MODERN APPRENTICESHIP MODEL FOR E-COMMERCE MAJOR IN CHINESE VOCATIONAL COLLEGE

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Thesis Title Apprenticeship System Development Model for E-commerce Major in Chinese Vocational College

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ABSTRACT

The purposes of this research are 1) to analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China, 2) to develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges, 3)to implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges, 4) to create an teacher's guide on "Implementing an Effective modern apprenticeship model in Chinese Vocational E-commerce Education. The sample consists of 21 experts in China who have a good education background in the field of painting design. Research tools include: 1) questionnaires, 2) structured interviews, and 3) evaluation forms. Data obtained will be statistically analyzed using methods such as median, quartiles, standard deviation, etc.

The results were found that 1) modern apprenticeships enhance vocational education quality and employability in China. 2) current curricula lag behind market needs, lacking practical and personalized training. 3) assessment systems are inconsistent and lack practical skill evaluation. 4) limited enterprise participation due to insufficient incentives and cooperation depth. 5) the optimized model addresses curriculum, support, quality, and technological integration. 6) continuous feedback

ensures updated course content and improved enterprise involvement. 7) a comprehensive teacher's guide is crucial for successful apprenticeship implementation.

Keywords: Modern Apprenticeship model, Vocational Education, E-commerce Specializations

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Rationale

Establishing a high-quality modern apprenticeship model is an important direction for vocational education reform in the new era. However, the implementation and promotion of the higher vocational e-commerce programme has encountered many challenges. These challenges have not only failed to achieve the desired goals, but have also caused various difficulties.

First, there are problems with the government system infrastructure. The lack of a clear understanding of modern apprenticeships in the government infrastructure has led to a lack of standardization (Zhao, Z.Q. 2017). The current system lacks legal safeguards and clear incentives, and the policy is fragmented and underfunded. Poor coordination among stakeholders has led to inconsistent participation, with significant differences in motivation between schools, businesses and students (Snell, K. 1996).

There are also challenges in terms of business participation. It is impractical to combine student recruitment with apprentice recruitment. In the case of a homogeneous student body, schools can only recruit students first and then work with businesses to recruit apprentices (Campbell, J., Mckay, A., & Thomson, E. 2005). Potential employees need to pass the secondary school graduation exam to qualify, and the cost-effectiveness ratio of training apprentices is high. Businesses need to pay wages, bear some security risks, and the training process may interfere with normal production. In addition, the apprentice turnover rate is also high, and some students choose to leave the business after completing their training in search of better opportunities (Gospel, H., & Fuller, A. 1998).

The identification of students with the role of apprentice is also an important issue. Many students have a low identification with the modern

apprenticeship and see it as a normal labour role in the company rather than an educational opportunity. They are not willing to be ‘experimental subjects’ of the reform or mere manual labourers. In addition, the legal status of students is not recognized, and they lack wage security and labour insurance. The need for further education also affects their decision to work in the company. If students decide to continue their studies, they cannot be hired as full-time employees, and the length of service with the partner company cannot be guaranteed (Canning, R., & Lang, L. 2004).

The overall quality of teaching is also a challenge, especially in the case of a lack of resources for dual mentors. The company mentors lack teaching experience, while the academic mentors often lack practical skills. There is a lack of understanding of the theory of modern apprenticeships, and there is a lack of in-depth understanding of the nature and implementation of the modern apprenticeship training model, and there are significant differences in the understanding of multiple stakeholders. There is a lack of curriculum development and corresponding teaching materials, and apprentices lack specialized teaching materials (Sun, J.Q., & Guo, J. 2020). Due to the confidentiality of the company's products, it is difficult to develop company-specific courses. In addition, specialized teaching standards are not perfect. The implementation of the concept and system has not yet moved away from the traditional teaching framework, and a diversified evaluation mechanism has not yet been fully established. These issues need to be urgently addressed to promote the smooth implementation of high-quality modern apprenticeships (Guo, G.Z. 2023).

Research Question

How to optimize modern apprenticeships model in vocational e-commerce professions to meet the challenges of government, business, role definition and teaching in China?

Objectives

1. To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.

2. To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges.

3. To implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges.

Scope of the Research

Objective 1: Analyze the challenges

Population:

1. E-commerce Industry Professionals: These are individuals currently employed in e-commerce enterprises, responsible for day-to-day operations and strategic planning in the industry.

2. Professors of e-commerce Vocational College: This group consists of educators responsible for imparting e-commerce education within their respective vocational colleges.

3. Administrators of e-commerce Vocational College: This group consists of administrators overseeing the functioning and strategic direction of the e-commerce programs within their respective vocational colleges.

The Sample Group:

1. 7 e-commerce Industry Professionals.
2. 7 professors of e-commerce Vocational Colleges.
3. 7 administrators of e-commerce Vocational Colleges.

Total 21 person as sample.

Independent Variables:

1. Curriculum Relevance
2. Industry Collaboration
3. Quality of Teaching Material
4. Pedagogical Methods

5. Student Engagement
6. Regulatory Support

Objective 2: Develop an optimized apprenticeship model

Population:

1. E-Commerce Industry Professionals: These individuals currently work in e-commerce businesses and are responsible for the day-to-day operations and strategic planning of the industry.

2. E-Commerce Career College Professors: This group consists of educators who are responsible for teaching e-commerce programs in their respective career colleges.

3. E-Commerce Career Academy Administrators: This group consists of administrators who manage and oversee the operations and strategic direction of e-commerce programs in their respective career academies.

The Sample Group:

1. 7 e-commerce Industry Professionals.
2. 7 professors of e-commerce Vocational Colleges.
3. 7 administrators of e-commerce Vocational Colleges.

Total 21 person as sample.

Independent Variables:

1. Teacher Training
2. Industry Feedback
3. Student Satisfaction
4. Performance Metrics
5. Virtual Learning Environment
6. Community Involvement

Objective 3: Implement, assess, and recalibrate the model

Population:

1. E-commerce industry professionals: these individuals currently work in e-commerce businesses and are responsible for the day-to-day operations and strategic planning of the industry.

2. E-Commerce career academy professors: this group consists of educators who are responsible for teaching e-commerce education in their respective career academies.

3. E-Commerce career academy administrators: this group consists of administrators who manage and oversee the operations and strategic direction of e-commerce programs in their respective career academies.

The Sample Group:

1. 3 e-commerce Industry Professionals.
2. 3 professors of e-commerce Vocational Colleges.
3. 3 administrators of e-commerce Vocational Colleges.

Total 9 person as sample.

Time

The research time of the researchers is from September 2023 to February 2024.

Advantages

1. A comprehensive multi-stakeholder approach: The study analyzes multiple aspects of the framework, including government, business engagement, student perceptions, and teaching quality. This comprehensive approach aims to provide a robust solution for multiple stakeholders involved in vocational e-commerce education to address challenges that span multiple parties.

2. Empirical basis for policy reform: Given the challenges identified in the study, such as the lack of clear government regulations and difficulties in engaging businesses, the study can serve as an empirical basis for constructing more effective and targeted policy interventions. This has the potential to impact the systematic improvement of vocational apprenticeship programs in China, especially in the field of e-commerce.

3. Creation of practical educational resources: One of the aims of the research is to create a teacher's guide for implementing an effective modern apprenticeship system. This will directly contribute to improving the quality of

vocational education and provide a valuable resource for educational institutions and their teachers.

4. Data-driven analysis: The research provides a data-driven perspective through a clearly defined sample group from different areas, including e-commerce industry professionals, students and vocational college teachers. This not only validates the proposed apprenticeship model, but also provides insights into the practical challenges and opportunities faced during its implementation.

Definition of Terms

Modern Apprenticeship Model: A structured program that combines vocational education with practical on-the-job training, aimed at equipping students with both theoretical knowledge and hands-on skills relevant to their field of study.

Chinese Vocational E-commerce Major: An academic program or field of study in China focused on providing students with the knowledge, skills, and expertise necessary for careers in e-commerce and related industries.

Curriculum Relevance: The extent to which the curriculum aligns with the industry requirements and real-world tasks apprentices are likely to encounter.

Industry Collaboration: The degree of partnerships, joint ventures, or collaborations between educational institutions and industry players in the e-commerce sector.

Quality of Teaching Material: The level of adequacy, up-to-dateness, and relevance of the material used for teaching.

Pedagogical Methods: The strategies, techniques, and approaches employed by educators in delivering the curriculum.

Student Engagement: The degree to which students are actively involved in their learning, including class participation, task completion, and engagement in practical work.

Regulatory Support: The presence and effectiveness of laws, guidelines, and policies that support or regulate the apprenticeship programs in e-commerce.

Teacher Training: The degree and quality of professional development available for instructors responsible for the apprenticeship program.

Industry Feedback: The extent to which industry stakeholders provide input on the design, implementation, and evaluation of the apprenticeship model.

Student Satisfaction: The level of students' contentment with the program, often measured through surveys or evaluations.

Performance Metrics: Quantifiable measures used to evaluate the success and effectiveness of the apprenticeship program.

Virtual Learning Environment: The digital platforms and technologies used to support or deliver aspects of the apprenticeship program.

Community Involvement: The degree to which local or global communities are involved in or impacted by the apprenticeship program.

Implementation Speed: The rate at which the apprenticeship model is rolled out and becomes fully functional within the educational environment.

Adjustment Frequency: How often the apprenticeship model is reviewed for potential adjustments or updates.

Resource Allocation: The distribution and utilization of financial, human, and material resources in implementing and sustaining the apprenticeship model.

Student Retention: The rate at which students continue in the program from year to year or complete it successfully.

Real-world Application: The extent to which skills and knowledge acquired during the apprenticeship can be directly applied in a work environment.

Institutional Support: The level of support provided by the educational institution in terms of administration, resources, and policy.

Quality Assurance Objective: Mechanisms in place to maintain and improve the quality of the apprenticeship program, including audits, peer reviews, and continuous feedback loops.

Research Framework

The framework is designed to address challenges through analysis and solutions. Inputs include existing apprenticeship data and stakeholder feedback. Research, interviews and analysis are used to identify challenges and propose solutions. The optimized apprenticeship model integrates solutions, best practices and industry trends. The model is further refined through workshops, testing and adjustments. After implementation, feedback is collected and adjustments are made to further optimize the model and promote its wider adoption. The teacher's guide brings together insights and best practices to ensure comprehensive and practical implementation guidance.

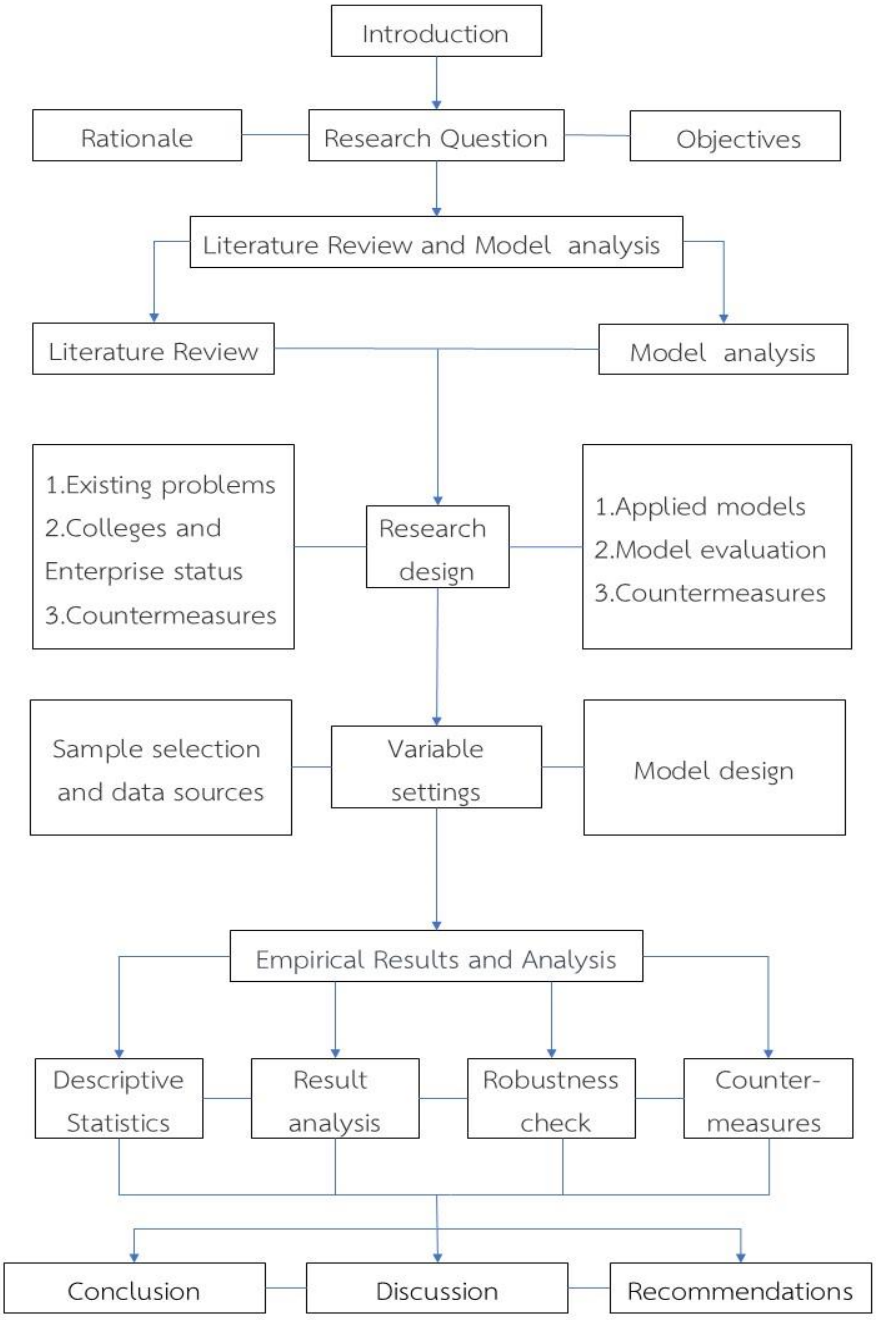


Figure 1.1 Research Framework

Chapter 2
Literature Review

The review synthesizes key insights from a wide range of scholarly works on issues such as inadequate institutional frameworks, poor quality of teaching and learning, insufficient business engagement, and underdeveloped assessment mechanisms. By integrating these multidisciplinary perspectives, the review provides a robust and multifaceted approach to reshaping the modern apprenticeship system. It is not only of significant academic value, but also crucial for policy formulation and for improving the quality and effectiveness of vocational e-commerce education in China.

This literature review will be developed based on the following research objectives:

1. To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.
2. To develop an optimized modern apprenticeship model for e-commerce curricula in Chinese vocational colleges.
3. To implement assess and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges.

Current challenges of modern apprenticeship model in vocational e-commerce education in China.

Modern apprenticeships face a number of challenges in their implementation, covering various aspects of training methods, curriculum design, assessment procedures and quality control. These problems have resulted in a lack of consistency and rigor in the content and assessment processes, and a failure to adequately provide apprentices with the necessary technical knowledge and general education. There is also a distinct lack of clear pathways for apprentices to pursue

higher education or lifelong learning. To address these issues, modern apprenticeships must adapt to the changing economy and labor market, prioritize general skills and lifelong learning, and ultimately enhance apprentices' adaptability and innovation.

The challenges facing modern apprenticeships are exacerbated by shortcomings in the pedagogical management models used by vocational schools. The lack of mechanisms and platforms to promote deep collaboration with enterprises hinders the realization of high-quality and effective apprenticeship training. Seamless integration of work and learning and solid school-business collaboration remain elusive (Hilary Steedman, 2001). In addition, educators often lack practical experience in industrial settings, resulting in their inability to provide hands-on instruction. The mismatch between specialized curricula and the needs of enterprises further exacerbates this problem. To address these issues, China's modern apprenticeship system should draw on successful foreign models while taking into account the unique characteristics of higher vocational education in the country (Yang yin hui, 2023). Innovations in curriculum development and implementation are needed to meet the individualized and diverse learning needs of apprentices. Educational models should aim to establish a comprehensive curriculum and an effective pedagogical management framework, equipped with rigorous assessment criteria and quality assurance mechanisms. Such a comprehensive approach is essential for the successful revitalization of modern apprenticeship in China (Penn, R. 1998).

Collaboration between schools and enterprises faces major challenges. Unfortunately, there is a lack of enthusiasm for such cooperation, resulting in a failure to achieve the seamless integration required for effective collaboration. In particular, businesses have shown a lack of motivation and accountability when engaging in joint educational efforts (Moon, H.N. 2018). To make matters worse, existing models of collaboration remain underdeveloped and largely superficial, lacking the depth and breadth needed to facilitate skill building. The construction of modern apprenticeship programs reveals significant shortcomings. Key principles such

as demand-driven planning and two-way development are often overlooked, resulting in a mismatch between the skills developed through apprenticeships and the actual needs of society (Ridzwan, C.R., & Yasin, R.M. 2015). In addition, the insufficient number of small businesses willing to participate hinders the availability of resources and conditions for practical teaching. This disconnect between theory and practice further exacerbates the problem.

Modern apprenticeship programs face ongoing challenges in terms of subjectivity, adaptability, and implementation. Successful implementation of modern apprenticeship programs relies on deep collaboration between higher vocational colleges, businesses, and government entities. However, issues such as lack of enthusiasm from participants, incomplete collaboration mechanisms, and uncertainty about the outcomes of the collaboration impede effective school-business collaboration. Addressing these issues is critical to improving the effectiveness of modern apprenticeship programs (Greig, M. 2019).

The lack of clarity in the definition and scope of modern apprenticeships has led to differences in implementation models and standards across countries and regions. This inconsistency also extends to regulatory and evaluation mechanisms. Therefore, there is an urgent need for a standardized modern apprenticeship framework. However, achieving this standardization faces significant challenges due to institutional inadequacies and lack of legal support. The lack of comprehensive laws, regulations, and policy support hinders the standardized implementation of apprenticeships (Campbell, J., McKay, A., & Thomson, E. 2006). This deficiency not only leads to a lack of regulation and safeguards in the apprenticeship system, but also creates barriers in the development of institutional structures. To complicate matters further, the improvement of the quality of talent development under modern apprenticeships requires attention. This includes specialized training, the development of core competencies and the upgrading of vocational and professional skills to meet the changing needs of enterprises and society. However, deficiencies in the level of institutionalization and standardization remain, affecting the availability of incentives and guarantees usually provided by accompanying

regulations and policies. There is also a need to address underdeveloped coordination mechanisms among stakeholders that currently impede the protection of students' rights and interests (Wang, Y., & Yang, Y.M. 2021). Finally, existing teaching quality standards and monitoring mechanisms remain inadequate due to insufficient government funding, a single enrollment model, and the need to strengthen the capacity of teaching teams and the vocational credentialing system. These challenges must be addressed to ensure the effectiveness and consistency of modern apprenticeship programs (Zhang, M., & Yu, X.S. 2020).

Despite their great value, modern apprenticeship programs face a lack of inclusiveness. Their scope is too narrow, focusing primarily on a small number of trades and occupations. This lack of inclusivity in the field of apprenticeships limits opportunities for individuals from a variety of demographic backgrounds, especially women and minorities. The consequences of this limitation of inclusivity are twofold: first, it perpetuates inequalities in access to apprenticeship opportunities and can limit the career prospects of marginalized groups. Second, it hinders the overall goal of building a more inclusive and equitable workforce. Addressing this challenge requires expanding programs to encompass a broader range of industries and actively promoting participation from underrepresented populations (Maguire, M. 2014). By doing so, modern apprenticeships can contribute significantly to a more diverse and inclusive labor market.

The challenge of inadequate communication and coordination mechanisms is prevalent in modern apprenticeship model. These mechanisms often fail to effectively reach employers and aspiring apprentices, limiting their knowledge and understanding of apprenticeship opportunities. The result is an underutilized apprenticeship system that fails to meet the diverse needs and preferences of different industries and regions (Huang, H. 2022). To address this issue, more dynamic and adaptive communication strategies are needed. These strategies should be designed to bridge the information gap and to stimulate interest among employers and potential apprentices. In addition, consideration should be given to developing customized solutions for different industries and regions that recognize the unique

dynamics that affect apprenticeship engagement and effectiveness. Well-coordinated efforts to disseminate information and foster connections between employers and apprentices can maximize the impact of modern apprenticeship programs.

The field of modern apprenticeship is plagued by a lack of clarity and uniformity in definitions and standards. Multiple interpretations and requirements exist across countries and industries, casting a shadow of uncertainty over the concept. This ambiguity, in turn, hinders efforts to establish consistent quality and effectiveness in apprenticeship programs. Addressing this issue will require a concerted effort to establish a universally accepted definition and standards for modern apprenticeship (Fuller, A., & Unwin, L. 2003). Such a definition should reflect the core principles and goals of apprenticeship while allowing flexibility to accommodate industry-specific needs. A standardized framework would not only clarify the purpose and scope of modern apprenticeships, but also provide a basis for quality assurance and improvement measures. This will ensure that apprenticeships are universally understood, recognized and valued, thereby enhancing their attractiveness and expanding their reach.

There is an urgent need for improved regulatory mechanisms in the field of modern apprenticeship. Currently, there is a lack of harmonized policy support and guidance, an effective system for assessing the quality of talent development, as well as a fair mechanism for cost sharing and benefit distribution. This lack seriously hampers the overall effectiveness of modern apprenticeship programs. To address this challenge, comprehensive governance mechanisms must be developed, including clear policy frameworks, quality assessment systems, and equitable economic structures (Spielhofer, T., & Sims, D. 2004).

Evaluation systems in modern apprenticeship programs often suffer from imperfections. These systems lack diverse, multidimensional and multi-stakeholder assessment methods to comprehensively assess and provide feedback on the educational outcomes of apprenticeships. In addition, it is difficult for the existing systems to effectively measure the effectiveness of teaching and learning and the level of talent in apprenticeship programs. In order to improve the assessment

environment, it is necessary to establish scientifically sound assessment standards and methods. This should lead to a comprehensive, diverse and inclusive student assessment system that will improve the validity and fairness of assessment (Ryan, P., & Unwin, L. 2001).

Lack of clarity and innovation in training goals is prevalent in modern apprenticeships. Apprenticeship training goals and timelines are often unclear, and training programs and assessment systems lack the innovation to adapt to changing educational needs and industry requirements. In addition, students may find that the teaching methods and assessment processes used by industry tutors are not suitable for them. Assessment methods in modern apprenticeships are often homogenized, making it difficult to comprehensively assess students' learning outcomes. To address these issues, diverse and innovative assessment mechanisms must be established in modern apprenticeships (Steedman, H. 2012). Currently, universities and online platforms differ in assessing students, making it difficult to form effective incentives and constraints. Enhancing the robustness and diversity of assessment mechanisms is critical and may require the involvement of industry associations and third-party assessment organizations to ensure a more comprehensive assessment.

Teaching staff development in modern apprenticeship programs faces a number of challenges that require urgent attention. One of the key barriers is the need to strengthen mechanisms for building the teaching force. In particular, school teachers generally lack practical industry experience, while industry mentors lack teaching skills and methodologies (Sims, D. 2004). This skills gap hinders effective co-teaching. In addition, the development of "dual-teacher" teachers, individuals with both academic and industry expertise, is lagging behind. This gap leads to difficulties in coordinating instruction and hands-on mentoring in apprenticeship programs.

The construction and redefinition of the mentor relationship in modern apprenticeship programs faces significant challenges. The traditional mentor-apprentice model is difficult to adapt to the needs of contemporary apprenticeships, especially in areas such as e-commerce management. The lack of mentors with teaching and industry operational experience hinders the establishment of

productive mentor-apprentice relationships. For this reason, there is a need to enhance apprentices' vocational competencies, career prospects, and ethical attitudes (Steedman, H. 2001).

In modern apprenticeship programs, curriculum development faces obstacles due to the lack of standardized standards and specifications. Curriculum materials and content are often school-centered and fail to fully meet industry requirements. In addition, teaching staff may lack the necessary training and expertise to effectively deliver practical, industry-relevant instruction. Students often have difficulty adapting to the learning environment, and the transition from an academic setting to a complex work environment is challenging. Bridging the gaps in curriculum matching and learning environment adaptation is critical to improving the quality and effectiveness of modern apprenticeships (Clarke, L., & Winch, C. 2004).

Schools tend to be lax in reviewing the qualifications of businesses and allow unsuitable businesses to participate in modern apprenticeship programs. This lack of scrutiny may jeopardize the quality and effectiveness of talent development. The participation of unqualified businesses may hinder the overall success of modern apprenticeship programs and fail to provide students with the necessary skills and experience.

Businesses involved in apprenticeship programs often exhibit a range of behavioral biases that may undermine the effectiveness and integrity of these programs. One of the most notable issues is the perception of modern apprenticeship programs as purely a source of revenue. In this case, firms may admit a large number of students into the program without sufficient consideration of the quality of training or resource availability. This may lead to an overabundance of apprentices and a strain on resources, resulting in a decline in the overall quality of training (Chen, H.S., Li, Y.J., Zheng, E.C., Huang, Z.D., & Shi, K.Y. 2021).

Similarly, some companies may not place enough emphasis on the actual learning and development of apprentices. To them, apprentices may be more like cheap labor than future assets that need to be developed. This view may lead to apprentices only performing repetitive tasks in a work environment without a full

understanding of the career they are learning. This not only hinders the personal development of the apprentice, but may also lead to a skills gap within the industry (Yang, F., & Rao, Y.T. 2019).

In addition, there are significant differences in the financial commitment to apprenticeship programs among different companies. Some companies are willing to invest in top-notch training programs and facilities, while others cut costs to maximize short-term gains, leading to inconsistent training quality.

Another point of contention is the lack of uniform standards for financial assistance for apprentices. Some companies offer generous scholarships or stipends, while others may provide little to no financial support. This inconsistency not only places an unnecessary financial burden on apprentices, but also affects their motivation and focus, as they may have to work part-time to make ends meet (Zeng, Y.Y., & Hu, H.X. 2017).

The lack of standardized provisions for mentor stipends is also an issue. Mentors are a critical component of any successful apprenticeship program and require the time and effort of experienced professionals. However, when mentor stipends are not standardized, it can lead to a lack of qualified mentors willing to invest time in training apprentices. As a result, apprentices may not receive the attention and guidance they need.

Overall, these behavioral biases within a business can seriously hinder the effectiveness of apprenticeship programs. They create unequal environments, impede individual and industry-wide skill development, and may even tarnish the reputation of the apprenticeship system. To address these issues, stakeholders such as governments and industry associations must establish standardized guidelines and best practices. Only then will apprenticeship programs be able to fulfill their true role: to serve as a bridge between education and industry to develop a new generation of skilled professionals.

The role of business in the development of apprenticeships is critical to the future of participants, as well as the workforce and industry as a whole. However, a troubling trend is the apparent lack of business enthusiasm for these programs.

Multiple key issues contribute to this lack of enthusiasm that have a profound impact on the effectiveness and impact of apprenticeship programs (Zhao, Z.Q. 2017).

The first major issue is the financial burden that these programs typically place on businesses. Developing a well-structured apprenticeship program is not only time-consuming, but it is also a major financial commitment. This involves not only the cost of mentors and trainers, but also the equipment, materials, and facilities needed for the training. In some cases, it can be difficult for companies to balance high costs with an uncertain return on investment. This reluctance to invest can severely hinder the depth and breadth of training programs, resulting in apprentices not being adequately prepared for the professional world (Li, B. 2020).

Second, there is often a clear disconnect between apprenticeship programs and traditional education systems within the firm. For example, curricula may not be well matched, creating gaps in knowledge and skills. This disconnect can lead to inefficiencies, as apprentices may find themselves needing to relearn basic concepts or being thrown into advanced tasks without adequate preparation. Additionally, this lack of integration often means that academic credits and vocational credentials are not transferable or mutually recognizable, further complicating an apprentice's education and career path (Dimeny, E., & Williamson, D. 2019).

Regional and specialization biases present another challenge. Different regions may have different industry priorities and skill needs, and apprenticeship programs that fail to adapt to these specifics may not meet expectations. Not all businesses have the resources or expertise to adapt their apprenticeship programs to meet these local or specialized needs. This leads to a "one-size-fits-all" approach that fails to capitalize on the unique attributes of each region or industry.

Financial commitment to apprenticeship programs is often inconsistent and inadequate. Even if a business agrees to start such a program, the allocated budget may not cover all the important aspects needed for a well-rounded apprenticeship. This may mean that while some areas, such as basic training, are fully funded, other

key areas, such as advanced skills development, mentorship, and practical work experience, may not receive sufficient attention (Unwin, L., & Wellington, J. 1995).

These problems are further exacerbated by low rates of business involvement and lack of long-term planning. Apprenticeship programs without a long-term strategy can become ad hoc initiatives when budget cuts are needed. This unstable environment undermines the potential for meaningful mentor-apprentice relationships, which are at the heart of any successful apprenticeship program. The mentors themselves are often a neglected aspect. For apprenticeships to work, experienced professionals within the company need to assume the role of mentor. These professionals should be trained in pedagogy and given the time and resources to mentor effectively. However, many firms lack a structured mentorship system and fail to allocate time and resources for the development of mentor teams (Zhang, Q., & Liu, R.Q. 2020).

In summary, the lack of enthusiasm for apprenticeship development in firms stems from a complex interaction of financial, structural, and strategic issues. The end result is often that these programs fail to adequately serve apprentices by providing them with the skills and knowledge they need to excel in their chosen fields. This shortfall not only affects students, but also weakens the overall workforce and hinders growth and innovation in the industry. In order for apprenticeship programs to reach their potential, a multifaceted approach is needed to address this business.

