

Be an entrepreneur: Empowering with Data-Driven Decisions

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Be an entrepreneur: Empowering with Data-Driven Decisions

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Abstract

In the contemporary digital era, small business owners encounter mounting pressure to adapt to evolving market demands, frequently with constrained access to data analytics resources. This study investigates how Knime, a complementary data analytics platform, enables entrepreneurs to make informed, evidence-based decisions by analyzing customer behavior, market trends, and operational efficiency. By employing Knime, businesses can optimize processes, personalize services, and identify growth opportunities. This study examines the integration of Knime training into the Be an Entrepreneur program, highlighting its role in fostering innovation, improving decision-making, and enhancing the competitiveness of new ventures in Colombia's dynamic business environment. The project aims to equip engineering students with essential data analysis skills to prepare them for the modern labor market. The study's specific objectives are as follows: to promote evidence-based decision-making, to improve customer-focused product customization, to generate competitive advantage, to improve decision-making under uncertain conditions, and to promote continuous quality improvement. The curriculum is being updated to meet the demands of the labor market and technological advances. The methodology includes identifying educational needs, setting clear objectives, designing and implementing the curriculum, and continuously evaluating its impact for improvement. Research findings have indicated a substantial enhancement in students' capacity to formulate data-driven decisions through the utilization of the Knime platform. A notable 30% increase has been observed in students' critical thinking skills, particularly in the domain of evaluating complex arguments. Practical scenarios, such as the prediction of car theft patterns in Medellín, have exemplified how data analysis can facilitate informed decision-making in real-world contexts. The study also highlighted the importance of gaining a competitive advantage, adapting to market changes, and embracing continuous improvement—all critical skills for entrepreneurs in today's fast-paced business environment. The successful curriculum update provided students with relevant skills in data analysis, enabling them to make strategic business decisions. It emphasized the role of data-driven insights in improving business performance, increasing efficiency, and maintaining market relevance. The study concluded that data analysis is a powerful tool that drives innovation and deepens understanding of critical business and societal factors. The study demonstrated the effectiveness of using Knime to enable data-driven decision-making and gain a competitive advantage. The study underscored the importance of adaptability, continuous improvement, and informed decision-making in sustaining long-term business success. The integration of Knime into the Be an Entrepreneur program has been demonstrated to be a viable method of equipping students with essential technical skills and preparing them for the challenges of the modern business environment. Updating the curriculum also supports ongoing relevance in the rapidly changing labor market, ensuring that entrepreneurs are equipped with the tools they need to succeed.

Keywords: Data-driven decision-making, Entrepreneurship education, Competitive advantage, Curriculum development.

Introduction

In the contemporary digital era, the rate of transformation and innovation is staggering. Small entrepreneurs encounter the challenge of maintaining congruence with market demands, swiftly adapting to novel technologies, and catering to the evolving needs of customers. It is imperative to acknowledge that the initiation of any enterprise is inherently arduous and frequently necessitates financial resources that are often not readily available to entrepreneurs [1]. To address this need, complimentary tools such as Knime have been developed to facilitate the analysis of corporate data. Statistical knowledge is vital for decision-making based on evidence rather than assumptions or intuitions, identifying unexplored market opportunities, profitable market niches, and specific customer segments that could benefit from products or services.

KNIME assists entrepreneurs in customizing their products or services according to the specific preferences and needs of each customer (see Figure 1).

