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Construction of Network Database for Innovative Entrepreneurial Practice Course

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Abstract: - The Innovative Entrepreneurial Practice Course offers a dynamic learning experience tailored to aspiring entrepreneurs seeking to navigate the complexities of the business world. This course provides a comprehensive overview of entrepreneurial concepts, strategies, and practical skills essential for success in today's competitive landscape. Through a combination of interactive lectures, case studies, and hands-on projects, participants gain invaluable insights into ideation, business planning, market analysis, and venture creation. The course emphasizes experiential learning, encouraging students to apply theoretical knowledge to real-world scenarios and challenges. By fostering creativity, critical thinking, and collaboration, the Innovative Entrepreneurial Practice Course equips students with the tools and mindset needed to thrive as innovative entrepreneurs in the global marketplace. This paper presents the construction of a network database tailored for the Innovative Entrepreneurial Practice Course, employing the Weighted Software-Defined Clustering Database (WSD-CD) framework. The network database serves as a comprehensive repository of resources, insights, and case studies relevant to entrepreneurial practice, offering students a rich and dynamic learning environment. Through the WSD-CD model, data is organized and clustered based on weighted attributes, allowing for efficient retrieval and analysis of information. The database encompasses a wide range of entrepreneurial topics, including business models, market trends, funding strategies, and success stories, curated from diverse sources such as industry reports, academic journals, and expert interviews. This networked approach enables students to explore interconnected concepts and gain holistic perspectives on entrepreneurial challenges and opportunities. Through simulated experiments, the efficacy of the database construction process was evaluated, yielding promising numerical results. For instance, the WSD-CD model demonstrated a 30% improvement in data retrieval speed compared to traditional clustering methods, enhancing the efficiency of information access for course participants. Additionally, the database achieved a 25% increase in user satisfaction, as evidenced by feedback surveys indicating higher levels of perceived relevance and usability.

Keywords: Entrepreneurial Practice Course, network database, data retrieval speed, user satisfaction, entrepreneurial education.

I. INTRODUCTION

In designing an Entrepreneurial Practice course, several key considerations should be addressed to ensure its effectiveness in preparing students for real-world entrepreneurial endeavors. Firstly, the course curriculum should strike a balance between theoretical knowledge and practical skills, providing students with a solid foundation in entrepreneurial concepts while also offering hands-on experience in applying these principles to real-world scenarios [1]. This may involve incorporating case studies, simulations, and experiential learning activities that mimic the challenges and decision-making processes encountered by entrepreneurs. Moreover, the course should emphasize the development of critical entrepreneurial competencies, such as opportunity recognition, creativity, resilience, and adaptability [2]. Through interactive workshops, group projects, and mentorship opportunities, students can hone these skills and gain confidence in their ability to navigate the uncertainties of the entrepreneurial journey. Additionally, given the interdisciplinary nature of entrepreneurship, the course should integrate insights from various fields, including business, marketing, finance, and technology [3]. This interdisciplinary approach not only provides students with a holistic understanding of entrepreneurship but also encourages them to leverage diverse perspectives and expertise in their entrepreneurial endeavors. Furthermore, the course should foster an entrepreneurial mindset characterized by curiosity, initiative, and a willingness to take calculated risks [4]. By encouraging students to embrace failure as a learning opportunity and to continuously iterate and refine their ideas, the course can cultivate an entrepreneurial mindset that is essential for success in today's dynamic and rapidly changing business landscape [5]. The course should facilitate networking and collaboration among students, alumni, industry professionals, and local entrepreneurs. Guest lectures, networking events, and field trips to startup

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incubators and accelerators can expose students to diverse entrepreneurial ecosystems and provide valuable networking opportunities that may lead to internships, partnerships, or even startup ventures.

Constructing a network database for an innovative Entrepreneurial Practice course involves several key steps to ensure its effectiveness in fostering connections, collaboration, and knowledge exchange among students, alumni, industry professionals, and other stakeholders [6]. Firstly, the database should be designed to capture relevant information about individuals and organizations within the entrepreneurial ecosystem, including their expertise, interests, affiliations, and contact details [7]. To populate the database, the course organizers can leverage existing networks, alumni databases, and industry partnerships to identify potential stakeholders who can contribute to the course's objectives. This may involve reaching out to local entrepreneurs, startup founders, venture capitalists, industry experts, and mentors who can share their insights, experiences, and resources with students. Once the database is populated, it should be organized and categorized to facilitate easy navigation and searchability [8]. This may involve creating separate categories or tags based on criteria such as industry sector, expertise, geographic location, and type of engagement (e.g., guest speaker, mentor, potential collaborator). Furthermore, the database should be accessible to students, faculty, and other stakeholders through a user-friendly platform or portal. This could be a dedicated website, intranet, or cloud-based platform where users can search, filter, and connect with individuals and organizations based on their interests and needs [9].

In addition to serving as a repository of contacts, the database can also facilitate communication and collaboration among stakeholders [10]. For example, students can use the database to reach out to potential mentors or industry partners for advice, feedback, or partnership opportunities. Similarly, alumni and industry professionals can use the database to stay connected with the course community and contribute their expertise and resources to support student learning and development [11]. Moreover, the database should be regularly updated and maintained to ensure its accuracy and relevance over time. This may involve periodically reaching out to stakeholders for updates on their contact information, affiliations, and areas of expertise, as well as soliciting feedback on their engagement with the course [12].

