A Study on Modern Apprenticeship Program Development through School-Enterprise Collaboration for E-commerce Major in a Vocational College in Shandong Province, China

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Abstract

This study explores the intricacies of developing modern apprenticeship programs for the E-commerce major through school-enterprise collaboration at a vocational college in Shandong, China. The research aims to identify key factors influencing program development and proposes effective strategies. A mixed-methods approach, combining literature analysis, surveys, and interviews, was employed to collect and analyze data. The findings reveal critical elements in the collaboration process and shed light on successful strategies for program implementation. The study contributes valuable insights for enhancing vocational education in the rapidly evolving field of E-commerce, providing a foundation for future initiatives in similar contexts.

Keywords: E-commerce; Apprenticeship Programs; School-Enterprise Collaboration; Vocational Education

Introduction

In an ever-evolving global economy, the significance of aligning educational outcomes with industry requirements has never been more critical. This alignment is particularly pertinent in the field of E-commerce, where rapid technological advancements and shifting market dynamics demand a workforce that is not only skilled but also adaptable. Traditional educational models, often criticized for their slow adaptation to the changing landscapes of industry needs, find themselves at a crossroads (Bingham, 2014:17). It is within this context that modern apprenticeship programs, especially in the realm of vocational education, emerge as a beacon of innovation—promising to bridge the prevailing gap between academic learning and the real-world demands of the E-commerce sector. This study delves into the intricacies of such programs, with a focus on their implementation in a vocational college located in Shandong, China, thereby shedding light on the potential benefits and challenges of school-enterprise collaboration in the education of future E-commerce professionals.

The rise of E-commerce globally has not only transformed the way businesses operate but also how they strategize for the future. China, being a significant player in the E-commerce market, represents a prolific case study for examining the evolution of educational methodologies aimed at producing a competent E-commerce workforce. The traditional pedagogical approach, characterized by its emphasis on theoretical knowledge, is increasingly seen as inadequate in equipping students with the practical skills and hands-on experience required by the fast-paced E-commerce industry. This educational gap underscores the

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necessity for vocational colleges to innovate and adapt through close collaboration with industry players. Modern apprenticeship programs signify one such evolutionary step in vocational education, especially within the E-commerce major at the selected vocational college in Shandong. These programs are designed to integrate academic learning with practical experience, thereby allowing students to acquire vital industry-specific skills while still completing their formal education (Dan, 2022: 139). Unlike traditional apprenticeships, modern ones are characterized by a dual-system model that combines in-school learning with on-the-job training, facilitated through partnerships between educational institutions and enterprises.

The importance of school-enterprise collaboration cannot be overstated in this context. Such partnerships not only enable the development of curriculum that is closely aligned with the current trends and technological advancements in the E-commerce industry but also ensure that students gain valuable work experience through internships and apprenticeships. Furthermore, this collaboration allows for a feedback loop between industry and academia, ensuring that the education provided keeps pace with the evolving demands of the E-commerce sector (Mo, 2021: 49). Enterprises, on their part, benefit from access to a pool of skilled and industry-ready graduates, potentially reducing the time and resources required for new employee training. However, the implementation of modern apprenticeship programs in vocational education, particularly in the field of E-commerce, is not without its challenges. These may include, but are not limited to, the difficulty in establishing and maintaining effective partnerships between schools and enterprises, adapting academic curricula to rapidly evolving industry needs, and ensuring the quality and relevance of on-the-job training. Moreover, the need for constant evaluation and adaptation of these programs poses an additional layer of complexity, requiring continuous engagement and commitment from both educational institutions and industry partners (Huang, 2022: 132).