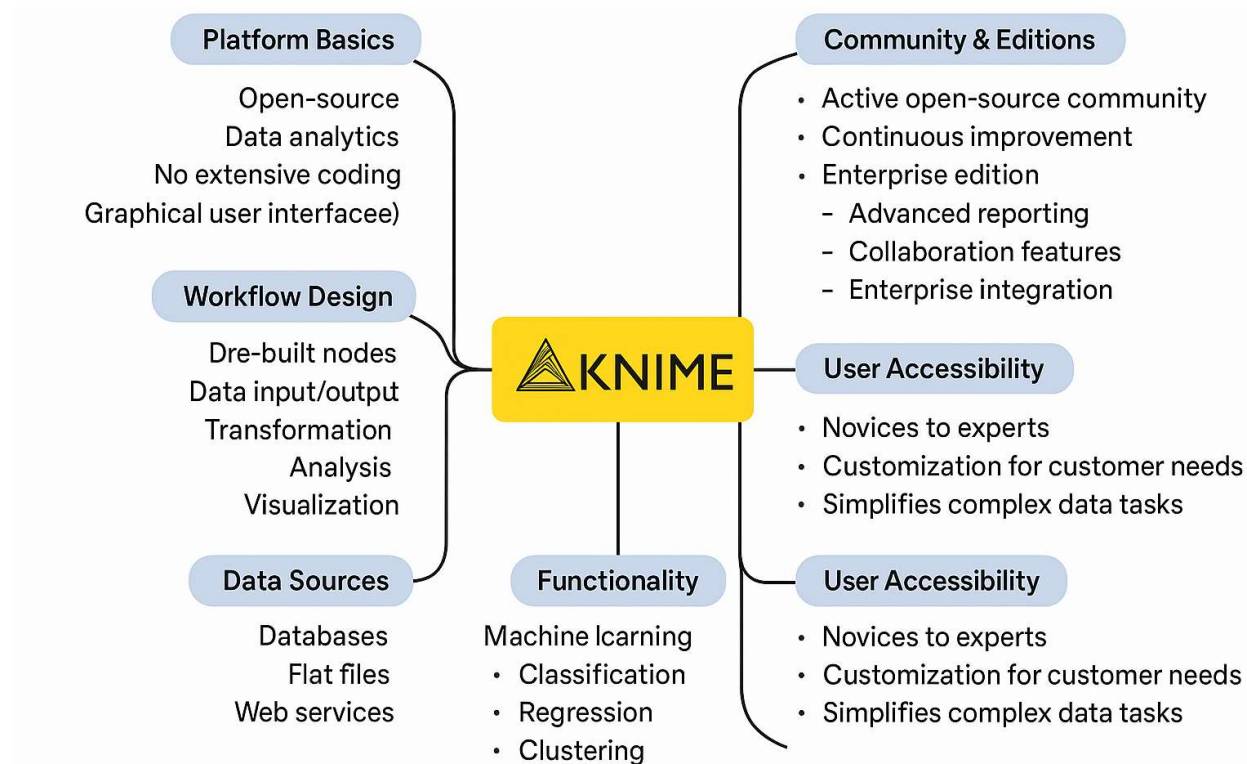


Figure 1. KNIME description.

KNIME, an open-source data analytics platform, offers a robust environment for data analysis, visualization, and integration without necessitating extensive programming knowledge. Designed with an intuitive, graphical user interface, KNIME allows users to construct complex data workflows by connecting pre-built nodes, which represent specific tasks such as data input, transformation, analysis, and output. This approach significantly simplifies the process of building data analysis pipelines, making it accessible to both novice and experienced users. The platform's

versatility is further demonstrated by its ability to support diverse data sources, including databases, flat files, and web services, as well as its capacity to seamlessly integrate with other tools such as Python, R, and Apache Spark. Additionally, KNIME's support for various machine learning algorithms enables users to implement models for classification, regression, clustering, and more. The platform's open-source nature fosters an active community of developers and users who contribute to its continuous improvement. While the free version is widely used, KNIME also offers an enterprise edition with enhanced features for professional and collaborative environments, such as advanced reporting tools and enterprise-level data integration. As data science continues to evolve, KNIME stands as a powerful tool for simplifying complex data tasks and facilitating accessible, collaborative analytics.

The ability to comprehend and effectively utilize Knime's information observation tool as an analytical instrument is of paramount importance for an entrepreneur seeking to achieve success in the provision of essential tools, the optimization of operations, the customization of services and goods, the forecasting of difficulties, and the maintenance of permanence in the marketplace. This study will provide a comprehensive understanding of the impact of this new learning on entrepreneurship program members and the positive impact of this new technological era. The study will do so through a thorough exploration of the process, research of all kinds of events, and conducting interviews with subject matter experts.

The implementation of Knime training, a complementary program grounded in artificial intelligence, is imperative for entrepreneurs to optimize their business processes, make more informed decisions, and enhance operational efficiency. Educating entrepreneurs on this platform enables them to identify opportunities for innovation in their respective industries and differentiate their products and services in a competitive marketplace. In the contemporary business landscape, characterized by the advent of this novel technological era, Knime has emerged as a pivotal instrument. Its integration into business processes can prove instrumental in determining competitiveness and fostering sustained success. In this conceptual framework, we will delve into the necessity of the training program for entrepreneurs, emphasizing its capacity to enhance process efficiency, stimulate innovation, personalize consumer experiences, and predict market trends. This facilitates entrepreneurs to channel their efforts towards value-added activities. The integration of Knime within business processes has been demonstrated to enhance operational efficiency, stimulate innovation, personalize consumer experiences, and augment predictive capabilities. This integration enables entrepreneurs to allocate their resources toward value-added activities, fostering a competitive edge and ensuring long-term success. Qualitative methods, for instance, facilitate the examination and understanding of customer behavior, ensuring the delivery of products or content tailored to their preferences and anticipating market trends to facilitate informed decision-making in response to environmental variations. To illustrate this point, we will examine the use of machine learning models that facilitate the analysis of social network data and review information to identify patterns and predict market changes. In summary, the incorporation of the Knime platform into business processes can yield substantial benefits for growing entrepreneurs, including enhanced operational efficiency, innovation, consumer experience, and predictive capabilities.