In addition, managing the dynamics between apprentices, full-time students and regular employees requires astute monitoring and strategic planning. Each of these groups has different expectations, goals, and benefits to be gained from apprenticeships. Therefore, creating a harmonious environment where everyone feels equally recognized and valued is a considerable administrative challenge.

Given these complexities, it is clear that implementing a truly effective apprenticeship program requires multidimensional planning that fully considers both educational and employment aspects. This may involve everything from developing a more transparent contractual framework for apprentices to developing a

comprehensive wage system that recognizes their dual role as learners and contributors to the workplace. On the education side, more efforts are needed to integrate apprenticeships into mainstream curricula, perhaps through collaboration between businesses and educational institutions to provide a balanced learning experience (Zhao, Y., & Wang, H.X. 2020).

In conclusion, while apprenticeships offer a promising avenue for integrating academic learning with real-world experiences, the practical challenges of their implementation are far from trivial. Achieving the desired balance of theory and practice and effectively managing the complex dynamics between apprentices, students, and regular employees is a daunting task that requires thoughtful strategies, adequate resources, and sustained commitment from stakeholders on all sides. Only by adopting a robust approach that can cope with these complexities can apprenticeships truly fulfill their promise as a mutually beneficial arrangement between learners and employers (Yuan, S.J., & Wu, Z.X. 2020).

The apprenticeship model is often touted as a bridge between academic institutions and the professional world, praised for its ability to provide students with hands-on experience. While the focus has traditionally been on technical skills and knowledge transfer, a key dimension that is often overlooked is the development of ethical and professional values for students participating in these programs. Deficiencies in this area are particularly evident in several workplace behaviors such as absenteeism, insubordination, and lack of responsibility (Hu, W., & Zhen, F.B. 2022).

Negative workplace behaviors such as absenteeism and insubordination are more than just symptoms of an individual's lack of discipline; they are often indicative of larger systemic issues in how apprenticeship programs incorporate ethical considerations. When these behaviors occur, they have a domino effect that affects more than just the apprentices themselves. Workflow can be disrupted, coworkers can suffer, and overall workplace productivity can decline. Even more concerning, if not corrected in a timely manner, these negative behaviors can

become entrenched, affecting the apprentice's long-term career trajectory (De Munck, B., & De Kerf, R. 2017).

Reluctance to be challenged is another issue that highlights the need for holistic character development in apprenticeship programs. The future of any industry relies on innovation and problem-solving skills. An attitude that avoids challenges is not only detrimental to the individual, but also to the collective progress of the workplace as a whole and the industry as a whole. Fostering a culture that embraces challenges and views them as opportunities for growth should be an essential part of teaching and learning in apprenticeship programs.

Again, a lack of responsibility is not just a personal failure, but also a flaw in the apprenticeship program where this attitude is allowed to flourish. In the professional world, a lack of accountability can have serious consequences, from missed deadlines to safety issues and even legal ramifications. The costs of such behavior are borne collectively by the firm, affecting its reputation and profits (Chang, M.S., Du, P., & Zhang, W. 2021).

Given these challenges, apprenticeship frameworks need to actively incorporate ethical and professional values into their curricula. This could include modules on workplace etiquette, time management, communication skills, and ethical decision-making. Case studies discussing ethical dilemmas in the field could provide apprentices with the tools to respond to similar challenges as they encounter them in their careers. Interactive sessions with industry professionals can provide apprentices with an understanding of the importance of ethics in their careers, providing a real-world context for these sessions (Campbell, J., Mckay, A., & Thomson, E. 2005).

Furthermore, the development of ethical and professional values should not be limited to theoretical discussions. Mentorship programs in apprenticeships should lead by example. Mentors play a key role in instilling these values, not only by acting as role models but also by providing constructive feedback to correct unprofessional behavior. Ethical and professional dimensions can also be added to

the assessment, for example through peer review to consider teamwork, reliability and ethical behavior (Churchill, S. 1997).

The development of ethical and professional values should be an ongoing process that needs to be continually assessed and updated in response to changes in industry standards and societal expectations. Regular assessments can measure the extent to which these values are being internalized and curriculum modifications can be made when needed (Gallacher, J., Whittaker, S., & Crossan, B. 2004).

In conclusion, while apprenticeship programs have made significant progress in providing practical skills, there is an urgent need to build on this foundation by focusing on a balance of ethical and professional development. By doing so, apprenticeship programs can evolve into well-rounded programs that not only produce skilled individuals, but also responsible and ethical professionals who are valuable to the workplace and society. Addressing this gap is not only a pedagogical concern, but also a pressing need for society, as today's apprentices are tomorrow's industry leaders (Gospel, H., & Fuller, A. 1998).

Apprenticeship programs are designed to provide a seamless transition from the classroom to the professional world, but a closer look reveals that they often fail to meet this goal. A major concern is the level of motivation and learning competencies of apprentices, which often do not meet the desired standards. This lack of motivation is not just an individual problem, but a systemic issue that points to deeper challenges in the modern apprenticeship system.

Many apprentices exhibit utilitarian tendencies towards their programs. Their focus is often only on meeting minimum requirements rather than actively participating in their learning. This lack of enthusiasm can have a profound effect on the effectiveness of the program, as apprentices who are not interested in learning are less likely to apply their theoretical knowledge to practice, thereby compromising the quality of their work. Lack of motivation also extends to practical and self-management skills. The practical components of apprenticeship programs are what students should be most invested in, as they provide a window into their future careers. However, a lack of self-management skills often means that apprentices are

not prepared for the demands of the professional world, which further diminishes the effectiveness of apprenticeship programs (Gray, D., & Morgan, M. 1998).

Addressing these motivational and learning challenges requires a multifaceted approach. First, apprenticeship programs can incorporate additional motivational strategies such as goal-setting exercises, mentorships, and real-world project opportunities to help students see the practical significance of their work. Feedback mechanisms can be built into these programs to give apprentices a better understanding of their progress and room for improvement, which can lead to intrinsic motivation. Similarly, the development of soft skills, such as self-management, should be an important part of the apprenticeship program. Modules focusing on time management, problem solving and self-efficacy can significantly improve student learning (Lin, C.H., Zhao, X., & Gao, C.M. 2021).

While individual motivation is one aspect of the problem, systemic challenges in modern apprenticeship model, particularly in terms of financial and incentive mechanisms, are also problematic. These mechanisms are often not sophisticated enough to deal with the web of interests between employers, apprentices, and government agencies. Cost-sharing models are often unclear or insufficiently defined, making it difficult to mobilize adequate funding for these projects. This financial uncertainty in turn affects the quality of the training provided, making apprenticeship programs less attractive to potential students and further reducing their motivation levels (Jiang, B.L., & Ji, M. 2022).

In addition, the risk of apprentices being poached by other employers after training has not been effectively addressed. This is a significant concern for employers who invest time and resources in training apprentices. The lack of effective measures to prevent such poaching further exacerbates the financial dynamics of these programs and makes employers more hesitant to invest in apprenticeship training. Therefore, developing strong contractual agreements that benefit both employers and apprentices can help mitigate this risk. For example, contracts can include clauses that require a minimum period of service after training

or provide financial incentives for retention to prevent apprentices from being poached (Canning, R., & Lang, L. 2004).

Incentive structures need to be overhauled to align the interests of all stakeholders. Higher standards of education could be encouraged by providing financial incentives to employers who meet specific standards in terms of training quality. Government subsidies could be allocated more dynamically, focusing on supporting programs or industries where apprenticeships make a greater social or economic contribution. This targeted approach would not only improve the financial viability of these programs, but also make them more attractive to employers and apprentices, thereby improving overall effectiveness (Huo, D.Y., & Ding, M.X. 2016).

In summary, apprentices' lack of motivation and learning capacity, coupled with systemic financial and incentive-related challenges, significantly impede the efficacy of modern apprenticeship programs. By addressing these issues through a more dynamic curriculum, improved feedback mechanisms, better financial planning, and strong incentive structures, apprenticeships can better prepare students for theoretical understanding and practical application in their chosen fields.

The rise of modern apprenticeship programs has been lauded as a bridge to bridge the gap between educational institutions and the labor market. These programs offer a unique combination of theory and practice designed to enhance the skills and employability of apprentices. However, the complex interactions between various stakeholders (businesses, educational institutions, government agencies, and apprentices) have resulted in multiple challenges that often hinder the effectiveness and sustainability of these programs (Snell, K. 1996).

First, one of the most contentious issues is the equitable distribution of training costs. Firms argue that they bear a major portion of the cost of training with no guarantee of long-term benefits because apprentices may move on to other employers after completing their training. Educational institutions have limited resources and are skeptical about the extent to which they should fund these programs. Government agencies face budget constraints and must prioritize between multiple competing social programs. Apprentices, often the most economically

precarious group, are concerned about the affordability of programs and their return on investment in professional development (Sun, J.Q., & Guo, J. 2020).

A potential solution could be a multi-tiered financing model where all stakeholders share the costs. Businesses could receive tax incentives to participate, educational institutions could offer tuition reductions for apprenticeship-related programs, and governments could set aside special funds to promote certain high-demand or high-impact industries. Apprentices can contribute through a "pre-payment model" that finances future apprenticeships once they have secured a stable job. This creates a situation of shared investment and shared risk that is more acceptable to all parties (Maynard, F., & Smith, V. 2004).

Another key issue is the determination of apprentice wage levels. Firms may use the excuse of providing educational opportunities to pay the minimum wage, but this can deter potential apprentices who may not be able to afford low-paying jobs. Here, the government can help set fair and economically viable minimum wage levels by consulting with industry and trade unions. By ensuring a basic living wage for apprentices, programs can attract a wider range of candidates, making it more likely that employers will find good people who meet their needs (Guo, G.Z. 2023).

Contract terms are another source of conflict. Employers want flexible terms that make it easy to terminate a contract if an apprentice does not meet their standards. Educational institutions, on the other hand, want contracts to be longer to ensure continuity of educational outcomes. Apprentices, on the other hand, prefer clear terms that ensure job security and career progression. Clear laws and regulations, combined with industry standards, can lead to the development of contracts that meet the needs of all stakeholders (Chen, J.F., & Wang, X.W. 2018).

Quality assurance in apprenticeship programs is also a major concern. Firms want a standardized measure of quality to ensure that they are acquiring a workforce with appropriate competencies. Educational institutions, on the other hand, are concerned with maintaining academic standards while adapting to the needs of different industries. Government agencies are tasked with ensuring that these programs meet national education and workforce standards. Here, the introduction

of a third-party evaluator, comprised of both educational institutions and industry organizations, can provide an objective assessment of program quality. Establishing a feedback mechanism allows for continuous evaluation and improvement of program standards based on these evaluations (Yang, F., & Gong, X.T. 2019).

Establishing an effective coordination mechanism is critical to resolving these conflicts. Regular multi-stakeholder meetings can provide a forum for open discussion and collaborative decision-making. Technology platforms can be used to streamline communication and coordination and enable real-time updates and monitoring. Policy frameworks should be flexible enough to adapt to the specific needs of the industry, yet solid enough to ensure basic standards in different areas.

In summary, while modern apprenticeship programs have great potential for workforce development, their growth and success are hindered by conflicting interests and coordination challenges. Addressing these conflicts and implementing effective coordination mechanisms are important steps in ensuring the sustainable success of these initiatives. This will not only benefit the apprentices, but also contribute to the development of a more skilled, adaptable, and stronger workforce for the benefit of society as a whole (Wu, H.F., & Huang, W.B. 2021).

Modern apprenticeship programs are at an interesting intersection between traditional education and the changing job market. Ideally, they should serve as conduits for skills development and provide a viable pathway for young people to make a smooth transition from education to employment (Sun, L.L., Liu, C.C., & Lin, M.N. 2022). However, multiple issues significantly reduce the attractiveness and effectiveness of these programs and present challenges for educators, policymakers, and industry leaders.

First, the fact that apprenticeships are considered less prestigious than academic education remains a notable barrier. Many students are guided by societal norms and parental expectations to favor academic degrees as a more stable and respected option. This perception prevents attracting potential candidates to apprenticeship programs who could benefit from and contribute to the program. Awareness campaigns aimed at redefining apprenticeships are critical. Schools,

parents, and society as a whole need to recognize the value of vocational training not as a lesser option, but as an alternative pathway that provides realistic skills and immediate employment opportunities. Real-life success stories and testimonials can play an important role in changing these perceptions (Maguire, M. 1998).

At the same time, especially in emerging or technology-driven industries, many businesses are hesitant to invest in apprenticeship programs. Reasons for this vary from misgivings about return on investment to concerns about the complexity of setting up and maintaining a program. In addition, small and medium-sized businesses may have particular difficulty allocating resources to training. Government incentives such as tax credits or grants can make these firms more willing to invest in apprenticeships, thereby expanding the scope and appeal of these programs (Ji, S., & Li, J. 2021).

Another key issue is the misalignment between actual training and actual industry needs, especially in evolving fields such as cross-border e-commerce. Often, curricula lag behind and use outdated technologies and tools, leaving apprentices less competitive upon graduation. Close collaboration between educational institutions and industry players is essential to ensure that curricula remain flexible and relevant. Annual or bi-annual reviews of course content, invited lectures by industry leaders, and real-world projects can provide students with real-world exposure and a smoother transition into the job market.

Infrastructure is another bottleneck. Practical training facilities are often underfunded and poorly equipped, reducing the quality of practical training. Government education budgets should be dedicated to upgrading and maintaining these training facilities to meet industry standards. Public-private partnerships could also be explored to invest in state-of-the-art facilities for use by educational institutions (Huang, C.F. 2020).

Finally, a standardized assessment and certification process should be implemented in apprenticeship programs. This will not only ensure the quality of training, but will also increase the credibility and recognition of apprenticeships, making them more attractive to students and employers. Creating a national body to

oversee these aspects could bring about uniformity and a sign of trust, thus elevating the status of apprenticeship (Li, C.H. 2017).

In conclusion, modern apprenticeship programs face a unique set of challenges that require multifaceted solutions. Addressing societal perceptions, aligning with industry needs, and improving infrastructure are critical to redefining the value proposition of apprenticeships. The active participation of government, educational institutions, industry, and apprentices themselves is essential to elevate the status and effectiveness of modern apprenticeship programs as an attractive pathway to career development in the 21st century (Huddleston, P. 1998).

The concept of apprenticeship is not new; it has long been recognized as an effective bridge between theoretical education and practical skills. However, the immaturity of internship and training conditions in modern apprenticeship programs has become an obstacle to realizing the potential inherent in this educational model. The knock-on effect of this problem affects not only the quality of education, but also the broader goal of developing the skills needed by the younger generation.

At the heart of the problem is the disconnect between the current educational infrastructure and the requirements for hands-on immersive training. Many educational institutions often rely on outdated facilities and technologies that do not meet industry standards. This is particularly worrying in fast-moving industries such as information technology, renewable energy and advanced manufacturing. Without state-of-the-art facilities and resources, educational institutions are unable to provide the quality of hands-on training needed to adequately prepare students to enter the workforce (JIA, W.S. 2017).

In addition, the lack of training equipment is a serious impediment to effective apprenticeship programs. For example, a mechanical engineering apprenticeship may require specialized machinery to teach students the nuances of modern manufacturing processes. When educational institutions lack these resources, they are left to simplify training programs or resort to theoretical approaches that do not provide a complete learning experience. This deficiency hinders the holistic

development of students and prevents them from being prepared for the challenges and complexities of their chosen fields.

This limitation in resources and infrastructure not only hinders the scalability of apprenticeship programs, but also raises questions about their sustainability. While policymakers may present an ambitious vision for expanding apprenticeship programs, these programs will always be fundamentally flawed if deficiencies in training conditions are not addressed. In this context, public-private partnerships may become a viable solution. Businesses can benefit greatly from well-designed apprenticeship programs that produce employees with the skills they need. As a result, businesses are interested in investing in educational infrastructure, either through direct funding or by providing specialized training equipment and facilities (Wu, J.C., & Ou, X.Y. 2022).

Innovative approaches such as virtual laboratories, augmented reality-based training modules and online mentorship programmes can bridge the gap between limited resources and the need for high-quality education. They can provide a "simulated, hands-on" experience that, while not a complete substitute for hands-on training, can still provide valuable experiential learning.

In addition, there is a need for more rigorous, standardized curricula developed by education experts and industry professionals. Such curricula would be more closely aligned with real-world needs and ensure that students are employable and competent upon completion of their apprenticeships. Regulators can play a role in this regard by setting guidelines and quality standards for apprenticeship programs across industries.

In conclusion, underdeveloped internship and training conditions are a key issue that threatens the effectiveness and credibility of modern apprenticeship programs. Addressing this issue requires a concerted effort by educational institutions, industry participants and policy makers. Investments in infrastructure, curriculum reset, public-private partnerships, and technological innovations are avenues that can be explored to revitalize and strengthen apprenticeship models. Only then can apprenticeship programs fully realize their promise of providing a

comprehensive, practical education that prepares students for the challenges of today's job market (Zhang, J.Q. 2018).

Educational institutions, policymakers, and industry stakeholders are increasingly recognizing the urgency of modernizing apprenticeship programs. However, a key bottleneck in the effort is the shortage of training equipment and facilities, especially when preparing for highly dynamic and evolving fields such as cross-border e-commerce. The lack of resources not only affects the quality of education, but also significantly hinders the development of students' practical skills, posing a long-term risk to both students and industry.

The root of the problem lies in the mismatch between industry expectations and what educational institutions can currently offer. For example, in cross-border e-commerce, students need hands-on experience with the latest software tools, digital marketing strategies, supply chain management solutions, and data analytics platforms. If the existing training facilities are outdated or inadequate, it will be difficult for students to translate theoretical knowledge into actionable insights in real-world situations (Zhu, A.W. 2022).

Inadequate training equipment and facilities not only limit the depth of the program, but also affect the breadth of topics that can be covered. Ideally, students would be exposed to all aspects of cross-border e-commerce, from market research and customer behavior analysis to technical skills such as website development and cybersecurity measures. However, resource constraints mean that educators often have to prioritize certain areas at the expense of others, providing an incomplete educational experience.

It is important to note that the consequences of inadequate training facilities are not limited to the field of education. Employers who hire graduates of these apprenticeship programs may find that they need to invest in significant additional training, delaying the time when these new hires are fully productive. This creates barriers to business participation in the development of apprenticeship programs in educational institutions, leading to a vicious cycle of underinvestment and suboptimal outcomes.

Addressing these challenges requires a multifaceted and integrated approach. One possible strategy is to develop public-private partnerships aimed at upgrading educational infrastructure. Companies in the cross-border e-commerce space can partner with educational institutions to identify critical gaps in training facilities and work together to fill them. This not only ensures modernization of training facilities, but also their direct relevance to industry needs (Bingham, H. 2014).

Another avenue for improvement is the integration of digital and distance learning tools to complement physical training facilities. For example, virtual laboratories and simulation software can provide some form of 'hands-on' experience without the need for real-world equipment. These digital platforms can also allow students to participate in real projects remotely, thereby gaining valuable hands-on experience.

Educational institutions also need to work more closely with industry experts when designing curricula and training modules. By making educational content more relevant to real-world needs and challenges, students can be better prepared for the specific roles they will fill after graduation.

Government involvement is also critical to addressing these issues. Financial incentives, tax credits, or direct funding could be considered to encourage investment in educational infrastructure. Overseeing the quality and requirements of standardized apprenticeship programs through regulation can also help to maintain consistency in training and make it easier for firms to trust the competence of program graduates.

In conclusion, the shortage of training equipment and facilities is a key issue that requires immediate attention to optimize the effectiveness of modern apprenticeship programs, especially in fast-growing industries such as cross-border e-commerce. This requires a concerted effort from educational institutions, industry stakeholders and policy makers. Through public-private partnerships, digital solutions, curriculum adaptation, and government support, we can overcome these challenges and deliver apprenticeship programs that are truly prepared for the realities of the modern labor market (Sun, Y., & Cui, H.W. 2021).

Modern apprenticeship programs face a number of challenges covering training methods, curriculum design, assessment procedures, and quality control, resulting in a lack of consistency and rigor in content and assessment processes. In addition, clear pathways for apprentices to enter higher education or lifelong learning are lacking. To address these issues, modern apprenticeships must prioritize the development of generic skills and lifelong learning to enhance apprentices' adaptability and innovation (Hong enhua, 2022). These challenges are exacerbated by the current pedagogical management model of vocational schools, which lacks mechanisms for in-depth collaboration with enterprises and insufficient practical experience of teachers in industrial settings. To revitalize China's modern apprenticeship system, it is important to learn from successful foreign models while taking into account the unique characteristics of higher vocational education in the country, with a focus on comprehensive curriculum development, effective instructional management frameworks, and rigorous quality assurance mechanisms. The lack of enthusiasm and effective integration between schools and enterprises hinders high-quality apprenticeship training. In addition, the definition and standards of modern apprenticeship are unclear, and a standardized framework is needed. Challenges remain in terms of subjectivity, adaptability and implementation, requiring deep collaboration among stakeholders. Inclusiveness, communication and coordination mechanisms need to be improved, and assessment systems, training objectives and curriculum alignment need to be strengthened (Cheng jialiang, 2021). Corporate vetting and resolution of behavioral motivational biases are critical, and financial and incentive mechanisms as well as conflicts of interest among stakeholders need to be addressed. Enhancing the status and attractiveness of modern apprenticeships, improving internship conditions, and reinforcing ethical and professional values are crucial (Chen kangdi, 2016). Finally, upgrading motivation, learning competencies, and assessment mechanisms, along with investing in adequate training facilities, will contribute to a more effective and inclusive modern apprenticeship.

Based on the previous analysis of the challenges facing the modern apprenticeship system in the field of vocational e-commerce education in China, it is evident that there are several key variables in this field that have a significant impact on the apprenticeship system.

Curriculum Relevance

Definition: The extent to which the curriculum aligns with the industry requirements and real-world tasks apprentices are likely to encounter.

Importance: A relevant curriculum ensures that students are prepared for the workforce, thereby reducing the skills gap and increasing employability.

Industry Collaboration

Definition: The degree of partnerships, joint ventures, or collaborations between educational institutions and industry players in the e-commerce sector.

Importance: Strong industry collaboration can provide practical learning opportunities, industry-standard resources, and enhanced employability for students.

Quality of Teaching Material

Definition: The level of adequacy, up-to-dateness, and relevance of the material used for teaching.

Importance: High-quality teaching materials contribute to better learning outcomes and prepare students to meet or exceed industry standards.

Pedagogical Methods

Definition: The strategies, techniques, and approaches employed by educators in delivering the curriculum.

Importance: Effective pedagogical methods can make the learning experience more engaging and can better equip students with the skills they need for the industry.

Student Engagement

Definition: The degree to which students are actively involved in their learning, including class participation, task completion, and engagement in practical work.

Importance: High levels of engagement often correlate with better learning outcomes and higher levels of satisfaction, which can, in turn, lead to better job placements.

Assessment and Evaluation Systems

Definition: The methods and criteria used to assess student learning and program effectiveness.

Importance: Proper assessment and evaluation systems ensure that learning outcomes are being achieved and allow for ongoing improvement of the program.

Job Market Alignment

Definition: The extent to which the program aligns with current job market demands, including required skills and knowledge.

Importance: Programs that closely align with the job market are more likely to produce graduates who can easily find employment in their field.

Teacher Professional Development

Definition: Opportunities for teachers to advance their skills and knowledge, particularly in e-commerce and modern apprenticeship pedagogy.

Importance: Teacher development is crucial for ensuring that the educational offering remains up-to-date and effective.

Regulatory Support

Definition: The presence and effectiveness of laws, guidelines, and policies that support or regulate the apprenticeship programs in e-commerce.

Importance: Regulatory support can legitimize and standardize apprenticeship programs, which can attract more participants and funding.

Technological Infrastructure

Definition: The availability and quality of technology, including hardware and software, used in delivering the educational program.

Importance: Robust technological infrastructure is critical in modern education for a wide range of tasks from teaching and assessment to administration and communication. I hope this elaboration on each variable will be useful for your

research paper on modern apprenticeship model in China's vocational e-commerce programs.

Modern apprenticeship model for e-commerce curricula in Chinese vocational colleges.

The application of modern apprenticeship in Chinese higher vocational education has become an increasingly prominent phenomenon. This paradigm shift has inspired a large number of studies aimed at measuring, applying and explaining the complexity of modern apprenticeship in Chinese higher vocational institutions. Various models have been used to study, explain and optimize modern apprenticeships in this context, from the well-known SECI model of knowledge creation and the Analytic Hierarchy Process (AHP) to the COMET model of vocational competence assessment, and from Yuan Chunqing's Symbiosis Theory to Parsons' AGIL model. Through this comprehensive literature review, this paper provides insights into the importance of these models in understanding and enhancing the implementation of modern apprenticeship programs, particularly in the area of e-commerce in higher vocational education in China. Highlighting empirical research and theoretical frameworks, this paper provides a comprehensive overview of the key role of these models in advancing our understanding and practice of modern apprenticeship.

First, the COMET vocational competency assessment model has been implemented in the context of modern apprenticeship in China's higher vocational education system. The model serves as an effective framework for assessing students' vocational competence, covering the three key dimensions of level, content, and action (Yuan Xiuyue, 2018). It relies on open-ended assessment items to assess students' competence in solving problems in real work situations.

Combined with this model, it can be seen that in order to establish a modern apprenticeship system in China that fits the local context and maintains internal consistency, several strategies are needed: shifting the focus of assessment to improving students' vocational competence, focusing on the identification of

individual foundational skills, closely monitoring students' starting points, and comprehensively tracking their developmental progress (Li Jun, 2019). Educational institutions and enterprises jointly implement assessment activities, synergistically utilize assessment data, conduct student background surveys, develop test items, conduct stage-by-stage competency assessments, provide timely feedback, and make diagnostic improvements. An information technology platform is used to dynamically portray occupational competence profiles, integrate students from educational institutions and enterprises into an online assessment community, transcend the time and spatial limitations of assessment, and achieve automatic collection and analysis of data related to occupational competence enhancement (Gu Pan, 2018).

In addition, symbiosis theory and Parsons' AGIL model have been widely used. The former is a theory that elucidates how different entities achieve symbiotic development, while the latter is a model that analyzes how a social system adapts, achieves its goals, integrates and maintains itself. In the context of developing a modern apprenticeship system in the field of e-commerce in China's higher vocational education, the adoption of a dual-mentor cooperative training mechanism has become crucial. This requires upgrading the professional and educational competence of dual tutors, clarifying their rights and responsibilities, standardizing their management and assessment processes, promoting the sharing and complementarity of resources such as talents, funds, and equipment between educational institutions and enterprises, and strengthening the support and supervision of the government and industry associations in order to establish a favorable policy environment (Li, 2019).

On the other hand, Parsons' AGIL model provides a structural framework for understanding how social systems adapt and function effectively. The four dimensions of the model-adaptation, goal attainment, integration, and latency-provide a holistic view of the functions and processes within an educational system. Applied to modern apprenticeships, the model helps identify key areas for improvement. For example, it can help align educational goals with employer needs,

ensure smooth integration of theoretical and practical training, and address the impact of latent factors such as cultural and social influences on learning and skills development.

In order to effectively implement modern apprenticeship in the context of e-commerce education, the dual tutor collaborative training mechanism is a practical strategy. This approach not only conforms to the principles of symbiosis theory, but also addresses the complexities described in the Parsons AGIL model. Enhancing the professional competence and teaching skills of dual tutors ensures that students receive high-quality guidance and mentoring throughout their apprenticeship (Davin, 2018). Additionally, clarifying the rights and responsibilities of dual mentors and standardizing the management and evaluation process helps to form a structured and organized apprenticeship program. This promotes transparency and accountability, which are key components to a successful outcome. Collaborative sharing of resources such as talent, financial support, and equipment between educational institutions and industry partners enhances the overall effectiveness of the apprenticeship program (Zhang, Yuhuan, 2019).

In order to provide an enabling environment for the implementation of modern apprenticeship, government support and the involvement of industry associations are indispensable. Government initiatives can include policy frameworks, financial incentives, and regulatory support to facilitate the growth of apprenticeship programs. Meanwhile, industry associations can provide valuable insights, industry standards, and networking opportunities that connect education and practice.

In addition, prominent in much of the research literature is the SECI knowledge creation model. The SECI model, proposed by Ikujiro Nonaka and Hirotaka Takeuchi, provides a framework for understanding how knowledge is created and transferred in organizations. SECI stands for Socialization, Externalization, Combination, and Internalization, which represent four modes of knowledge transformation (Qian Li, 2018).

Socialization: this model emphasizes the sharing of tacit knowledge through direct interaction and shared experiences between individuals. In the context of

modern apprenticeships, it highlights the importance of peer learning, mentoring and creating supportive learning communities. Externalization: here, tacit knowledge is externalized and expressed in an explicit form, such as a document, manual, or guide (Yue Wang and Huiying Wen, 2016). In the context of apprenticeship programs, this may involve documenting best practices, learning experiences, and skill development processes. Combination: knowledge is synthesized by combining explicit knowledge from different sources. In the context of modern apprenticeships, this model encourages the combination of academic knowledge with practical skills acquired in the workplace. Internalization: in this last model, explicit knowledge is internalized and transformed into tacit knowledge through practical application and experience. For apprentices, this means applying theoretical concepts learned in the classroom to real-world tasks under the guidance of an experienced mentor.

Applying the SECI model to the development of effective modern apprenticeship programs in China clearly requires a number of strategies (Zhou & Ping, 2017). First, the alignment of education with industry needs requires the creation of occupation-specific clusters based on job roles. This involves conducting thorough industry research to identify the specific job tasks and professional competencies required for each role. Additionally, it is critical to create job role competency analysis sheets that break down the knowledge, technical skills, managerial competencies, and personality traits required for each job role into separate units of competency (Kang, 2016). In addition, competency and personality models were developed to categorize and refine these competencies and create a tiered ranking system for professional skills, management skills, and personality traits. The tiered approach ensures that apprentices acquire a full range of skills.