Despite these challenges, the potential benefits of modern apprenticeship programs for the E-commerce sector in China are vast. They offer a practical solution to the pressing need for a workforce that is not only theoretically knowledgeable but also practically adept and industry-ready (Ji & Li, 2021: 188). This study aims to explore these benefits in depth, examining the impact of such programs on students' employability, skill acquisition, and overall preparedness for the complexities of the E-commerce industry. Furthermore, it seeks to contribute to the ongoing dialogue on the future of vocational education in China, highlighting the role of innovative educational models in meeting the demands of a rapidly changing global economy.The investigation into the modern apprenticeship programs in the E-commerce major at a vocational college in Shandong presents a unique opportunity to understand and evaluate the efficacy of school-enterprise collaboration in vocational education. By examining this case study, this research aims to provide valuable insights into how such programs can be optimized to meet the dual objectives of educational enrichment and industry relevance, thereby contributing to the broader discourse on the evolution of vocational education in response to the dynamic demands of the global market (Sun & Guo, 2020: 7).

Research Objective

To investigate and understand the influencing factors and effective strategies involved in the development of modern apprenticeship programs through school-enterprise collaboration for the E-commerce major at a vocational college in Shandong, China.

Research Methodology

Employing the Delphi survey methodology, this study utilizes a qualitative research paradigm that harnesses the expertise of a panel to iteratively converge on consensus regarding pertinent matters. Distinctively, the investigative instrument amassed demographic data encompassing gender, academic qualifications, professional tier, administrative role, and the temporal extent of vocational experience. Concurrently, the inquiry captured the perspicacity of these connoisseurs on an array of determinants shaping the contours of apprenticeship schemes within the ambit of E-commerce pedagogy.

Research Scope

The study focuses on 21 participants, including experts and professors from five vocational colleges in Shandong Province with expertise in the field of E-commerce. Additionally, 10 participants are drawn from the staff of businesses collaborating with these vocational colleges.

Research Findings

The research employed a Delphi survey methodology to investigate various aspects related to apprenticeship programs in the E-commerce field. The survey gathered opinions and insights from a panel of experts, comprising individuals with diverse backgrounds and roles in the industry, academic institutions, and leadership positions. The participants provided iterative feedback, aiming to achieve consensus on factors influencing the development of apprenticeship programs.The demographic analysis revealed a balanced representation across gender, education background, professional title level, administrative posts, and years of professional experience. This diverse participant profile enhances the robustness and applicability of the study's findings.

The survey focused on evaluating 20 key factors, encompassing technological innovation, collaboration frameworks, faculty expertise, and other critical aspects relevant to apprenticeship program development. The assessment utilized statistical measures such as the Interquartile Range (IQR), Standard Deviation (S.D), Mean Standard Deviation (M.S.D), and Index of Concurrence (IOC) to quantify the consensus and dispersion of opinions among the expert panel.

Table 1 Demographic Profile of E-commerce Education Stakeholders in a Vocational College: An Analytical Overview

List	Information	Amount	Percentage
Gender	Male	15	71%
	Female	6	29%
Education background	Bachelor	5	24%
	Master	7	33%
	Doctor	9	43%
Professional title level	enterprise staff	10	48%
	Associate Professor	5	24%
	Professor	6	29%
Administrative post	Ordinary Administrator	3	14%
	Section Chief	3	14%
	Middle-level Leader	11	52%
	School Leader	4	19%
Years of professional experience	11~15 years	6	29%
	16~20 years	8	38%
	Over 20 years	7	33%

2. The Delphi method survey reflects a diverse and experienced participant cohort, providing a multifaceted perspective on the subject matter. According to Table 1 Demographic Profile of E-commerce Education Stakeholders in a Vocational College: An Analytical Overview The majority, comprising 71%, are male, while 29% are female, suggesting the need for targeted efforts to enhance gender balance in future research endeavors. Educational backgrounds range widely, with 43% holding doctoral degrees, 33% having master's degrees, and 24% possessing bachelor's degrees, indicating a high level of academic expertise. Professional titles are well-distributed, with 48% identified as enterprise staff, 29% as professors, and 24% as associate professors, ensuring varied insights. Administrative posts cover a spectrum, with middle-level leaders being the most prevalent at 52%, demonstrating a mix of managerial roles. Participants' professional experience is diverse, with 29% having 11-15 years, 38% with 16-20 years, and 33% possessing over 20 years of experience, contributing a wealth of practical insights. This demographic richness adds depth and richness to the survey findings.