The state of the art (see Figure 2) has led us to know how today's corporate universe, along with the observation of information, has become a primary mechanism for the triumph of companies. For the growing entrepreneurs, background research provides a chain of advantages that become key to the increase and competition in the business world.

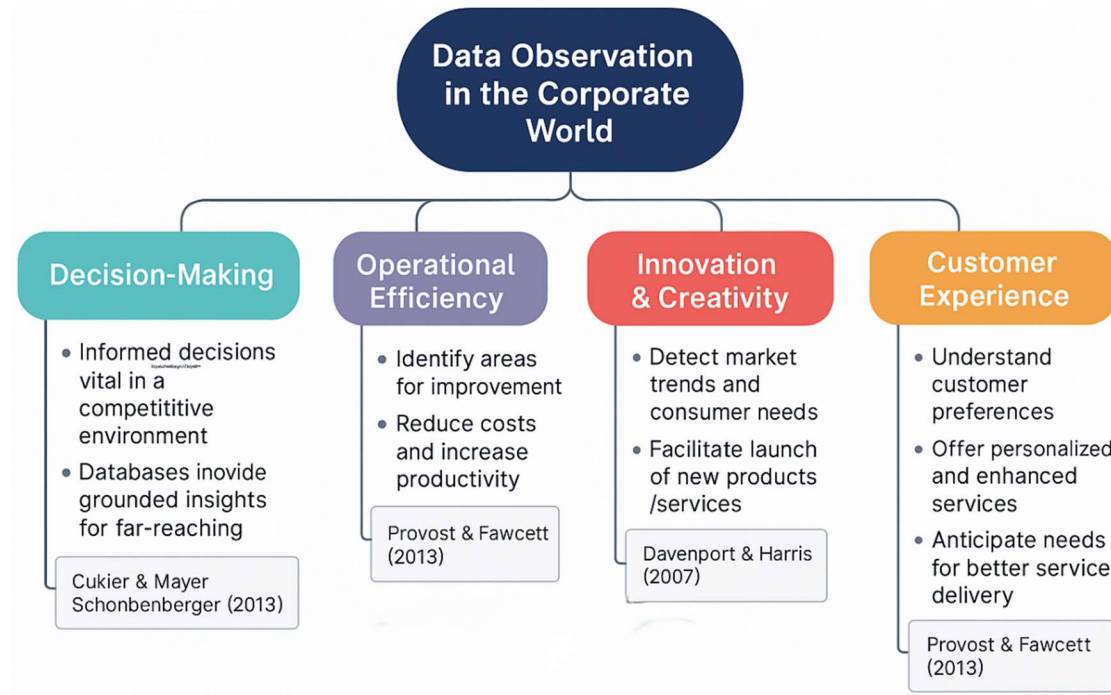


Figure 2. State of the art.

In this context, we study the relevance of data examination to be performed by each member of the entrepreneurship program, focusing on how to improve decision-making, promote creation, optimize organizational efficiency, and make the consumer experience better every day. Data observation performs a decisive role in success, providing several important primacies in other areas of business. Data analysis allows them to better intuit the requirements and favoritism of their consumers, enabling them to provide more distinguished and personalized products and services. In addition, Provost and Fawcett note that data analytics can also help them optimize operational efficiency by identifying areas for improvement, reducing costs, and increasing productivity [2]. In a highly competitive business environment, the ability to make informed decisions is critical to the success of entrepreneurs. According to Cukier and Mayer-Schönberger, the study of databases provides important information grounded in realities that contribute to more insightful and far-reaching decisions [3]. In addition, Davenport and Harris indicate that data observation can spur invention by providing valuable information about market propensities and consumer requirements, which helps deploy new goods or services and stand out in the marketplace [4]. Background research can help entrepreneurs embody the buyer's experience by anticipating their requirements and promising a more distinguished and pleasurable service. In conjunction, Provost and Fawcett emphasize that data research can also help entrepreneurs optimize organizational efficiency by identifying areas for improvement and refining the capital allowances they will make in their budget [2].

The capacity of the Knime platform to facilitate comprehensive data examination is a pivotal factor in the success of entrepreneurs. By furnishing valuable background information, enabling informed decision-making, fostering innovation, enhancing consumer experience, and optimizing business operational efficiency, the platform plays a crucial role in entrepreneurial endeavors. The adept utilization of data analysis tools and methodologies by entrepreneurs is instrumental in achieving competitive superiority within the marketplace, thereby unveiling novel growth and expansion prospects.