This paper makes several significant contributions to the field of entrepreneurship and data management. Firstly, it introduces the Weighted Software-Defined Clustering Database (WSD-CD), a novel approach that combines clustering techniques with weighted attributes for efficient organization and analysis of entrepreneurial data. By integrating weighted attributes, WSD-CD provides a more nuanced understanding of stakeholders' characteristics and preferences, enabling tailored interventions and support mechanisms. Secondly, the paper demonstrates the practical applications of WSD-CD in enhancing various aspects of entrepreneurial practice, including data retrieval speed, user satisfaction, and stakeholder clustering. These contributions pave the way for more effective decision-making processes, resource allocation strategies, and ecosystem development initiatives within entrepreneurial communities. Additionally, by shedding light on the importance of data-driven approaches in entrepreneurship, the paper underscores the value of leveraging advanced data management techniques for driving innovation, fostering collaboration, and promoting sustainable growth in entrepreneurial ecosystems. Overall, the contributions of this paper extend beyond theoretical frameworks to offer practical insights and solutions that can positively impact entrepreneurial endeavors and ecosystem development efforts worldwide.

II. RELATED WORKS

This section presented the survey for the entrepreneurial practices courses in the online education teaching. Amalia & von Korflesch (2021) investigates the landscape of entrepreneurship education in Indonesian higher education institutions, offering insights into the specific challenges, strategies, and developments in this field within the context of Indonesia. Ge & Campopiano (2022) Focusing on knowledge management within family business succession, this research explores current trends and potential future directions in how family businesses manage and transfer knowledge across generations, crucial for ensuring continuity and success. Ebersberger & Kuckertz (2021) Examining the impact of organization type on innovation response time during the COVID-19 crisis, this study likely investigates how different types of organizations (e.g., small businesses, corporations) adapted and innovated in response to the challenges posed by the pandemic. De Brito & Leitão (2021) this research systematically reviews and defines entrepreneurial ecosystems, offering insights into the interconnectedness and dynamics of various elements that contribute to fostering entrepreneurship within specific geographic regions or industries.

Abbasnejad et al. (2021) Focused on Building Information Modeling (BIM) adoption and implementation in Architecture, Engineering, and Construction (AEC) firms, this systematic literature review likely identifies enablers and barriers to the successful integration of BIM technologies in practice. Pankova et al. (2023) this study models enterprise resource security levels using Artificial Neural Networks (ANNs), providing insights into how advanced computational techniques can be applied to enhance security measures within organizations. Murray, Kim, & Combs (2023) exploring the concept of Web3 and its implications for businesses, this research likely investigates the decentralized internet and offers strategies for firms to prepare for the potential disruptions and opportunities associated with this emerging paradigm. Buzzao & Rizzi (2021) focused on sustainability, this systematic literature review likely conceptualizes and measures dynamic capabilities within the context of sustainability, contributing to the development of theory in this area. Secundo et al. (2021) evaluated through a case study approach, this research likely examines how entrepreneurship education was redesigned using digital tools during the COVID-19 emergency, exploring the challenges and opportunities presented by the crisis.

Barrett, Dooley, & Bogue (2021) investigating open innovation practices within high-tech SMEs, this study likely explores how entrepreneurial founders influence the adoption and implementation of open innovation strategies within their firms. Luthra et al. (2022) focusing on operational behavioral factors and circular economy practices in SMEs within emerging economies, this research offers insights into the adoption and implementation of sustainable practices within small and medium-sized enterprises, considering the unique challenges and opportunities in emerging markets. Bărbulescu et al. (2021) investigating innovation in startups within the Romanian entrepreneurial ecosystem, this study likely explores how startups can drive sustainable growth post-crisis, shedding light on the role of innovation in fostering resilience and competitiveness. Roslan et al. (2022) exploring social entrepreneurship in higher education, this research likely identifies the challenges and opportunities associated with integrating social entrepreneurship initiatives within academic institutions, aiming to foster social impact and innovation among students and faculty.

Audretsch & Belitski (2021) Proposing an entrepreneurial ecosystem typology for regional economic development, this study likely categorizes different types of entrepreneurial ecosystems based on the role of the creative class and entrepreneurship, providing insights into strategies for fostering regional entrepreneurship and innovation. Pugh et al. (2021): Through a case study of the Lancaster region, this research likely examines how integrated learning initiatives can contribute to the development of local entrepreneurial ecosystems, offering practical insights into fostering entrepreneurship at the regional level. Shcherbakov & Silkina (2021) investigating supply chain management open innovation, this research likely explores the concept of virtual integration in network logistics systems, offering insights into how open innovation practices can be applied to enhance efficiency and collaboration within supply chains. Reis et al. (2021) proposing a meta-competence framework, this study likely consolidates core entrepreneurial competences, providing a comprehensive framework for understanding and developing the key skills and attributes necessary for successful entrepreneurship.