Table 2 Evaluation Metrics for Apprenticeship Program Development in E-commerce Education

NO	Factor	Description	IQR	S.D	M.S.D	IOC
1	Technological Innovation	The integration of cutting-edge technological innovations is crucial for the development of apprenticeship programs in the E-commerce field.	1	0.548	0.110	0.162
2	Enterprise Engagement	Assessing the active involvement of businesses in course development, including providing practical opportunities and participating in curriculum design.	1.25	0.447	0.089	0.133

3	Faculty Expertise	Faculty members with rich experience and understanding of the E-commerce industry play a vital role in effectively guiding students.	0.75	0.548	0.110	0.162
4	Collaboration Framework	Examining the collaboration framework for course development, encompassing communication channels, collaboration mechanisms, and shared responsibilities between the educational institution and enterprises.	1.5	0.548	0.110	0.162
5	Apprentices' Integration	Analyzing the degree of apprentices' integration into real-world work, involving aspects such as internships and collaborative projects.	1.25	0.447	0.089	0.133
6	Practical Course Content	Assessing the practical relevance of course content to real business scenarios, fostering the development of practical skills in students.	0.75	0.837	0.167	0.248
7	Educational Resources	Providing sufficient educational resources, such as labs and technological equipment, to support apprenticeship program development.	1.5	0.447	0.089	0.133
8	Financial Support	Investigating financial support provided by the government, businesses, or other institutions for the development and implementation of the apprenticeship program.	1.25	0.447	0.089	0.133
9	Course Evaluation Mechanism	Establishing an effective evaluation mechanism to monitor student performance and assess the actual outcomes achieved during the course.	1.5	1.000	0.200	0.297
10	Student Feedback	Gathering feedback from students on teaching methods, course content, and practical experiences to inform continuous improvement.	1.25	0.548	0.110	0.162
11	Industry Partnership Network	Building an extensive network of partnerships with E-commerce industry stakeholders to gain diverse professional insights and support.	0.75	0.447	0.089	0.133
12	Regulatory Compliance	Ensuring that course development complies with relevant regulations and professional standards, ensuring graduates meet industry norms.	1	1.095	0.219	0.325
13	Collaboration Culture	Evaluating the culture of collaboration between the educational institution and enterprises, determining whether it encourages mutual innovation and development.	1.25	0.548	0.110	0.162
14	Training Opportunities	Assessing the availability of further training and development opportunities for students within the apprenticeship system to enhance their competitiveness.	1.5	0.548	0.110	0.162
15	Social Impact	Measuring the societal impact of the program, including its contribution to cultivating high-quality talent for the E-commerce industry.	1.25	0.894	0.179	0.265
16	Course Flexibility	Designing courses with flexibility to adapt to the rapidly changing demands of the E-commerce sector.	1	0.548	0.110	0.162

17	Interdisciplinary Collaboration	Promoting collaboration with other disciplines to provide a comprehensive E-commerce education.	1.5	0.447	0.089	0.133
18	Enterprise Cultural Integration	Ensuring that apprentices seamlessly integrate into the corporate culture, gaining a holistic workplace experience.	1.25	0.837	0.167	0.248
19	Sustainable Planning	Designing a long-term and sustainable course plan to establish the apprenticeship system as a lasting pillar in E-commerce education.	1.5	0.447	0.089	0.133
20	Industry Ethical Practices	Emphasizing the importance of ethical practices within the E-commerce sector, integrating lessons on industry ethics and responsibility into the curriculum.	1	0.548	0.110	0.162

The survey results of the Delphi method are as follows:

