educational purpose, research method, sample size, research quality and publication [5]. Their findings emphasize the already use of big data analytics to enhance the effectiveness of teaching and identify entrepreneurial opportunities. However, more advanced pedagogical designs for diagnosis, prediction, intervention, prevention, and recommendation are needed.

Currently, the educational support offered to the business sector focuses more on recognizing and exploring key technologies, including predictive and generative AI alongside their implications and ethical concerns [6]. The applied, hands-on exploration using these technologies is left to the data science experts, who often lack the business background to derive actionable insights. The separation between the two domains, therefore, hinders the strategic implementation of AI technologies to this field and delays decision-making. The scenario where data scientists are "overwhelmed" by the complexity and quantity of data, while business experts are "underwhelmed" by the tangible output of those data scientists, is not uncommon [7]. A new approach to entrepreneurial education could facilitate skills building to bridge this gap.

Building on the existing context, this article focuses on identifying the state of the art for the use of artificial intelligence tools in entrepreneurial education by studying use cases, more specifically studying the entrepreneurial education offered at Vienna University of Technology and the use of AI tools in this process.

II. CURRENT STATE OF ENTREPRENEURIAL EDUCATION

A close look at the entrepreneurial formats offered within academic institutions emphasized the multitude of formats existent on this specific topic. These formats go beyond the mere theoretical education on entrepreneurship and innovation to a more applied, experimental business training. Such formats include pre-incubation, incubation and acceleration programs, hackathons and competitions, entrepreneurship centers and hubs, funding and investment opportunities, networking events and conferences on innovation and entrepreneurship, an entrepreneur in residence or an advisor in residence program, platforms for innovation partnerships and investment and the traditional Technology Transfer Offices [8]. For example, the DutchCE university consortium in the Netherlands run about 600 events and programs per year for students, new entrepreneurs, and established businesses. Their offerings include: entrepreneurship classes for students, innovation challenges with companies and startups, a program to test business ideas called "Get Started", an incubator program named "Get Business" and various partnership formats for the more advanced startups[8].

An emerging trend in academia is the concept of 'Learning Factories,' which are educational replicas of industrial setups. For a Learning Factory to be considered industrially and educationally significant, it should ideally meet four key criteria: inclusion of authentic processes, reconfigurability, production of physical products, and incorporation of pedagogical elements to support learning [9]. Examples of such factories include the MIT.nano Fabrication Facility that provides cutting-edge nanoscale fabrication and characterization tools for research in nanoscience and nanotechnology, the M-Cube Pilot Plant (ETH Zurich, Switzerland) that focuses on sustainable chemical and process engineering for environmentally friendly manufacturing processes or SCALE-UP (University of Cambridge, UK) that focuses on logistics and supply chain research, offering a space to test new logistics technologies and strategies.

III. PAGE STYLE AI-POWERED TOOLS FOR ENTREPRENEURSHIP TRAINING

Contrary to the universal expert assumption that AI lacks creativity [10] and its minimal impact on the creative process [11], one technology stood out as one that could enhance or even replace tasks like idea generation, sales, scaling, content creation, and communication: Generative artificial intelligence [12]. This has sparked calls for its integration into entrepreneurship education to prepare students for future opportunities but at the same time the need for an assessment on its impact on teaching methods, pedagogy, assessment and its use for explorative entrepreneurship [13].

Integrating AI tools in the educational program for entrepreneurship is not only important for productivity, efficiency and competitiveness. The way how an entrepreneur is able to use these technologies can convey both positive and negative consequences [14]. Senior practitioners surveyed by the IBM Institute for Business Value and Oxford Economics in 2023, believe that the greatest value from generative AI will come from its application in operational, product, service, and business model innovation, although transitioning to complex business model innovation is a significant challenge [15]. Currently, AI tools like for example IBM Watson, Ideanote, or GrowthBot can help entrepreneurs discover and implement new business models by analyzing market trends, consumer behavior, and operational data at scale. While IBM Watson, the tech giant's AI platform, offers extremely useful tools for business model innovation by analyzing market trends and consumer behavior to suggest new strategies, training future entrepreneurs on such a complex platform can be challenging. Users require specialized skills to integrate and maintain and the cost alone cannot be covered by a university already strained with resources.

Idea generation plays a crucial role in both intrapreneurship and entrepreneurship. It serves as a cornerstone of the business development process taught to entrepreneurs, and assisting AI tools also exist to facilitate this process. Ideanote for example uses AI to crowdsource and refine business ideas. However, this places input data at the core of the process, opening the door to biases and a decrease in the quality of the ideas generated (especially in cases where the users need more expertise and experience). Synthesizing and prioritizing the ideas generated can also prove challenging.

Tools that promise to generate potential growth strategies based on existing business data could also be helpful in an entrepreneur's arsenal. GrowthBot, is such an example but its effectiveness depends on the quality and completeness of input data. The less accurate the data, the less actionable the insights. Such tools also come with the disadvantage that they lack references to risk management and operational efficiency and cannot be used for first-time entrepreneurs starting up where there is a clear lack of any data.

Baden-Fuller and Haefliger highlight the strong connection between technology and business performance, asserting that the business model serves as the crucial link between them [16]. Business model innovation is therefore essential for ensuring resilience in the rapidly evolving software industry, especially as technological advancements continue to reshape the landscape. In the open-source software sector, where traditional revenue models are often challenged, the ability to innovate business models is critical for maintaining competitive advantage and sustainability [17].

According to Lazzaroti et al., entrepreneurial firms have also been particularly interested in the artificial intelligence-human sequential decision-making model for its

potential to improve open innovation strategies.

This model is practical because it shifts the focus of problem-solving from the costly process of fathering solutions to the more efficient tasks of assessing and choosing the best ideas suggested [18].