Drawing on Japan's modern apprenticeship model, improvements in mentor selection, personal interaction, and incentives for knowledge transfer can improve the effectiveness of skills transfer and innovation in apprenticeship programs. Strengthening the government's guidance and support mechanisms, including cost sharing, compensation, risk sharing, and giving enterprises the right to participate, can inspire enterprises to actively participate in modern apprenticeship programs (Zhang

Bei, 2019). In addition, strategies should include establishing a platform for school-enterprise cooperation, optimizing the curriculum structure and forming a teaching innovation team. These measures are crucial to promote the integration of the "1+X" BIM certification system and modern apprenticeship, especially in the field of engineering management education (Hu Chuanxun, 2019). Finally, it is crucial to use web crawler technology to extract job market recruitment data to analyze the competency requirements of e-commerce technical service professionals. For example, in positions such as graphic design, a comprehensive assessment system should be constructed that includes knowledge reserves, technical skills and comprehensive quality. The use of Rubric scoring methods helps to effectively assess student performance in both theoretical and practical courses. Using these strategies and using the SECI model as a guiding framework can significantly contribute to the development of robust and effective modern apprenticeship programs in the Chinese vocational education system (Qi Mu and Xia Zhikun, 2019).

Similar to the SECI (Socialization, Externalization, Combination, Internalization) model of knowledge creation, the Analytic Hierarchy Process (AHP) model is a decision-making tool. The AHP is a decision-making tool developed by Thomas Sarti to deal with complex problems with multiple criteria and choices. It is particularly useful in the presence of subjective judgments and the importance of different criteria. In the context of a modern apprenticeship program, the AHP model can be used to evaluate and prioritize the various factors that influence a decision. It allows decision makers to structure complex problems, establish evaluation criteria, and make informed choices based on quantitative and qualitative data (Zhonghuan Liang and Lijuan Xu, 2017).

There are a variety of strategies that can be used to enhance the competencies of teachers in modern apprenticeship programs. These strategies focus on improving the practical skills, personal qualities, managerial competencies, and teaching abilities of modern apprenticeship teachers: competency-based training for companies provides teachers with specialized training that meets the dynamic needs of the industry (Li Xinlin, 2019). These trainings ensure that teachers are well versed

in the latest industry trends and developments and enhance their practical knowledge. Prioritizing teachers with key personal qualities identifies and prioritizes teachers with a strong sense of responsibility, work ethic, and the right values. These personal qualities are essential for effective mentoring and coaching of apprentices. Improve project management and interpersonal skills to provide teachers with project management skills to effectively oversee apprenticeship programs. Improving their interpersonal skills helps promote effective collaboration between educational institutions and businesses (Gu Pan, 2018).

By implementing these measures, the competencies of teachers in modern apprenticeship programs can be significantly improved. This, in turn, contributes to the overall success and effectiveness of these programs, ensuring that apprentices receive high-quality training and mentoring that prepares them for real-world challenges and opportunities. To strengthen the operational mechanisms of modern apprenticeship programs in higher vocational institutions, several strategies are necessary: strengthening the government's top-level design and institutional development, and enhancing the government's role in setting the overall direction and regulations of modern apprenticeship programs (Xu Yuanyuan and Meng Yanmei, 2016). Develop comprehensive legal and institutional safeguards, set up specialized coordination and management departments, and provide policy support and incentives. Strengthen industry participation and management, and establish institutional safeguards for industry participation by strengthening the guiding and coordinating role of industry associations (Wu, Jianhong, and Xu, Ying, 2019). Develop industry standards and assessment systems to ensure consistency with industry needs and standards. Reform the cooperative education mechanism between enterprises and educational institutions, clarify the rights and responsibilities of both parties, and establish cost-sharing and risk mitigation mechanisms. Promote resource sharing and complementarity of advantages between enterprises and educational institutions. Improve the management of the educational process in educational institutions and strengthen their internal management systems, including the construction of integrated curriculum systems. Adopting various methods, such as

alternate education, rotational training and on-the-job internships, in order to enhance the quality and effectiveness of teaching and learning (Zhang Xian and Zeng Zhuoyu, 2021).

These strategies contribute to the overall success and sustainability of modern apprenticeship programs in higher education vocational institutions, ensuring that they meet the needs of various stakeholders and lead to positive outcomes for students and industry. To establish a modern apprenticeship teaching quality evaluation system based on the new Kirkpatrick four-level assessment model, the following strategies are essential: the response level, which collects participant feedback on course design, content, and pedagogy through methods such as surveys and focus group discussions. Learning level, which assesses participants' mastery of knowledge, skills and attitudes through course exams, project-based assessments and practical skills assessments. Behavioral level, which assesses the standardization of participants' skill practices and their adherence to these standards in practical work in the enterprise. This can be assessed through observation and interviews. The outcome level, which measures the impact of the apprenticeship program by analyzing participants' performance improvements and achievements.

By implementing these strategies aligned with the new Kirkpatrick Four-Level Assessment Model, institutions can comprehensively assess the effectiveness and quality of their modern apprenticeship programs to ensure that they are meeting expected learning outcomes and producing skilled graduates who are ready to enter the workplace (Gao, 2018).The CIPP assessment model consists of a contextual assessment, an input assessment, a process assessment, and an outcome assessment, and is useful in assessing the training program's effectiveness, including programs in modern apprenticeship model, plays a key role. The model examines participant satisfaction, learning outcomes, behavioral changes, and performance improvement (Gao, Yuxing, 2018).

To establish a talent development program assessment system based on the CIPP model in the context of modern apprenticeship, the following strategies are key: scientifically defining the teaching objectives of the cooperative program and

setting clear and unambiguous teaching and learning objectives that are aligned with the curriculum. Clarify teaching and assessment criteria to ensure transparency and alignment with program goals. Emphasize increased co-op funding, recognizing the importance of financial investment in co-op programs. Increased funding can be used as an incentive to enhance student engagement and satisfaction. Co-develop evaluation criteria with relevant stakeholders, including educational institutions, industry partners, and students, to collect regular and timely feedback and make necessary adjustments to implementation strategies.

By implementing these strategies, institutions can effectively utilize the CIPP assessment model to assess and enhance the quality of talent development courses in modern apprenticeship programs. This ensures that programs are aligned with their goals, are adequately resourced, and can be continuously improved to meet the needs of learners and industry partners (Jun Li, 2020).

By systematically analyzing these diverse models, this literature review aims to contribute to the ongoing discussion of modern apprenticeship in vocational higher education in China. By highlighting the key contributions of these models, insights into the multifaceted nature of modern apprenticeship, its effectiveness and its alignment with the evolving needs of e-commerce professional and industry stakeholders are provided (Yang Yun, 2015).

Adaptability of Model

Definition: The ability of the apprenticeship model to adjust to different educational, economic, or industry contexts.

Importance: An adaptable model can be more readily customized to fit various needs, increasing its effectiveness and broad applicability.

Cost-Effectiveness

Definition: A measure of the economic efficiency of the apprenticeship model, assessing the benefits relative to the resources and costs involved.

Importance: Cost-effective models are more sustainable and can be more easily scaled, benefiting both educational institutions and students.

Scalability

Definition: The capacity for the apprenticeship model to grow and accommodate more students or adapt to new environments without compromising quality.

Importance: Scalable models can reach more students, thereby having a larger positive impact on workforce development.

Faculty Training

Definition: The degree and quality of professional development available for instructors responsible for the apprenticeship program.

Importance: Well-trained faculty are key for effective teaching and thus crucial for the success of an apprenticeship model.

Industry Feedback

Definition: The extent to which industry stakeholders provide input on the design, implementation, and evaluation of the apprenticeship model.

Importance: Industry feedback ensures that the model remains aligned with real-world requirements and trends.

Student Satisfaction

Definition: The level of students' contentment with the program, often measured through surveys or evaluations.

Importance: Higher student satisfaction can lead to better learning outcomes, lower dropout rates, and more positive word-of-mouth, aiding in the recruitment of future students.

Performance Metrics

Definition: Quantifiable measures used to evaluate the success and effectiveness of the apprenticeship program.

Importance: Effective metrics provide a way to objectively assess the program's strengths and weaknesses, aiding in its refinement and improvement.

Virtual Learning Environment

Definition: The digital platforms and technologies used to support or deliver aspects of the apprenticeship program.

Importance: As e-commerce is inherently digital, a robust virtual learning environment is key for simulating real-world tasks and challenges.

Community Involvement

Definition: The degree to which local or global communities are involved in or impacted by the apprenticeship program.

Importance: Community involvement can offer additional resources, perspectives, and opportunities for students, enriching their educational experience.

Diversity and Inclusion

Definition: The extent to which the apprenticeship program accommodates and supports individuals from diverse backgrounds.

Importance: Diversity and inclusion can lead to a richer, more creative learning environment, and better prepare students for a globalized work environment.

Implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges.

In the further exploration of the assessment and application of the above model, as a key link between the preceding analysis and the forthcoming recommendations, the solutions systematized below aim to effectively address the multifaceted challenges outlined in the preceding section:

Policy and regulatory improvements are necessary to ensure the effectiveness and efficiency of these programs. Modern apprenticeship programs in e-commerce in China's higher vocational education sector are on the rise. However, they also face regulatory and policy challenges that need to be addressed in order to achieve their sustainable growth and effectiveness (Zhou, Dajun, 2016).

First, existing policies and regulations governing modern apprenticeship programs in Chinese higher education institutions need to be carefully reviewed and improved. The complexity of the e-commerce field requires that policies be explicitly tailored to its unique needs. Comprehensive reforms are essential to

enhance and clarify these regulations to ensure that they are aligned with the rapidly evolving e-commerce environment (Zhang Bei, 2019).

To do so, policymakers need to collaborate with industry experts, educational institutions, and other stakeholders to review and adapt existing regulations. This collaborative approach can help identify specific needs in the e-commerce space and develop policies that provide clear guidance and strong support structures. Through improvements in policy and regulation, modern apprenticeship programs in e-commerce in China's higher vocational education could evolve into a more flexible, efficient, and responsive model (Zhongmei Li, 2020). These changes will help meet the growing demand for a skilled and adaptable workforce in the e-commerce industry, while providing students with valuable and industry-relevant learning experiences.

Policy and regulatory enhancements emphasize comprehensive reforms to clarify and strengthen policies and regulations. This is critical to providing clear guidance and a strong support structure. The second dimension emphasizes the need for increased financial support to strengthen the financial foundation of apprenticeship programs to ensure their durability and scalability in the changing e-commerce environment. These multifaceted approaches aim to move modern apprenticeship programs in e-commerce to a higher level of relevance, effectiveness and sustainability.

Ensuring active and sustained business involvement in the apprenticeship training process and achieving this goal requires a strategic approach that effectively incentivizes active business participation. This section describes the importance of facilitating business engagement and outlines some of the strategies and mechanisms that can be used to encourage active business participation (Huang, Rui, 2019).

The role of business involvement in modern apprenticeship programs cannot be overlooked. It serves as a critical bridge between the theoretical frameworks provided by educational institutions and the practical skills essential in the rapidly evolving world of e-commerce. Indeed, when businesses invest in apprenticeship programs, they are not only investing in their future workforce, but

also in their own long-term success and competitiveness. However, maximizing this engagement requires a multifaceted approach, particularly in terms of designing and implementing incentives that are aligned with the needs and desires of the business.

First, there is a need to emphasize the tangible benefits that firms derive from active participation in apprenticeship programs. While the benefits of having a skilled workforce that meets the needs of the industry are obvious, it is also important to emphasize how apprenticeship programs can save money in the hiring process. These programs allow companies to assess and train potential employees in a real-world environment, thereby reducing the risk of an inappropriate hire. Additionally, apprentices who turn into full-time employees are often able to assimilate more quickly into the company's culture and operating philosophy, reducing onboarding time and costs (Toner, P. 2008).

Second, financial incentives can play an important role in encouraging firm participation. These incentives can range from direct subsidies and grants to tax incentives for firms that host apprentices. A tiered incentive structure based on a firm's level of participation and commitment can further refine this approach. For example, companies that commit to participating in a multi-year program or hosting additional apprentices could receive additional benefits. This not only makes financial sense for companies, but adds sustainability and longevity to the apprenticeship program itself.

Third, well-designed collaboration between educational institutions and firms can also be an important incentive. This can include a business voice in curriculum design, thus ensuring that training is aligned with actual industry needs. It can also extend to joint research and development programs that combine the fresh perspectives of apprentices with the experience and resources of firms to solve complex problems and provide innovative solutions (Deissinger, T. 2004).

Fourth, the role of quality assurance and certification should not be underestimated. Firms are more likely to participate in apprenticeship programs that are accredited by reputable agencies or institutions. Quality assurance measures can include standardized testing and assessment, periodic reviews and audits. The

assurance that apprentices receive high-quality, industry-relevant training can significantly increase business interest in participating in apprenticeship programs.

Fifth, there is a need to address the issue of "brain drain" - whereby apprentices trained under the auspices of a company leave for employment with other companies. Contractual agreements, such as a commitment to work for the enterprise for a specified period of time after training, can mitigate this risk. While such measures may appear restrictive, they provide a reasonable trade-off that ensures that a firm's investment in an apprentice will result in long-term gains (Chengxin Zhu, 2020).

In summary, business engagement is critical to the success of modern apprenticeship programs, especially in a dynamic and rapidly evolving industry like e-commerce. The advantages are numerous, from saving on recruitment and training costs to developing a skilled and job-ready workforce. However, to realize these advantages, we need to implement a range of incentives that cater to the diverse needs and motivations of businesses. Only then will we be able to create a symbiotic relationship between educational institutions and businesses to ensure that apprenticeship programs are both effective and sustainable.

One of the main ways to incentivize businesses to participate in apprenticeship programs is to provide financial incentives. Governments and educational institutions can work together to provide tax incentives or subsidies to businesses that are actively involved in training apprentices. These financial incentives can help offset the costs involved in providing mentoring and training for apprentices, making them more attractive to businesses. Businesses often need employees with specific skills and competencies. Educational institutions can work closely with businesses to design tailored apprenticeship programs to meet industry-specific needs (Yi Wang, 2018). By aligning training with industry requirements, businesses are more likely to participate because they can ensure that apprentices have the skills needed for the job.

Providing apprentices with industry-recognized certificates or credentials upon successful completion of training can be a powerful incentive. Not only do these credentials increase the employability of the apprentice, but they also have a positive impact on participating businesses, demonstrating their commitment to workforce development. Institutions and businesses can collaborate to develop curricula for apprenticeship programs (Jun Li, 2019). This ensures that training is aligned with industry standards and emerging trends, making it more valuable to both parties. Additionally, it strengthens the sense of ownership and involvement of the business in the training process. Offering a mentorship program, where an experienced professional from the business mentors and guides the apprentice, can be an attractive proposition. In addition, creating networking opportunities between apprentices and industry experts can promote a sense of community and industry integration and incentivize firms to actively participate (Gerxin, 2018).

In the field of higher vocational education in China, especially in the field of e-commerce, enhancing the participation of enterprises in modern apprenticeship programs is crucial for developing a skilled workforce that can effectively contribute to the development of the industry. By implementing a combination of financial incentives, customized training, industry certifications, collaborative curriculum development, and mentorship opportunities, the active participation of firms can be greatly encouraged (Yang Yun, 2015). These strategies not only benefit educational institutions and apprentices, but also contribute to the overall development and competitiveness of China's e-commerce industry.

The precise setting of training objectives plays a key role in shaping the effectiveness of modern apprenticeship programs, especially in the field of higher vocational education in China, focusing on the dynamic field of e-commerce. These objectives are carefully formulated and continuously refined through stakeholder collaboration, competency mapping, and an outcomes-based education framework that serves as a compass to guide the development of training skilled e-commerce professionals. Ensuring alignment with industry needs and facilitating a regular review mechanism, these precise training objectives drive program design, assessment, and

resource allocation, ultimately producing graduates who are able to excel in the evolving environment of China's e-commerce industry. Through strategic collaboration and a commitment to training accuracy, this approach not only shapes skilled apprentices, but also strengthens the competitiveness and innovation potential of China's e-commerce industry (Zhou, Dajun, 2016).

Additionally, calibrating these training goals is critical to keeping the program relevant and responsive. Collaboration between academia and industry, often through advisory boards and collaborative projects, ensures that training objectives are aligned with the latest industry trends, technologies, and best practices (Zhexin Xiong, 2019). This precision is key to preventing skills from becoming obsolete, especially in the rapidly evolving field of e-commerce. In addition, it helps foster a culture of lifelong learning among apprentices, encouraging them to continuously update their skills to meet the changing demands of the digital economy.

Optimizing content support mechanisms has become an important task in modern apprenticeship programs for higher vocational education in China, especially for the field of e-commerce. These mechanisms serve to improve the quality, relevance and effectiveness of apprenticeship programs. In order to ensure that these programs are seamlessly aligned with the dynamic needs of the e-commerce industry, several key strategies must be adopted (Liu, Y. J., 2019).

First, regular revision of educational materials is key to optimizing content support. Given the rapidly changing nature of the e-commerce field, educational content has limited durability. Therefore, a process of systematically reviewing and updating course materials is essential (Jinfeng Yang, 2019). This ensures that apprentices are always exposed to the latest industry trends, cutting-edge technologies, and relevant case studies, which enhances the usefulness and applicability of their learning experience. Partnerships between educational institutions and industry leaders facilitate this process, allowing real-world insights to be seamlessly integrated into the curriculum.

Additionally, fine-tuning the curriculum structure plays a key role in optimizing content support. Apprenticeship programs should be designed with a

strategic focus to teach learners comprehensive skills that are precisely aligned with the multifaceted needs of the e-commerce industry. This requires a thorough analysis of the course structure, including the sequencing of courses and the allocation of study time for different subjects. The curriculum should be adapted not only to reflect the dynamic needs of the industry, but also to accommodate the diverse learning styles and abilities of the apprentices (Zou Muying, 2019). This adaptation process should remain dynamic and be reassessed periodically to ensure the continued effectiveness of the curriculum in producing highly work-ready graduates suitable for the e-commerce field.

In addition to these efforts, the provision of supplemental instructional resources is another key aspect of optimizing content support. These resources can include digital libraries, online tutorials, or access to industry-specific software and tools. By providing apprentices with a variety of supplemental materials, educational institutions can enable them to delve deeper into areas of interest or fill in gaps in specific skills, resulting in a more well-rounded and adaptable talent pool. These supporting resources should be easily accessible and carefully curated to ensure that they are easy for apprentices to use.

Standardization of mentoring methods is a key area that requires careful attention. These methods serve as a compass for mentoring apprenticeship programs, ensuring a structured, efficient, and standardized approach to operations. In order to foster an ecosystem of adherence to prescribed rules and procedures, a multifaceted strategy is needed (Yingying Qin, 2016).

First, it is crucial to establish comprehensive guidelines that clarify the roles, responsibilities, and expectations of all stakeholders involved in the apprenticeship program. These guidelines should include the obligations of educational institutions, businesses, apprentices, and regulatory agencies. By providing a clear roadmap for each participant, these guidelines contribute to a common understanding of program goals, processes, and desired outcomes. This clarity helps reduce ambiguity, mitigate potential conflicts, and ensure a harmonious and productive partnership between academia and industry (Ningning Wang, 2017).

In addition, the implementation of strong monitoring and evaluation mechanisms is essential to standardize mentoring methods. Audits, evaluations, and performance reviews should be conducted on a regular basis to assess the effectiveness of and adherence to prescribed procedures in apprenticeship programs. These assessments should include key aspects of training quality, compliance with industry standards, and the overall experience of the apprentice. The insights gained from these assessments serve as valuable feedback that can help with program improvement and the implementation of standard operating procedures (Feng, Xinguang, 2017).

Additionally, standardization of mentoring methods can be significantly enhanced by leveraging technology and digital platforms. The development of dedicated software or digital platforms can facilitate transparent communication, documentation, and tracking of apprenticeship activities. These platforms can serve as central hubs where apprentices, mentors, educators, and industry representatives can collaborate, share progress updates, and report any deviations from prescribed procedures. This digitization not only simplifies administrative tasks, but also ensures real-time visibility of program compliance (Pan State, 2015).

Since e-commerce is a rapidly evolving field, educators need to stay up-to-date with the latest industry trends, technologies, and tools. Training programs can bridge the gap between academia and industry by providing teachers with real-world knowledge and hands-on experience. For example, regular industry-led workshops can immerse faculty in current best practices, from understanding big data analytics to the intricacies of digital marketing and supply chain management (Hongwei Ouyang, 2015).

In addition, the unique nature of apprenticeship programs-where learning takes place both in the classroom and in the real world-requires teachers to take on dual roles: teacher and mentor. As mentors, educators need to guide students through the complexities of the workplace, which are often beyond the scope of traditional pedagogy. Customized teacher training programs can help educators excel

in this dual role, focusing on mentoring, leadership, and effective communication skills.

In addition, support initiatives such as research grants, industry collaboration opportunities, and access to advanced e-commerce tools can help educators stay ahead of the curve (Yanfei Wang, 2016). These initiatives not only enhance the quality of teaching and learning, but also foster an environment of continuous learning for the educators themselves, which is a trait they can impart to their students.

The importance of strengthening assessment methods cannot be overlooked. This necessity stems from the desire to achieve greater scientific rigor in assessment and diagnosis, ultimately leading to a more accurate and nuanced portrayal of students' abilities and performance. An important aspect of enhancing assessment methods is diversifying the assessment tools and techniques used in apprenticeship programs (Yan Han, 2016). This diversity allows for a comprehensive assessment of student competencies that includes not only traditional exams, but also hands-on assessments, project-based assessments, and real-world simulations. By employing multiple assessment methods, a more comprehensive view of student competencies can be obtained, aligning with the multifaceted needs of the e-commerce industry.

In addition, the integration of technology-driven assessment tools can play a key role in modernizing assessment methods (Chen, Lianghua, 2021). The use of cutting-edge technologies, such as data analytics and artificial intelligence, allows for the analysis of large amounts of data related to student performance. This data-driven approach can provide valuable insights about individual learning trajectories and areas in need of improvement, helping to provide personalized interventions to support student growth.

Additionally, it is critical to emphasize formative assessment strategies that provide ongoing feedback and opportunities for students to self-assess and reflect on their progress. By fostering a culture of continuous improvement and self-directed

learning, apprenticeship programs can better prepare students for the dynamic and evolving environment of e-commerce (Wendy Ho, 2014).

It is important to promote industry integration and collaborative synergy. This strategic goal aims to enhance the active participation of industry stakeholders and build strong collaborative relationships between educational institutions and businesses, ultimately ensuring that training modules are seamlessly aligned with the evolving career needs of the e-commerce industry.

In order to achieve this goal, it is crucial to initiate and maintain a dialog between educational institutions, students and industry representatives. Regular communication channels should be established to facilitate the exchange of insights, feedback and industry-specific knowledge (Tan, Shaohua, 2021). This dialogue-driven approach helps educators to stay abreast of the rapidly changing needs of the e-commerce industry, enabling them to make timely adjustments to training modules and course content. In addition, industry participation can be incentivized through mechanisms such as advisory boards and industry academic partnerships. By involving industry experts in curriculum development and project management, apprenticeship programs can gain real-world insights and ensure that students are equipped with the most relevant and up-to-date knowledge and skills.

Collaborative synergies between educational institutions and businesses can also include co-designed apprenticeship programs in which both parties work together to identify learning objectives, competencies, and training

Pathways. These co-designed programs foster a sense of ownership and co-responsibility, further strengthening the alignment between education and industry needs (Luo, 2021).

Strengthening the institutional framework is a strategic necessity. This includes establishing and strengthening specialized institutional mechanisms, such as vocational education teaching steering committees. These committees play a key role in strengthening the management and oversight of apprenticeship programs and ensuring their effectiveness and relevance (Li Xun, 2016).

Vocational education teaching steering committees play several key roles in the enhancement of modern apprenticeship programs. First, they play a key role in curriculum development and refinement. By bringing together experts from educational institutions and the e-commerce industry, these committees can collaborate to design curricula that are aligned with industry needs. This dynamic approach ensures that students are equipped with up-to-date, industry-relevant knowledge and skills.

Second, these committees facilitate regular evaluation and assessment of the program. They establish key performance indicators (KPIs) and benchmarks to measure the success and impact of apprenticeship programs. Through systematic evaluation, educational institutions can improve the quality of their programs based on a data-driven approach, thereby enhancing the overall learning experience for students. In addition, the Vocational Education Teaching Steering Committee serves as a platform for constructive dialogues between academia, industry, and relevant government agencies (Zhu, L., 2019). These dialogues help identify emerging trends, challenges, and opportunities in the field of e-commerce. As a result, the committees can recommend strategic adjustments to apprenticeship programs to ensure that they remain flexible and responsive to the changing landscape of the industry. In addition, these committees can facilitate collaboration between educational institutions and e-commerce businesses. They can assist in brokering agreements and Memorandums of Understanding (MoUs) to formalize the commitment of both parties to the success of the apprenticeship program.

From the previous analysis of the main components of a modern apprenticeship system in the field of vocational e-commerce education in China, it is clear that several key variables play an important role in this field.

Implementation Speed

Definition: The rate at which the apprenticeship model is rolled out and becomes fully functional within the educational environment.

Importance: Faster implementation can lead to quicker benefits for students and institutions, although it must be balanced against the need for thoroughness and quality control.

Stakeholder Feedback

Definition: Input and evaluations from all parties involved in or affected by the apprenticeship program, including educators, students, industry partners, and administrative staff.

Importance: This feedback provides a multi-perspective view on program efficacy, which is essential for balanced assessment and subsequent improvements.

Adjustment Frequency

Definition: How often the apprenticeship model is reviewed for potential adjustments or updates.

Importance: Frequent adjustments can make the program more responsive to changing needs but must be managed to avoid disrupting long-term learning goals.

Post-Implementation Review

Definition: A formal review conducted after the apprenticeship model has been implemented to assess its effectiveness and identify areas for improvement.

Importance: Post-implementation reviews are critical for understanding the real-world impact of the program and making data-driven improvements.

Resource Allocation

Definition: The distribution and utilization of financial, human, and material resources in implementing and sustaining the apprenticeship model.

Importance: Efficient resource allocation ensures the program can be maintained sustainably and at high quality over time.

Success Indicators

Definition: Pre-defined metrics or benchmarks used to evaluate the overall success of the apprenticeship program.

Importance: Clearly defined success indicators make it easier to objectively assess program effectiveness and report to stakeholders.

Student Retention

Definition: The rate at which students continue in the program from year to year or complete it successfully.

Importance: High retention rates often indicate student satisfaction and program effectiveness, thereby increasing the overall value and reputation of the program.

Real-world Application

Definition: The extent to which skills and knowledge acquired during the apprenticeship can be directly applied in a work environment.

Importance: The more directly skills can be applied to real-world scenarios, the more valuable the training becomes for both students and employers.

Institutional Support

Definition: The level of support provided by the educational institution in terms of administration, resources, and policy.

Importance: Strong institutional support can be a cornerstone for the program's success, providing the necessary foundation and resources for effective implementation.

Quality Assurance

Definition: Mechanisms in place to maintain and improve the quality of the apprenticeship program, including audits, peer reviews, and continuous feedback loops.

Importance: Quality assurance ensures that the program meets certain standards and expectations, providing confidence to both learners and employers.I hope these definitions and discussions of importance serve your third objective well. These factors are crucial for the effective implementation, assessment, and recalibration of modern apprenticeship model in vocational e-commerce programs.

Suggestion on teacher's guide on "Implementing an Effective modern apprenticeship model in Chinese Vocational E-commerce Education.

Based on the foregoing discussion and subsequent literature review, a number of actionable recommendations have been made to enhance educators' teaching strategies. These suggestions include: partnering with companies for real-world project simulations, organizing workshops and short-term internships, interdisciplinary curriculum design, student personal brand development, and continuous assessment methods. Here are the details.

In today's digital age, the importance of e-commerce in shaping the global economic paradigm cannot be underestimated. For educational institutions offering business and technology programs, there is an immediate need to incorporate practical, real-world e-commerce projects into the curriculum. The goal is to go beyond theoretical knowledge and help students gain valuable hands-on experience that will enable them to adapt to industry demands. One solution is to design one or more real or simulated e-commerce projects with companies as large-scale coursework during semesters or throughout the academic year (Joan Mok, 2021).

The first step in this ambitious academic program is to form strategic partnerships with e-commerce companies that are willing to collaborate. It is important to reach out to companies that see a win-win situation for this type of collaboration. For the companies, it is an opportunity for brand exposure and possible discovery of new talent; for the institution, it is a way to enrich the educational experience. However, a rigorous vetting process should be put in place to ensure that the partnering business meets the educational objectives of the program and provides real value to students. Consider forming committees of faculty, industry experts, and even students to conduct these evaluations.

Another option to consider is using an open source e-commerce platform to set up simulations. Open source platforms are customizable and scalable, allowing students to experiment with various business models, payment gateways and digital marketing strategies in a risk-free environment. Educators can integrate real-world challenges such as managing online traffic, dealing with cybersecurity issues and

integrating digital payment systems. As students tackle these challenges, they will acquire practical skills that are immediately applicable to the workplace (Wallis, P. 2012).

Once a partnership has been established or a platform chosen, the next step is project development. These projects should be designed to cover multiple aspects of e-commerce - from inventory management, data analytics, and SEO optimization to customer service, digital marketing, and international business strategy. If feasible, real data from partner companies can be used to provide students with a more authentic learning experience.