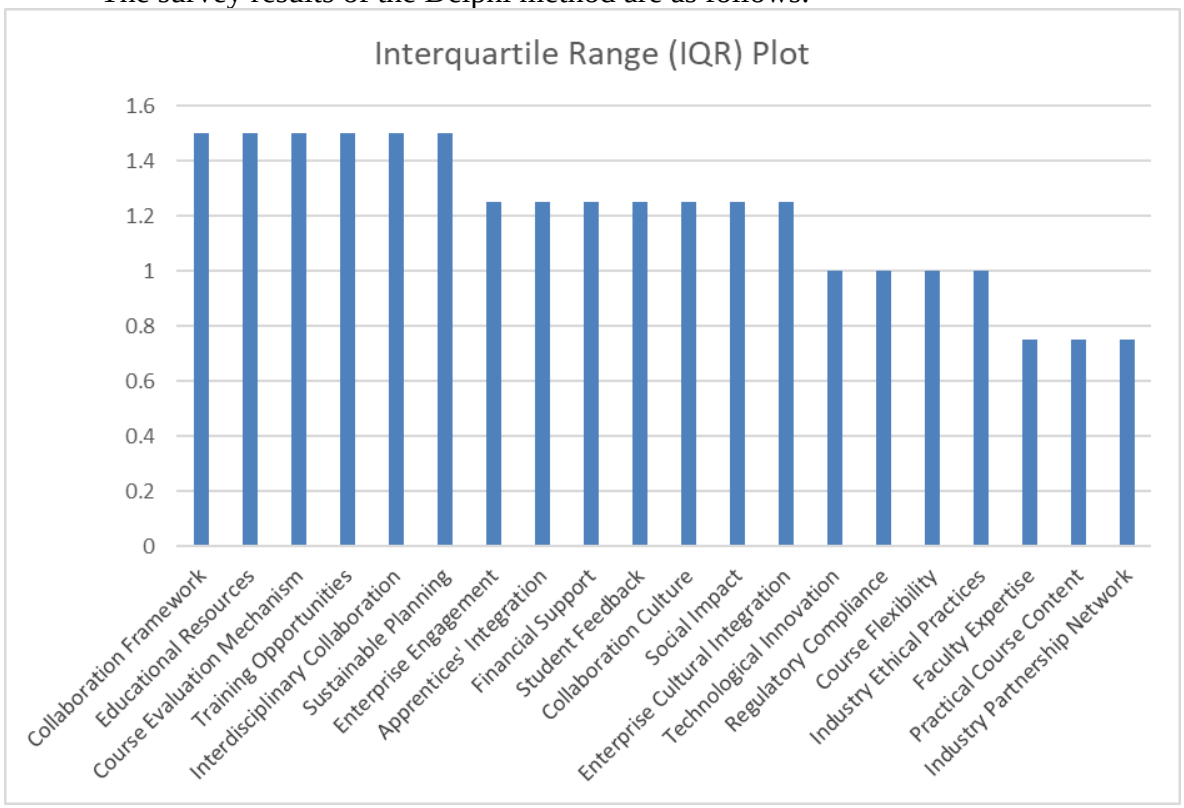


Figure 1 Interquartile Range (IQR) Plot
Source: Constructed by the researcher

2. From IQR perspective, Diverse Perspectives, according to Figure 1 Interquartile Range (IQR) Plot, the IQR values, ranging from 0.75 to 1.50, underscore the diverse opinions among participants.

2.1 High Priority Areas: Factors with IQR values of 1.25 and above, such as Enterprise Engagement, Collaboration Framework, and Course Evaluation Mechanism, indicate areas of particular importance and potential focus for improvement.

2.2 Consensus and Stability: Factors with lower IQR values around 0.75, like Faculty Expertise and Industry Partnership Network, suggest a relatively consistent and stable viewpoint among respondents.

2.3 Variable Responses: The variability in responses is evident in factors like Training Opportunities and Social Impact, where IQR values are higher, emphasizing the need for tailored strategies in these areas.