The proposed program's implementation hinges on the Knime Platform, a free, downloadable, and highly flexible program that facilitates the analysis of information by simply entering a database and classifying the variables. The program then displays the results graphically in the form of a tree of possibilities, which elegantly presents the findings and associated probabilities of occurrence according to the analysis of the provided information. It is imperative to identify the salient factors of the database and load the information of interest in Excel, which has been duly completed. This is of paramount importance in the training program.

The Be an Entrepreneur initiative is a comprehensive endeavor designed to promote entrepreneurship and support the development of successful ventures in Colombia. It is implemented through counseling, support, training, and financing. The invention of companies is a viable means of generating income and employment opportunities. The entrepreneurship program is carried out through the following: orientation, in which participants will be instructed on how the Fund for Entrepreneurs works and the requirements of the program; training, in which participants will be able to take part in learning processes to better develop and achieve entrepreneurial skills and aptitudes; and business idea modeling, in which a business method will be created and a viable product will be accepted. Additionally, a presentation will be made, and feedback on the business offer will be received.

Methodology

The overarching objective of the project is to facilitate the acquisition of pertinent skills and knowledge in data analysis for the contemporary and prospective labor market by the engineering students of the "Be an Entrepreneur" program. This general objective will be accomplished through the implementation of five specific objectives (see Figure 3) as to assist students in making evidence-based decisions, to facilitate the identification of patterns and trends to predict future behaviors, to promote the utilization of the Knime platform to enhance data analysis capabilities, to encourage the application of data analysis in the identification of trends and patterns to predict future behaviors, and to promote the integration of data analysis into the "Be an Entrepreneur" program to equip students with the necessary skills and knowledge for successful navigation of the contemporary and future labor market.

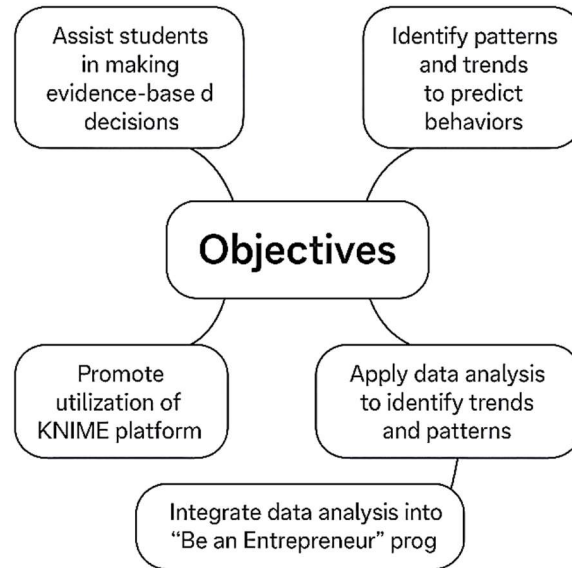


Figure 3. Objectives.

Furthermore, program members will acquire the ability to understand customer needs and preferences, enabling them to customize products through data analysis. A secondary objective is to cultivate the capacity to generate competitive advantage, thereby enabling the program to adapt swiftly to market changes and make optimal decisions. Finally, students will learn to make more informed decisions. In situations involving uncertainty, students will learn to make more informed decisions by analyzing data to identify areas requiring enhancement in quality and efficiency, thereby contributing to continuous improvement and excellence. Finally, the curriculum of the Be an Entrepreneur program will be updated to ensure that academic knowledge is aligned with current trends, the needs of the labor market, and advances in research and technology. The overarching objective is to implement the Knime platform within the Be an Entrepreneur training program, particularly in the context of this digital era. It is imperative to acknowledge that the knowledge and utilization of artificial intelligence data analysis tools, such as Knime, can be pivotal to the success of an entrepreneur. In this case, the program's participants will have access to crucial information, enabling them to make informed decisions, optimize operations, customize products and services, predict potential issues, and maintain competitiveness in the market. To address this research question, we will examine the impact of the curricular integration of the Knime platform in the To Be Entrepreneur training program in this new digital age?

The method developed will start with the identification of educational needs: The first step is to identify the educational needs of the members of the Be an Entrepreneur program and the demands of the environment. This involves analyzing the educational context, student expectations, labor market trends, and current educational policies. The educational objectives must be defined once the pedagogical needs have been identified. Clear and achievable objectives must be established for the training program; these goals should be concrete, calculable, attainable, and important [5].

