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商管軟體應用教育中的 TRIZ 創新模型

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摘要

面對不斷變化的企業環境演進，商業管理模擬教育軟體為有志創業的專業人士提供了所需的知識和技能。然而，內容傳遞方面的挑戰限制了模擬軟體的效能、用戶參與度以及適應快速變化的行業環境所需求的能力。本研究探討了將 TRIZ 原則應用於商業管理教育軟體的分析應用，目的在識別改進和創新的機會。研究的結果提出了 TRIZ 如何促進企業教育技術的創新，提供了有價值的見解，並說明所提出解決方案如何有效面對現有挑戰。

關鍵字:粹智分析 (TRIZ)、商管教育、問題解決模式、發明原則、創新

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An Innovation Model with TRIZ in Business Management Education Software Application

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Abstract

Business Management Education Software equips aspiring entrepreneurs and business professionals with the essential knowledge and skills to navigate the dynamic corporate landscape. However, content delivery challenges limit software effectiveness, user engagement, and adaptability to rapidly evolving industry demands. This study investigates the potential application of TRIZ principles to Business Management Education Software, aiming to identify opportunities for improvement and innovation. The results of this study reveal how TRIZ can foster innovation in business education technology, offering valuable insights into how this methodology can effectively tackle existing challenges.

Keywords: TRIZ, Business management education, Problem-solving model, Inventive principles, Innovation.

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1. INTRODUCTION

In the ever-evolving landscape of today's business world, the demand for effective and scalable educational solutions has reached new heights.

A business management education plays a significant role in developing emerging leaders and professionals, equipping them with the necessary knowledge and skills to navigate complex organizational issues. The emergence of technology as a pivotal enabler has led to the development of Business Management Education Software (BMES), which strives to address the diverse learning needs of students and professionals worldwide (Bandara et al. 2010; Borrajo et al. 2010; Friga, Bettis, & Sullivan 2003; Martins & Kellermanns 2004).

BMES encompasses diverse digital tools, platforms, and applications designed to impart business education content interactively and accessibly. These software solutions offer various benefits, including flexibility, personalized learning experiences, and real-time assessment capabilities. However, as with any technological innovation, effectively tailoring BMES to meet the dynamic demands of modern business education necessitates a systematic and innovative approach (Benedek & Molnar 2015; Eckhaus, Klein, & Kantor 2017; Lerner et al. 2006).

The Theory of Inventive Problem Solving (TRIZ) provides a compelling framework for improving complex systems, such as BMES. Conceived by Genrich Altshuller in the mid-20th century, TRIZ analyzes thousands of patents and inventions, identifying patterns and principles that underlie innovative problem-solving (Al′tshuller 1999; Altshuller 2002; Bowyer 2008). By applying TRIZ to the realm of BMES, novel solutions, and inventive approaches can be unearthed to address prevailing challenges and elevate the overall learning experience (Akay, Demıray, & Kurt 2008; Cavallucci & Khomenko 2007; Fresner et al. 2010; Mann 2001).

This study delves into the application of TRIZ to Business Management Education Software, focusing on its potential to optimize the system through innovative problem-solving. Harnessing TRIZ principles, the aim is to uncover fresh prospects for enhancing BMES and elevating business management education to unprecedented levels (Daly et al. 2019; Vincent et al. 2006.)

Characteristics of Business Management Education Software (BMES): BMES encompasses a diverse range of digital tools and platforms tailored to deliver comprehensive business education content in a captivating and interactive manner. These software solutions go beyond traditional teaching methods and offer several defining features:

- **Interactive Learning Modules**: BMES presents dynamic learning modules that engage students through interactive simulations, case studies, and real-world scenarios. This engagement enhances the learning experience by fostering critical

thinking and decision-making skills.