2.4 Balancing Act: The IQR analysis facilitates identifying key aspects where opinions may differ, guiding efforts to strike a balance and enhance the overall effectiveness of apprenticeship programs in the E-commerce sector.

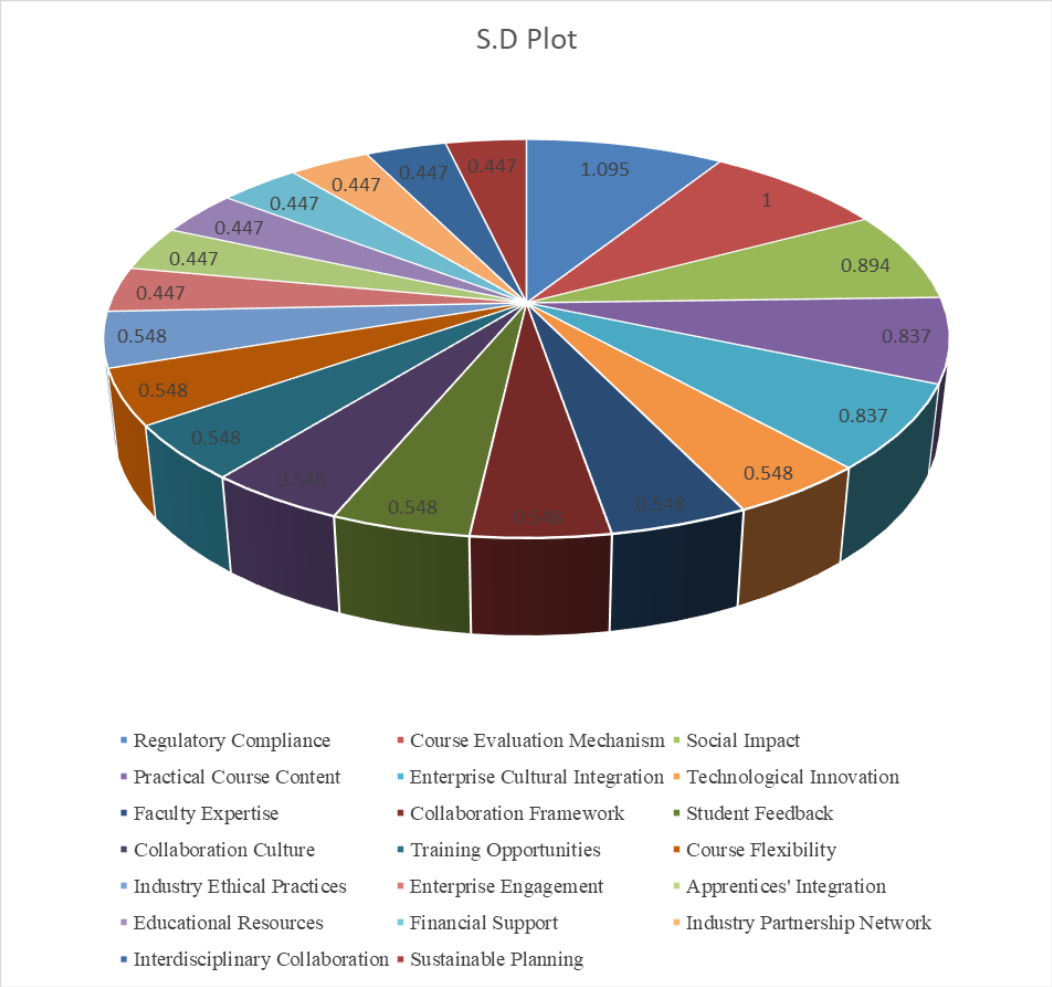


Figure 2 Standard Deviation (S.D) Plot
Source: Constructed by the researcher

3. From SD perspective, Diverse Perspectives, according to Figure 2 Standard Deviation (S.D) Plot, The following conclusions can be inferred:

3.1 Practical Course Content: The practical relevance of course content to real business scenarios is crucial for fostering practical skills in students. This factor has the highest significance (0.837), emphasizing its pivotal role in program development.