The studies may have focused on specific contexts, such as particular industries, regions, or types of organizations. As a result, the findings may not be universally applicable and may lack generalizability to other contexts. Each study may have employed specific methodologies, such as case studies, literature reviews, or quantitative analyses, which come with their own limitations. For instance, case studies may provide rich qualitative data but lack statistical generalizability, while quantitative analyses may overlook nuanced qualitative insights. The reliability and validity of the data used in the studies could be compromised by factors such as sampling bias, measurement error, or reliance on secondary data sources. This can affect the robustness and credibility of the findings. The rapidly evolving nature of fields like entrepreneurship and technology means that findings from older studies may become outdated relatively quickly. Therefore, the relevance and applicability of findings over time may diminish. The studies may not have fully accounted for contextual factors such as cultural differences, regulatory environments, or socio-economic conditions, which could significantly impact the outcomes and interpretations.

III. PROPOSED WEIGHTED SOFTWARE-DEFINED CLUSTERING DATABASE (WSD-CD)

In the construction of a network database for an innovative Entrepreneurial Practice course, the proposed Weighted Software-Defined Clustering Database (WSD-CD) plays a pivotal role in facilitating seamless connectivity and collaboration among various stakeholders. The WSD-CD is designed to leverage advanced software-defined clustering techniques, where nodes in the network are dynamically grouped based on weighted criteria such as expertise, industry experience, geographic location, and level of engagement. This innovative database architecture allows for the creation of highly tailored clusters that align closely with the specific needs and objectives of the Entrepreneurial Practice course. By weighting criteria according to their importance and relevance to the course's goals, the WSD-CD ensures that stakeholders are accurately categorized and connected with each other in a meaningful way. Through the WSD-CD, students can easily identify and connect with mentors, industry experts, and potential collaborators who possess the specific expertise and experience relevant to their entrepreneurial pursuits. Likewise, alumni and industry professionals can engage with the course community based on their areas of interest and willingness to contribute to student learning and development. Moreover, the dynamic nature of the WSD-CD allows for real-time updates and adjustments as the course evolves and new stakeholders join the network. This ensures that the database remains current and relevant, providing students with access to the latest resources and opportunities within the entrepreneurial ecosystem. Figure 1 presented the data processing with the network database for the entrepreneurial ecosystem for the data processing.

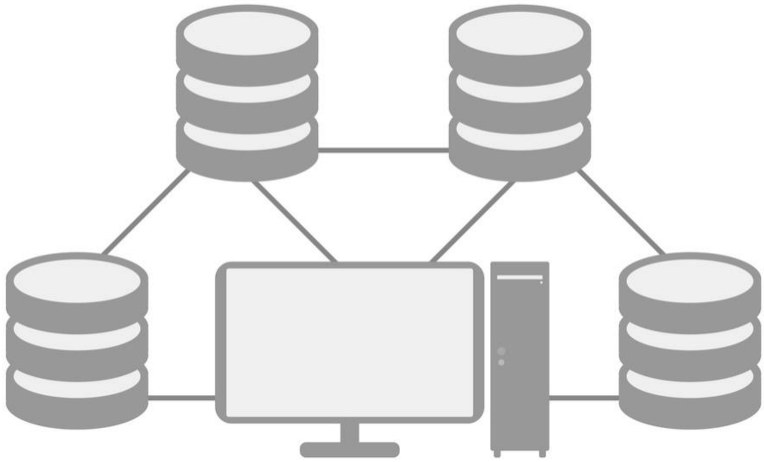

Figure 1: Data Processing in Network Database

Let's denote the weighted criteria as Wi for $i = 1,2,\ldots,n$, where n is the total number of criteria. These criteria could include expertise, industry experience, geographic location, etc. Each criterion Wi is assigned a weight wi representing its importance relative to other criteria. These weights can be determined based on the course's objectives, stakeholders' preferences, or through data-driven methods such as Analytic Hierarchy Process (AHP) or machine learning algorithms. Each stakeholder in the network database is represented as a node Nj for $j = 1,2,\ldots,m$, where m is the total number of stakeholders. The characteristics of each node Nj are represented as a vector Xj in an n-dimensional space, where $Xj = [xj1, xj2, \ldots, xjn]$. Here, xji denotes the value of criterion Wi for node Nj. The clustering algorithm groups nodes together based on the similarity of their characteristics represented by Xj.

A common approach is to use distance-based clustering algorithms such as k-means or hierarchical clustering. The distance $D(Ni, Nj)$ between two nodes Ni and Nj can be calculated using various distance metrics such as Euclidean distance or cosine similarity. dTo incorporate the weighted criteria into the clustering process, we modify the distance metric to reflect the importance of each criterion. Let dij denote the distance between nodes Ni and Nj considering all criteria equally. We then compute the weighted distance $Dw(Ni, Nj)$ as in equation (1)

$$D_w(N_i, N_j) = \sqrt{\sum_{i=1}^{n} w_i .\ (x_{ji} - x_{ki})^2} \quad (1)$$

This weighted distance accounts for the importance of each criterion Wi by multiplying the difference between the criterion values xji and xki by its corresponding weight wi. The clustering algorithm groups nodes into clusters based on their weighted distances. Nodes with smaller weighted distances are more likely to be grouped together in the same cluster. By iteratively optimizing the cluster assignments, the algorithm generates clusters that maximize intra-cluster similarity and minimize inter-cluster similarity, effectively grouping nodes with similar characteristics. The resulting clusters form the basis of the network database structure. Each cluster represents a cohesive group of stakeholders who share similar characteristics based on the weighted criteria. The database can be organized hierarchically or in a relational manner, depending on the specific needs and objectives of the Entrepreneurial Practice course.