The structure of these programs must also be carefully considered. Traditional grading methods may not adequately reflect the depth of learning and skill acquisition involved in these complex tasks. Therefore, consider using a multifaceted assessment model that includes, but is not limited to, peer review, faculty assessment, and feedback from industry partners. This ensures that students are held accountable not only for the final outcome, but also for the process and teamwork. Students will benefit greatly from these programs. Not only will they gain a comprehensive understanding of the e-commerce field, they will develop soft skills such as teamwork, problem solving, and time management. They will also build a professional portfolio that they can present to potential employers, giving them a competitive edge in the job market.

Additionally, educational institutions can create an alumni network focused on e-commerce, encouraging former students to interact with current students to share knowledge, experiences, and even employment opportunities. This sense of community would add extra value to the program, making it more attractive to prospective students and industry partners (Jian Liu, 2023).

In summary, integrating real-world or simulated e-commerce projects into academic programs provides an unparalleled educational experience. Collaborations between educational institutions and e-commerce companies or the utilization of open source platforms provide students with the tools they need to succeed in the competitive world of e-commerce. By taking this holistic approach, educational

institutions not only remain relevant, but also make significant contributions to the industry, training the next generation of e-commerce professionals.

The combination of academic theory and practical experience is at the heart of an effective educational strategy, especially in a constantly evolving technology-driven field like e-commerce. One of the most innovative ways to achieve this combination is by integrating real-world project simulations in partnership with existing businesses. This approach not only facilitates a more nuanced understanding of theoretical concepts, but also provides students with a highly valuable set of practical skills that can be directly applied to their future careers. The traditional education system leans heavily on theoretical courses, but fields like e-commerce need to move away from this tradition and towards a more holistic, practice-oriented pedagogy.

In order to realize this educational vision, educators need to proactively engage in a dialogue with local and international e-commerce businesses. The goal should be to create a symbiotic relationship that is evident: businesses benefit from a fresh perspective and a de facto expanded workforce that can tackle real-world challenges, while students gain insight into the inner workings of the industry. Citing Shannon Kang's 2016 academic research, this partnership provides a risk-free platform for companies to assess the capabilities of potential future employees.

At the same time, educators should not underestimate the power of simulation projects, especially those that can be executed on open-source e-commerce platforms such as Jingdong or Taobao. These platforms are not only testing platforms, but also microcosms of the e-commerce world, providing students with a low-risk environment to experiment, make mistakes, and learn from them. As Hairong Zhou and Yang Qiu pointed out in their 2018 study, the flexibility of these platforms allows for seamless integration of academic programs that target specific learning objectives, such as inventory management, customer relationship management, or even digital marketing strategies.

Another under-explored aspect is the integration of these real or simulated programs into academic grading systems. Traditional assessment models may not be sufficient to fully capture the multifaceted skills and competencies developed in these project efforts. Educators may need to consult with industry partners to develop more sophisticated assessment metrics to accurately evaluate student performance. These metrics could include aspects of teamwork, problem solving, strategic thinking, and adaptability, in addition to the final outcome of the program.

In addition, it is not just about learning the "how" but also about understanding the "why". Students should be encouraged to critically reflect on their experiences, not only to identify effective strategies, but also to understand why they are effective. This reflective practice provides a deeper understanding of the e-commerce ecosystem and prepares students not only as employees, but also as future industry leaders.

By participating in these authentic programs, students also have the opportunity to network with industry professionals, paving the way for future employment or entrepreneurial opportunities. Schools can further facilitate this by organizing regular interactive sessions with industry leaders to enrich the academic experience beyond the classroom.

In conclusion, real-world project simulation in partnership with companies is more than just an innovative educational strategy; it marks a paradigm shift in the approach to e-commerce education. It accomplishes the dual goal of enriching theoretical understanding while also instilling a comprehensive set of practical skills that are highly valuable in the professional world. This holistic approach is not only the future of e-commerce education, but may also be a model that other professional fields can learn from to provide a more effective and relevant academic experience.

Arranging one or two seminars or short internships during the semester to provide students with the opportunity to learn in a real-world work environment. Establish partnerships with local e-commerce businesses to provide students with one-week to one-month internships. Integrating seminars and short-term internships

into the academic calendar bridges the gap between theoretical knowledge and real-world application, a key aspect often missing in traditional educational settings. This is especially important in the fast-changing world of e-commerce, where the value of hands-on experience can rival classroom learning (Migong Wang, 2019). To implement this, educators can reach out to local e-commerce businesses to demonstrate the benefits for both parties. For businesses, these short-term internships provide a talent pipeline and a source of new perspectives. At the same time, students have the opportunity to tackle real-world business challenges under the guidance and supervision of industry professionals. This experience gives them a better understanding of the day-to-day operations, workflows and challenges in an e-commerce business.

The duration of these internships ranges from one week to one month, ensuring that students are able to engage in meaningful work without compromising on their academic commitments. These short-term internships are long enough to allow students to absorb real-world knowledge, yet short enough to allow them to focus on their academic program. Workshops can also be held in collaboration with industry experts, covering topics such as digital marketing strategy, SEO optimization, or data analytics. These seminars can be used as short, intensive training programs to provide students with specific skills or knowledge areas that are immediately applicable (Qi Mu and Xia Zhikun, 2019).

Incorporate interdisciplinary elements such as marketing, data analytics, and programming into e-commerce course design. Designing course syllabi to include other relevant courses or modules outside of the basic e-commerce discipline, such as Python programming, SEO fundamentals, and data analytics. The eCommerce industry is a complex intersection of multiple disciplines - from marketing and data science to software development. As such, interdisciplinary curriculum design is critical to producing well-rounded graduates who meet the needs of the industry (Xinlin Li, 2019). This multifaceted approach goes beyond traditional e-commerce studies to provide students with a broader understanding and skills that are applicable in a variety of roles within the industry. To this end, educators should

modify existing curricula to embed courses that provide complementary skills. For example, integrating a Python programming course could provide students with the programming skills needed to analyze big data or develop a basic e-commerce platform. Understanding the basics of search engine optimization (SEO) would provide the necessary knowledge base for the marketing aspects of an e-commerce business. Meanwhile, a data analytics module can provide students with the skills to extract actionable insights from customer data, thereby

skills to extract actionable insights that can inform business strategies (Seah Rui-Long, 2015).

Such a comprehensive program should be carefully designed to ensure that it maintains a focus on core e-commerce competencies while enriching students with other relevant skills. Educators can consult with industry experts to ensure that the curriculum is aligned with current trends and needs. Adopting an interdisciplinary curriculum design not only makes e-commerce learning more dynamic and comprehensive, but also prepares students for the real-world challenges they will face in their careers (Zhu, Min, 2020). They will have the tools to solve problems from multiple perspectives, providing more effective and innovative solutions.

Educate students on how to build and maintain a personal brand, which is especially important in the e-commerce space. Design seminars or short courses that focus on personal branding, covering topics such as social media management, personal website creation, and online marketing strategies. In today's connected world, personal branding has become an important part of professional success, especially in the highly competitive e-commerce industry. A well-planned personal brand not only sets students apart in their job search, but also adds credibility to their online presence.

Bringing this concept into the educational arena, specialized workshops or short courses can be designed to guide students through the details of managing their personal brand. These seminars can cover a variety of topics ranging from effective social media utilization to the creation of personal websites. For example, a course on social media management could teach students how to present

themselves online, showcase their skills and projects, and network with industry professionals. This also includes understanding algorithms as well as when and what to post to maximize reach and engagement. Another component could be a course on designing and maintaining a personal website that serves as an extension of a resume and portfolio, showcasing projects, accomplishments, or even blog posts that reflect expertise in the field of e-commerce (Jinfeng Yang and Zhexin Xiong, 2019).

The intersection of e-commerce and education provides an unprecedented opportunity to develop versatile professionals who are not only proficient in the technical aspects of the field, but also possess the skills necessary to navigate the modern digital landscape. In addition to the traditional academic focus on theory and principles, the inclusion of courses on online marketing strategies is especially necessary. These strategies are more than just skill building; they provide students with the tools to significantly enhance their personal brands and set them apart in a competitive job market.

Understanding the core elements of online marketing strategies is crucial in this regard. For example, content marketing can be an important course module. Students should learn how to create and manage blogs, white papers or video content to attract and engage their target audience. These skills go beyond traditional marketing as they involve storytelling and brand positioning, which are key aspects of making a candidate more relatable and appealing, both to potential employers and consumers.

Similarly, search engine optimization (SEO) is not only a tool for businesses, but an essential skill for anyone looking to build a strong online presence. SEO can help students understand how to rank their portfolios or blogs on search engines, driving organic traffic and increasing their visibility. A comprehensive course can cover everything from keyword research to link building strategies and website optimization. Since e-commerce relies heavily on search algorithms, the skills here are not only useful for personal branding, but also directly applicable to multiple positions within the industry.

Email marketing, while often seen as a traditional channel, still holds great value in the modern ecommerce ecosystem. Understanding its nuances can enable students to run successful email campaigns, whether it's selling a product or creating value through a newsletter. Students can learn how to segment their audience, create compelling content, and analyze key metrics to further optimize their strategy. Again, the skills gained are not just academic; they provide a practical edge that can be immediately applied to real-world situations, giving students a starting line when they enter the professional world.

By providing students with these marketing tools, educational institutions can help them make a smooth transition into the workforce or entrepreneurial ventures. they are not just skilled individuals, but also have a strong digital presence as well-rounded professionals. This multifaceted preparation can significantly improve their competitiveness in the e-commerce space, enabling them to use their personal brand as a unique selling proposition (Hongwei Cui, 2018).

In addition, the practical experience gained from implementing these online marketing strategies can be of great benefit. For example, students can undertake course projects in which they can run actual marketing campaigns and perhaps even work with real-world businesses, enabling them to apply their theoretical knowledge to real-world situations. These projects can be used as case studies, providing valuable material for their portfolios and showcasing their skills to future employers or investors.

However, these benefits are not limited to the short term; they have far-reaching long-term implications. A well-crafted personal brand can open doors to future opportunities, not just immediate ones in the job market. It can lead to speaking engagements, industry recognition, and even business partnerships. In this sense, incorporating personal brand development into the curriculum is not just an added value, but a long-term investment in students' futures (Dan, 2022).

Incorporating these components into the educational experience is not only an enrichment of the curriculum, but a fundamental paradigm shift that aligns education with the evolving needs of the e-commerce industry. By doing so,

educational institutions are not only keeping up with the times, but also balancing the dual purpose of academic instruction and real-life preparation, thus providing comprehensive, long-term value to students in their future careers.

In contemporary education, especially in a rapidly evolving field like e-commerce, a single method of assessment is increasingly seen as insufficient to fully assess a student's mastery of a subject. Particularly in fields that require not only theoretical knowledge but also practical skills, emotional intelligence and teamwork skills, the traditional single examination approach is no longer able to fairly assess the overall quality of students. Therefore, it is particularly important to adopt diversified assessment methods to cover a wide range of skills and knowledge areas. This is why the integration of multiple assessment methods including program assessment, teamwork assessment, internship performance and periodic examinations is crucial.

First and foremost, program assessments provide a unique insight into a student's ability to apply theoretical knowledge to real-world situations. They can also measure other key skills such as problem solving, innovation, and even leadership. A student must demonstrate a combination of technical, managerial, and interpersonal skills from the beginning to the end of the program. Assessments can include not only the end result, but also the process, considering factors such as creativity, efficiency, and how the student overcame obstacles.

Similarly, teamwork is an important but often overlooked area in traditional assessment models. The modern workplace is a collaborative hub, so the ability to work effectively as a team is invaluable. A teamwork assessment can evaluate a student's ability to communicate, compromise, and contribute to the achievement of a common goal. Such an assessment can be based on peer review, mentor assessment, or even self-assessment, providing a multi-dimensional view of a student's teamwork skills.

Internship performance is another integral method of assessment. Unlike program evaluations that may sometimes be limited to academic or simulated environments, internships place students in an actual business setting. Here, they are

expected to demonstrate not only technical skills, but also adaptability, learning curves, and even how they fit into the company culture. Feedback from company mentors can provide invaluable insights into how students perform in real-life work scenarios, making it an important aspect of comprehensive student assessment.

Regular exams, while sometimes seen as less reflective of real-world skills, still have value in assessing a student's grasp of theoretical concepts. Exams can be designed to test not only memorization but also conceptual understanding and problem-solving skills. These exams can take a variety of forms, from traditional written tests to more modern, interactive online assessments. When used in conjunction with other assessment methods, exams provide a more comprehensive view of a student's academic abilities.

By the end of the semester, a comprehensive assessment should be conducted that combines all of these different metrics. This is more than simply averaging scores; it is a careful analysis of the unique strengths and weaknesses highlighted by each type of assessment. For example, a student who excels in practical projects but struggles in exams may need different academic support than a student who excels in theoretical understanding but lacks practical skills.

In addition, additional tools such as seminar feedback, Q&A sessions and tutor assessments can add layers to this comprehensive assessment. These elements provide context and often explain the reasons behind student performance, guiding educators to tailor future teaching strategies for each individual.

In conclusion, the key to producing graduates who are theoretically sound and practically proficient lies in the use of a diverse, multi-layered assessment system. Each assessment method brings its own unique metrics to the table, and it is only through a combination of these methods that educational institutions can hope to produce well-rounded professionals. A comprehensive end-of-semester assessment that includes real-world projects, teamwork, internship experiences, and classroom exams is the final piece of this complex but invaluable assessment mosaic.

Traditional educational settings often rely on standardized tests as the primary means of assessment. However, given the dynamic and multifaceted nature of e-commerce, a more comprehensive assessment strategy is necessary. Such a comprehensive assessment approach measures not only students' depth of knowledge, but also their ability to apply it in diverse, real-world scenarios.

To accomplish this approach, teachers can create a multifaceted assessment framework. First, project-based assessments can provide insight into students' understanding of e-commerce platforms, as well as their problem-solving and creative skills. These projects can be individual or team tasks that encourage teamwork and collaboration, which are key attributes in any professional setting (Tong, Hongbing, 2018).

The role of assessment cannot be underestimated in modern education, especially in areas such as e-commerce that require the acquisition of both theoretical and practical skills. Through assessment, educators can measure the effectiveness of their teaching methods and students can receive feedback for improvement. Internship assessment and traditional exams each bring a unique perspective to the process, making their combination essential in an integrated, multi-level assessment strategy.

Internship assessments occupy a unique place in this system because they allow for the assessment of a student's competencies in a real-world work environment. Companies involved in internships can provide detailed feedback covering everything from technical skills on e-commerce platforms and tools to soft skills such as communication, problem solving and leadership. For example, students may be assigned to lead a small digital marketing campaign or be involved in improving a website's user interface. Their performance in these roles provides valuable insight into their readiness to undertake similar tasks after graduation.

The feedback component of the internship serves a dual purpose. First, it directly informs students of their strengths and areas for improvement, giving them the opportunity to refine their skills before entering the job market. Secondly, it also provides a form of market feedback for the educational institution itself. If multiple

students are underperforming in certain areas during their placements, this may indicate that there are gaps in the curriculum that need to be addressed.

On the other hand, traditional exams play an important role in assessing students' theoretical understanding. While they may not simulate real-world scenarios, they do test the conceptual and analytical skills needed to understand and solve them. In addition, with the modernization of teaching methods, these exams can be designed to test more than just rote memorization. They can include case studies, scenario questions and even simulations that require students to apply theoretical principles to real-world situations. Therefore, instead of eliminating traditional exams, they should be updated and integrated into a comprehensive assessment system.

Equally important, the field of e-commerce is always in a state of flux, with new technologies, regulations and market trends emerging all the time. To ensure that students are able to adapt to this changing environment, the assessment strategy itself should be constantly updated. Implementing diverse assessment methods can provide a nuanced, multidimensional understanding of student competencies. By combining the strengths of internship assessments and traditional exams, educators can gain a more complete picture of how well prepared students are to transition from the classroom to the competitive world of e-commerce. This rich feedback mechanism can identify students who are not only capable of becoming good employees, but even have the potential to become future leaders in e-commerce.

In conclusion, the call for diverse and evolving assessment strategies is not just an educational preference, it is a necessity. It enriches the educational experience, provides long-term value, and most importantly, prepares students not only to be job-ready, but also to be industry-leading professionals in the dynamic, evolving world of e-commerce.

Based on the aforementioned analysis of the content of modern apprenticeship model in the field of vocational e-commerce education in China, it is evident that several key variables play an important role in this field.

Guide Usability

Definition: The ease with which instructors can understand and apply the guide in their teaching environment.

Importance: A user-friendly guide will be more readily adopted by instructors, thereby having a more immediate impact on teaching quality.

Case Studies Included

Definition: The presence of real-world or hypothetical examples within the guide that demonstrate how the apprenticeship model can be applied.

Importance: Case studies can provide actionable insights and make theoretical concepts more relatable, thus aiding in practical implementation.

Skill Transferability

Definition: The ability of the skills taught through the apprenticeship model to be applied in various job roles or industry sectors.

Importance: High transferability increases the value of the educational experience for students, making them more versatile in the job market.

Instructional Techniques

Definition: The methods and approaches recommended in the guide for effectively conveying knowledge and skills.

Importance: Effective instructional techniques enhance the learning experience, making the apprenticeship model more successful.

Problem-solving Methods

Definition: Approaches and techniques outlined in the guide for solving practical or theoretical problems encountered during apprenticeships.

Importance: These methods equip instructors with the tools they need to address challenges, improving the overall quality of the educational experience.

Ethical Considerations

Definition: Guidelines or recommendations on addressing ethical dilemmas or issues that may arise in implementing the apprenticeship model.

Importance: Ethical considerations ensure that the program is not only effective but also fair and responsible, contributing to its long-term sustainability.

Time Management

Definition: Strategies within the guide for effectively managing time in both teaching and learning activities.

Importance: Good time management allows for a more structured and efficient learning environment, thus improving the quality of the apprenticeship experience.

Peer Review

Definition: Mechanisms or recommendations for undergoing or conducting evaluations by educational peers to assess the quality of the apprenticeship implementation.

Importance: Peer reviews provide a level of quality assurance and offer constructive feedback for continuous improvement.

Adaptability to Changes

Definition: The degree to which the guide and its recommendations can be adapted to new developments in the industry or educational methodologies.

Importance: A guide that can adapt to changes is more sustainable and ensures that the apprenticeship model remains relevant over time.

Cultural Sensitivity

Definition: The extent to which the guide considers cultural nuances relevant to the educational context in which it will be applied.

Importance: Cultural sensitivity ensures the guide and the apprenticeship model are more universally applicable and respectful of diverse student backgrounds. I hope this analysis aids in the development of an instructor's guide focused on effectively implementing modern apprenticeship model in vocational e-commerce education in China.

Based on all the above literature review, the following 12 factors are summarized in the table below:

Table 2.1 Impact factor summary and code representation

CODE	Impact Factor
C1	Curriculum Development
C2	Collaboration and Partnerships
C3	Teaching and Learning Materials
C4	Pedagogical Practices
C5	Student Engagement and Support
C6	Assessment and Evaluation
C7	Infrastructure and Technology
C8	Program Implementation
C9	Organizational Support
C10	Governance and Ethical Considerations
C11	Cost Management
C12	Community and Inclusivity

The following is a summary of the literature review of each factor, with only the important parts listed and the others described in the original article. Each factor is represented by a code, check table 2.1 for the code representation.

Table 2.2 Contributions of Authors to Key Areas in Modern Apprenticeship model for E-commerce Education

Name & Date	C 1	C 2	C 3	C 4	C 5	C 6	C 7	C 8	C 9	C 10	C 11	C 12
Bingham, H., 2014	√											
Campbell, J., 2006	√	√										√
Chen kangdi, 2016				√		√			√			
Dai Wen, 2018							√					
Dan, L., 2022	√		√									
Dimeny, E., 2019	√										√	
Feng Xinguang, 2017	√			√			√					
Fuller, A., 2003	√											√
Greig, M., 2019	√											
Gu Pan, 2018	√						√			√		
He Wenting, 2014			√						√			
Hong enhua, 2022						√						
Hu Chuanxun, 2019	√		√		√							
Huang, Z.D., 2021	√								√			√
Ji, S., 2021												
Kang Shanshan, 2016	√									√		
Li Jianping, 2019			√				√					
Lin, M.N., 2022	√				√							
Liu Yongjun, 2019		√						√				
Liu, C.C., 2022	√											
Luo Yonghua, 2021	√											
Maguire, M., 2014	√					√	√			√		√
McKay, A., 2006	√			√								
Meng Yanmei, 2016	√											
Moon, H.N., 2018	√											
Ou, X.Y., 2022								√				
Ouyang Hongwei, 2015					√							

Table 2.2 (Continued)

Name & Date	C 1	C 2	C 3	C 4	C 5	C 6	C 7	C 8	C 9	C 10	C 11	C 12
Penn, R., 1998	√			√								
Qiu Yang, 2018	√											
Rao, Y.T., 2019	√											
Ren, P.P., 2022									√			
Ridzwan, C.R., 2015	√							√				
She Ruilong, 2015			√			√						
Sims, D., 2004	√	√										
Spielhofer, T., 2004	√											
Steedman, H., 2001	√											
Sun, Y., 2021	√				√				√			√
Tan Shaohua, 2021	√											
Thomson, E., 2006	√											
Tong Hongbing, 2018	√				√							
Unwin, L., 2003	√											√
Wang Yanfei, 2016			√									
Williamson, D., 2019	√										√	
Wu, J.C., 2022								√				
Wu, Z.X., 2020									√		√	
Xiong Zhexin, 2019	√		√				√					
Xu Lijuan, 2017					√							
Yasin, R.M., 2015	√											
Yu, X.S., 2020	√			√								√
Zeng, Y.Y., 2017	√											
Total	**25**	**11**	**3**	**11**	**4**	**7**	**4**	**4**	**4**	**4**	**10**	**2**

Chapter 3
Research Methodology

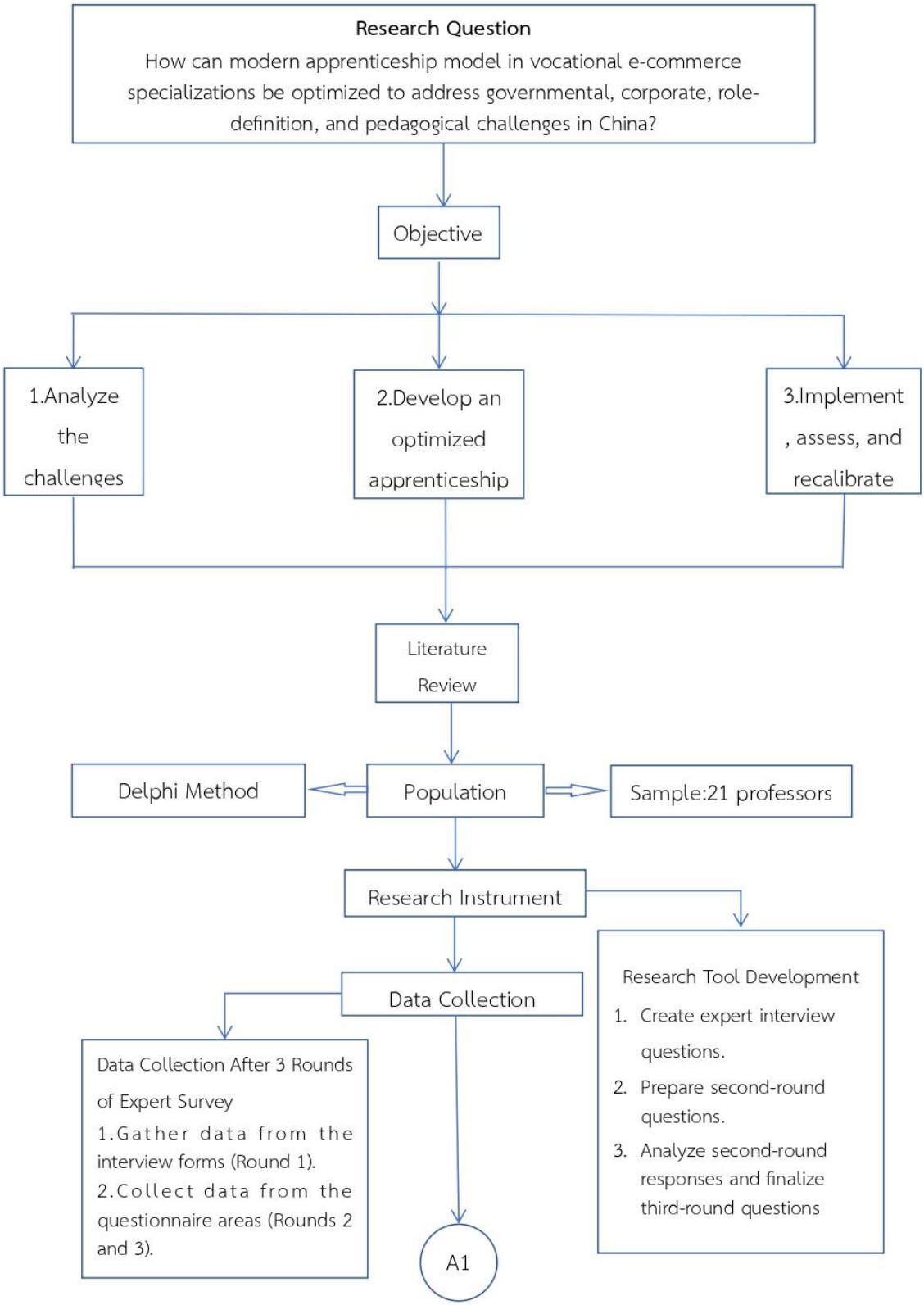
The main objective of this doctoral dissertation is to investigate and address the multifaceted and complex issues that currently hinder the optimization of modern apprenticeship model, particularly in this area of educational specialization. Based on well-designed research questions, this study aims to shed light on how to optimize the modern apprenticeship system to address a range of challenges in China's unique socio-cultural and economic environment, including government policies, business expectations, role definitions, and pedagogical approaches.

The structure of this study is built on four core objectives. The first objective is to map the current bottlenecks and limitations that hinder the effective implementation of apprenticeship models in vocational e-commerce programs. The second objective is to develop a more streamlined and efficient apprenticeship framework for China's rapidly growing e-commerce industry. The third objective aims to empirically validate this optimization model through real-world implementation, rigorous evaluation, and subsequent adjustments based on the research findings. Finally, the fourth objective is to disseminate these insights through the creation of a guidebook for educators. Together, these objectives form the pillars of the research methodology of this thesis. The next section explores the methodological approach in detail, outlining the research design, data collection strategies, and analytical techniques that will be used to achieve these objectives and answer the core research questions.

In the scholarship of this doctoral dissertation, the research can be conceptualized as unfolding in three phases: the initial development of the research proposal, the execution of the research procedures, and the subsequent preparation of the research report. The procedural component was designed using a multi-stage

approach aimed at achieving the stated objectives. Specifically, the Delphi method was used to achieve objectives 1 and 2 as a rigorous means of generating expert consensus. In contrast, focus groups were used to achieve objectives 3 and 4, providing valuable qualitative insights through interactive discussions. This methodological framework ensured a comprehensive and in-depth exploration of the research questions.

The diagram provided outlines the entire research process, from initiation to knowledge dissemination. It provides a visual overview of the structured approach to achieving the research objectives.


Research Question
How can modern apprenticeship model in vocational e-commerce specializations be optimized to address governmental, corporate, role-definition, and pedagogical challenges in China?
Objective
1.Analyze the challenges
2.Develop an optimized apprenticeship
3.Implement , assess, and recalibrate
Literature Review
Delphi Method
Population
Sample:21 professors
Research Instrument
Research Tool Development
1. Create expert interview questions.
2. Prepare second-round questions.
3. Analyze second-round responses and finalize third-round questions
Data Collection
Data Collection After 3 Rounds of Expert Survey
1.Gather data from the interview forms (Round 1).
2.Collect data from the questionnaire areas (Rounds 2 and 3).
A1

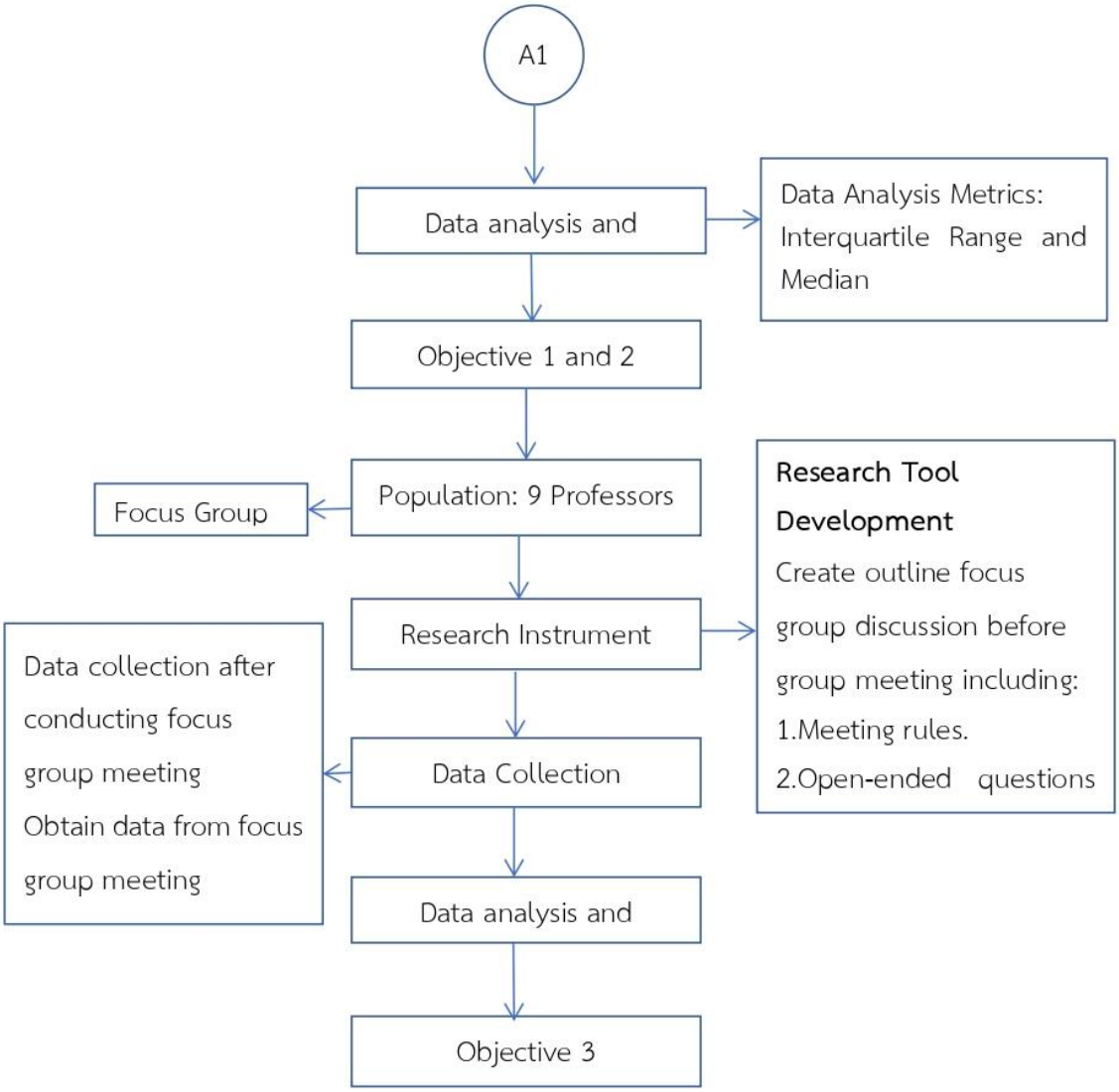


Figure 3.1 Details of the research process step

The detailed content of the research method is as follows:

Stage 1

Apply the Delphi method to achieve objective 1 and objective 2

The Population

Select 21 experts from the field of digital technology e-commerce teaching in vocational colleges in Weifang city.