Outside predicting future revenue streams based on emerging trends, AI tools are also being used for the generation of investment slide decks. More specifically, tools used in the process of generating investor pitch decks have become widely popular. Such tools include ProAI, Upmetrics, and Beemerdocs. Some provide more than just presentation generation; they offer additional research and industry insights, financial projections, and even guidance on fundraising strategy and valuation and all the visuals needed to convey a promising business case properly.

IV. TRAINING FUTURE ENTREPRENEURS AT VIENNA UNIVERSITY OF TECHNOLOGY

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

Armed with an overview of the entrepreneurial educational landscape, for the purpose of this research, we focused on a specific case study: the entrepreneurial programs offered by the Vienna University of Technology and how artificial intelligence tools are being used within these formats. The Vienna University of Technology was selected as a study case since it provides a unique blend of technological knowledge and business knowledge under the umbrella of the "Business Informatics" bachelor and master programs.

For the purpose of this research, we've conducted an analysis of the courses and formats offered using the website of the university and its course management tool, TISS, followed by nine interviews with students who attended at least one of the identified courses. The university offers 42 courses where entrepreneurial topics are included and, additionally, eight formats for applied entrepreneurial education for its academic personnel, including a Technology Transfer Office and an Innovation Incubation Center running a pre-incubation, incubation, and various formats bridging the gap between research and product. The latter are highly personalized and focus on the specific needs of the technologies developed at the university, which makes them difficult to compare and evaluate. At their core lies the concept of mentoring and input sessions, where expert input comes from well-versed experts from the industry. Interestingly enough, the early formats were built initially at the Faculty of Informatics and rolled up cross-university together with a re-branding into the services of the Innovation Incubation Center.

Specific to TU Wien and the topic at hand are three programs: a bachelor's and a master's in Business informatics[19] [20], where the focus is on the application of information technology in companies and the design of business processes and additionally an external curriculum on innovation: Extended Study on Innovation[21] open to all master students of the university that fosters innovation thinking fosters innovation thinking and offers a solid education and network for entrepreneurial spirits, business developers and/or innovation managers.

Three students from each program were selected for an interview. The results of the interviews with the bachelor students revealed that the study program contains multiple elements that are relevant to entrepreneurial formation. The courses offered range from the basics of business administration to economics and management and various courses on organization management and optimizations. However, those courses focus more on understanding the basics, and even if they do have a lot of applied work in the forms of use cases, discussions, and building organizational strategies, there are very few tools presented for the actual entrepreneurial application (e.g., the software environment R). The focus of the AI-focused course is to understand current methods, algorithms, and prompting techniques of Generative AI, including, for example, Large Language Models such as ChatGPT. Additionally, there is a great emphasis on data visualization.

In short, the study program lays a solid foundation for running a business. Still, it emphasizes the technical skills required to develop tools where AI can be applied in the business sector. Similarly to the interviews with the bachelor students, the interviews with the master students also emphasized the interdisciplinarity approach of combining IT and business. The study program also offers an optional "Innovation" subject that focuses explicitly on entrepreneurship skills. Overall, the study program provides an excellent education for analyzing, designing, and implementing information systems in business settings, but the students have not recalled explicitly working with AI tools. Instead, they have worked on developing AI tools for business needs. The students see themselves more as a bridge between technical and business aspects.

For the third category of interviews, the students who underwent the Extended Study on Innovation praised the hands-on entrepreneurial education they received. They considered it a great complement to the solid technical skills they already possessed, and the fact that it was offered parallel to the other study programs but happening only in the evenings or weekends allowed them to expand their skills fast without direct interference with their current study program. Unfortunately, they could not recall using specific AI tools during the courses. Still, the content provided was valuable for the ones interested in starting AI-driven businesses, which was the case in the cohorts of one of the students interviewed. One of the students also mentioned that AI tools were less widespread when the individual underwent the courses and expects that now more AI tools are being integrated into the

learning process. On the other side, one student expressed his reserve towards the existing AI tools on the market right now due to the potential for made-up results (hallucinations) and emphasized that even with strong, powerful AI tools, validation is a step that should not be missed in any entrepreneurial journey.

V. FURTHER RESEARCH

Considering the intricate complexities, limitations, and nuances, it becomes evident that certain topics, due to their depth, could not be fully addressed in the research journey. A first example is the focus on the entrepreneurial formats offered to students. The study can be expanded to incorporate as well the formats identified for the academic personnel.

Moreover, a longitudinal study could be implemented to track how the use of AI tools evolved over time in the context of entrepreneurial education at the Vienna University of Technolgy. This could help identify trends, challenges, and best practices in incorporating emerging technologies into entrepreneurial curricula.

Further research could also take the form or a comparative study across multiple universities from various geographical regions on how they integrate AI tools in their entrepreneurial educational programs.

VI. CONCLUSIONS

Vienna University of Technology offers a comprehensive entrepreneurial education landscape, combining technological and business knowledge through its Business Informatics programs and additional entrepreneurial formats. However, there is a noticeable gap between the technical education in AI and the practical application of AI tools in entrepreneurship courses.

The university provides a significant number of entrepreneurship-related courses (42) and also additional formats for the academic entrepreneurial education. The study case focused exclusively on the programs offered to the students, not the ones for the academic personnel.

While the Business Informatics programs (both bachelor's and master's) provide a strong foundation in IT and business, they focus more on developing technical skills for AI application in business rather than explicitly teaching the use of AI tools for entrepreneurship.

The Extended Study on Innovation program offers valuable hands-on entrepreneurial education, complementing the technical skills students acquire in their main programs, but at the time of the interviews, it did not heavily incorporate AI tools in its curriculum. However, AI could be incorporated into projects and ideas developed by students.

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