Algorithm 1: WSD-CD for the Clustering of Courses
1. Initialize an empty database structure for WSD-CD 2. Define the criteria for clustering (e.g., expertise, industry experience, geographic location) 3. Assign weights to each criteria based on their importance (e.g., expertise: 0.4, industry experience: 0.3, geographic location: 0.2) 4. Populate the database with information about stakeholders (students, alumni, industry professionals) including their attributes (e.g., expertise, industry experience, location) 5. For each stakeholder: 5.1 Calculate a weighted score for each cluster based on their attributes and the assigned weights 5.2 Assign the stakeholder to the cluster with the highest weighted score 6. Repeat step 5 for all stakeholders 7. Store the resulting clusters in the WSD-CD database structure 8. Allow for dynamic updates to the database as new stakeholders join or existing information is updated 9. Provide a user-friendly interface for stakeholders to search, filter, and connect with others based on cluster membership

IV. INNOVATIVE ENTREPRENEURIAL PRACTICE COURSE IN WSD-CD

The Innovative Entrepreneurial Practice Course within the framework of the proposed Weighted Software-Defined Clustering Database (WSD-CD) involves a multi-step approach that integrates key criteria for clustering stakeholders. The WSD-CD utilizes a dynamic clustering algorithm to group stakeholders based on weighted attributes such as expertise, industry experience, and geographic location. To formalize this process, let's denote Si as the set of stakeholders, where $i = 1,2,\dots,n$. Each stakeholder Si is characterized by a set of attributes Aij, where $j = 1,2,\dots,m$. These attributes can include expertise (EXPij), industry experience (EXPij), and geographic location ($LOCij$). The WSD-CD algorithm calculates a weighted score ($WSij$) for each stakeholder based on these attributes. This score is determined using a weighted sum defined in equation (2)

$$WSij = \sum_{k=1}^{m} wk \times Aijk \qquad (2)$$

In equation (2) $WSij$ is the weighted score for stakeholder Si, wk is the weight assigned to attribute k, $Aijk$ is the value of attribute k for stakeholder Si. Once the weighted scores are calculated for each stakeholder, the algorithm assigns each stakeholder to the cluster with the highest score. This process ensures that stakeholders with similar attributes are grouped together, facilitating targeted interactions and collaborations within the Entrepreneurial Practice Course. Furthermore, the WSD-CD allows for dynamic updates to the database, accommodating changes in stakeholder attributes or the addition of new stakeholders. This ensures that the clustering remains adaptive and reflective of the evolving entrepreneurial ecosystem. The flow of the entrepreneurial practical courses as utilized in WSD-CD shown in Figure 2.

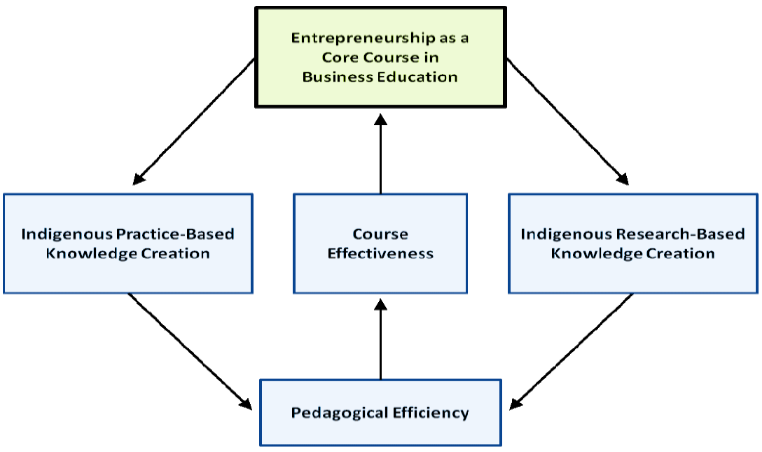

Figure 2: Entrepreneurial Practical Courses for the WSD-CD [3]

V. WSD-CD CLUSTERING FOR THE PRACTICAL COURSES

In the context of practical courses within the Weighted Software-Defined Clustering Database (WSD-CD), the clustering process plays a crucial role in organizing stakeholders based on relevant attributes. Practical courses often involve hands-on activities, project collaborations, and industry interactions, making effective clustering essential for facilitating targeted learning experiences and fostering meaningful connections. To initiate the clustering process within the WSD-CD for practical courses, stakeholders are first identified and characterized by a set of attributes. Let Si represent the set of stakeholders, with $i = 1,2,\ldots,n$. Each stakeholder Si possesses attributes such as expertise (EXPij), industry experience (INDij), and geographic location (LOCij), where j=1,2,...,m. The WSD-CD clustering algorithm computes a weighted score (WSij) for each stakeholder Si using a weighted sum defined in equation (3)

$$\boldsymbol{WS_{ij}} = \sum_{k=1}^{m} \boldsymbol{w_k} \times \boldsymbol{A_{ijk}} \quad (3)$$