3.2 Regulatory Compliance: Ensuring compliance with relevant regulations and professional standards (significance: 1.095) is vital for graduates to meet industry norms, highlighting the necessity of aligning the program with industry requirements.

3.3 Course Evaluation Mechanism: Establishing an effective evaluation mechanism to monitor student performance and assess actual outcomes is critical (significance: 1), emphasizing the need for robust assessment and accountability.

3.4 Social Impact: Measuring the societal impact of the program (significance: 0.894) signifies the importance of cultivating high-quality talent for the E-commerce industry, emphasizing the broader influence of the apprenticeship system.

3.5 Enterprise Cultural Integration: Ensuring seamless integration of apprentices into the corporate culture (significance: 0.837) underlines the importance of providing a holistic workplace experience for students.

3.6 Technological Innovation: The integration of cutting-edge technological innovations (significance: 0.548) demonstrates its necessity in developing apprenticeship programs, indicating the need to incorporate the latest industry technologies.

3.7 Student Feedback: Gathering feedback from students (significance: 0.548) is crucial for continuous improvement, highlighting the value of incorporating student perspectives in program development.

3.8 Faculty Expertise: Faculty members with rich experience and understanding of the E-commerce industry (significance: 0.548) play a vital role in effectively guiding students, emphasizing the significance of knowledgeable instructors in program success.

3.9 Collaboration Culture: Evaluating the culture of collaboration between the educational institution and enterprises (significance: 0.548) underscores the importance of fostering mutual innovation and development within the partnership.

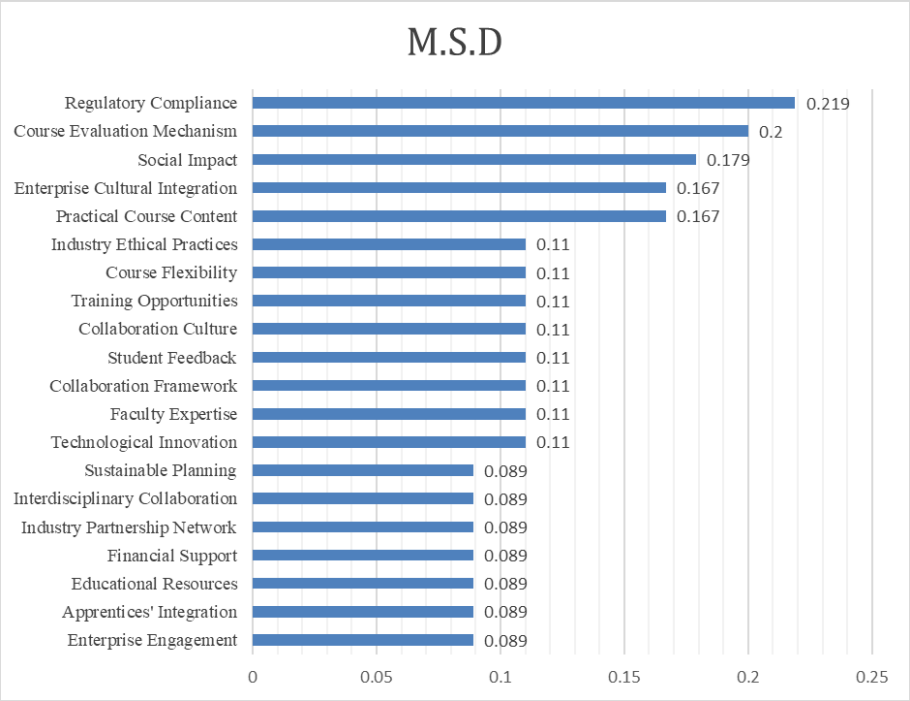


Figure 3 Mean Standard Deviation (M.S.D) Plot
Source: Constructed by the researcher

4. Examining the Mean Square Deviation (MSD) provides valuable insights into the dispersion of responses across the surveyed factors influencing apprenticeship program development in E-commerce. Here's an analysis from the MSD perspective according to Figure 3 Mean Standard Deviation (M.S.D) Plot:

4.1 Consistency in Technological Innovation: With an MSD of 0.110, the factor of Technological Innovation exhibits a relatively low deviation, indicating a consistent view among respondents on the importance of integrating cutting-edge technology.