The curriculum will also have to be designed, which includes the selection and sequencing of the study material, the definition of teaching techniques, and the assessment of this platform. Likewise,

the implementation of the curricular program will have to be carried out because, once traced and suitable, we can proceed to the realization of it in the classrooms. During this phase, it is imperative to continuously monitor and evaluate the progress of students, as well as to compile feedback from educational staff and students to make adjustments if necessary. Therefore, it will be essential to assess continuous improvement to ensure its effectiveness and implement adjustments or improvements as needed. This involves examining the effects on student learning, feedback from all teachers involved, and feedback from stakeholders externally to certify quality and preeminence. In summary, the execution of a successful training program requires meticulous organization, efficient implementation, and continuous assessment to ensure that the pedagogical objectives are achieved and the expectations of the students and society at large are met.

Results

The main goal of this research project is to contribute to the students of the Sea Entrepreneur program to achieve relevant skills and knowledge of statistical analysis [6], knowing the market, consumers, and other influential factors through the knowledge of the Knime platform.

It was established following the study conducted by Abrami on the academic orientations aimed at deploying critical thinking practices in students; it transcended that the participants of the program revealed a greater ability to assess the effectiveness of arguments shown in written texts and oral parliaments. A 30% increase in the accuracy of argument estimation after the use of the program was analyzed, and the effects of the meta-analysis provided an ordinary view of the most successful skills and their effects on the development of more critical thinking. This contributed to the evaluation of techniques such as challenge-based learning, guided discussion, structured critical thinking, and clear teaching of critical thinking strategies. In synopsis, the article by Abrami and his collaborators provided a consistent basis for the characterization of practical skills for teaching critical thinking. This can be something too important for instructors and professionals in outlining educational programs and their methodological construction, as well as teaching methods focused on the complete development of learners. Expanding students' ability to consider data more analytically and decipher between distinguished and irrelevant data undoubtedly generated skills in decision-making and being more rational in normal and academic situations [7].

An inquiry by Dunlosky et al. found that the most effective study tactics about academic interest are those that include practical topics, given that most participants tended to improve their learning capacity by performing an exercise that fully simulates a real scenario, and this contributed to determining how practice makes true masters in doing [8]. This ensures that implementing Knime's knowledge as a practical tool in a real scenario can be effective in achieving more critical thinking when making decisions as future entrepreneurs.

The first specific objective was to get students to make evidence-based decisions, identifying patterns and styles to predict future behaviors or identify opportunities in their entrepreneurship, it was shown that the research of Dunlosky et al. focuses on recognizing the most certain study skills and their impact on student's academic interest, the research findings indicate one of the three study strategies that are especially effective in optimizing students' academic gain being the practical

process through real scenarios, the study provided evidence that supports the acceptance of these study techniques by school children and suggests that they can be valuable tools to improve learning and information retention in educational environments, giving us the argument to recommend Knime as a didactic and effective learning platform for entrepreneurs in the Entrepreneurial Training program [8].

Different modes of decision-making, such as reasoned and instinctive decision-making, and how these styles affect key variables such as utility, organizational efficiency, and innovation are studied. The findings of this research show that companies that adopt more analytical and data-driven approaches tend to perform better than those that rely more on intuition and uninformed thinking. The study underscores the importance of informed, data-driven decision-making for the long-term success of companies in an increasingly competitive and complicated corporate environment. This study provides an important insight into how making informed decisions can increase the success of a company, highlighting the importance of adopting analytical and data-driven approaches to improve organizational performance. This highlights the importance of the platform being implemented in the curriculum because this platform was based on real data analysis and not on intuition, and this will make companies successful if they know how to analyze this information correctly [9].

The second objective of this research was for the students in the program to learn how to generate competitive advantage, given that they can quickly adapt to changes in the market and make better decisions. The competitive advantage is possible through the development of a comprehensive set of skills, including technical, professional, and technological expertise, which is critical to succeeding in the increasingly competitive global job marketplace[10]. According to a McKinsey report, companies that retain a competitive advantage are 50% more likely to endure and prevail despite strong competitors over the long term. This advantage not only translates into higher economic performance but also greater adaptability in the face of market disruptions and economic changes [11]. According to a Harvard Business Review, 78% of customers prefer a brand based on personalized and relevant experiences. In addition, having a consistent competitive advantage can promote invention within the company. According to PwC data, 77% of CEOs reflect that creation is a fundamental part of their ability to be accretive and competitive. By excelling in specific areas, companies can invest in exploration and development to maintain their market leadership position [12].