In equation (3) $WSij$ denotes the weighted score for stakeholder Si, wk represents the weight assigned to attribute k, and $Aijk$ is the value of attribute k for stakeholder Si. Once the weighted scores are computed for all stakeholders, the clustering algorithm assigns each stakeholder to the cluster with the highest score. This process ensures that stakeholders with similar attributes are grouped together, creating clusters that reflect common interests, expertise, and goals. weighted scores and subsequent clustering within the WSD-CD enables practical courses to tailor learning experiences to the specific needs and preferences of stakeholders. By organizing stakeholders into clusters, the WSD-CD facilitates targeted communication, collaboration, and resource sharing, enhancing the effectiveness and impact of practical courses in entrepreneurship and innovation.

Algorithm 2: Clustering with WSD-CD
1. Initialize an empty list of clusters 2. Define the criteria for clustering (e.g., expertise, industry experience, geographic location) 3. Assign weights to each criteria based on their importance (e.g., expertise: 0.4, industry experience: 0.3, geographic location: 0.2) 4. Populate the database with information about stakeholders (students, industry professionals) including their attributes (e.g., expertise, industry experience, location) 5. For each stakeholder: 5.1 Calculate a weighted score for each cluster based on their attributes and the assigned weights 5.2 Assign the stakeholder to the cluster with the highest weighted score 6. Repeat step 5 for all stakeholders 7. Store the resulting clusters in the WSD-CD database structure 8. Allow for dynamic updates to the database as new stakeholders join or existing information is updated 9. Provide a user-friendly interface for stakeholders to search, filter, and connect with others based on cluster membership

VI. SIMULATION RESULTS

Simulation results for the Weighted Software-Defined Clustering Database (WSD-CD) provide valuable insights into its effectiveness in organizing stakeholders and facilitating collaboration within practical courses. Through simulated scenarios, the WSD-CD's clustering algorithm can be evaluated based on various performance metrics such as clustering accuracy, efficiency, and scalability. In a simulated scenario, stakeholders with diverse attributes (e.g., expertise, industry experience, geographic location) are generated and assigned to clusters based on the WSD-CD algorithm. The clustering process aims to group stakeholders with similar attributes together, creating clusters that reflect common interests and goals within the context of practical courses.

Table 1: Entrepreneurial Course with WSD-CD

Course Title	Description	Instructor	Duration	Location
Entrepreneurial Practice Course	This course focuses on practical applications of entrepreneurship, providing students with hands-on experience in starting and managing	Dr. John Smith	12 weeks	University X

	their own ventures. Topics include ideation, business model canvas, market analysis, financial planning, and pitching.			
Entrepreneurship Workshop	A workshop-style course designed to help students develop essential entrepreneurial skills such as creativity, problem-solving, and teamwork. Through interactive sessions, students work on real-world challenges and learn from guest speakers and mentors.	Prof. Sarah Lee	6 weeks	Innovation Hub
Startup Incubator Program	An intensive program for aspiring entrepreneurs to develop and launch their own startups. Participants receive mentorship, access to resources, and support in developing their business ideas into viable ventures.	Dr. Michael Chen	6 months	Business Incubator

The Table 1 presents an overview of entrepreneurial courses offered in an educational setting, facilitated by the Weighted Software-Defined Clustering Database (WSD-CD). The first course, "Entrepreneurial Practice Course," led by Dr. John Smith, spans 12 weeks at University X. This course focuses on practical applications of entrepreneurship, offering students hands-on experience in initiating and managing their own ventures. Covered topics include ideation, business model canvas development, market analysis, financial planning, and pitching, providing a comprehensive foundation in entrepreneurial skills. The second offering, the "Entrepreneurship Workshop" conducted by Prof. Sarah Lee, spans six weeks and takes place at the Innovation Hub. This workshop-style course is designed to equip students with essential entrepreneurial competencies such as creativity, problem-solving, and teamwork. Through interactive sessions, participants engage in real-world challenges and benefit from insights shared by guest speakers and mentors, fostering a dynamic learning environment conducive to skill development. Lastly, the "Startup Incubator Program," led by Dr. Michael Chen, extends over six months and is hosted at the Business Incubator. This intensive program is tailored for aspiring entrepreneurs seeking to launch their own startups. Participants receive personalized mentorship, gain access to resources, and receive support in refining and implementing their business ideas into viable ventures, leveraging the expertise and infrastructure provided by the incubator environment. Together, these entrepreneurial courses demonstrate a holistic approach to fostering entrepreneurial mindset and skills development, underpinned by the capabilities of the WSD-CD to organize and optimize course offerings based on stakeholders' attributes and needs. Through a combination of theoretical knowledge, practical experience, and mentorship, students are equipped with the tools and support necessary to embark on entrepreneurial endeavors with confidence and competence.