The qualifications of these 21 experts are as follows:

1. More than 10 years of work or teaching experience in e-commerce field;
2. Having an intermediate or above professional title or a doctoral degree;
3. Principal, teacher, or e-commerce manager;
4. Having rich experience in e-commerce field.

Research Instruments

1. Expert questionnaire content

There are three versions of the expert questionnaire, corresponding to three rounds of expert opinion consultation:

(1) The first version is an expert interview form. Researchers use a questionnaire consisting of three parts, as follows:

Part I: Demographic variables (Checklist), General information of the respondents, totaling 41 items,

Part II: Variables of Determining the variables of effective e-commerce teaching. (Five-point rating scale), totaling 41 items.

Part III: Suggestions and additional comments (Open Ended).

The instrument, propose effective teaching model on modern apprenticeship system of e-commerce Major in Chinese vocational college, required the respondents to determine the degree to which each statement reflecting the

components of effectiveness. Each statement is to measure on a 5-point Likert's scale (1932);

5 = Strongly Agree,

4 = Agree,

3 = Neutral,

2 = Disagree,

1 = Strongly Disagree.

as shown in the **Table 3.1**.

Table 3.1 Measurement scale of effective modern apprenticeship system of e-commerce Major in Chinese vocational college.

Perception level	Score
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

The second version is a five-level estimation questionnaire that combines the opinions of the first round of experts. The specific content is:

The factors that affect modern apprenticeship model in vocational e-commerce education in China.

The third version is a five-level estimation questionnaire with the same content as the second round, and includes the corresponding indicator values (Quartile range, median) for the second round of scoring results.

2. Construction process of expert questionnaire:

Step 1: Construct the first-round of expert questionnaire;

Step 2: Invite 5 experts to test the target consistency index (IOC) of the expert questionnaire;

Step 3: Modify the expert questionnaire based on the expert's suggestions;

Step 4: Distribute expert questionnaires to 21 experts;

Step 5: After collecting opinions on the questionnaire, prepare the first draft of the second-round of expert questionnaire;

Step 6: Conduct the remaining two rounds of expert questionnaires (the same method as the first five steps);

Step 7: Summarize three rounds of expert opinions to obtain a digital technology supported model on modern apprenticeship model in vocational e-commerce education in China.

Data Collection

Researchers collect data based on research tools. The steps are as follows:

1. Design and develop an expert questionnaire to determine a list of 21 experts who can participate in three rounds of questions.

2. The researchers requested that the Graduate School of Bansomdejchaopraya Rajabhat University issue a letter requesting the collection of 21 experts.

3. Implement three rounds of expert opinion survey and feedback.

4. Analysis of expert opinions. After each round of expert feedback, opinions are gathered based on the content of the expert questionnaire, ultimately forming a consensus view.

Data Analysis

In the data analysis of this study, researchers analyzed the questionnaires provided by experts in the first and second rounds using statistical indicators, as follows:

Interquartile range (IQR)

The Interquartile range can be used to analyze the concentration and distribution of expert opinions.

IQR (Interquartile Range) is a statistical measure of the degree of concentration in a data set. It indicates the degree of dispersion of the data in the middle 50% range. The calculation method is as follows:

1. Sort the data in ascending order.

Calculate the first quartile (Q1): This is the lower quartile and represents the 25th percentile of the data.

Calculate the third quartile (Q3): This is the upper quartile and represents the 75th percentile of the data.

Calculate IQR: IQR = Q3 - Q1

2. Determination of the IQR interval value

In order to assess the degree of consensus of the expert opinion based on the IQR, the following criteria are generally used, which are usually based on the data distribution and the experience of the expert group.

(1) High Consensus

Interval: $0 \leq IQR \leq 1.8$

Explanation: A small IQR value indicates that the expert opinions are relatively concentrated, with fewer differences, and that a large proportion of experts agree within a certain range. Generally speaking, such an IQR value indicates a tight data distribution and a high degree of consensus among the experts.

(2) Medium consensus (Medium Consensus)

Interval: 1.8 < IQR ≤ 2.0

Explanation: A moderate IQR value indicates that there is a certain degree of disagreement among the experts, but there is still a certain degree of consensus. This range indicates that the data distribution is slightly loose, but most of the expert opinions are still close.

(3) Low Consensus

Interval: IQR > 2.0

Explanation: A large IQR value indicates that the opinions of the experts are widely dispersed and lack consistency. At this time, the differences between the experts are obvious, the data is widely distributed, and it is difficult to reach a consensus.

3. How are the values for these intervals determined?

These intervals are not always fixed, but are determined based on the conventions and experience of the research field. In some cases, the researcher may adjust these intervals based on the data distribution of previous studies.

Rule of thumb: By analyzing previous expert opinion survey data, researchers may find typical IQR ranges and define different levels of consensus accordingly.

Statistical analysis: Researchers may use data analysis methods to determine a reasonable range. For example, these thresholds can be set by analyzing the data distribution of a large sample.

In general, these intervals reflect the degree of concentration and dispersion of expert opinion, and thus help researchers assess the degree of consensus among the expert group on a particular issue.

This article adopts the consensus standard from Wu Jianxin's (2014) viewpoint, as follows:

Table 3.2 Consensus Degree Based on Interquartile Range (IQR) in Expert Opinion Surveys

Interquartile range	Consensus Degree
0≤IQR≤1.8	High
1.8<IQR≤2.0	Medium
IQR>2.0	Low

Median (Md)

The median is the score in the middle of the score data provided by all experts in order. It can describe the concentration trend of expert opinions, and then explain the meaning according to the standards set by the researcher as follows:

Table 3.3 Median-Based Expert Opinion Classification

Median	The possibility of this item
Md ≥ 4.50	Most likely
3.50 ≤ Md ≤ 4.49	More likely
2.50 ≤ Md ≤ 3.49	Moderate likely
1.50 ≤ Md ≤ 2.49	Less likely
Md ≤ 1.50	Least likely

In the provided context, the **median (Md)** represents a central tendency measure of the data provided by experts. The median is the middle value of a data set when all expert ratings are ordered from lowest to highest. It effectively describes the concentration of expert opinions, particularly in cases where the data may include outliers.

The concept of the median used here is a fundamental statistical measure that is widely adopted in various fields for analyzing data distribution. It is not

attributed to a specific researcher but is a standard tool in statistics. The researcher has set specific standards for interpreting the median to classify the likelihood of expert opinions.

1. **Order the Data:**

   Arrange all the expert ratings in ascending order.

2. **Find the Middle Value:**

   (1) If the number of data points ***n*** is odd, the median is the value at the ***(n+1)/2*** position in the ordered list.

   (2) If the number of data points ***n*** is even, the median is the average of the values at the ***n/2*** and ***n/2+1*** positions.

The median was obtained from the Answers from all experts, Then interpret the meaning according to the criteria set by the researcher as follows:

The median of 4.50 and above means that the group of experts considers that the statement is most probable.

The median value is between 3.50-4.49 meaning that the group of experts considers that the statement is very likely.

The median value is between 2.50-3.49 meaning that the group of experts considers that the message is likely Moderately possible.

The median value is between 1.50-2.49 meaning that the group of experts agrees that the message is likely Less likely.

The median value is less than 1.50 indicating that the group of experts considers the message least likely.

This paper develops the questionnaire of Modern Apprenticeship System of Chinese Vocational E-commerce Major, and determines the suitability and feasibility of the questionnaire answers through the results of the second and third rounds of questionnaire feedback. After the feedback of the third round of questionnaire, the median value is 3.5 or higher, which is considered as the high level

agreed by experts. Experts believe that QR (Interquartile distance) is consistent at 1.50 and below.

Stage 2

Employ the focus groups to achieve objective 3.

Research Instruments

Discussion Outline

The researcher used each component of problem and resolution on effective modern apprenticeship system of e-commerce Major in Chinese vocational college, from phase (2) To evaluate the model by using Focus Group Discussion.

Population and Sample

The main personnel are composed of 9 experts.

Condition requirements for major personnel:

Professionals with proposing the e-commerce teaching in higher vocational colleges in Weifang city or using relevant management experience to carryout work.

They had reasonable experience or certain achievements in e-commerce teaching and modern apprenticeship using model in higher vocational colleges in Weifang City.

Their success in Modern Apprenticeship System using of Chinese Vocational E-commerce Major or teaching had been widely recognized.

The key informants without relevant mature ability or experience were from ordinary instructors.

The key informants were selected by purposive sampling technique with the above criteria.

Discussion Outline

A discussion outline is a summary of the topics to be covered in the focus group meeting. The discussion outline generally includes 2 parts:

(1) Meeting rules

(2) Open-ended questions about the model

Data Collection

The data collection steps are as follows:

Step 1: Determine the time, location, and 9 group members for the focus group meeting.

Step 2: Keep contact with key line people and show your identity and willingness. Select researchers as host, orderly organizing meetings.

Step 3: Develop a focus group discussion outline.

Step 4: Formally implement a focus group meeting, with the host stimulating in-depth discussions among group members. Members interact each other and have more ideas.

Step 5: Use the recording device to record the discussion process of the meeting, and write the focus group meeting report after the meeting.

Data Analysis

Based on the voice recordings and meeting reports of the focus group meeting. Analyze their acceptance of the feasibility of the research system. The details are as follows:

1. The focus group discussion was chaired by the researcher; this discussion shall be about evaluating Modern Apprenticeship System of Chinese Vocational E-commerce Major model in higher vocational colleges.

2. Based on the principles of freedom and voluntary, the experts spoke freely during the discussion, and gave the direction of objective 2 (To develop an effective digital technology supported model on modern apprenticeship system of e-commerce Major in Chinese vocational college).

3. According to the research results of researcher objective1 (To study the component of problem and resolution on effective modern apprenticeship system of e-commerce Major in Chinese vocational college), and gave more new ideas on

digital technology supported model on modern apprenticeship system of e-commerce Major in Chinese vocational college.

Summarize

This study is mainly divided into the following two stages. The author will complete it one by one in the order of time:

Stage 1: Use Delphi to achieve objective 1 and 2, that is to analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China, and to develop an optimized modern apprenticeship model for e-commerce curricula in Chinese vocational colleges.

Stage 2: Use the focus group to achieve objective 3 and 4, that is, to implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges and to create an teacher's guide on "Implementing an Effective modern apprenticeship model in Chinese Vocational E-commerce Educat

Chapter 4

Result of Analysis

This research was to study how can modern apprenticeship model in vocational e-commerce specializations be optimized to address governmental, corporate, role-definition, and pedagogical challenges in China. And four objectives will be achieved as follows: 1) To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China. 2) To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges. 3) To implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges. 4) To create a guide on "Implementing an Effective modern apprenticeship model in Chinese Vocational E-commerce Education.

The data analysis result can be presented as follows:

1. Symbol and abbreviations
2. Presentation of data analysis
3. Results of data analysis

The details are as follows.

Symbol and Abbreviations

IOC refers to Indexes of Item-Objective Congruence

IQR refers to Interquartile Range

S.D. refers to standard deviation

The data collection and analysis for this chapter are modularly organized according to the objectives outlined in the article, as follows:

Objective 1: To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.

A summary of literature review of the current challenges.

Modern apprenticeship encounters a series of challenges in its execution, spanning various aspects such as training methods, curriculum design, assessment procedures, and quality control. These issues have led to a lack of cohesion and rigor in both the content and evaluation processes, failing to adequately equip apprentices with the necessary technical knowledge and general education. Additionally, there's a noticeable absence of clear pathways for apprentices to pursue higher education or lifelong learning. To address these concerns, modern apprenticeship must adapt to the ever-evolving economy and labor market by prioritizing generic skills and lifelong learning, ultimately enhancing the adaptability and innovation capabilities of apprentices. The shortcomings in the teaching management model employed by vocational schools exacerbate the challenges faced by modern apprenticeship. Insufficient mechanisms and platforms for fostering deep collaboration with enterprises hinder the attainment of high-quality and effective apprenticeship training. Achieving a seamless integration of work and study, as well as robust school-enterprise cooperation, remains elusive (Hilary Steedman, 2001). Furthermore, educators often lack practical experience in industrial settings, leading to a deficiency in their ability to provide hands-on instruction. The misalignment between the professional course offerings and the demands of enterprises only compounds the problem. To address these issues, modern apprenticeship in China must draw inspiration from successful foreign models while considering the unique characteristics of higher vocational education in the country (Yang yin hui, 2023). Innovations are required in course development and implementation to cater to the individualized and diverse learning needs of apprentices. The educational model should aim to establish a comprehensive curriculum system and effective teaching management framework, complete with rigorous evaluation standards and quality assurance

mechanisms. This comprehensive approach is essential for the successful revitalization of modern apprenticeship in China (Penn, R.1998).

Cooperation between Schools and Enterprises faces significant challenges. Unfortunately, it lacks enthusiasm, leading to an inability to achieve the seamless integration necessary for effective collaboration. Enterprises, in particular, display a lack of motivation and responsibility when it comes to participating in joint education efforts (Moon, H.N.2018). To make matters worse, the existing cooperation model remains underdeveloped, primarily operating on the surface without the depth and breadth required to foster the accumulation of technical skills. The construction of modern apprenticeship programs reveals notable shortcomings. Critical principles, such as demand-oriented planning and dual development, are often overlooked, resulting in a misalignment between the skills cultivated through apprenticeships and the actual needs of society (Ridzwan, C.R., & Yasin, R.M. 2015). Moreover, there is a shortage of smaller enterprises willing to participate, which hampers the availability of practical teaching resources and conditions. This disconnect between theory and practice further exacerbates the issue. Modern apprenticeship faces persistent challenges concerning subjectivity, adaptability, and implementation. The successful execution of modern apprenticeship programs hinges on deep cooperation among higher vocational colleges, enterprises, and government entities. However, several obstacles hinder effective school-enterprise collaboration, including a lack of enthusiasm among participants, incomplete cooperation mechanisms, and uncertainty surrounding the outcomes of these cooperative efforts. Addressing these issues is essential for improving the effectiveness of modern apprenticeship programs (Greig, M. 2019).

The definition and scope of modern apprenticeship lack clarity, leading to variations in implementation models and standards across different countries and regions. This lack of uniformity also extends to regulatory and assessment mechanisms. Consequently, there is a pressing need to establish a standardized

framework for modern apprenticeship. However, achieving this standardization faces significant challenges due to institutional insufficiencies and a lack of legal support. The absence of comprehensive legal regulations and policy support hampers the standardized implementation of apprenticeship (Campbell, J., McKay, A., & Thomson, E. 2006). This deficiency not only results in the absence of norms and safeguards within the apprenticeship system but also creates obstacles in the development of institutional structures. To further complicate matters, quality improvement in talent development under modern apprenticeship demands attention. This entails a focus on specialized training, core competency cultivation, and enhancing vocational and professional skills to meet the evolving demands of enterprises and society. Yet, the inadequate level of institutionalization and standardization persists, affecting the availability of incentives and safeguards typically offered by complementary regulations and policies. Additionally, there is a need to address the underdeveloped coordination mechanisms among stakeholders, which presently hinder the protection of students' rights and interests (Wang,Y., & Yang, Y.M.2021). Lastly, the existing standards for teaching quality and supervision mechanisms remain inadequate due to various factors such as insufficient government funding, a monotonous enrollment and recruitment model, and the imperative to strengthen the teaching team's capacity and the vocational qualification certificate system. These challenges must be addressed to ensure the effectiveness and coherence of modern apprenticeship programs (Zhang, M., & Yu, X.S. 2020).

Modern apprenticeship programs, while highly valuable, grapple with the issue of limited inclusivity. Their scope remains too narrow, primarily catering to a select range of industries and professions. This lack of diversity within the apprenticeship landscape curtails opportunities for individuals from various demographic backgrounds, including women and ethnic minorities. The consequence of this restricted inclusivity is twofold: firstly, it perpetuates disparities in access to apprenticeships, potentially limiting career prospects for marginalized groups.

Secondly, it hinders the overall goal of building a more inclusive and equitable workforce. Addressing this challenge necessitates an expansion of the program's scope, accommodating a broader array of industries and actively promoting participation from underrepresented demographics (Maguire, M.2014). By doing so, modern apprenticeships can contribute significantly to a more diverse and inclusive labor market. Inadequate communication and coordination mechanisms are pervasive challenges within modern apprenticeship model. These mechanisms have often failed to effectively reach employers and aspiring apprentices, limiting their awareness and understanding of apprenticeship opportunities. The result is an underutilized apprenticeship system that does not align with the varying needs and preferences of different industries and regions (Huang, H. 2022). The modern apprenticeship landscape is marred by a lack of clarity and uniformity in its definitions and standards. Diverse interpretations and requirements persist across countries and industries, casting a shadow of ambiguity over the concept. Such a definition should reflect the core principles and objectives of apprenticeship while allowing for flexibility to accommodate industry-specific needs. A standardized framework would not only clarify the purpose and scope of modern apprenticeships but also lay the foundation for quality assurance and improvement measures. The modern apprenticeship landscape faces a pressing need for improved management mechanisms. Currently, it lacks unified policy support and guidance, effective systems for evaluating the quality of talent development, and equitable mechanisms for cost-sharing and profit distribution. This absence significantly hampers the overall effectiveness of modern apprenticeship programs. To address this challenge, it is essential to develop comprehensive management mechanisms that encompass clear policy frameworks, quality assessment systems, and fair economic structures (Spielhofer, T., & Sims, D.2004).

Based on the literature review above, we have distilled 30 influencing factors for the modern apprenticeship system in the field of e-commerce in Chinese vocational colleges. The summary is as follows:

Table 4.1 Key Areas of Responsibility in Modern Apprenticeship Programs

	College	Enterprise	College & Enterprise
1	Curriculum Relevance	Cost-Effectiveness	Resource Allocation
2	Faculty Training	Industry Collaboration	Student Retention
3	Quality of Teaching Material	Industry Feedback	Diversity and Inclusion
4	Pedagogical Methods	Real-world Application	Instructional Techniques
5	Student Engagement	Student Satisfaction	Ethical Considerations
6	Assessment and Evaluation Systems	Quality Assurance	Stakeholder Feedback
7	Job Market Alignment	Performance Metrics	Time Management
8	Teacher Professional Development	Guide Usability	Adaptability of Model
9	Technological Infrastructure	Case Studies Included	Post-Implementation Review
10	Virtual Learning Environment	Implementation Speed	Adaptability to Changes

Presentation of Data Analysis

Presentation of Data Analysis of objective 1 : To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.

Part 1: In the initial segment of the personal information survey, the collection of essential details about the respondents was undertaken to acquire an in-depth insight into their backgrounds and characteristics. The crucial survey

elements encompass Gender, Education Background, Administrative Post, Years of Work in college, and Professional Title Level. By exploring these survey components, the intention is to thoroughly examine the information of the respondents, covering aspects such as gender, educational attainment, administrative responsibilities, tenure in the university, and professional title levels. The analysis of this data will facilitate a more effective understanding of the respondents' perspectives and responses in the survey.

Part 2: The second part of the survey focuses on a questionnaire about modern apprenticeship in Chinese vocational education. This part comprises 12 primary indicators and 40 tertiary indicators. These 40 tertiary indicators are presented in the form of survey questions for experts to answer.

Part 3: The first round of the survey involves inviting 5 experts to test the inter-rater reliability of the expert questionnaire using the Intra-Class Correlation (ICC) coefficient. After the test, the questionnaire is modified based on expert feedback. Following these revisions, the second round of the survey is conducted.

Part 4: The second round of the survey involves inviting 21 experts to participate in the questionnaire. The results of the survey are then analyzed and the process is repeated three times. The final outcomes determining the factors influencing modern apprenticeship in Chinese vocational education are eventually confirmed.

Results of Data Analysis

First Round Survey

The primary focus of the first-round survey is to test the inter-rater reliability of the questionnaire. This step is crucial for subsequent surveys and expert interviews. In selecting experts, preference is given to those with rich experience in modern apprenticeship in vocational education and higher professional ranks. A summary of information for the 5 experts is provided below.

Table 4.2 Demographic Information of Respondents

Information		Amt	Percentage
Gender	Male	4	80
	Female	1	20
Education background	Master	4	80
	Doctor	1	20
Professional title level	Associate Professor	4	80
	Professor	1	20
Administrative post	Middle-level Leader	3	60
	School Leader	2	40
Years of professional experience	16~20 years	2	40
	Over 20 years	3	60

The corresponding codes for the first, second-level indicators are as follows:

Table 4.3 Key Components for the Effective Implementation and Sustainability

Item	Description
C1	**Curriculum Development**
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.
C2	**Collaboration and Partnerships**
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.
C2c	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.

Table 4.3 (Continued)

Item	Description
C3	**Teaching and Learning Materials**
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.
C4	**Pedagogical Practices**
C4a	Real-world application is vital for the success of modern apprenticeship in e-commerce.
C4b	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.
C4c	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.
C5	**Student Engagement and Support**
C5a	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.
C5b	Student retention is highly important for the success of modern apprenticeship in e-commerce.
C5c	Time management is crucial for the success of modern apprenticeship in e-commerce.
C6	**Assessment and Evaluation**
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.
C6b	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.
C6c	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.

Table 4.3 (Continued)

Item	Description
C7	**Infrastructure and Technology**
C7a	Scalability is vital for the success of modern apprenticeship in e-commerce.
C7b	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.
C8	**Program Implementation**
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.
C8c	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.
C9	**Organizational Support**
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.
C10	**Governance and Ethical Considerations**
C10a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.
C10c	Ethical considerations are crucial for the sustainability of modern apprenticeship in e-commerce.
C11	**Cost Management**
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.
C12	**Community and Inclusivity**

Table 4.3 (Continued)

Item	Description
C12a	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.
C12b	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.

The first round of questionnaire surveys primarily aimed to test the consistency of the questionnaire's objectives. To enhance efficiency and accuracy, the survey questions were divided into two parts.

The first part involved the classification and summary of the questionnaire, making it easier to comprehend. There were a total of 40 questions categorized into 12 major groups, each represented by the letter "C" followed by a sequential number.

The second part comprised the investigation of the 30 specific questions. The survey used a 5-point Likert scale, where 5 indicated "Strongly Agree," 4 indicated "Agree," 3 indicated "Neutral," 2 indicated "Disagree," and 1 indicated "Strongly Disagree."

The results are as follows.

Table 4.4 Summary of Key Factors and Metrics in Modern Apprenticeship Programs

NO	Impact Factor	S.D	IQR	IOC
C1	Curriculum Development	0.55	1.0	0.85
C2	Collaboration and Partnerships	0.55	1.5	0.90
C3	Teaching and Learning Materials	0.89	1.0	0.85
C4	Pedagogical Practices	0.55	1.0	0.85
C5	Student Engagement and Support	0.45	1.0	0.95
C6	Assessment and Evaluation	0.84	1.0	0.80
C7	Infrastructure and Technology	0.45	1.5	0.80
C8	Program Implementation	0.55	1.0	0.85
C9	Organizational Support	0.89	1.5	0.85
C10	Governance and Ethical Considerations	0.55	1.0	0.90
C11	Cost Management	0.45	1.5	0.95
C12	Community and Inclusivity	0.89	1.0	0.90

Standard Deviation (S.D.)

The Standard Deviation (S.D.) values provide insights into the variability and consistency of expert opinions across different factors influencing the effectiveness of modern apprenticeship model in vocational e-commerce education. The majority of the factors, such as Curriculum Development (C1), Teaching and Learning Materials (C3), Pedagogical Practices (C4), Student Engagement and Support (C5), Assessment and Evaluation (C6), Program Implementation (C8), and Community and Inclusivity (C12), exhibit a lower S.D. of 1.0. This indicates a relatively high level of agreement among experts regarding these factors. However, factors like Collaboration and Partnerships (C2), Infrastructure and Technology (C7), Organizational Support (C9), and Cost Management (C11) show higher S.D. values of 1.5, suggesting greater variability in expert opinions and possibly indicating areas where consensus is harder to achieve.

Interquartile Range (IQR)

The Interquartile Range (IQR) values further elucidate the concentration and spread of expert opinions. An IQR of 1.0 is observed for several factors, including Curriculum Development (C1), Teaching and Learning Materials (C3), Pedagogical Practices (C4), Student Engagement and Support (C5), Assessment and Evaluation (C6), Program Implementation (C8), Governance and Ethical Considerations (C10), and Community and Inclusivity (C12). This consistency aligns with the lower S.D. values, indicating a strong consensus among experts for these factors. On the other hand, Collaboration and Partnerships (C2), Infrastructure and Technology (C7), Organizational Support (C9), and Cost Management (C11) have an IQR of 1.5, pointing to a broader range of opinions and highlighting areas where expert views are more divergent.

Item-Objective Congruence (IOC)

The Item-Objective Congruence (IOC) values demonstrate how well each factor aligns with the research objectives. Factors like Collaboration and Partnerships (C2), Governance and Ethical Considerations (C10), and Community and Inclusivity (C12) also exhibit high IOC values of 0.90, indicating significant alignment with the research goals. Conversely, factors such as Assessment and Evaluation (C6) and Infrastructure and Technology (C7) have lower IOC values of 0.80, suggesting these areas might require further refinement to better meet the research objectives.

In conclusion, certain areas such as Infrastructure and Technology and Assessment and Evaluation exhibit greater variability and slightly lower congruence. These insights can guide targeted improvements in the implementation of modern apprenticeship model in vocational e-commerce education.

After conducting a consistency test with five experts, all 30 influencing factors identified in the literature review have been incorporated into the questionnaire. However, ten additional questions from the questionnaire were identified by the experts, which were not temporarily addressed in the literature review, and will be put in the entire table. They are listed below:

Table 4.5 Key Impact Factors and Descriptions for Modern Apprenticeship Program Success

Item	Impact Factor	Description
C1	Curriculum Development	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.
C2	Collaboration and Partnerships	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.
C3	Teaching and Learning Materials	Guide usability is crucial for the success of modern apprenticeship in e-commerce.
C4	Pedagogical Practices	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.
C5	Student Engagement and Support	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.
C6	Assessment and Evaluation	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.
C7	Infrastructure and Technology	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.
C8	Program Implementation	Cultural sensitivity is crucial for the sustainability of modern apprenticeship in e-commerce.
C9	Organizational Support	Including case studies is vital for the success of modern apprenticeship in e-commerce.
C12	Community and Inclusivity	Community involvement is vital for the success of modern apprenticeship in e-commerce.

Achievement of Objective 2: To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges.

The completion of model creation involves the final determination of the influencing factors. This process will be accomplished through two rounds of Delphi method questionnaire surveys.

Table 4.6 Expert Information Statistics for 21 Participants:

Professor Info		Amt	Percentage
Gender	Male	15	71
	Female	6	29
Education background	Bachelor	5	24
	Master	7	33
	Doctor	9	43
Professional title level	Lecturer	4	19
	Associate Professor	7	33
	Professor	10	48
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

According to the analysis above, the faculty is predominantly male and highly educated, with a strong representation of advanced academic qualifications. The professional titles suggest a well-established and senior academic body, while the administrative roles indicate significant involvement in institutional governance. Additionally, the extensive professional experience of the faculty members highlights

a wealth of expertise and long-term commitment to their profession. Addressing the gender imbalance and promoting greater diversity may be areas for future improvement to enhance the inclusivity and dynamism of the academic environment.