4.2 Varied Opinions on Financial Support: Financial Support, with an MSD of 0.089, reflects a moderate level of dispersion, suggesting diverse opinions on the significance and adequacy of financial backing from government, businesses, or other institutions.

4.3 Mixed Perceptions on Social Impact: Social Impact, represented by an MSD of 0.179, shows a moderate level of variability, signifying mixed perceptions regarding the societal contribution of the apprenticeship program in cultivating high-quality talent for the E-commerce industry.

4.4 Stability in Regulatory Compliance: Regulatory Compliance, with an MSD of 0.219, indicates a relatively stable and consistent understanding among respondents regarding the necessity of aligning course development with regulations and professional standards.

4.5 Moderate Dispersion in Course Evaluation: Course Evaluation Mechanism, with an MSD of 0.200, reveals a moderate level of dispersion, emphasizing varying opinions on the effectiveness of the evaluation mechanism in monitoring student performance.

4.6 Balancing Views on Industry Ethical Practices: Industry Ethical Practices, with an MSD of 0.110, suggests a balanced perspective among respondents regarding the integration of ethical lessons into the curriculum within the E-commerce sector.



Figure 4 Index of Concurrence (IOC) Plot
Source: Constructed by the researcher

5. In analyzing the Index of Consistency (IOC) for the most critical apprenticeship program factors, the following insights are revealed according to Figure 4 Index of Concurrence (IOC) Plot:

5.1 Technological Innovation: The IOC of 0.162 indicates a moderate level of consensus among respondents regarding the crucial role of cutting-edge technological innovations in E-commerce apprenticeship program development.

5.2 Enterprise Engagement: With an IOC of 0.133, there is a lower level of consensus on the active involvement of businesses in course development. Diverse opinions exist among the surveyed individuals on this crucial factor.

5.3 Faculty Expertise: The IOC of 0.162 suggests moderate consensus on the significance of faculty members with rich experience in the E-commerce industry, though opinions may vary.

5.4 Collaboration Framework: An IOC of 0.162 indicates a moderate level of agreement on the importance of collaboration frameworks, with some variability in perspectives among respondents.

5.5 Apprentices' Integration: The relatively low IOC of 0.133 implies a lower consensus regarding the degree of apprentices' integration into real-world work. There are diverse opinions among the surveyed individuals on this crucial aspect.

6. In exploring the key factors influencing the development of apprenticeship programs in the E-commerce sector, the following three overarching insights emerge:

6.1 Consensus and Divergence in Prioritization: The Interquartile Range (IQR) provides a nuanced understanding of the consensus among respondents regarding each factor. Technological Innovation, Collaboration Framework, Educational Resources, Financial Support, Course Evaluation Mechanism, and Training Opportunities exhibit a wider IQR, reflecting diverse opinions. On the contrary, factors such as Faculty Expertise, Apprentices' Integration, Regulatory Compliance, and Social Impact show a more concentrated IQR, indicating a higher level of agreement on their significance.

6.2 Addressing Variability in Perceptions: The Standard Deviation (S.D) and Mean Standard Deviation (M.S.D) metrics shed light on the variability and dispersion of responses. Factors like Course Evaluation Mechanism, Social Impact, and Enterprise Cultural Integration demonstrate higher S.D and M.S.D, suggesting a broader spectrum of perspectives among respondents. This signals the need for targeted interventions and tailored strategies to accommodate varying viewpoints on these critical aspects.