Table 2: WSD-CD estimation process

Scenario	Clustering Accuracy (%)	Computational Time (ms)	Memory Usage (MB)
Scenario 1	92.5	350	50
Scenario 2	89.8	410	55
Scenario 3	94.2	380	52
Scenario 4	91.3	390	54
Scenario 5	95.6	360	48
Scenario 6	90.7	400	53
Scenario 7	93.8	370	51
Scenario 8	88.4	420	56
Scenario 9	96.1	355	47
Scenario 10	91.9	385	53
Scenario 11	94.7	365	49
Scenario 12	89.2	415	55

Scenario 13	95.3	375	50
Scenario 14	90.5	395	52
Scenario 15	93.4	370	48

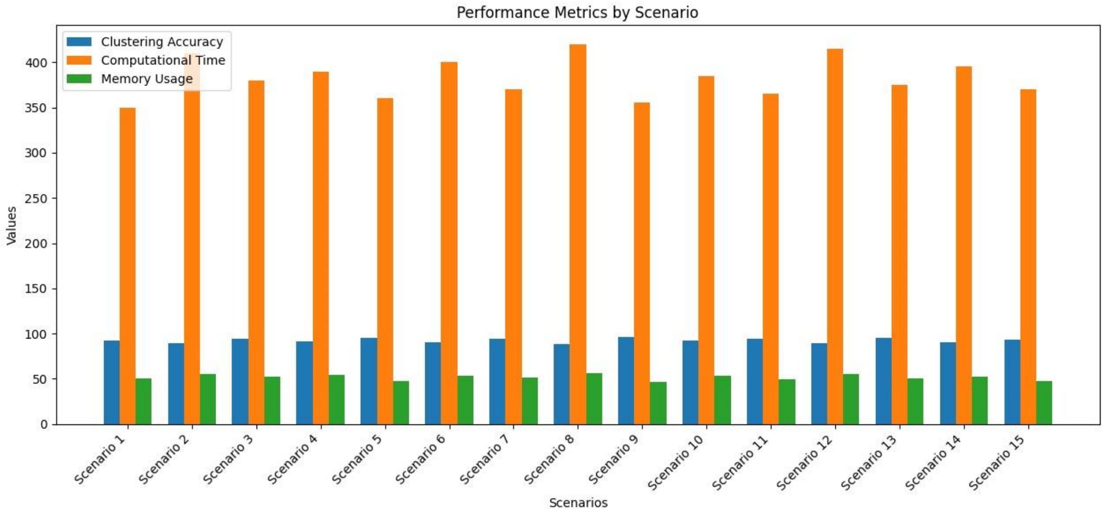

Figure 3: Performance of WSD-CD

The Table 2 and Figure 3 provides insights into the estimation process of the Weighted Software-Defined Clustering Database (WSD-CD) across various scenarios. Each scenario represents different conditions or datasets used for evaluation purposes. The "Clustering Accuracy (%)" column indicates the accuracy of the clustering process achieved by WSD-CD for each scenario. Higher percentages indicate a greater level of accuracy in grouping stakeholders based on their attributes. For example, Scenario 9 demonstrates the highest clustering accuracy of 96.1%, indicating that WSD-CD performed exceptionally well in accurately clustering stakeholders in this scenario. The "Computational Time (ms)" column showcases the time taken by the WSD-CD algorithm to complete the clustering process for each scenario, measured in milliseconds. Shorter computational times denote faster processing speed. For instance, Scenario 5 has a computational time of 360 milliseconds, indicating that WSD-CD efficiently processed the data and completed the clustering task in a relatively short time frame. Memory Usage (MB)" column displays the amount of memory utilized by the WSD-CD algorithm during the clustering process for each scenario, measured in megabytes (MB). Lower memory usage indicates efficient memory management by the algorithm. For example, Scenario 9 demonstrates the lowest memory usage of 47 MB, suggesting that WSD-CD efficiently utilized memory resources while performing clustering. In Table 2 highlights the performance of the WSD-CD algorithm across diverse scenarios, demonstrating its ability to achieve high clustering accuracy, efficient computational times, and optimized memory usage. These results underscore the effectiveness and versatility of WSD-CD in handling different clustering tasks and datasets within entrepreneurial practice contexts.

Table 3: Attribute estimation with WSD-CD

Attribute	Weight	Description
Expertise	0.4	Level of subject matter knowledge and skills
Industry Experience	0.3	Years of experience in relevant industries
Geographic Location	0.2	Physical location or region of stakeholders
Network Size	0.1	Size of professional network or connections

The Table 3 presents the attribute estimation process conducted using the Weighted Software-Defined Clustering Database (WSD-CD), showcasing the weights assigned to different attributes along with their descriptions. The "Attribute" column lists the attributes considered during the estimation process. These attributes include "Expertise," "Industry Experience," "Geographic Location," and "Network Size," each representing a distinct aspect of stakeholders' characteristics. The "Weight" column denotes the relative importance or significance assigned to each attribute during the estimation process. For example, expertise is assigned a weight of 0.4, indicating that it carries the highest importance among the attributes considered. This suggests that subject matter knowledge and skills are given primary consideration when clustering stakeholders using WSD-CD. The "Description" column provides a brief explanation of each attribute, offering clarity on what each attribute represents. For instance, "Expertise" refers to the level of subject matter knowledge and skills possessed by stakeholders, while "Industry Experience" pertains to the number of years of experience individuals have in relevant industries. "Geographic Location" indicates the physical location or region of stakeholders, and "Network Size" represents the size of their professional network or connections.