Table 4.7 Round 2 Survey outcome present

Item	Survey Question	S.D.	IOR	IOC
C1	**Curriculum Development**			
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.	0.56	1.5	0.90
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.	0.48	1.0	0.85
C1c	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.	0.25	3.0	0.85
C2	**Collaboration and Partnerships**			
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.	0.31	1.0	0.80
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.	0.54	1.5	0.80
C2c	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.	0.46	1.0	0.85
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.	0.39	1.5	0.85
C3	**Teaching and Learning Materials**			
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.	0.63	1.5	0.95

Table 4.7 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.	0.22	1.0	0.90
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.	0.41	1.0	0.85
C3d	Guide usability is crucial for the success of modern apprenticeship in e-commerce.	0.53	1.5	0.90
C4	**Pedagogical Practices**			
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.	0.47	1.0	0.85
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.	0.6	1.0	0.95
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.	0.27	1.0	0.80
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.	0.35	1.5	0.80
C5	**Student Engagement and Support**			
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.	0.59	1.5	0.85
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.	0.29	1.0	0.90
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.	0.66	1.5	0.95
C5d	Time management is crucial for the success of modern apprenticeship in e-commerce.	0.5	1.0	0.90

Table 4.7 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C6	**Assessment and Evaluation**			
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.	0.24	1.5	0.90
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.	0.55	1.0	0.85
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.	0.32	1.0	0.85
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.	0.65	1.0	0.95
C7	**Infrastructure and Technology**			
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.	0.42	1.5	0.80
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.	0.67	1.0	0.85
C7c	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.	0.36	4.0	0.85
C8	**Program Implementation**			
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.	0.43	1.5	0.95
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.	0.64	1.0	0.90
C8c	Cultural sensitivity is crucial for the sustainability of modern apprenticeship in e-commerce.	0.33	1.5	0.30
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.	0.26	1.5	0.90

Table 4.7 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C9	**Organizational Support**			
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.	0.49	1.0	0.85
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.	0.4	1.0	0.95
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.	0.24	1.0	0.80
C10	**Governance and Ethical Considerations**			
C10a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.	0.32	5.0	0.85
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.	0.65	1.5	0.85
C10c	Ethical considerations are crucial for the sustainability of modern apprenticeship in e-commerce.	0.3	3.0	0.90
C11	**Cost Management**			
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.	0.67	1.0	0.90
C12	**Community and Inclusivity**			
C12a	Community involvement is vital for the success of modern apprenticeship in e-commerce.	0.22	4.0	0.90
C12b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.	0.41	1.0	0.44
C12c	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.	0.53	1.0	0.55

In the comprehensive analysis of the main table, several issues were identified within specific items. The items C1c, C7c, C8c, C10a, C10c, C12a, C12b, and C12c displayed significant variances in expert opinions, reflected by high IQR scores and low

IOC values. These discrepancies suggest divergent perspectives on key aspects such as adjustment frequency, resource allocation, cultural sensitivity, regulatory support, ethical considerations, community involvement, diversity and inclusion, and skill transferability in the context of modern apprenticeship in e-commerce. The identified problems are detailed as follows: [provide detailed descriptions as previously listed]. These findings indicate a need for further examination and potential refinement in these areas to achieve a more unified and effective approach.

Table 4.8 Analysis of Divergent Expert Opinions and Issues in Modern Apprenticeship Programs

Item Code	Item Description	Issue	Analysis
C1c	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.	IQR of 3.0 indicates significant divergence in expert opinions.	Experts have different understandings of the necessity of frequent adjustments; some emphasize the need for frequent changes, while others prioritize curriculum stability.
C7c	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.	IQR of 4.0, indicating significant divergence in expert opinions.	There are varying opinions on the importance and methods of resource allocation, potentially due to differing priorities regarding resources such as funding, technical tools, or human resources.
C8c	Cultural sensitivity is crucial for the sustainability of modern apprentice ship in e-commerce.	IOC of 0.30 indicates low consensus among experts, IQR of 1.5	Experts differ in the emphasis placed on cultural sensitivity, possibly prioritizing technical skills more, or having varying definitions of "cultural sensitivity."

Table 4.8 (Continued)

Item Code	Item Description	Issue	Analysis
C10a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.	IQR of 5.0, indicating extreme divergence in opinions.	Views on the role of government and regulatory bodies vary; some experts see it as critical, while others favor industry-driven standards and flexibility.
C10c	Ethical considerations are crucial for the sustainability of modern apprenticeship in e-commerce.	Low IOC and IQR of 3.0 indicate some level of disagreement.	The importance of ethical issues may vary depending on the specific ethical concerns being prioritized, such as data privacy, fair treatment of apprentices, or corporate social responsibility.
C12a	Community involvement is vital for the success of modern apprenticeship in e-commerce.	IQR of 4.0, indicating significant divergence in opinions.	Experts have differing views on the definition and importance of community involvement, with some emphasizing connections with the community and others prioritizing direct industry participation and collaboration.
C12b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.	IOC of 0.44, IQR of 1.0, indicating a lack of strong consensus.	There are differing perceptions of the importance of diversity and inclusion, possibly due to varying levels of emphasis on these values in the field.

Table 4.8 (Continued)

Item Code	Item Description	Issue	Analysis
C12c	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.	IOC of 0.55, IQR of 1.0, indicating some level of consensus but not strong.	Experts may have differing definitions of transferable skills, with some emphasizing soft skills applicable across industries and others focusing on specialized technical skills within the e-commerce field.

After revisions, the content of C1c, C7c, C8c, C10a, C10c, C12a, C12b, and C12c has been updated as follows.

Table 4.9 Revised Survey Questions for Modern Apprenticeship in E-Commerce

NO	Previous Survey Question	Updated Survey Question
C1c	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.	Increasing the frequency of collaboration between businesses and schools is crucial for the sustainability of modern apprenticeship in e-commerce.
C7c	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.	Allocating internship resources in businesses is crucial for the success of modern apprenticeship in e-commerce.
C8c	Cultural sensitivity is crucial for the sustainability of modern apprenticeship in e-commerce.	Emphasizing cultural sensitivity in apprenticeships is crucial for the sustainability of modern apprenticeship in e-commerce.

Table 4.9 (Continued)

NO	Previous Survey Question	Updated Survey Question
C10a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.	Regulatory support from schools and businesses is crucial for the success of modern apprenticeship in e-commerce.
C10c	Ethical considerations are crucial for the sustainability of modern apprenticeship in e-commerce.	Ethical considerations in schools are crucial for the sustainability of modern apprenticeship in e-commerce.
C12a	Community involvement is vital for the success of modern apprenticeship in e-commerce.	Community promotion and business involvement are crucial for the success of modern apprenticeship in e-commerce.
C12b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.	Diversity and inclusivity in job positions within businesses are crucial for the sustainability of modern apprenticeship in e-commerce.
C12c	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.	Transferability of skills in businesses is crucial for the success of modern apprenticeship in e-commerce.

After revising the questionnaire, the third round of survey has commenced. The results are as follows: Round 3 survey outcome as follows:

Table 4.10 Round 3 survey outcome

Item	Survey Question	S.D.	IOR	IOC
C1	**Curriculum Development**			
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.	0.56	1.5	0.90
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.	0.48	1.0	0.85
C1c	Increasing the frequency of collaboration between businesses and schools is crucial for the sustainability of modern apprenticeship in e-commerce.	0.25	1.0	0.85
C2	**Collaboration and Partnerships**			
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.	0.31	1.0	0.80
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.	0.54	1.5	0.80
C2c	Obtaining industry feedback is crucial for the implemen tation of modern apprenticeship in e-commerce.	0.46	1.0	0.85
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.	0.39	1.5	0.85
C3	**Teaching and Learning Materials**			
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.	0.63	1.5	0.95
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.	0.22	1.0	0.90
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.	0.41	1.0	0.85
C3d	Guide usability is crucial for the success of modern apprenticeship in e-commerce.	0.53	1.5	0.90

Table 4.10 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C4	**Pedagogical Practices**			
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.	0.47	1.0	0.85
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.	0.6	1.0	0.95
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.	0.27	1.0	0.80
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.	0.35	1.5	0.80
C5	**Student Engagement and Support**			
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.	0.59	1.5	0.85
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.	0.29	1.0	0.90
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.	0.66	1.5	0.95
C5d	Time management is crucial for the success of modern apprenticeship in e-commerce.	0.5	1.0	0.90
C6	**Assessment and Evaluation**			
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.	0.24	1.5	0.90
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.	0.55	1.0	0.85

Table 4.10 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.	0.32	1.0	0.85
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.	0.65	1.0	0.95
C7	**Infrastructure and Technology**			
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.	0.42	1.5	0.80
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.	0.67	1.0	0.85
C7c	Allocating internship resources in businesses is crucial for the success of modern apprenticeship in e-commerce.	0.36	1.5	0.85
C8	**Program Implementation**			
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.	0.43	1.5	0.95
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.	0.64	1.0	0.90
C8c	Emphasizing cultural sensitivity in apprenticeships is crucial for the sustainability of modern apprenticeship in e-commerce.	0.33	1.5	0.85
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.	0.26	1.5	0.90
C9	**Organizational Support**			
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.	0.49	1.0	0.85
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.	0.4	1.0	0.95

Table 4.10 (Continued)

Item	Survey Question	S.D.	IOR	IOC
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.	0.24	1.0	0.80
C10	**Governance and Ethical Considerations**			
C10a	Regulatory support from schools and businesses is crucial for the success of modern apprenticeship in e-commerce.	0.32	1.0	0.85
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.	0.65	1.5	0.85
C10c	Ethical considerations in schools are crucial for the sustainability of modern apprenticeship in e-commerce.	0.3	1.0	0.90
C11	**Cost Management**			
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.	0.67	1.0	0.90
C12	**Community and Inclusivity**			
C12a	Community promotion and business involvement are crucial for the success of modern apprenticeship in e-commerce.	0.22	1.5	0.90
C12b	Diversity and inclusivity in job positions within businesses are crucial for the sustainability of modern apprenticeship in e-commerce.	0.41	1.0	0.85
C12c	Transferability of skills in businesses is crucial for the success of modern apprenticeship in e-commerce.	0.53	1.0	0.90

After adjustments, all questionnaire results fall within the acceptable range for S.D., IQR and IOC.

Based on the results from the two rounds of survey questionnaires mentioned above, all the factors influencing the modern apprenticeship system in the field of e-commerce in Chinese vocational colleges have been identified. The relevant model can be designed as follows

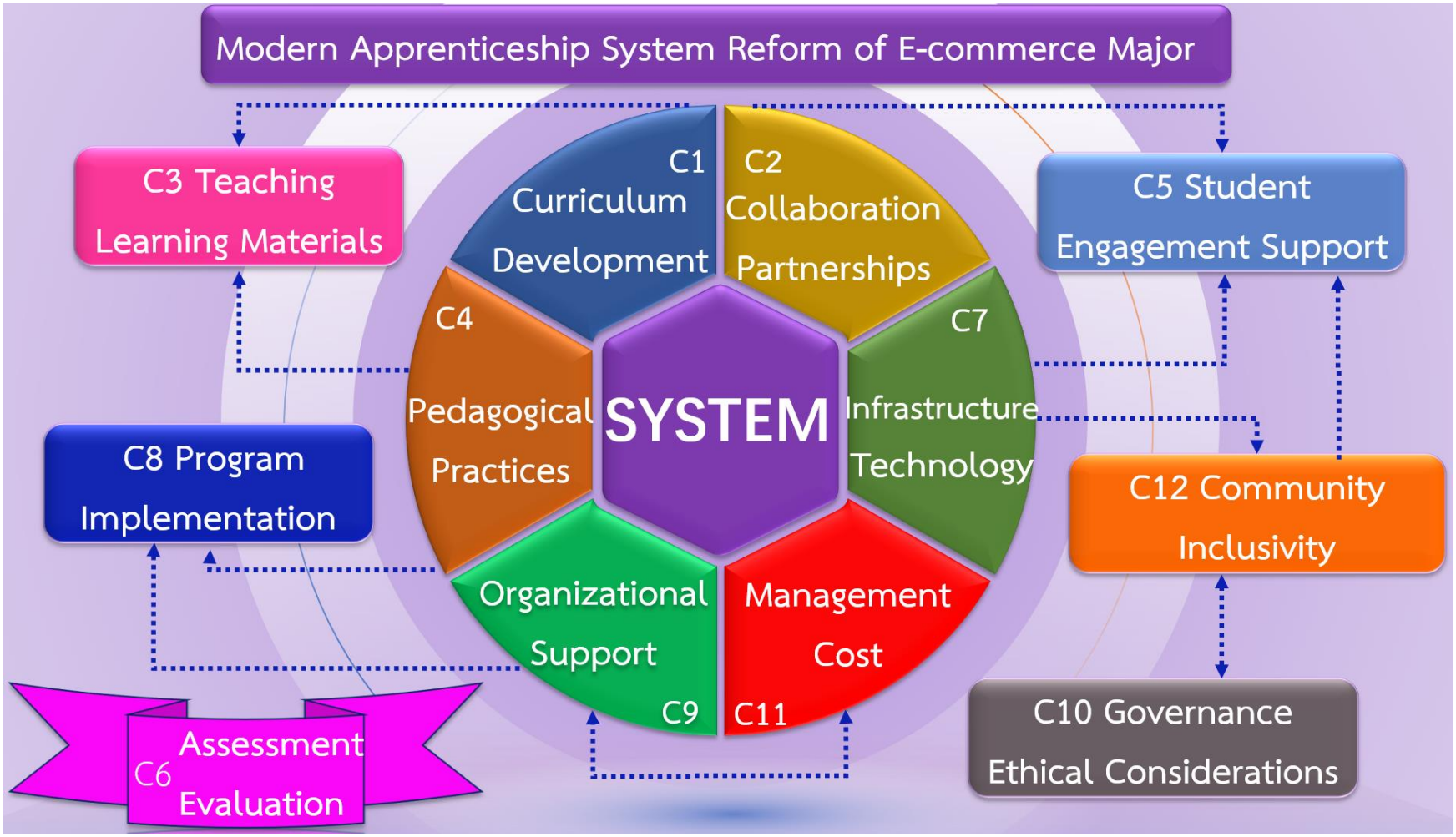


Figure 4.1 Model Framework of Modern Apprenticeship in E-Commerce

1. Curriculum Design and Industry Alignment (C1a, C1b, C1c, C2a, C2c, C2d, C4b) Curriculum Development: Tailor the curriculum to reflect current e-commerce practices and future trends, ensuring it remains relevant and aligned with industry needs. Industry Collaboration: Establish strong partnerships with e-commerce businesses to provide real-world insights, case studies, and live projects for apprentices. Continuous Update Mechanism: Implement a system for regular curriculum updates based on feedback from industry partners, technological advancements, and market demands.

2. Regulatory and Institutional Support (C10a, C9a) Regulatory Framework: Work with governmental and sector-specific bodies to ensure the apprenticeship program meets all regulatory standards and receives appropriate support. Institutional Infrastructure: Secure commitment from educational institutions to provide the necessary resources, including faculty, facilities, and technological tools.

3. Quality Assurance and Ethical Practices (C10b, C10c) Develop a quality assurance system to regularly evaluate and improve the teaching methods, material, and apprenticeship outcomes. Embed ethical considerations into the curriculum, focusing on data privacy, consumer rights, and fair trade practices in e-commerce.

4. Economic and Social Sustainability (C11a, C12a, C12b) Cost-Effectiveness: Ensure the program is financially accessible to a wide range of students, potentially through sponsorships, scholarships, or funding from industry partners. Community and Diversity: Engage with diverse communities to promote inclusivity and broaden access to the apprenticeship program. Encourage the participation of underrepresented groups in e-commerce.

5. Pedagogical Approaches (C4a, C4c, C4d, C3a, C3b) Adaptive Learning Methods: Use a mix of pedagogical strategies suited to e-commerce, such as project-based learning, problem-solving tasks, and experiential learning. Faculty Development: Provide ongoing professional development for instructors to stay abreast of e-commerce trends and teaching innovations.

6. Technology Integration and Digital Learning Environment (C3c, C7a) Utilize a robust virtual learning environment that supports interactive learning, simulates e-commerce platforms, and facilitates remote apprenticeships. Invest in the technological infrastructure to support scalable and flexible learning experiences, including AI-driven personalized learning paths.

7. Student Engagement and Success (C5a, C5b, C5c, C5d) Implement strategies to maximize student engagement through interactive content, gamification, and community building. Provide resources for effective time management, ensuring students can balance apprenticeship responsibilities with personal commitments.

Objective3: 3. To implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges.

Employ the focus groups to achieve objective 3.

Personnel info as follows:

Table 4.11 Professor group information table

Professor Info		Amt	Percentage
Gender	Male	6	67
	Female	3	33
Education background	Master	1	11
	Doctor	8	89
Professional title level	Associate Professor	1	11
	Professor	8	89
Administrative post	Middle-level Leader	3	33
	School Leader	6	67
Years of professional experience	16~20 years	2	22
	Over 20 years	7	78

Meeting Time: April 10, 2024, at 8:30 AM

Meeting Venue: Office 219, Building 4, Bin Hai Campus, Shandong Vocational College of Information Technology

Facilitator: Mr. Zhang

The agenda for this round of focus group discussions is based on the 12 major categories derived from the survey questionnaire. The summary is as follows:

Curriculum Development (C1): 1) How would you describe the current state of curriculum development in the context of modern apprenticeship in e-commerce? 2) What aspects of the curriculum do you believe are most crucial for the success of apprenticeship programs?

Collaboration and Partnerships (C2): 1) How effective are the current collaborations and partnerships in promoting modern apprenticeship in e-commerce? 2) What types of partnerships do you think would enhance the success of apprenticeship initiatives?

Teaching and Learning Materials (C3): 1) In your opinion, how essential are the quality and relevance of teaching and learning materials for the success of apprenticeship programs? 2) What improvements or innovations do you suggest for enhancing teaching and learning materials?

Pedagogical Practices (C4): 1) How would you assess the current pedagogical practices in the context of e-commerce apprenticeship? 2) What pedagogical methods do you think are most effective in this domain?

Student Engagement and Support (C5): 1) What role does student engagement play in the sustainability of apprenticeship programs? 2) How can support mechanisms be improved to enhance the overall experience for students?

Assessment and Evaluation (C6): 1) How do you perceive the effectiveness of current assessment and evaluation systems in apprenticeship? 2) What changes or additions would you propose for better evaluating apprenticeship success?

Infrastructure and Technology (C7): 1) To what extent does the existing infrastructure and technology support modern apprenticeship in e-commerce? 2) What technological advancements or infrastructure changes do you believe would have the most impact?

Program Implementation (C8): 1) How smoothly is the current implementation of apprenticeship programs in e-commerce? 2) What challenges, if any, have you observed in the implementation process?

Organizational Support (C9): 1) In your opinion, how crucial is organizational support for the success of apprenticeship initiatives? 2) What specific forms of support do you think organizations should provide?

Governance and Ethical Considerations (C10): 1) How are governance and ethical considerations addressed in the context of modern apprenticeship? 2) What ethical considerations do you believe are most relevant to apprenticeship programs?

Cost Management (C11): 1) How do you perceive the current cost management strategies in promoting apprenticeship in e-commerce? 2) What cost-effective measures or improvements would you recommend?

Community and Inclusivity (C12): 1) What role does community involvement play in the success of apprenticeship programs? 2) How can inclusivity be enhanced to ensure a diverse range of participants?

After intense discussion, two responses were selected for each question as the final answers.

Curriculum Development (C1): How would you describe the current state of curriculum development in the context of modern apprenticeship in e-commerce?

Strengths: Relevance to Industry Needs: The current curriculum development exhibits strength in aligning with the dynamic needs of the e-commerce industry. It reflects a clear understanding of the skills and knowledge required for apprentices to excel in their roles within this sector. Integration of Practical Skills: The curriculum effectively integrates practical, hands-on skills that are crucial for e-commerce

professionals. This practical orientation ensures that apprentices are well-prepared for real-world challenges and scenarios. Areas for Improvement: Adaptability to Technological Advances: One area that requires attention is the adaptability of the curriculum to rapid technological changes within the e-commerce landscape. Ensuring that the curriculum stays current with the latest industry technologies and trends is essential for providing apprentices with cutting-edge knowledge. Enhancing Interdisciplinary Elements: While the curriculum may be strong within specific e-commerce domains, there is room for improvement in incorporating interdisciplinary elements. This could involve integrating aspects from related fields, such as digital marketing or data analytics, to provide apprentices with a more holistic skill set. In summary, the current state of curriculum development in modern e-commerce apprenticeship programs demonstrates strengths in relevance and practicality. However, continuous efforts should be made to enhance adaptability to technological changes and incorporate interdisciplinary elements for a more comprehensive educational experience.

What aspects of the curriculum do you believe are most crucial for the success of apprenticeship programs? Foundational Aspects: Core Technical Skills: A solid foundation in core technical skills relevant to e-commerce, such as website development, data analysis, and digital marketing, is fundamental for apprentices. These skills form the basis for their professional growth and effectiveness in the workplace. Practical Application: Incorporating hands-on, practical application of theoretical knowledge ensures apprentices can translate what they learn in the classroom directly into their work. This practical experience is essential for building confidence and competence. Advanced Components: Industry-Relevant Specializations: Offering opportunities for apprentices to specialize in specific areas within e-commerce, such as cyber security, user experience (UX) design, or supply chain management, contributes to their expertise and adaptability to diverse roles within the industry. Soft Skills and Professional Development: Beyond technical skills,

the curriculum should emphasize the development of soft skills like communication, teamwork, and problem-solving. Additionally, including modules on professional development, ethics, and leadership helps apprentices navigate the broader aspects of their careers. By focusing on these foundational aspects and incorporating advanced components, the curriculum becomes a comprehensive and effective tool for ensuring the success of apprenticeship programs in the e-commerce sector. This dual emphasis on core technical skills and broader professional development creates a well-rounded educational experience for apprentices.

Collaboration and Partnerships (C2):

How effective are the current collaborations and partnerships in promoting modern apprenticeship in e-commerce? Organizational Perspective: Industry-Academia Collaboration: Evaluating the extent of collaboration between educational institutions offering e-commerce programs and industry stakeholders is crucial. The effectiveness can be measured by the development of joint initiatives, co-designed curriculum, and shared resources that align with industry needs. Government and Industry Partnerships: Assessing partnerships with government bodies and industry associations is essential. The effectiveness is determined by the support provided in terms of policy alignment, funding, and creating an enabling environment for apprenticeship programs in e-commerce. Individual Perspective: Student-Employer Engagement: Measuring the engagement between students (apprentices) and their employers provides insights into the effectiveness of partnerships. This includes the provision of meaningful work experiences, mentorship programs, and career development opportunities. Alumni Success Stories: Tracking the success stories of program alumni within the e-commerce industry serves as an indicator of the effectiveness of partnerships. Positive outcomes, such as high employability rates and career advancement, demonstrate the real-world impact of collaboration. By evaluating collaborations and partnerships from both organizational and individual perspectives, a comprehensive understanding of their effectiveness in

promoting modern apprenticeship in e-commerce can be obtained. This dual assessment ensures that both macro-level partnerships and micro-level interactions contribute to the overall success of the apprenticeship programs.

What types of partnerships do you think would enhance the success of apprenticeship initiatives?

Strategic Partnerships: Industry-Academia Collaboration: Strengthening partnerships with key industry players and educational institutions is crucial. This involves developing long-term collaborations that align curriculum development with industry needs, ensuring apprentices gain relevant and up-to-date skills.

Government and Regulatory Bodies: Forming partnerships with governmental and regulatory bodies can enhance the success of apprenticeship initiatives. These collaborations can involve advocating for supportive policies, securing funding, and ensuring compliance with industry standards. Operational Partnerships: Employer Networks: Building partnerships within employer networks is essential for providing apprentices with diverse and high-quality work experiences. Establishing connections with a range of employers ensures apprentices are exposed to various aspects of the e-commerce industry. Professional Associations: Collaborating with professional associations related to e-commerce can contribute to the success of apprenticeship initiatives. These partnerships can provide access to industry insights, networking opportunities, and continuous professional development for both apprentices and educators. By focusing on strategic partnerships that shape the overarching vision of apprenticeship programs and operational partnerships that facilitate day-to-day implementation, organizations can create a holistic framework for success. This approach ensures that apprenticeship initiatives are well-supported at both the macro and micro levels, fostering a comprehensive and effective learning experience.

Teaching and Learning Materials (C3):

In your opinion, how essential are the quality and relevance of teaching and learning materials for the success of apprenticeship programs?

Quality of Instructional Content: Alignment with Industry Standards: Ensuring that teaching materials align with current industry standards is essential. High-quality content should reflect the latest advancements, technologies, and best practices in the e-commerce sector, providing apprentices with relevant and up-to-date knowledge. Engagement and Interactivity: Quality materials should be designed to engage apprentices actively. Incorporating interactive elements, case studies, and real-world examples enhances the learning experience, making it more dynamic and applicable to the challenges of the e-commerce industry. Practical Application and Relevance: Applicability to Real-World Scenarios: The relevance of teaching materials lies in their ability to bridge theoretical knowledge with real-world application. Materials should offer practical insights, case scenarios, and hands-on exercises that prepare apprentices for the challenges they will face in the e-commerce workplace.

Flexibility and Adaptability: In a rapidly evolving field like e-commerce, teaching materials must be adaptable. They should accommodate changes in industry trends, technologies, and practices. Flexibility in the curriculum allows apprentices to stay current and develop skills that are in demand. By emphasizing both the quality of instructional content and the practical relevance of teaching materials, apprenticeship programs can optimize the learning experience. This dual focus ensures that apprentices not only acquire theoretical knowledge but also gain the practical skills necessary for success in the dynamic e-commerce landscape.

What improvements or innovations do you suggest for enhancing teaching and learning materials?

Content Enrichment: Integration of Emerging Technologies: Incorporating emerging technologies such as augmented reality (AR), virtual reality (VR), or interactive simulations can elevate the learning experience. These technologies

provide apprentices with immersive and engaging content, fostering a deeper understanding of e-commerce concepts and practices. Regular Updates and Industry Insights: Ensure that teaching materials are regularly updated to reflect the latest trends, tools, and industry insights in e-commerce. Establish mechanisms for continuous content review and collaboration with industry experts to maintain relevance and alignment with the rapidly evolving e-commerce landscape. Interactive Learning Strategies: Gamification Elements: Introduce gamification elements to make learning more interactive and enjoyable. Incorporating challenges, quizzes, or gamified scenarios within teaching materials can enhance engagement and motivate apprentices to actively participate in their learning journey. Collaborative Learning Platforms: Utilize online platforms and collaborative tools that enable apprentices to interact with peers, share experiences, and collaborate on projects. This promotes a sense of community and allows apprentices to learn from each other, fostering a more dynamic and supportive learning environment. By focusing on content enrichment through emerging technologies and regular updates and incorporating interactive learning strategies, teaching and learning materials can be transformed into dynamic resources that effectively prepare apprentices for the challenges of the e-commerce industry. Content Enrichment: Integration of Emerging Technologies: Incorporating emerging technologies such as augmented reality (AR), virtual reality (VR), or interactive simulations can elevate the learning experience. These technologies provide apprentices with immersive and engaging content, fostering a deeper understanding of e-commerce concepts and practices. Regular Updates and Industry Insights: Ensure that teaching materials are regularly updated to reflect the latest trends, tools, and industry insights in e-commerce. Establish mechanisms for continuous content review and collaboration with industry experts to maintain relevance and alignment with the rapidly evolving e-commerce landscape. Interactive Learning Strategies: Gamification Elements: Introduce gamification elements to make learning more interactive and enjoyable. Incorporating challenges, quizzes, or gamified

scenarios within teaching materials can enhance engagement and motivate apprentices to actively participate in their learning journey. Collaborative Learning Platforms: Utilize online platforms and collaborative tools that enable apprentices to interact with peers, share experiences, and collaborate on projects. This promotes a sense of community and allows apprentices to learn from each other, fostering a more dynamic and supportive learning environment.

By focusing on content enrichment through emerging technologies and regular updates and incorporating interactive learning strategies, teaching and learning materials can be transformed into dynamic resources that effectively prepare apprentices for the challenges of the e-commerce industry.

Pedagogical Practices (C4):

How would you assess the current pedagogical practices in the context of e-commerce apprenticeship?

Instructional Methods: Experiential Learning Opportunities: Assess the extent to which pedagogical practices provide apprentices with hands-on and real-world experiences in e-commerce. Experiential learning, such as internships, projects, and case studies, can enhance practical skills and prepare apprentices for the challenges of the industry. Adaptability to Diverse Learning Styles: Evaluate how pedagogical practices cater to diverse learning styles and preferences. Incorporating a variety of instructional methods, such as lectures, group discussions, and online resources, ensures that apprentices with different learning preferences can engage with the material effectively. Learning Environment: Collaboration and Networking: Assess the opportunities for collaboration and networking within the learning environment. Pedagogical practices that encourage apprentices to work together, share insights, and connect with industry professionals can contribute to a more enriching learning experience. Integration of Technology: Evaluate the integration of technology in pedagogical practices. Virtual classrooms, online resources, and interactive tools can enhance the accessibility and effectiveness of learning, especially in the dynamic field

of e-commerce. By examining instructional methods for experiential learning and adaptability to diverse styles, along with evaluating the learning environment's focus on collaboration and technology integration, a comprehensive assessment of current pedagogical practices in e-commerce apprenticeship can be achieved.

What pedagogical methods do you think are most effective in this domain?

Active Learning Strategies: Project-Based Learning: Assess the effectiveness of project-based learning approaches where apprentices work on real-world projects relevant to e-commerce. This method encourages hands-on experience, problem-solving, and the application of theoretical knowledge in practical scenarios.