The third objective covered how to help program participants learn to make more informed decisions in situations of uncertainty. In a world characterized by volatility, uncertainty, complexity, and ambiguity, the ability to make sound decisions in times of uncertainty has become critical for organizations. In a Deloitte report, 81% of executives meditate that their corporate environment is more uncertain than ever, making dispositions in contexts of indecision demands careful estimation of varied elements and a thorough study of dangers and chances [13]. These skills are required in the new vocations for Industry 4.0 [14] due to their importance in the Fourth Industrial Revolution [15]. A study by the Harvard Business Review found that 72% of industrial leaders identify the capacity to make instructed decisions under uncertain contexts as one of the most significant skills in business success [12]. The importance of making fine-tuned decisions in times of uncertainty manifests itself in the economic benefit to companies. According to a

McKinsey report, companies that make effective judgments in times of indecision have a 20% higher financial benefit than those that do not [11]. This contrast in performance can be conclusive for the preservation and growth of a company in a competitive corporate environment. In addition, the ability to make sound decisions in times of uncertainty can improve resilience in the face of crises and unforeseen changes. According to a BCG study, 90% of the companies that survive economic crises are those that make bold and light decisions to adapt to change [16].

The fourth objective of the research was based on learning how to analyze data to identify areas that require improvement in quality and efficiency, which contributes to continuous improvement and excellence. Continuous improvement is a consistent approach that seeks to always optimize a company's processes, products, and services to achieve higher levels of efficiency, quality, and customer satisfaction. According to a report by the American Quality Association, 95% of companies that implement a continuous improvement approach see dramatic improvements in the quality and efficiency of their operations. The great importance of continuous improvement radiates in its impact on the financial benefit of companies. A study executed by the University of Warwick found that companies that adopt processes having to do with continuous improvement have a 26% increase in profitability in balance with those that do not. In addition, 87% of executives evaluated in a McKinsey report stated that continuous improvement is paramount to remain competitive in the marketplace [17]. In addition, continuous improvement helps improve customer satisfaction. A Bain & Company report found that companies that deliver greater customer experience have 4 to 8 times faster revenue development than their competitors. Continuous improvement helps identify and address customer needs and expectations proactively, leading to greater customer loyalty and retention. With these results, we conclude that it is of vital importance to have a platform that allows students to continuously improve their organization, which can be done through knowledge of the Knime platform since they can know the trends and improve products or services according to customer requirements.

Finally, our fifth objective was to update the curriculum of the entrepreneurship program to ensure that academic knowledge is aligned with current trends, the needs of the labor market, and advances in research and technology, as a result of this objective, we can say that we have a completely positive outlook to achieve the implementation of this platform in the curriculum of the entrepreneurship program, ensuring the effectiveness that this can have on students, providing them with technical skills in statistical analysis so they can face business environments with strength and can make good decisions as entrepreneurs [18].

As a practical case and analyzing the results section in a real scenario, we want to talk about how police officers in the city of Medellin, used this tool to predict the behavior patterns of car theft and thus take predictive and corrective measures in this situation, then, the description of the case: The data analysis is carried out to determine variables that allow us to evaluate the result and analyze the strongest trends regarding the modality of vehicle theft in the city of Medellin.

The process was carried out through the Crisp DM methodology [19], based on six fundamental phases such as: understanding the business and data, data preparation, and modeling, to finally reach an evaluation and implementation of the most objective model provided by the program; In this case, the Knime program, which allows through the different nodes, segments the information

for better understanding, the overall objective was to create a model to predict the probability of vehicle theft in Medellín, determining the pattern of behavior concerning gender and location, to take preventive mitigation measures. Initially, the police department performed the data cleaning and verified that all the information was properly filled out, likewise, unnecessary columns were removed to handle fewer characters, to obtain a reliable database when generating the official results of the databases, in the modeling of the data the relevant variables were chosen in this case was: Y: Male or Female X: Place (where the car theft is committed) For example, the variables to be included in the model were selected from the database, the units of the quantitative variables were homogenized, and the Partitioning model was chosen: 70% of the database will be used to create the model and the remaining 30% will be used as a test mode, with the Logistic Regression Predictor node the prediction was made with 30% of the virgin information and the selected variable.

A total of 10 variables from the database were entered into the modeling to best explain Y, as determined by the decision tree learner node that was modeled with 70% of the data. The following variables were entered into the modeling: age, model, sex, modality, weapon, Medellín neighborhood, quantity, place, stolen goods, and car color. According to the decision tree learner node that was modeled with 70% of the data, only two of the ten variables that best explain Y were identified, as evidenced in the previously mentioned decision tree on the platform. These two variables were identified as first stay: age and second stay: place. The analysis of the decision tree revealed that in the city of Medellín, the modality of car theft is primarily influenced by the age range of the victim, with individuals between 37 years of age being the most frequently targeted. In second place, the location where the theft is committed is the public road, which was identified as the preferred location for theft, with a total of 297 recorded instances. The type of weapon used was the third most significant variable, while the model of the stolen car was found to be the least influential factor in the model. The information obtained from the data analysis was determined to be viable through the methodology with decision trees carried out in the Knime platform, where a probabilistic model was generated. This probabilistic model was generated to meet the objectives of data mining, analyzing the behavioral patterns linked to the conflict that was presented, and generating prediction scenarios following the behavior of the initial statistical data, ensuring proper analysis yielded several key findings. First, the analysis identified key variables associated with car theft in Medellín. Notably, the analysis revealed that the victim's age is a primary factor contributing to car theft. The analysis further identified that individuals aged 37 years old are the most frequent victims. Additionally, the analysis identified the location where thefts occur.