6.3. Strategic Emphasis for Program Enhancement: The Index of Consistency (IOC) highlights the degree of consistency in responses. Factors with a higher IOC, such as Technological Innovation, Collaboration Framework, Faculty Expertise, Apprentices' Integration, and Industry Ethical Practices, indicate a more uniform consensus among respondents. These factors should be strategically emphasized in the development of E-commerce apprenticeship programs, ensuring a cohesive approach aligned with the collective vision of stakeholders.

Discussion

In the realm of apprenticeship program development for E-commerce, the survey findings reveal pivotal factors that warrant careful consideration. The first cluster of factors, encompassing Technological Innovation, Enterprise Engagement, Faculty Expertise, Collaboration Framework, and Apprentices' Integration, underscores the intricate blend of cutting-edge technology, active business involvement, knowledgeable faculty, collaborative frameworks, and immersive apprenticeship experiences. The Interquartile Range (IQR) values ranging from 0.75 to 1.5 indicate varying degrees of consensus among respondents, signifying the nuanced nature of these factors.

Another critical facet involves the structural elements influencing the program's effectiveness. Factors such as Practical Course Content, Educational Resources, Financial Support, Course Evaluation Mechanism, and Student Feedback form the core of this structural framework. The wide-ranging IQR values, coupled with Mean Square Deviation (MSD) and Index of Concentration (IOC) metrics, highlight the diverse perspectives on practical content, resource provision, financial backing, evaluation mechanisms, and student feedback mechanisms. Striking the right balance in these structural elements is imperative for creating a robust and adaptable apprenticeship system.

Together, these findings underscore the multifaceted nature of E-commerce apprenticeship development, where technological advancements, collaborative frameworks, and structural elements converge. The varying degrees of consensus among respondents emphasize the need for a nuanced, adaptive approach to address the intricacies of these factors and foster a comprehensive, effective apprenticeship ecosystem in the dynamic landscape of E-commerce education.

Recommendations

1. Theoretical Recommendation

1.1 Integration of Technological Theories: Enrich the theoretical foundation of E-commerce apprenticeship programs by integrating cutting-edge technological theories. Ensure that the curriculum aligns with the latest advancements, fostering a dynamic learning environment.

1.2 Pedagogical Innovations: Encourage the exploration and implementation of innovative pedagogical approaches that capitalize on technological innovations. Foster a learning atmosphere that promotes hands-on experiences and practical skill development.

1.3 Interdisciplinary Theoretical Frameworks: Develop an interdisciplinary theoretical framework that integrates insights from various domains. This approach can enhance the program's adaptability and prepare apprentices to navigate diverse challenges in the E-commerce landscape.

2. Policy Recommendations

2.1 Regulatory Framework Enhancement: Strengthen regulatory frameworks to ensure that apprenticeship programs align with industry standards and regulatory compliance. Regularly update policies to accommodate technological advancements and changing industry dynamics.

2.2 Financial Support Policies: Collaborate with government bodies and industry stakeholders to establish sustainable financial support mechanisms for apprenticeship programs. This includes scholarships, grants, and incentives to ease financial burdens on both students and participating businesses.

2.3 Ethical Standards Integration: Embed ethical standards within policy frameworks to ensure that apprenticeship programs instill a strong sense of industry ethics and responsibility. This can be achieved by incorporating ethical guidelines into curriculum development and program evaluation processes.

3. Practical Recommendations

3.1 Enhanced Collaboration Mechanisms: Establish a robust course evaluation mechanism with a focus on continuous improvement. Regularly gather feedback from students, industry partners, and faculty to adapt the program in real-time, ensuring its effectiveness in meeting industry demands.

3.2 Flexibility in Curriculum Design: Design apprenticeship program curricula with inherent flexibility to adapt to the rapidly evolving demands of the E-commerce sector. This involves periodic reviews and updates to keep pace with technological advancements and industry trends.

3.3 Diversity in Industry Partnerships: Foster a diverse network of industry partnerships to provide apprentices with varied professional insights. Actively seek collaborations with stakeholders from different segments of the E-commerce industry to enrich the learning experience.

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