Collaborative Learning: Evaluate the impact of collaborative learning methods, such as group discussions, team projects, and peer-to-peer interactions. Collaboration fosters a dynamic learning environment, allowing apprentices to share insights, learn from each other, and develop teamwork skills. Technology Integration: Simulations and Virtual Reality: Explore the use of simulations and virtual reality in pedagogical methods. Simulations provide a risk-free environment for apprentices to practice skills and decision-making, especially in areas like online transactions and e-commerce platforms. Interactive Online Modules: Assess the effectiveness of interactive online modules that incorporate multimedia, quizzes, and case studies. These methods leverage technology to engage apprentices actively, offering flexibility in learning and adapting to the digital nature of the e-commerce industry.

By considering the effectiveness of active learning strategies, such as project-based and collaborative learning, along with exploring the integration of technology through simulations and interactive online modules, educators can identify pedagogical methods that align with the unique demands of e-commerce apprenticeship.

Student Engagement and Support (C5):

What role does student engagement play in the sustainability of apprenticeship programs?

Motivation and Learning Outcomes: Motivation and Commitment: Evaluate how student engagement contributes to the motivation and commitment of apprentices. Assess whether actively involved students demonstrate a higher level of commitment to their apprenticeship programs. Consider factors such as enthusiasm, attendance, and a sense of ownership in their learning journey. Learning Outcomes: Explore the correlation between student engagement and positive learning outcomes. Analyze whether engaged apprentices tend to acquire and retain knowledge more effectively. Consider aspects like improved problem-solving skills, critical thinking, and the ability to apply theoretical concepts in practical scenarios. Relationship Building and Collaborative Environment: Building a Supportive Community: Examine the role of student engagement in fostering a supportive community among apprentices. Investigate whether engaged students contribute to creating a positive learning environment where collaboration, knowledge-sharing, and peer support thrive. Enhancing Communication: Assess the impact of student engagement on communication channels between students, educators, and industry mentors. Evaluate whether actively engaged students are more likely to communicate effectively, seek guidance, and participate in discussions, thereby enhancing the overall learning experience. By exploring the motivational aspects and learning outcomes associated with student engagement, as well as examining how engagement contributes to relationship building and a collaborative learning environment, stakeholders can gain insights into the pivotal role of student engagement in sustaining apprenticeship programs.

How can support mechanisms be improved to enhance the overall experience for students?

Accessibility and Proactive Support: Resource Accessibility: Evaluate the accessibility of essential resources for students participating in apprenticeship programs. Assess whether there are sufficient resources, materials, and tools available to support learning and practical application. Consider aspects such as the availability of updated curriculum materials, relevant technologies, and access to industry-related databases. Proactive Support Systems: Investigate the effectiveness of proactive support systems in place. Analyze whether there are mechanisms for identifying and addressing challenges faced by students early on. Consider mentorship programs, counseling services, and regular check-ins to provide personalized support and guidance to apprentices. Skill Development and Professional Growth: Skill Development Opportunities: Examine the opportunities provided for skill development beyond the core curriculum. Assess whether apprentices have access to additional training, workshops, or certifications that contribute to their overall skill set. Consider how these opportunities align with industry demands and emerging trends. Career Guidance and Placement Services: Evaluate the effectiveness of career guidance and placement services. Analyze whether apprentices receive sufficient support in navigating their career paths, securing internships, and transitioning into the workforce. Consider the role of mentorship, networking opportunities, and feedback mechanisms for continuous improvement. By focusing on the accessibility of resources and proactive support systems, as well as emphasizing skill development and professional growth through career guidance, apprenticeship programs can enhance the overall experience for students, ensuring they are well-prepared for successful entry into the workforce.

Assessment and Evaluation (C6):

How do you perceive the effectiveness of current assessment and evaluation systems in apprenticeship?

Alignment with Learning Objectives: Evaluate the extent to which the current assessment and evaluation systems align with the overall learning objectives of apprenticeship programs in e-commerce. Assess whether these systems effectively measure the attainment of key skills, competencies, and knowledge outlined in the curriculum. Fairness and Consistency: Examine the perceived fairness and consistency of the assessment and evaluation processes. Assess whether apprentices believe that the evaluation criteria are applied consistently and fairly across different participants. Explore potential challenges or biases that might impact the perceived effectiveness. Suggestions for Improvement: Enhanced Formative Assessment: Propose the integration of more robust formative assessment methods. This could involve incorporating regular, ongoing assessments throughout the apprenticeship to provide continuous feedback and support skill development in real-time. Technological Innovation: Suggest leveraging technology to enhance assessment methodologies. This might include incorporating digital tools, simulations, or interactive platforms that can better capture and evaluate apprentices' practical skills and problem-solving abilities in the e-commerce context.

What changes or additions would you propose for better evaluating apprenticeship success?

Holistic Competency Assessment: Evaluate the feasibility of implementing a holistic competency assessment framework that goes beyond traditional metrics. Assess apprentices on a broader set of skills, including critical thinking, problem-solving, adaptability, and interpersonal skills, which are crucial for success in the e-commerce sector. 360-Degree Feedback Mechanism: Propose the introduction of a 360-degree feedback mechanism that involves input from various stakeholders, including mentors, peers, and industry professionals. This can provide a more

comprehensive and well-rounded evaluation of apprentices' performance, capturing different perspectives on their capabilities and contributions. Integration of Real-world Projects: Project-Based Assessments: Advocate for the incorporation of project-based assessments that simulate real-world scenarios encountered in e-commerce. This approach can evaluate apprentices' practical application of knowledge and their ability to handle authentic challenges faced in the industry. Industry Collaboration for Evaluation: Explore opportunities for collaboration with e-commerce industry partners in designing and evaluating apprenticeship projects. This would ensure that assessments are aligned with industry standards and expectations, enhancing the relevance and validity of the evaluation process.

Infrastructure and Technology (C7):

To what extent does the existing infrastructure and technology support modern apprenticeship in e-commerce?

Technological Infrastructure Adequacy: Evaluate the current technological infrastructure's adequacy to meet the demands of modern apprenticeship in e-commerce. Assess factors such as the availability of up-to-date hardware and software, high-speed internet access, and other digital resources necessary for effective learning and collaboration. Digital Learning Tools and Platforms: Examine the effectiveness of digital learning tools and platforms in supporting apprenticeship programs. Evaluate the accessibility, usability, and integration of these tools into the curriculum. Consider aspects such as virtual labs, online collaboration platforms, and e-commerce simulation tools to determine their impact on apprentices' learning experiences. Innovation and Future-Readiness: Incorporation of Emerging Technologies: Investigate the extent to which emerging technologies, such as augmented reality (AR), virtual reality (VR), or artificial intelligence (AI), are integrated into the apprenticeship program. Assess whether the use of these technologies aligns with industry trends and prepares apprentices for the evolving landscape of e-commerce.

What technological advancements or infrastructure changes do you believe would have the most impact?

Integration of Artificial Intelligence (AI): Evaluate the potential impact of integrating AI technologies in apprenticeship programs. Assess how AI can enhance personalized learning experiences, provide real-time feedback, and simulate complex scenarios relevant to the e-commerce industry. Enhanced Virtual Learning Environments: Explore the impact of creating more immersive and interactive virtual learning environments. Consider advancements in virtual reality (VR) and augmented reality (AR) to provide apprentices with realistic simulations, enhancing their understanding of e-commerce operations and challenges. Infrastructure Changes for Improved Support: Upgrading Network Infrastructure: Assess the impact of upgrading network infrastructure to support faster and more reliable internet connectivity. Explore how improved bandwidth and connectivity can enhance online collaboration, video conferencing, and access to digital learning resources. Investment in Cybersecurity Measures: Evaluate the importance of investing in cybersecurity measures to ensure the protection of sensitive data and secure online interactions. Assess the impact of robust cybersecurity infrastructure on creating a safe learning environment for apprentices engaged in e-commerce activities.

Program Implementation (C8):

How smoothly is the current implementation of apprenticeship programs in e-commerce?

1) Operational Efficiency: Evaluate the operational efficiency of the current implementation. Assess how smoothly the administrative processes, coordination between stakeholders, and day-to-day activities are carried out. Consider aspects such as the enrollment process, communication channels, and logistics. 2) Adaptability to Changes: Examine the program's adaptability to changes in the e-commerce landscape. Assess how well the apprenticeship program accommodates emerging trends, technological advancements, and shifts in industry demands. Consider the

agility of the program in adjusting curriculum and practices to stay relevant. 3) Suggestions for Improvement: Streamlining Administrative Processes: Propose strategies to streamline administrative processes, reducing bureaucratic hurdles. Evaluate the impact of implementing digital platforms for smoother enrollment, communication, and documentation processes. 4) Continuous Professional Development: Assess the effectiveness of ongoing professional development opportunities for faculty and industry partners. Consider the impact of regular training sessions, workshops, and updates on maintaining a dynamic and responsive apprenticeship program.

What challenges, if any, have you observed in the implementation process?

Engagement and Participation: Assess the level of engagement and participation from both students and industry partners. Identify any challenges related to maintaining consistent involvement, fostering collaboration, and ensuring active participation throughout the apprenticeship. Resource Allocation and Support: Evaluate the adequacy of resources allocated to support the implementation process. Examine challenges related to funding, infrastructure, and administrative support. Assess how well the program addresses these challenges and provides necessary resources for successful implementation. Suggestions for Improvement: Enhancing Student Engagement: Propose strategies to enhance student engagement, such as interactive learning methods, mentorship programs, or real-world projects. Evaluate the impact of these measures on student motivation and commitment to the apprenticeship. Optimizing Resource Allocation: Assess the effectiveness of resource allocation strategies and propose improvements. Consider adjustments in budgeting, infrastructure enhancement, and securing additional support to address challenges in resource availability and distribution.

Organizational Support (C9):

In your opinion, how crucial is organizational support for the success of apprenticeship initiatives?

Leadership Commitment and Alignment: Evaluate the extent to which organizational leaders are committed to and aligned with the goals of apprenticeship initiatives. Assess how leadership support influences the overall success of apprenticeship programs in e-commerce. Structural Adaptability and Integration: Examine the organizational structure's adaptability to accommodate apprenticeship programs. Analyze the integration of apprenticeship initiatives within the existing framework and assess how well the organization supports the seamless incorporation of such programs. Proposed Areas for Improvement: Leadership Advocacy and Communication: Propose strategies to enhance leadership advocacy and communication regarding the importance of apprenticeship initiatives. Evaluate the impact of improved communication on organizational support and the overall success of apprenticeship programs. Enhancing Structural Flexibility: Suggest ways to enhance the organizational structure's flexibility to better accommodate apprenticeship programs. Explore opportunities for streamlining administrative processes, aligning curriculum development with organizational goals, and fostering collaboration between different departments.

What specific forms of support do you think organizations should provide?

Evaluate the extent to which organizations allocate sufficient resources and funding to support apprenticeship initiatives in e-commerce. Assess the impact of financial and material support on program effectiveness and sustainability. Professional Development Opportunities: Examine the provision of professional development opportunities for faculty and staff involved in apprenticeship programs. Assess how ongoing training and skill enhancement contribute to the success of the programs. Recommendations for Enhancement: Optimizing Resource Allocation:

Propose strategies to optimize resource allocation, ensuring that apprenticeship programs receive adequate financial support and access to necessary materials. Evaluate the potential benefits of increased investment in apprenticeship initiatives.

Expanding Professional Development Initiatives: Suggest ways to expand and improve professional development opportunities for faculty and staff engaged in apprenticeship programs. Explore avenues for continuous learning, workshops, and collaborative learning experiences to enhance teaching and mentoring skills.

Governance and Ethical Considerations (C10):

How are governance and ethical considerations addressed in the context of modern apprenticeship?

Policy and Regulatory Framework: Evaluate the existing governance structures and policy frameworks governing modern apprenticeship programs in e-commerce. Analyze the effectiveness of these structures in ensuring compliance with ethical standards and legal requirements. Ethical Guidelines and Practices: Assess the presence and adherence to ethical guidelines within apprenticeship programs. Examine how ethical considerations are integrated into the curriculum, assessment processes, and overall program design. Improvements and Ethical Enhancements: Strengthening Regulatory Oversight: Propose strategies to strengthen regulatory oversight, ensuring that governance structures align with ethical standards and legal requirements. Explore mechanisms for continuous monitoring and improvement. Enhancing Ethical Education: Suggest ways to enhance ethical education within apprenticeship programs. Consider incorporating ethical modules into the curriculum and providing training for mentors, instructors, and apprentices to promote a culture of ethical awareness and responsibility.

What ethical considerations do you believe are most relevant to apprenticeship programs?

Fair Treatment and Equal Opportunities: Examine how apprenticeship programs ensure fair treatment and equal opportunities for all participants, regardless

of background, gender, or other potential sources of bias. Evaluate existing measures and propose enhancements to uphold fairness. Confidentiality and Data Security: Assess how apprenticeship programs handle confidential information and ensure data security. Propose measures to strengthen protocols, protect apprentice data, and maintain confidentiality throughout the program. Addressing Ethical Considerations: Transparent Communication: Emphasize the importance of transparent communication regarding program expectations, opportunities, and potential challenges. Explore strategies to enhance communication between mentors, apprentices, and program administrators, ensuring informed and ethical decision-making. Ethical Decision-Making Training: Propose the incorporation of ethical decision-making training within the curriculum. Identify specific areas where apprentices may encounter ethical dilemmas and develop training modules to equip them with the skills to navigate such situations responsibly.

Cost Management (C11):

How do you perceive the current cost management strategies in promoting apprenticeship in e-commerce?

Financial Accessibility for Apprentices: Evaluate the extent to which the current cost management strategies ensure financial accessibility for apprentices. Analyze existing financial models, scholarship opportunities, or support mechanisms in place to make apprenticeship programs financially viable for participants. Program Sustainability and Resource Allocation: Assess the sustainability of cost management strategies and their impact on resource allocation. Examine how efficiently financial resources are distributed across various aspects of the apprenticeship program and propose improvements for better sustainability. Proposed Enhancements for Cost Management: Cost-Benefit Analysis: Advocate for the incorporation of a comprehensive cost-benefit analysis into the cost management strategies. Assess the direct and indirect benefits of the program against the associated costs to ensure that resources are allocated optimally, maximizing the return on investment. Industry

Collaboration for Funding: Explore opportunities for collaboration with industry partners to secure additional funding for apprenticeship programs. Propose strategies for engaging businesses and leveraging external financial support to alleviate costs and enhance the overall financial sustainability of the programs.

What cost-effective measures or improvements would you recommend?

Technology Integration for Efficiency: Explore ways to integrate technology into apprenticeship programs to enhance efficiency and reduce associated costs. This may include leveraging online platforms for training, virtual collaboration tools, or streamlined administrative processes. Strategic Partnerships and Resource Sharing: Advocate for the establishment of strategic partnerships among educational institutions, businesses, and relevant stakeholders to facilitate resource sharing. This could involve sharing facilities, instructional materials, or expertise, thereby reducing individual program costs. Recommended Improvements: Skill Transferability Enhancement Programs: Propose the development of skill transferability enhancement programs that focus on maximizing the impact of acquired skills across various contexts. This can increase the long-term value of the apprenticeship experience, making it a more cost-effective investment. Flexible and Adaptive Curriculum Models: Suggest the implementation of flexible and adaptive curriculum models that can easily accommodate changes in industry demands. This ensures that apprenticeship programs remain relevant over time, reducing the need for frequent and costly program overhauls.

Community and Inclusivity (C12):

What role does community involvement play in the success of apprenticeship programs?

Local Industry Integration: Assess the extent to which local industries are involved in apprenticeship programs. Determine if there is active collaboration with businesses in the community to align apprenticeship training with industry needs. Evaluate the impact of such integration on program success. Community Perception

and Support: Explore the perception of the community towards apprenticeship programs. Investigate whether there is a positive understanding and support for these initiatives. Analyze how community support contributes to the overall success and sustainability of apprenticeship programs in e-commerce. Enhancing Community Involvement: Community Outreach and Awareness Campaigns: Propose the development of outreach and awareness campaigns aimed at educating the local community about the benefits of apprenticeship programs. Assess the effectiveness of such campaigns in garnering community support and participation. Collaborative Community Projects: Recommend the initiation of collaborative projects between apprenticeship programs and local community organizations. Explore how involving apprentices in community projects enhances their skills and contributes to the overall success of the apprenticeship initiative.

How can inclusivity be enhanced to ensure a diverse range of participants?

Diversity Recruitment Strategies: Evaluate the effectiveness of current strategies for recruiting a diverse range of participants in apprenticeship programs. Explore the success of targeted outreach efforts and partnerships with organizations that promote inclusivity. Tailored Support Mechanisms: Assess the existence of tailored support mechanisms within apprenticeship programs to accommodate diverse participants. Examine mentorship programs, resources, or additional support provided to ensure inclusivity and equal opportunities for success. Recommendations for Inclusivity Enhancement: Strategic Partnerships with Diversity Advocates: Propose forming strategic partnerships with organizations or advocates specializing in diversity and inclusion. Evaluate the impact of such collaborations on widening the participant pool and fostering inclusivity. Cultural Sensitivity Training: Recommend implementing cultural sensitivity training for program facilitators and mentors. Assess the effectiveness of these training initiatives in creating an inclusive environment and addressing potential cultural barriers.

Based on the content of the document and in conjunction with the research objectives, the following is a detailed summary of the results:

Objective 1: Analyze the existing challenges of the modern apprenticeship system in China's vocational e-commerce education.

The research identified key challenges, including a lack of coherence in curriculum design, insufficient collaboration between educational institutions and enterprises, and inadequate regulatory support. These issues have affected the effectiveness of apprenticeship programs, leading to a gap between the skills acquired by apprentices and the needs of the industry. In addition, experts have different opinions on key issues such as cultural sensitivity, resource allocation and inclusiveness, highlighting the need for a standardized approach to modern apprenticeships.

Objective 2: Develop an optimized modern apprenticeship model for e-commerce majors in vocational colleges in China.

A comprehensive model was developed, emphasizing curriculum relevance and industry alignment, strong partnerships between educational institutions and businesses, and robust support systems. The model was refined through multiple rounds of expert questionnaires to ensure that it addressed the issues identified. Key factors in the model included regulatory support, quality assurance and ethical practices, which were central to the model to enhance the adaptability and sustainability of the apprenticeship program.

Objective 3: Implement, evaluate and recalibrate the modern apprenticeship system designed for e-commerce majors in vocational colleges in China.

The implementation phase involved detailed planning and coordination across various departments, focusing on market research, curriculum development, apprentice recruitment, and business partnerships. The study established a regular evaluation and feedback mechanism to ensure the continuous improvement and

adaptability of the apprenticeship program. The implementation plan for these strategies is detailed in the document, including specific responsibilities and evaluation criteria for each phase.

Together, these results form a comprehensive strategy for optimizing the modern apprenticeship model in vocational e-commerce education in China, addressing the key challenges identified in the initial analysis and ensuring the model's relevance and effectiveness in the context of the evolving e-commerce industry

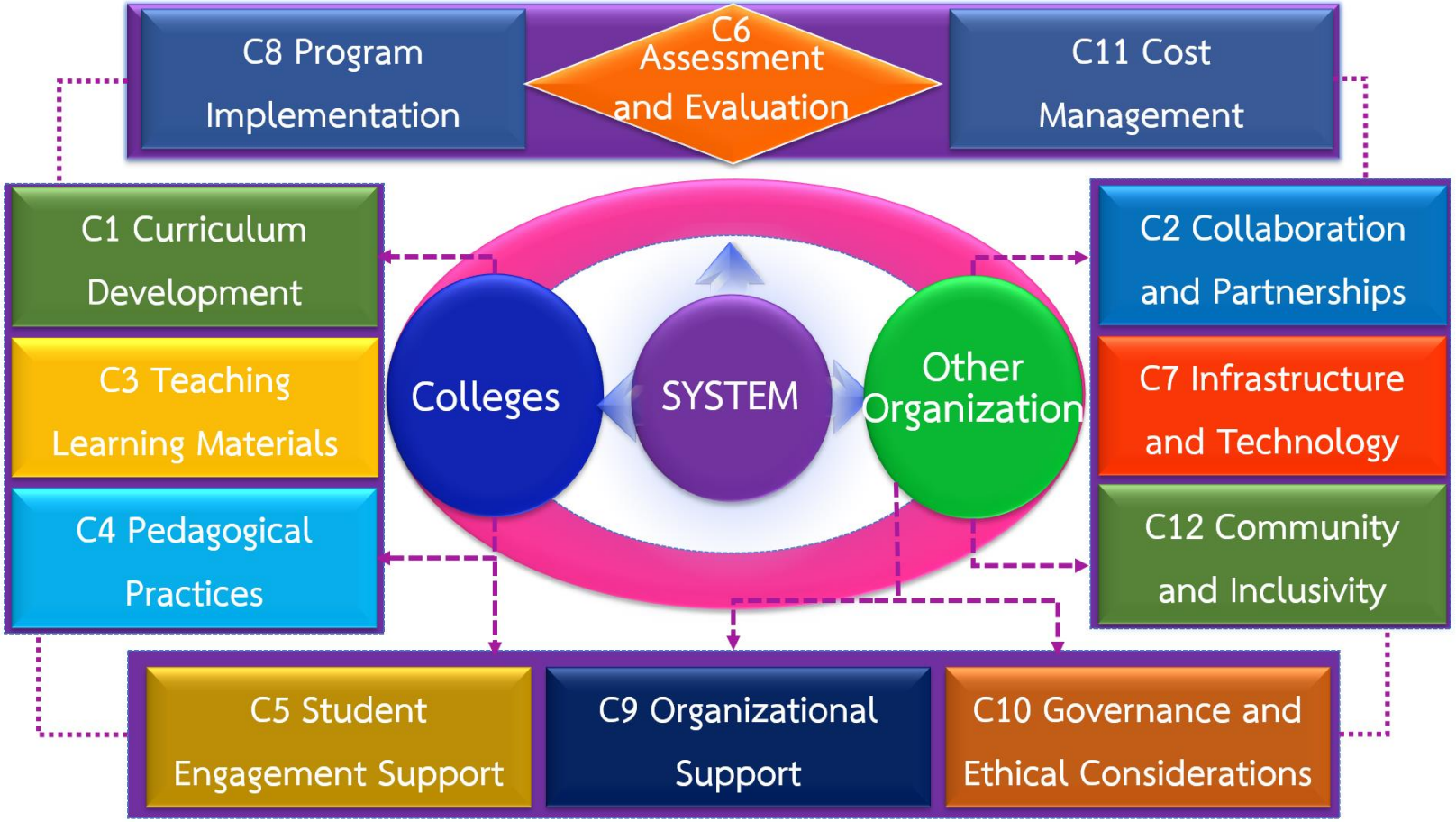


Figure 4.2 Updated Model Framework of Modern Apprenticeship in E-Commerce

Chapter 5
Conclusion Discussion and Recommendation

The aims of the present study include:

1. To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.

2. To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges.

3. To implement, assess, and recalibrate the designed modern apprenticeship model for e-commerce programs in Chinese vocational colleges.

The details are as follows:

Conclusion

Based on the above objectives, the following conclusions are drawn:

1. Importance of Modern Apprenticeship

The implementation of modern apprenticeship in vocational e-commerce education in China is crucial. It effectively improves the quality of vocational education and produces high-quality technical and skilled personnel who meet the market demand. By combining theory and practice, modern apprenticeship improves students' competitiveness in employment (Zhou & Ping, 2017).

2. Challenges facing the modern apprenticeship system

At present, the implementation of the modern apprenticeship system faces many challenges, including deficiencies in training methods and curriculum design, lack of sound assessment procedures and quality control, and insufficient depth and breadth of school-enterprise cooperation. If these problems are not solved, the effectiveness of the implementation of the apprenticeship system and the quality of student learning will be seriously affected: 1) Inadequate training methods and curriculum design (Kang,

2016). 2) Lack of sound assessment procedures and quality control (Zhang Bei, 2019). 3) Insufficient depth and breadth of school-enterprise cooperation.

3. Effectiveness of the Optimized Modern Apprenticeship Model

The optimized Modern Apprenticeship model effectively addresses these challenges by strengthening curriculum design and industry alignment, policy support and institutional safeguards, quality assurance and ethical practices, economic and social sustainability, and the integration of pedagogical methods and technologies: 1) Curriculum design and industry alignment. 2) Policy support and institutional safeguards (Deissinger, T. 2004). 3) Quality assurance and ethical practices. 4) Economic and social sustainability (Chengxin Zhu, 2020). 5) Integration of teaching methods and technology.

4. Importance of Feedback

Focus group discussions and multiple rounds of survey feedback revealed that timely updating of curriculum content, increased enterprise participation, and improvements in technology and infrastructure are critical to the implementation of Modern Apprenticeship. By soliciting extensive feedback from businesses and students, problems can be identified and adjustments made in a timely manner to ensure smooth implementation and continuous improvement of the apprenticeship program (Qian Li, 2018).

5. The Need for Teacher Guides

Developing a specific teacher's guide provides educators with clear guidance to ensure the successful implementation and promotion of Modern Apprenticeship in vocational e-commerce education in China. The teacher's guide should cover curriculum design, teaching methods, school-enterprise cooperation, quality assurance and assessment, providing comprehensive support and guidance to enhance teachers' competence and capability (Li, 2019).

In conclusion, effective implementation of Modern Apprenticeship in vocational e-commerce education in China requires not only addressing current

challenges, but also continuous optimization and improvement of teaching models, assessment mechanisms and school-enterprise cooperation (Li Jun, 2019). Through the development of specific teacher guidelines and the provision of policy support and resources, modern apprenticeship will play an important role in cultivating high-quality technical and skilled personnel and promoting the development of vocational education.

Discussion

Objective 1 : Challenges of Modern Apprenticeship in Vocational E-commerce Education in China

First, training and curriculum design is often outdated and not aligned with industry needs. The lack of practical courses and the predominance of traditional lecture-based teaching methods lead to a passive and insufficiently personalised learning process.

Secondly, assessment and quality control mechanisms are inconsistent. The current focus is on theoretical examinations rather than practical skills, and feedback mechanisms are inadequate, limiting opportunities for apprentices to improve. The quality control system lacks comprehensive monitoring, affecting overall educational standards.

Third, school-enterprise co-operation is weak. Many enterprises have low participation due to inadequate incentives and lack the resources needed to provide high-quality training. Partnerships are often superficial, with limited integration of theoretical knowledge and practical application.

Objective 2 : Developing an Optimized Modern Apprenticeship Model for E-commerce Programs

First, it is crucial to align the curriculum with the needs of the industry. Curricula should be regularly updated on the basis of industry research and experts should be invited to participate in their design to ensure their relevance. Practical

projects and simulations should be integrated into the curriculum to enhance the application of skills in real-life situations.

Second, strong policy and institutional support is needed. This includes government support, a sound legal framework, adequate resource allocation for teachers and infrastructure, and regular teacher training to enhance their capacity to deliver quality education.

Thirdly, the implementation of comprehensive quality assurance and ethical practices is crucial. Establishing standardised assessment systems, conducting regular evaluations and providing timely feedback will help to improve educational outcomes. Incorporating ethics education will help develop professional behaviour and social responsibility among apprentices.

Fourth, economic and social support mechanisms should be developed. The provision of scholarships and corporate sponsorship can reduce the financial burden. Raising public awareness of the advantages of modern apprenticeship will encourage wider participation. Encouraging community participation and fostering a sense of social responsibility among apprentices is equally important.

Finally, innovative teaching methods and technology integration are crucial. Project-based, case study and experiential learning methods should be adopted. Technologies such as virtual reality (VR), augmented reality (AR), online learning platforms and artificial intelligence can personalise the learning experience and effectively track the progress of apprentices.

Objective 3: Implementing, Assessing, and Recalibrating the Apprenticeship Model

Firstly, keeping the course relevant is key. Regularly update course content based on industry feedback and market demand to ensure alignment with current trends. Inviting industry experts to provide lectures and workshops can enhance practical insights.

Secondly, it is important to promote business participation and support through effective incentives. Providing financial subsidies, recognition schemes and co-operation agreements can incentivise enterprises to provide more internship and training opportunities. Establishing a platform for school-enterprise co-operation will help facilitate communication and resource sharing.

Finally, it is crucial to support the development of technology and infrastructure. Regular upgrading of teaching equipment, setting up dedicated e-commerce laboratories and providing ongoing technical training for faculty will support hands-on learning. The development of online learning platforms and virtual laboratories would provide apprentices with a flexible and accessible learning environment.

Recommendations

Based on these conclusions, the following specific recommendations are proposed to improve the implementation of modern apprenticeship in vocational e-commerce education in China, to enhance the quality of vocational education, and to cultivate high-quality technical and skilled personnel.

First, training methods and curriculum design should be regularly updated according to industry needs. This includes conducting industry research, dynamically adjusting the curriculum, and inviting industry experts to participate in curriculum design to ensure the relevance and practicality of course content. Increasing the practical aspects of the courses through project-oriented learning, real-life case studies and internships will help apprentices gain valuable hands-on experience.

Secondly, it is crucial to strengthen the assessment procedures and quality control. A scientific assessment system should be established with clear criteria covering knowledge, practical skills and professional ethics. A combination of formative and summative assessment is used to monitor progress and provide

feedback. Regular assessment of the effectiveness of teaching and the learning outcomes of apprentices can help improve teaching methods and course content.

Third, it is important to promote in-depth school-enterprise cooperation. Establishing a collaborative platform for information sharing and regular exchange activities will enhance the partnership. Long-term cooperation agreements can help clarify the roles of each party and ensure an ongoing partnership. Developing incentive mechanisms, such as providing financial subsidies and honorary awards, will motivate enterprises to participate more actively in apprenticeship programs.