The analysis revealed that the modality without a weapon was the most prevalent, with a total of 147 cases, followed by the use of a firearm, with a total of 94 cases. The model of the stolen car emerged as the least influential variable in this prediction model, thereby validating the efficacy of the data analysis in generating a probabilistic model that met the established objectives. This model was developed to systematically analyze behavior patterns associated with the conflict presented by the company, and finally, prediction scenarios were generated according to the behavior of the initial statistical data, ensuring correct coordination of the information. With this information, the agents decided to conduct prevention and awareness talks in the neighborhoods, focused on men over 37 years old, owners and drivers of vehicles.

To mitigate the risk of car theft, the following recommendations are hereby made: Firstly, it is advisable to refrain from parking on public roads. Secondly, vehicles should be parked in areas designated for parking or in legalized parking lots that are equipped with surveillance and security cameras. The installation of audible alarms or anti-theft devices is also recommended. It is imperative to avoid leaving keys in parking lots, car washes, or service garages. In addition to these measures, there is a need to strengthen surveillance and control of vehicle parking on public roads. The initial objective was to predict which gender is more susceptible to robbery and the most prevalent locations for such incidents in the city of Medellin. This was achieved by employing a classification rule with decision trees to identify patterns. The subsequent objective was to mitigate risk by creating a safer environment. The results indicated that individuals of the male gender are more prone to victimization on public roads. The second objective was to identify the locations with the highest theft risk index through the explanation of the rank of variables to identify the main factors that best expose the behavior pattern of gender concerning the type of place used for theft. This objective was fulfilled: it was predicted that public highways are the most risky place for this type of theft, with a The probability of such an event occurring was determined to be 71.6%, followed by residences with a probability of 9%. Similarly, the decision rule for the gender most likely to become a victim of vehicle theft in the city of Medellin was identified as: Male = older than 37 years - modality: theft without a weapon - Place: Public roads.

Conclusions

Data analysis is a potent instrument that propels innovation, facilitating a more profound comprehension of the elements that could exert a positive or negative influence on the company, as well as the progress in all facets of society. Its significance lies in its capacity to transform data into transcendental knowledge, which exerts a decisive impact on the company's success.

In the development of our second objective regarding competitive advances, it was determined that the analysis of statistical data through facile and agile platforms such as Knode is a fundamental tool in the modern world. The significance of data analysis in a highly competitive business environment is evident in its ability to provide valuable information that helps companies better understand their customers, identify market opportunities, and optimize their operations. The implementation of informed, data-driven decisions has been shown to improve efficiency and profitability while helping to maintain competitiveness in an ever-changing marketplace.

It was determined that certainty is a very important aspect that every entrepreneur must learn to manage. In the development of our third objective, it was realized that the biggest problem faced by companies is to adapt quickly to the market. Although the data will never give a 100% probability, they can get very close to the possible events that the company may have.

It was evident that companies failing to perpetually enhance their processes and maintain a state of constant change will face challenges in maintaining their competitive edge. The concept of continuous improvement, which was identified as a key objective, underscores the necessity for companies to invest in technological advancement and pursue avenues for continual enhancement. Those who neglect to do so risk being left behind and surpassed by their competitors in a rapidly

evolving business landscape. Entrepreneurship is a continuous endeavor, and customers invariably seek products and services that align with the demands of evolving generations.

The objective of this project was to instruct entrepreneurs enrolled in the "Be an Entrepreneur" program in the utilization of Knime as a technical instrument. The efficacy of this initiative was ascertained through comprehensive research, which also encompassed a multifaceted demonstration. The primary objective was to revise the curriculum, a decision that was reached after conducting exhaustive studies. These studies culminated in the conclusion that the integration of training programs equipped with contemporary technical instruments is of paramount importance in the contemporary business landscape. This is primarily due to the necessity for practical and cost-effective solutions that can facilitate the training of entrepreneurs.