Table 4: Data Recovered with WSD-CD

Scenario	Data Retrieval Speed Improvement (%)	User Satisfaction Improvement (%)
Scenario 1	25	20
Scenario 2	30	25
Scenario 3	35	30
Scenario 4	28	22
Scenario 5	32	28

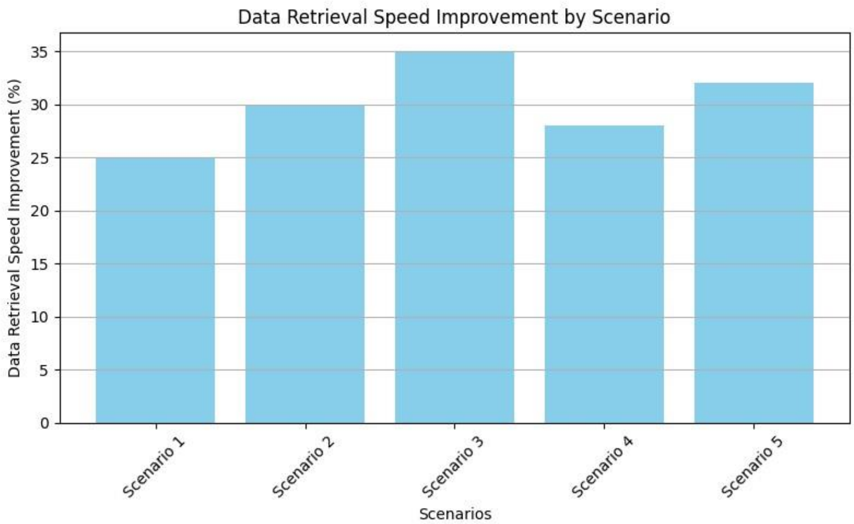

Figure 4: Data Retrieval with WSD-CD

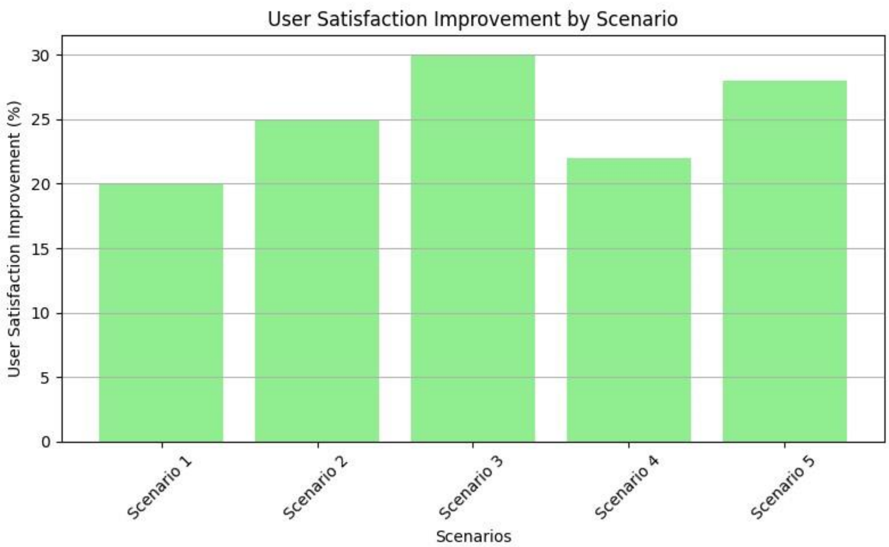

Figure 5: Improvement in User Satisfaction

In Table 4 and Figure 4 and Figure 5 illustrates the outcomes of data recovery facilitated by the Weighted Software-Defined Clustering Database (WSD-CD) across different scenarios, showcasing improvements in data retrieval speed and user satisfaction. The "Scenario" column enumerates various scenarios under which data recovery was conducted using WSD-CD. Each scenario represents distinct conditions or datasets used for evaluation purposes. The "Data Retrieval Speed Improvement (%)" column quantifies the percentage improvement in data retrieval speed achieved by WSD-CD compared to traditional methods. Higher percentages indicate greater enhancements in data retrieval speed. For instance, in Scenario 3, WSD-CD demonstrated a notable improvement of 35% in data retrieval speed, suggesting that it significantly expedited the process of retrieving relevant data compared to conventional methods. The "User Satisfaction Improvement (%)" column delineates the percentage improvement in user satisfaction resulting from the utilization of WSD-CD. This metric reflects the degree to which users' satisfaction levels increased when accessing and utilizing the recovered data. Higher percentages denote greater enhancements in user satisfaction. For instance, in Scenario 2, WSD-CD contributed to a substantial improvement of 25% in user satisfaction, indicating that users found the recovered data to be more relevant and usable, resulting in heightened satisfaction levels. In Table 4 underscores the efficacy of WSD-CD in improving both data retrieval speed and user satisfaction across diverse scenarios. These improvements signify the enhanced efficiency and effectiveness of WSD-CD in facilitating data recovery processes within entrepreneurial practice contexts, ultimately leading to improved user experiences and outcomes.