Fourth, policy support and institutional safeguards are needed to create a supportive environment. This includes advocating for sound laws and regulations, providing policy incentives such as financial subsidies, and ensuring that vocational institutions have adequate resources and facilities, including skilled teaching staff and state-of-the-art equipment.

Finally, optimizing technological and infrastructural support is critical to enhancing the learning experience of apprentices. Regularly upgrading teaching equipment, building specialized e-commerce laboratories and providing technical training for teachers will support hands-on learning. The development of online learning platforms and virtual laboratories to provide apprentices with flexible and accessible learning options to meet diversified learning needs and enhance overall skills development.

Future Research Directions

Although the implementation of modern apprenticeship has been widely analyzed in vocational e-commerce education in China, there are still some areas that need further research and exploration. The following are the future research directions:

First, research on diversified apprenticeship models should be prioritized. Although the current focus is on school-enterprise cooperation and curriculum design, there is a need for innovative and diverse apprenticeship models. Future

research could explore cross-industry apprenticeship models, applying them to areas such as artificial intelligence and big data. Drawing on international apprenticeship experiences and localizing them to implement a flexible model that combines online and offline learning could also enhance the adaptability of the system.

Second, in-depth research on school-enterprise cooperation mechanisms is needed. Optimizing these mechanisms is crucial to the long-term success of apprenticeships. Research could focus on establishing efficient collaboration platforms, developing incentives to increase enterprise participation, and improving the management and evaluation of collaborative programs.

Third, strengthening the assessment system and quality control is crucial. Research should aim to establish a multi-dimensional assessment system covering knowledge, practical skills and professional ethics. Developing dynamic quality control mechanisms to monitor teaching and learning in real time, and utilizing big data and artificial intelligence to innovate assessment techniques can improve the accuracy and effectiveness of assessment.

Fourth, research on the integration of technology and education should be deepened. Exploring the use of virtual reality (VR) and augmented reality (AR) for immersive learning experiences, the development of online learning platforms and mobile apps for flexible learning, and the use of artificial intelligence to create smart teaching aids will enhance the overall quality and engagement of vocational education.

Finally, it is critical to investigate the long-term impact of apprenticeships on apprentices' career development. Research could track the career paths, employment rates, and salary levels of apprenticeship graduates to assess the effectiveness of apprenticeships. Research should also examine how apprenticeship programs develop work ethic and soft skills, and gather feedback from businesses on the performance of graduates to optimize and improve the implementation of apprenticeships.

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

Lists of experts in Delphi

NO	Experts Name	Professional Title	Work years	Working College
1	Mr Xu Shaobo	Professor	17	Shandong Vocational College of Information Technology
2	Ms Sun Jie	Associate Professor	16	Shandong Vocational College of Information Technology
3	Mr Yin Bo	Associate Professor	20	Shandong Vocational College of Information Technology
4	Mr Zhang Wei	Associate Professor	17	Shandong Vocational College of Information Technology
5	Mr Shi Tongwen	Associate Professor	18	Weifang Vocational College
6	Ms Guo Bing	Associate Professor	12	Weifang Vocational College
7	Ms Qian Yuan	Associate Professor	21	Shandong College of Economics and Business
8	Ms Liu Jinyu	Associate Professor	13	Shandong College of Economics and Business
9	Ms Li Na	Associate Professor	18	Shandong Transport Vocational College
10	Mr Xuan Shuxuan	Associate Professor	21	Shandong Transport Vocational College
11	Mr Liu Kai	Associate Professor	13	Shandong Vocational College of Science and Technology
12	Ms Guo Wei	Associate Professor	17	Shandong Vocational College of Science and Technology
13	Ms Li Xin	Associate Professor	19	Shandong Chemical Engineering Vocational College

Lists of experts in Delphi

NO	Experts Name	Professional Title	Work years	Working College
14	Ms Liang Yuqi	Associate Professor	22	Weifang Engineering Vocational College
15	Mr Zhang Jian	Associate Professor	19	Weifang Business Vocational College
16	Ms Zhang Yuping	Associate Professor	22	Shandong Maritime Vocation College
17	Mr Zhang Zhaoliang	Associate Professor	17	Weifang Environmental Engineering Vocational College
18	Ms Wang Tong	Associate Professor	14	Weifang Environmental Engineering Vocational College
19	Mr Yang Bo	Associate Professor	23	Weifang Business Vocational College
20	Ms Qi Chunliu	Associate Professor	15	Weifang Engineering Vocational College
21	Mr Qi Mingzhe	Professor	25	Weifang Engineering Vocational College

Lists of experts in Focus group

NO	Experts Name	Professional Title	Work years	Working College
1	Mr Yin Bo	Associate Professor	20	Shandong Vocational College of Information Technology
2	Ms Qian Yuan	Associate Professor	21	Shandong College of Economics and Business
3	Mr Xuan Shuxuan	Associate Professor	21	Shandong Transport Vocational College
4	Ms Li Xin	Associate Professor	19	Shandong Chemical Engineering Vocational College
5	Ms Liang Yuqi	Associate Professor	22	Weifang Engineering Vocational College
6	Mr Zhang Jian	Associate Professor	19	Weifang Business Vocational College
7	Ms Zhang Yuping	Associate Professor	22	Shandong Maritime Vocation College
8	Mr Yang Bo	Associate Professor	23	Weifang Business Vocational College
9	Mr Qi Mingzhe	Professor	25	Weifang Engineering Vocational College

Appendix B

Official letter

Ref.No. MHESI 0643.14/ 1472

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

25 July 2024

Subject: Request for Cooperation in Data Collection

Dear Shandong Vocational College of Information Technology

This is to certify that Mr. Qi Chunyang is a Digital Technology Management for Education, of Bansomdejchaopraya Rajabhat University. He is conducting research entitled " Modern Apprenticeship System Reform of Chinese Vocational E-commerce Major" under the supervision of Associate Professor Dr. Sombat Teekasap as major advisor and Dr. Nainapas Injoungjirakit and Assistant Professor Dr.Prapai Sridama as co-advisor. His contact information is as follows: telephone number +86 15628730813, email 1125406281@qq.com

In this regard, the student researcher has to collect data from lecturers and students using questionnaire and interview. The students will subsequently coordinate with you and provide more detail on this matter.

Accordingly, I would like to kindly request for your permission to allow this student researcher to collect data for academic purposes. Your cooperation will be highly appreciated.

Yours faithfully,

Assistant Professor Dr. Tanaput Chancharoen
(Vice Dean of Graduate School for Dean of Graduate School)
Bansomdejchaopraya Rajabhat University
Tel.+662-473-7000
www.bsru.ac.th
E-mail: grad@bsru.ac.th

Ref.No. MHESI 0643.14/ 1452

Bansomdejchaopraya Rajabhat University
1061 Itsaraparb Hirunrujee
Thonburi Bangkok 10600

25 July 2024

Subject: Invitation to validate research instrument

Dear Professor Mr Xu Shaobo, Shandong Vocational College of Information Technology

Mr. Qi Chunyang is a graduate student in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled " Modern Apprenticeship System Reform of Chinese Vocational E-commerce Major"

The thesis advisory committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

Assistant Professor Dr.Thanaput Chancharoen
(Vice Dean of Graduate School for Dean of Graduate School)

Bansomdejchaopraya Rajabhat University
Tel.+662-473-7000
www.bsru.ac.th
E-mail: grad@bsru.ac.th

Appendix C

Research Instruments

Participant Recruitment E-mail

Dear:_____

I hope this message finds you well. As a student at Bansomdejchaopraya Rajabhat University, I am currently undertaking a dissertation focused on the reform of the Modern Apprenticeship System for the E-commerce Major in Chinese vocational colleges. Given your esteemed experience and expertise in this area, I am reaching out to seek your valuable insights.

This study aims to gather perspectives on the Modern Apprenticeship System Reform specifically from the viewpoint of course design, rather than regulatory frameworks. The inclusion of expert opinions like yours is essential to ensure a comprehensive and representative understanding of the subject matter.To conduct this research, I will employ the qualitative Delphi method, which will involve at least three rounds of interview questions. Your participation would require a minimum of two interviews, totaling approximately three hours of your time. Rest assured, all responses will be treated with strict confidentiality, and pseudonyms or aggregated data will be used in the reporting of results. There are no identified risks associated with participation, apart from the time commitment involved.

Should you be willing to contribute to this study, kindly respond to this email. I will then forward a formal consent form and further details. I am also available to address any questions or concerns you may have prior to your participation. For additional information, you may also contact my mentor.

Sincerely Yours, Mr. Qi Chunyang
Candidate for PhD in digital technology management for education
Bansomdejchaopraya Rajabhat University

Round One Interview Questions

Subject

Reform of the Modern Apprenticeship System for the E-commerce Major in Chinese vocational colleges

Research objective

To analyze the current challenges of modern apprenticeship model in vocational e-commerce education in China.

Explanation

This round one interview questions form is part of research for a dissertation. The objective is to study the component of problem and resolution in effective painting design teaching. The information obtained will be of great benefit to the researcher and can be a body of knowledge in short course for undergraduate students. Another thing is that the information obtained will be kept secret. The analysis and presentation will be an overall picture only and will not cause any damage to your business. Please give your interview answers as truthfully and as possible as possible. The interview is divided into 13 parts:

Part 1: General information of the interviewer

Part 2: Curriculum Development

Part 3: Collaboration and Partnerships

Part 4: Teaching and Learning Materials

Part 5: Pedagogical Practices

Part 6: Student Engagement and Support

Part 7: Assessment and Evaluation

Part 8: Infrastructure and Technology

Part 9: Program Implementation

Part 10: Organizational Support

Part 11: Governance and Ethical Considerations

Part 12 Cost Management

Part 13 Community and Inclusivity

Note : Definitions of terms are at the end of the interview form.

Part 1: General information of the interviewee.

1.Name.....

2.Age.....years

3.Highest educational qualification.....

4.Work experience.....years

5.Current job position.....

6.Professional technical title.....

Part 2: Curriculum Development

1. In what ways do you perceive the relevance of the curriculum as a factor that can significantly promote modern apprenticeship in the field of e-commerce?

-Your Answer: _____

2. To what extent do you believe that aligning the curriculum with the job market is essential for ensuring the effectiveness and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 3: Collaboration and Partnerships

3. Could you elaborate on the importance of industry collaboration and how it influences the success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

4. What is your perspective on the role of professional development opportunities for teachers in enhancing the quality and advancement of modern apprenticeship in e-commerce?

-Your Answer: _____

5. How significant do you consider stakeholder feedback in the development and success of modern apprenticeship initiatives in e-commerce?

-Your Answer: _____

Part 4: Teaching and Learning Materials

6. What are your thoughts on the impact of high-quality teaching materials on the progression and effectiveness of modern apprenticeship in e-commerce?

-Your Answer: _____

7. In your experience, how critical is the provision of training for faculty in the context of supporting and advancing modern apprenticeship programs in e-commerce?

-Your Answer: _____

8. Can you discuss the importance of a virtual learning environment in supporting the goals and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 5: Pedagogical Practices

9. How do you assess the importance of real-world application in the curriculum for the success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

10. What role do you think adopting problem-solving methods plays in enhancing the learning experience and outcomes in modern apprenticeship programs in e-commerce?

-Your Answer: _____

11. From your perspective, how important is it to implement suitable instructional techniques to achieve the desired outcomes in modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 6: Student Engagement and Support

12. In what ways do you think student satisfaction contributes to the sustainability and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

13. How do you evaluate the importance of student retention in maintaining the effectiveness and continuity of modern apprenticeship programs in e-commerce?

-Your Answer: _____

14. Could you discuss the relevance of time management skills in the context of modern apprenticeship programs and their impact on the success of students in e-commerce?

-Your Answer: _____

Part 7: Assessment and Evaluation

15. What are your views on the importance of having robust assessment and evaluation systems to ensure the sustainability and effectiveness of modern apprenticeship programs in e-commerce?

-Your Answer: _____

16. How do you perceive the role of success indicators in assessing the performance and outcomes of modern apprenticeship programs in e-commerce?

-Your Answer: _____

17. In what ways do you think peer review contributes to the evaluation and improvement of modern apprenticeship programs in the e-commerce sector?

-Your Answer: _____

Part 8: Infrastructure and Technology

18. How critical do you find scalability in the context of infrastructure for supporting the growth and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

19. Can you discuss the significance of resource allocation in ensuring the smooth operation and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 9: Program Implementation

20. How do you view the importance of model adaptability in ensuring the relevance and sustainability of modern apprenticeship programs in e-commerce?

-Your Answer: _____

21. What is your opinion on the necessity of adapting to changes within modern apprenticeship programs, particularly in the rapidly evolving field of e-commerce?

-Your Answer: _____

22. How important do you consider the speed of implementation in the successful deployment of modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 10: Organizational Support

23. What role do you think institutional support plays in the successful implementation and operation of modern apprenticeship programs in e-commerce?

-Your Answer: _____

24. How do you assess the value of conducting post-implementation reviews for modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 11: Governance and Ethical Considerations

25. How essential do you find regulatory support in ensuring the compliance and success of modern apprenticeship programs in e-commerce?

-Your Answer: _____

26. What is your perspective on the role of quality assurance processes in maintaining high standards in modern apprenticeship programs in e-commerce?

-Your Answer: _____

27. How do you consider the role of ethical considerations in the long-term sustainability and credibility of modern apprenticeship programs in e-commerce?

-Your Answer: _____

Part 13: Cost Management

28. In what ways do you think cost-effectiveness can be achieved and its importance in promoting modern apprenticeship programs in the e-commerce sector?

-Your Answer: _____

Part 13: Community and Inclusivity

29. How do you perceive the importance of promoting diversity and inclusion within modern apprenticeship programs for the sustainability and success of the e-commerce field?

-Your Answer: _____

30. What is your view on the significance of skill transferability in ensuring that graduates of modern apprenticeship programs in e-commerce can adapt to various roles and industries?

-Your Answer: _____

Evaluation of guidelines form

Reform of the Modern Apprenticeship System for the E-commerce Major in Chinese vocational colleges

Research objective

To study the component of problem and resolution in effective painting design teaching.

Explanation

The researcher therefore asked for assistance from experts. Please check the questions in the Interview regarding suitability and consistency with the content.

Please mark "√".

Mark	Channel	Opinion
√	+1	Consistent
	0	Unsure
	-1	Not consistent

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
C1 Curriculum Development										
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.									
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.									

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
C1c	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.									
C2 Collaboration and Partnerships										
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.									
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.									
C2c	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.									
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.									
C3 Teaching and Learning Materials										
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.									
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.									
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in									

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
	e-commerce.									
C3d	Guide usability is crucial for the success of modern apprenticeship in e-commerce.									
C4 Pedagogical Practices										
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.									
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.									
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.									
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.									
C5 Student Engagement and Support										
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.									
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.									
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.									

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
C5d	Time management is crucial for the success of modern apprenticeship in e-commerce.									
C6 Assessment and Evaluation										
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.									
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.									
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.									
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.									
C7 Infrastructure and Technology										
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.									
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.									
C7c	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.									
C8 Program Implementation										
C8a	Model adaptability is highly important for the									

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
	sustainability of modern apprenticeship in e-commerce.									
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.									
C8c	Cultural sensitivity is crucial for the sustainability of modern apprenticeship in e-commerce.									
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.									
C9 Organizational Support										
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.									
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.									
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.									
C10 Governance and Ethical Considerations										
C10a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.									
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.									
C10	Ethical considerations are crucial for the									

NO	Description	level of compliance					Suggestions and reasons (if any)	Opinion level note		
		1	2	3	4	5		-1	0	+1
c	sustainability of modern apprenticeship in e-commerce.									
C11 Cost Management										
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.									
C12 Community and Inclusivity										
C12a	Community involvement is vital for the success of modern apprenticeship in e-commerce.									
C12b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.									
C12c	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.									

Additional comments or suggestions regarding.

.....

.....

.....

Round Two Evaluation of elements form Subject

Research objective

To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges。

Explanation

1. This element evaluation form is intended to collect your opinions as an expert. The questions in the assessment are about the details of the component of problem and resolution on optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges.

2. Comments are given to assess the consistency of the component of problem and resolution on optimized modern apprenticeship model. Please consider what is specified in each item. How consistent is it in practice? Then check “√”in the box according to your opinion as follow:

Score level 5 means most consistent.

Score level 4 means very consistent.

Score level 3 means moderately consistent.

Score level 2 means less consistent.

Score level 1 means least consistent.

The last section “suggestions and reasons” asks you to express your opinions. In order to make the details of the elements of the problem and resolution more complete.

3.Open-ended questions at the end of each episode's schedule. Please give additional comments or suggestions for the completeness of each aspect of the Format in particular.

General information of the interviewee.

1.Name.....

2.Age.....years

3.Highest educational qualification.....

4.Work experience.....years

5.Current job position.....

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
C1 Curriculum Development							
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.						
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.						
C1c	Adjustment frequency is vital for the sustainability of modern apprenticeship in e-commerce.						
C2 Collaboration and Partnerships							
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.						
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.						
C2c	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.						
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.						
C3 Teaching and Learning Materials							
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.						
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.						
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.						
C3d	Guide usability is crucial for the success of modern						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
	apprenticeship in e-commerce.						
C4 Pedagogical Practices							
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.						
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.						
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.						
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.						
C5 Student Engagement and Support							
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.						
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.						
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.						
C5d	Time management is crucial for the success of modern apprenticeship in e-commerce.						
C6 Assessment and Evaluation							
C6a	Assessment and evaluation systems are highly						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
	important for the sustainability of modern apprenticeship in e-commerce.						
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.						
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.						
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.						
C7 Infrastructure and Technology							
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.						
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.						
C7c	Resource allocation is crucial for the success of modern apprenticeship in e-commerce.						
C8 Program Implementation							
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.						
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.						
C8c	Cultural sensitivity is crucial for the sustainability of modern apprenticeship in e-commerce.						
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
C9 Organizational Support							
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.						
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.						
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.						
C10 Governance and Ethical Considerations							
C10 a	Regulatory support is essential for the success of modern apprenticeship in e-commerce.						
C10 b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.						
C10 c	Ethical considerations are crucial for the sustainability of modern apprenticeship in e-commerce.						
C11 Cost Management							
C11 a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.						
C12 Community and Inclusivity							
C12 a	Community involvement is vital for the success of modern apprenticeship in e-commerce.						
C12 b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.						
C12 c	Skill transferability is crucial for the success of modern apprenticeship in e-commerce.						

Additional comments or suggestions regarding.

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Round three Evaluation of elements form Subject

Research objective

To develop an optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges。

Explanation

1. This element evaluation form is intended to collect your opinions as an expert. The questions in the assessment are about the details of the component of problem and resolution on optimized modern apprenticeship model for e-commerce major in Chinese vocational colleges.

2. Comments are given to assess the consistency of the component of problem and resolution on optimized modern apprenticeship model. Please consider what is specified in each item. How consistent is it in practice? Then check “√”in the box according to your opinion as follow:

Score level 5 means most consistent.

Score level 4 means very consistent.

Score level 3 means moderately consistent.

Score level 2 means less consistent.

Score level 1 means least consistent.

The last section “suggestions and reasons” asks you to express your opinions .In order to make the details of the elements of the problem and resolution more complete.

3.Open-ended questions at the end of each episode's schedule. Please give additional comments or suggestions for the completeness of each aspect of the Format in particular.

General information of the interviewee.

1.Name.....

2.Age.....years

3.Highest educational qualification.....

4.Work experience.....years

5.Current job position.....

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
C1 Curriculum Development							
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.						
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.						
C1c	Increasing the frequency of collaboration between businesses and schools is crucial for the sustainability of modern apprenticeship in e-commerce.						
C2 Collaboration and Partnerships							
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.						
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.						
C2c	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.						
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.						
C3 Teaching and Learning Materials							
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.						
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.						
C3d	Guide usability is crucial for the success of modern apprenticeship in e-commerce.						
C4 Pedagogical Practices							
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.						
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.						
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.						
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.						
	C5 Student Engagement and Support						
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.						
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.						
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.						
C5d	Time management is crucial for the success of						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
	modern apprenticeship in e-commerce.						
C6 Assessment and Evaluation							
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.						
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.						
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.						
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.						
C7 Infrastructure and Technology							
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.						
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.						
C7c	Allocating internship resources in businesses is crucial for the success of modern apprenticeship in e-commerce.						
C8 Program Implementation							
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.						
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
C8c	Emphasizing cultural sensitivity in apprenticeships is crucial for the sustainability of modern apprenticeship in e-commerce.						
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.						
C9 Organizational Support							
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.						
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.						
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.						
C10 Governance and Ethical Considerations							
C10a	Regulatory support from schools and businesses is crucial for the success of modern apprenticeship in e-commerce.						
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.						
C10c	Ethical considerations in schools are crucial for the sustainability of modern apprenticeship in e-commerce.						
C11 Cost Management							
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.						
C12 Community and Inclusivity							
C12	Community promotion and business involvement						

NO	Description	level of compliance					Suggestions and Reasons (if any)
		1	2	3	4	5	
a	are crucial for the success of modern apprenticeship in e-commerce.						
C12 b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.						
C12 c	Transferability of skills in businesses is crucial for the success of modern apprenticeship in e-commerce.						

Additional comments or suggestions regarding.

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Focus Group Form

Title: Modern Apprenticeship System Reform of E-commerce Major

Explanation:

The purpose of this form is to focus on the Modern Apprenticeship System Reform of E-commerce Major through the Focus Group method. 9 experts who meet the qualification requirements have been carefully selected to ensure the professionalism and depth of the discussion. Together, the experts will delve into each specific strategy proposed forModern Apprenticeship System Reform of E-commerce Major. The team of experts will review each proposed strategy individually, and based on the discussion , a final conclusion will be made for each strategy: "Pass", "Modify", "Add", "Delete". Regarding the strategies of effective online teaching and learning in vocational computer programming education, please tick “√” the corresponding option column.

Thank You

Qi Chunyang

A dissertation meeting the requirements for

a Doctorate in Educational Technology Management

Bansomdejchaopraya Rajabhat University

NO	Impact Factor	Result			
		Pass	Modify	Add	Delete
C1	Curriculum Development				
C2	Collaboration and Partnerships				
C3	Teaching and Learning Materials				
C4	Pedagogical Practices				
C5	Student Engagement and Support				
C6	Assessment and Evaluation				
C7	Infrastructure and Technology				
C8	Program Implementation				
C9	Organizational Support				
C10	Governance and Ethical Considerations				
C11	Cost Management				
C12	Community and Inclusivity				

Focus Group Question:

No.	Category	Questions
C1	Curriculum Development	1) How would you describe the current state of curriculum development in the context of modern apprenticeship in e-commerce? 2) What aspects of the curriculum do you believe are most crucial for the success of apprenticeship programs?
C2	Collaboration and Partnerships	1) How effective are the current collaborations and partnerships in promoting modern apprenticeship in e-commerce? 2) What types of partnerships do you think would enhance the success of apprenticeship initiatives?
C3	Teaching and Learning Materials	1) In your opinion, how essential are the quality and relevance of teaching and learning materials for the success of apprenticeship programs? 2) What improvements or innovations do you suggest for enhancing teaching and learning materials?
C4	Pedagogical Practices	1) How would you assess the current pedagogical practices in the context of e-commerce apprenticeship? 2) What pedagogical methods do you think are most effective in this domain?
C5	Student Engagement and Support	1) What role does student engagement play in the sustainability of apprenticeship programs? 2) How can support mechanisms be improved to enhance the overall experience for students?
C6	Assessment and Evaluation	1) How do you perceive the effectiveness of current assessment and evaluation systems in apprenticeship? 2) What changes or additions would you propose for better evaluating apprenticeship success?

No.	Category	Questions
C7	Infrastructure and Technology	1) To what extent does the existing infrastructure and technology support modern apprenticeship in e-commerce? 2) What technological advancements or infrastructure changes do you believe would have the most impact?
C8	Program Implementation	1) How smoothly is the current implementation of apprenticeship programs in e-commerce? 2) What challenges, if any, have you observed in the implementation process?
C9	Organizational Support	1) In your opinion, how crucial is organizational support for the success of apprenticeship initiatives? 2) What specific forms of support do you think organizations should provide?
C10	Governance and Ethical Considerations	1) How are governance and ethical considerations addressed in the context of modern apprenticeship? 2) What ethical considerations do you believe are most relevant to apprenticeship programs?
C11	Cost Management	1) How do you perceive the current cost management strategies in promoting apprenticeship in e-commerce? 2) What cost-effective measures or improvements would you recommend?
C12	Community and Inclusivity	1) What role does community involvement play in the success of apprenticeship programs? 2) How can inclusivity be enhanced to ensure a diverse range of participants?

Appendix D

The Results of the Quality Analysis of Research Instruments

The index of objective congruence (IOC)

Modern Apprenticeship System Reform of E-commerce Major

NO	Description	Experts					IOC	Validity
		1	2	3	4	5		
C1 Curriculum Development		**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C1a	Curriculum relevance is crucial in promoting modern apprenticeship in the field of e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C1b	Job market alignment is crucial for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C1c	Increasing the frequency of collaboration between businesses and schools is crucial for the sustainability of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C2 Collaboration and Partnerships		**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C2a	Industry collaboration is vital for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C2b	Providing professional development opportunities for teachers is crucial for advancing modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C2c	Obtaining industry feedback is crucial for the implementation of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C2d	Stakeholder feedback is crucial for the success of modern apprenticeship in e-commerce.	**1**	**0**	**1**	**1**	**1**	**0.8**	**Valid**
C3 Teaching and Learning Materials		**1**	**1**	**0**	**1**	**1**	**0.8**	**Valid**
C3a	The quality of teaching material is essential for advancing modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**

NO	Description	Experts					IOC	Validity
		1	2	3	4	5		
C3b	Providing training for faculty is highly important for advancing modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C3c	A virtual learning environment is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C3d	Guide usability is crucial for the success of modern apprenticeship in e-commerce.	1	0	1	1	1	0.8	Valid
C4 Pedagogical Practices		1	1	1	1	1	1	Valid
C4a	Adopting suitable pedagogical methods is highly important for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C4b	Real-world application is vital for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C4c	Adopting problem-solving methods is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C4d	Adopting suitable instructional techniques is highly important for the success of modern apprenticeship in e-commerce.	1	0	1	1	1	0.8	Valid
C5 Student Engagement and Support		1	1	1	1	1	1	Valid
C5a	Student engagement is crucial for the sustainability of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C5b	Student satisfaction is highly important for the sustainability of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid

NO	Description	Experts					IOC	Validity
		1	2	3	4	5		
C5c	Student retention is highly important for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C5d	Time management is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	0	1	0.8	Valid
C6 Assessment and Evaluation		1	1	1	1	1	1	Valid
C6a	Assessment and evaluation systems are highly important for the sustainability of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C6b	Establishing and measuring performance metrics is crucial for evaluating the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C6c	Success indicators are crucial for evaluating the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C6d	Peer review is highly important for the evaluation of modern apprenticeship in e-commerce.	1	1	1	0	1	0.8	Valid
C7 Infrastructure and Technology		1	1	1	1	1	1	Valid
C7a	Technological infrastructure is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C7b	Scalability is vital for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C7c	Allocating internship resources in businesses is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid

NO	Description	Experts					IOC	Validity
		1	2	3	4	5		
C8 Program Implementation		**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C8a	Model adaptability is highly important for the sustainability of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C8b	Adaptability to changes is crucial for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C8c	Emphasizing cultural sensitivity in apprenticeships is crucial for the sustainability of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C8d	Implementation speed is highly important for the success of modern apprenticeship in e-commerce.	**1**	**0**	**1**	**1**	**1**	**0.8**	**Valid**
C9 Organizational Support		**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C9a	Institutional support is crucial for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C9b	Post-implementation review is crucial for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C9c	Including case studies is vital for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C10 Governance and Ethical Considerations		**1**	**1**	**1**	**1**	**1**	**1**	**Valid**
C10a	Regulatory support from schools and businesses is crucial for the success of modern apprenticeship in e-commerce.	**1**	**1**	**1**	**1**	**1**	**1**	**Valid**

NO	Description	Experts					IOC	Validity
		1	2	3	4	5		
C10b	Quality assurance is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C10c	Ethical considerations in schools are crucial for the sustainability of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C11 Cost Management		1	1	1	1	1	1	Valid
C11a	Cost-effectiveness is crucial in promoting modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C12 Community and Inclusivity		1	1	1	1	1	1	Valid
C12a	Community promotion and business involvement are crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid
C12b	Diversity and inclusion are crucial for the sustainability of modern apprenticeship in e-commerce.	0	1	1	1	1	0.8	Valid
C12c	Transferability of skills in businesses is crucial for the success of modern apprenticeship in e-commerce.	1	1	1	1	1	1	Valid

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mr. Qi Chunyang

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 22nd August 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Accept Research/Full Paper

Journal of Roi Kaensarn Academi

Modern Learning Development Centre

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Date : May 16, 2024

Acceptance Letter

Dear Author (S) : Chunyang Qi, Sombat Teekasap, Nainapas Injoungjirakit and Prapai Sridama

Paper ID : 671004

PaperTitle : The Study of Modern Apprenticeship Program Development through the School-Enterprise Collaboration for E-commerce Major in Vocational College of Shandong Province in China

This is to enlighten you that above manuscript reviewed and appraised by the review committee member of Journal of Roi Kaensarn Academi by 3 assessors and it is accepted for the purpose of publication in Journal of Roi Kaensarn Academi at Group 1 of Thai journal citation Index Centre (TCI) with ISSN 2697-5033 (Online) Volume 9 Issue 10 October 2024 that will be available at https://so02.tci-thaijo.org/index.php/JRKSA/index

Sincerely

Teedanai Kapko

Dr.Teedanai Kapko

Editor Journal of Roi Kaensarn Academi

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