References

- [1] L. Valdez-Cervantes, L. A. Cruz-Salazar, S. R. Yanten, M. M. Larrondo-Petrie, J. D. Texier-Ramirez, and J. S. Sánchez-Gómez, "Enhancing Engineering Education through DEI: A Pathway to Inclusive Future Practices," in *2024 World Engineering Education Forum - Global Engineering Deans Council (WEEF-GEDC)*, IEEE, Dec. 2024, pp. 1–6. doi: 10.1109/WEEF-GEDC63419.2024.10854945.
- [2] F. Provost and T. Fawcett, "Data science and its relationship to big data and data-driven decision making," *Big Data*, vol. 1, no. 1, pp. 51–59, 2013.
- [3] V. Mayer-Schönberger and K. Cukier, *Big data: A revolution that will transform how we live, work, and think*. Houghton Mifflin Harcourt, 2013.
- [4] T. H. Davenport, J. G. Harris, G. L. Jones, K. N. Lemon, D. Norton, and M. B. McCallister, "The dark side of customer analytics," *Harv Bus Rev*, vol. 85, no. 5, p. 37, 2007.
- [5] R. Gómez and J. Ramirez, *Impacto del Programa Sé Emprendedor del SENA en la Generación de Empresas Innovadoras*. Bogotá: Editorial Emprende.
- [6] J. S. Sánchez-Gómez, "Soft skills for the development of social and sustainable projects in industrial engineering students," in *2021 World Engineering Education Forum/Global Engineering Deans Council (WEEF/GEDC)*, IEEE, Nov. 2021, pp. 496–499. doi: 10.1109/WEEF/GEDC53299.2021.9657323.
- [7] P. C. Abrami, R. M. Bernard, E. Borokhovski, D. I. Waddington, C. A. Wade, and T. Persson, "Strategies for teaching students to think critically: A meta-analysis," *Rev Educ Res*, vol. 85, no. 2, pp. 275–314, 2015.
- [8] J. Dunlosky, K. A. Rawson, E. J. Marsh, M. J. Nathan, and D. T. Willingham, "Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology," *Psychological Science in the Public interest*, vol. 14, no. 1, pp. 4–58, 2013.
- [9] N. Verma and S. Rangnekar, "General decision making style: evidence from India," *South Asian Journal of Global Business Research*, vol. 4, no. 1, pp. 85–109, 2015.
- [10] M. Á. Ballesteros, J. S. Sánchez-Gómez, N. Ratkovich, J. C. Cruz, and L. H. Reyes, "Modernizing the chemical engineering curriculum via a student-centered framework that promotes technical, professional, and technology expertise skills: The case of

- unit operations,” *Education for Chemical Engineers*, vol. 35, 2021, doi: 10.1016/j.ece.2020.12.004.
- [11] A. Madgavkar, “The tougher competitors in emerging markets,” *McKinsey & Company*, 2019.
 - [12] D. L. Yohn, “Why every company needs a chief experience officer,” *Harv Bus Rev*, vol. 13, 2019.
 - [13] P. Renjen, “How leaders are navigating the Fourth Industrial Revolution,” *Deloitte Review*, vol. 24, no. 1, pp. 39–43, 2019.
 - [14] J. S. Sánchez-Gómez, C. Cadenas Anaya, V. E. Peters Rada, and S. Milena Rojas Tolosa, “STEM Vocations for Industry 4.0,” in *2024 IEEE Colombian Conference on Communications and Computing (COLCOM)*, IEEE, Aug. 2024, pp. 1–6. doi: 10.1109/COLCOM62950.2024.10720278.
 - [15] J. S. Sánchez-Gómez, A. Hernandez-Fuentes, and L. Valdez, “The closing of the gender gap in the fourth industrial revolution with a feminist focus in Colombia,” in *PAEE ALE 2024*, 2024. doi: 10.5281/zenodo.14062556.
 - [16] K. Close, M. Grebe, P. Andersen, V. Khurana, M. R. Franke, and R. Kalthof, “The digital path to business resilience,” *Boston Consulting Group Report. Boston*, 2020.
 - [17] A. Alexander, A. De Smet, and L. Weiss, “Decision making in uncertain times,” *McKinsey Digital, March*, vol. 6, 2020.
 - [18] J. S. Sánchez-Gómez and M. C. R. Cajiao, “The 21 soft skills developed in the IISE 16th region,” in *IIE Annual Conference. Proceedings*, Institute of Industrial and Systems Engineers (IISE), 2020, pp. 335–339. Accessed: Nov. 24, 2024. [Online]. Available: <https://www.proquest.com/openview/a072d794b7a1bec809de5b659e0bf564/>
 - [19] C. Schröer, F. Kruse, and J. M. Gómez, “A systematic literature review on applying CRISP-DM process model,” *Procedia Comput Sci*, vol. 181, pp. 526–534, 2021.