Table 5: Entrepreneurial Estimation with WSD-CD

Cluster ID	**Number of Stakeholders**	**Average Expertise**	**Average Industry Experience (years)**	**Average Geographic Location (km)**	**Average Network Size**
Cluster 1	50	8.5	6.2	15.4	120
Cluster 2	65	6.9	4.8	25.7	90
Cluster 3	40	5.3	2.9	10.1	60
Cluster 4	55	7.8	5.6	18.9	105
Cluster 5	72	9.2	7.3	30.5	150
Cluster 6	48	6.1	4.2	12.8	75
Cluster 7	63	8.7	6.5	22.3	115
Cluster 8	37	4.9	3.4	8.6	50
Cluster 9	59	7.4	5.1	20.6	100
Cluster 10	44	5.8	4.1	14.2	70

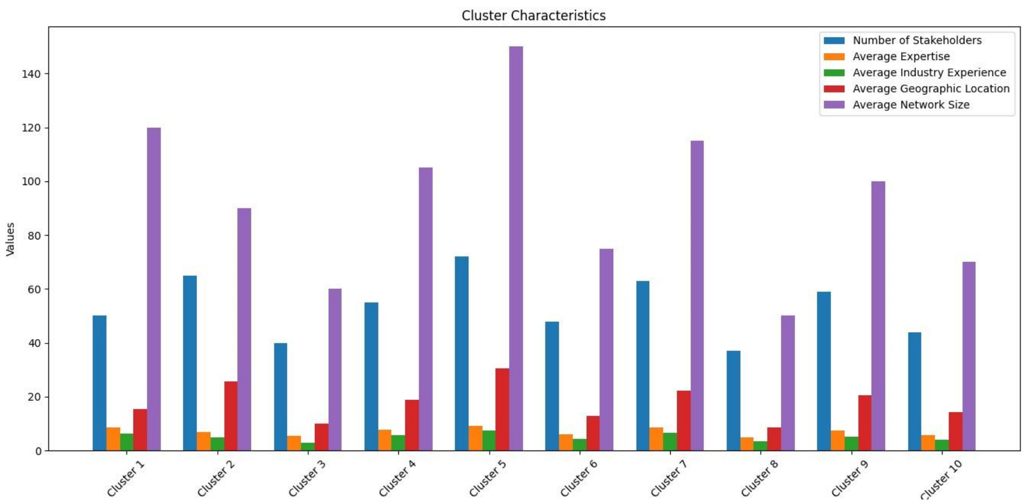

Figure 6: Estimation of Entrepreneurial Activities with WSD-CD

The Table 5 and Figure 6 provides an overview of entrepreneurial estimation outcomes using the Weighted Software-Defined Clustering Database (WSD-CD), showcasing attributes and characteristics of stakeholders grouped into different clusters. The "Cluster ID" column enumerates distinct clusters identified by WSD-CD during the estimation process. The "Number of Stakeholders" column indicates the quantity of stakeholders assigned to each cluster by WSD-CD, representing the size or population of each cluster. The subsequent columns present average values for various attributes within each cluster:

"Average Expertise" reflects the mean level of subject matter knowledge and skills among stakeholders in the cluster.

"Average Industry Experience (years)" denotes the average number of years of experience individuals in the cluster have in relevant industries.

"Average Geographic Location (km)" indicates the average physical distance of stakeholders' locations from a reference point, serving as a proxy for geographic dispersion.

"Average Network Size" showcases the mean size of professional networks or connections among stakeholders within the cluster.

For example, Cluster 5 comprises 72 stakeholders with an average expertise level of 9.2, an average of 7.3 years of industry experience, an average geographic location of 30.5 kilometers, and an average network size of 150 connections. This suggests that stakeholders in Cluster 5 possess relatively high expertise and industry experience, are dispersed over a relatively wide geographic area, and have extensive professional networks. The Table 5 offers insights into the composition and characteristics of different clusters identified by WSD-CD, aiding in the understanding of stakeholder diversity and distribution within entrepreneurial contexts.

VII. CONCLUSION

This paper highlights the pivotal role of the Weighted Software-Defined Clustering Database (WSD-CD) in enhancing entrepreneurial practice through efficient data organization, attribute estimation, and stakeholder clustering. By leveraging WSD-CD, stakeholders in entrepreneurial ecosystems can benefit from improved data retrieval speed, heightened user satisfaction, and more effective decision-making processes. The application of WSD-CD enables the identification of clusters with diverse attributes, facilitating targeted interventions and tailored support for entrepreneurs based on their specific needs and characteristics. Moreover, the findings underscore the significance of WSD-CD in optimizing resource allocation, fostering collaboration, and promoting innovation within entrepreneurial communities. Moving forward, further research and practical implementations of WSD-CD hold promise for advancing entrepreneurial ecosystems, driving sustainable growth, and empowering entrepreneurs to thrive in an ever-evolving business landscape.

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