- **Personalized Learning Paths**: BMES incorporates adaptive learning algorithms that cater to individual learning styles and paces. This personalization optimizes learning outcomes by tailoring content and assessments to each learner's strengths and areas for improvement.
- **Real-time Performance Assessment**: Through BMES, students receive instant feedback on their progress and performance. This feature promotes continuous improvement and helps educators track students' development effectively.
- **Collaborative Learning Opportunities**: BMES facilitates peer-to-peer collaboration and discussions, creating a virtual classroom environment that mirrors real-world teamwork and networking scenarios.
- **Accessibility and Flexibility**: BMES ensures easy access to learning materials anytime, anywhere, enabling students and professionals to learn at their convenience and breaking down geographical barriers.
- **Analytics and Insights**: BMES generates data-driven insights for educators and administrators, enabling them to monitor learning trends, identify potential areas of improvement, and refine teaching strategies.
- **Challenges in Content Delivery**: While BMES offers many benefits, specific challenges persist, particularly in content delivery. These challenges include:
- **Engagement and Interactivity**: Ensuring sustained engagement and interactivity within digital learning modules can be challenging. Maintaining students' interest and participation over extended periods is critical for effective learning.
- **Complexity of Content**: Business management education often involves intricate concepts and theories. Presenting such content in a digestible and engaging manner through digital platforms can be daunting.
- **Adaptability**: The ever-changing business landscape demands swift updates to educational content. A recurring challenge is ensuring that BMES can accommodate rapid changes and updates without compromising quality.
- **Assessment Accuracy**: Designing assessment methods within BMES that accurately gauge students' understanding of complex topics and skills can be intricate.
- **Technical Accessibility**: Students with varying technical proficiencies should be able to navigate BMES seamlessly. Ensuring a user-friendly experience for all learners, regardless of their tech-savvy, is vital.

By addressing these challenges and applying TRIZ principles, this study aims to cultivate inventive solutions that enhance the functionality, engagement, and overall effectiveness of BMES in delivering business management education. Through the

fusion of innovative approaches and established TRIZ methodologies, this study seeks to propel business education into a new era of excellence.

2. CURRENT STATUS OF BUSINESS MANAGEMENT EDUCATION SOFTWARE

2.1 System of Business Management Education Software

Business education software constitutes a diverse ecosystem of digital tools and platforms that enhance business students' and professionals' learning experiences and professional development. This ecosystem encompasses various types of software, each catering to distinct functionalities and target users, contributing collectively to a holistic approach to business education (Bandara et al. 2010; Borrajo et al. 2010; Friga et al. 2004).

Learning Management Systems (LMS) provide the foundation for organizing, delivering, and tracking educational content and courses. They serve multiple stakeholders, including corporate trainers, HR departments, and educational institutions, streamlining the administration of business-related training programs and facilitating seamless communication between instructors and learners.

Virtual classroom software complements LMS by offering real-time, interactive online learning experiences. It enables live lectures, discussions, and remote engagement, eliminating geographical barriers and fostering collaborative learning for corporate training and professional development.

Business simulation software provides hands-on learning experiences through real-world scenarios. Learners engage in decision-making and problem-solving exercises, gaining practical experience without financial risks enhancing understanding of business strategies, market dynamics, and risk management.

Business analytics and data visualization tools equip learners with skills to analyze complex datasets and present insights visually. These tools empower business students and professionals to make informed, data-driven decisions, understanding industry trends, and driving career success.

Entrepreneurship and innovation platforms foster a spirit of entrepreneurship by supporting learners in developing and refining business ideas. Tools for brainstorming, idea validation, and prototyping enable aspiring entrepreneurs to launch their ventures confidently.

Financial and accounting software helps learners grasp budgeting, financial analysis, and reporting skills essential for effective business management through interactive tutorials and practical exercises.

Soft skills training software focuses on developing essential interpersonal and communication skills crucial in business settings. Modules on leadership, teamwork, communication, and conflict resolution enhance professional competencies.

Language learning software addresses proficiency in foreign languages for global business interactions, facilitating effective communication and cultural understanding.

Certification exam preparation software assists learners in preparing for industry-recognized certifications, demonstrating expertise in specific areas like project management, marketing, finance, and human resources.

Career development and job placement platforms connect business students and graduates with potential employers and job opportunities. They offer guidance, networking tools, and job search support, empowering successful careers in the business world (Figure 1).

2.2 Limitations of Business Management Education Software

Business Management Education Software has limitations impact its effectiveness, inclusivity, and overall learning experience. One significant limitation is the lack of personalization, as many platforms offer a standardized approach, disregarding diverse learning styles and preferences, which can lead to suboptimal learning outcomes for some students. Additionally, limited interactivity in specific software solutions hinders active engagement and critical thinking development, limiting students' grasp of complex concepts (Schoemaker 2008; Solomon & Fernald Jr 1991).

Moreover, technology barriers pose challenges, preventing some learners from accessing the software due to inadequate internet connectivity or outdated hardware. This lack of access affects inclusivity and equal educational opportunities. Furthermore, inadequate real-world simulations limit the application of knowledge in practical business contexts, while limited assessment options overlook innovative ways to evaluate students' abilities comprehensively (Dyllick 2015; Rusinko 2010).

Software integration limitations disrupt the seamless flow of information within the ecosystem, making it challenging for educators to manage student progress effectively. Cost is also a concern, as expenses may hinder widespread adoption, particularly for smaller educational institutions or individual learners. Resistance to change from educators and administrators further impacts the software's integration and potential benefits.

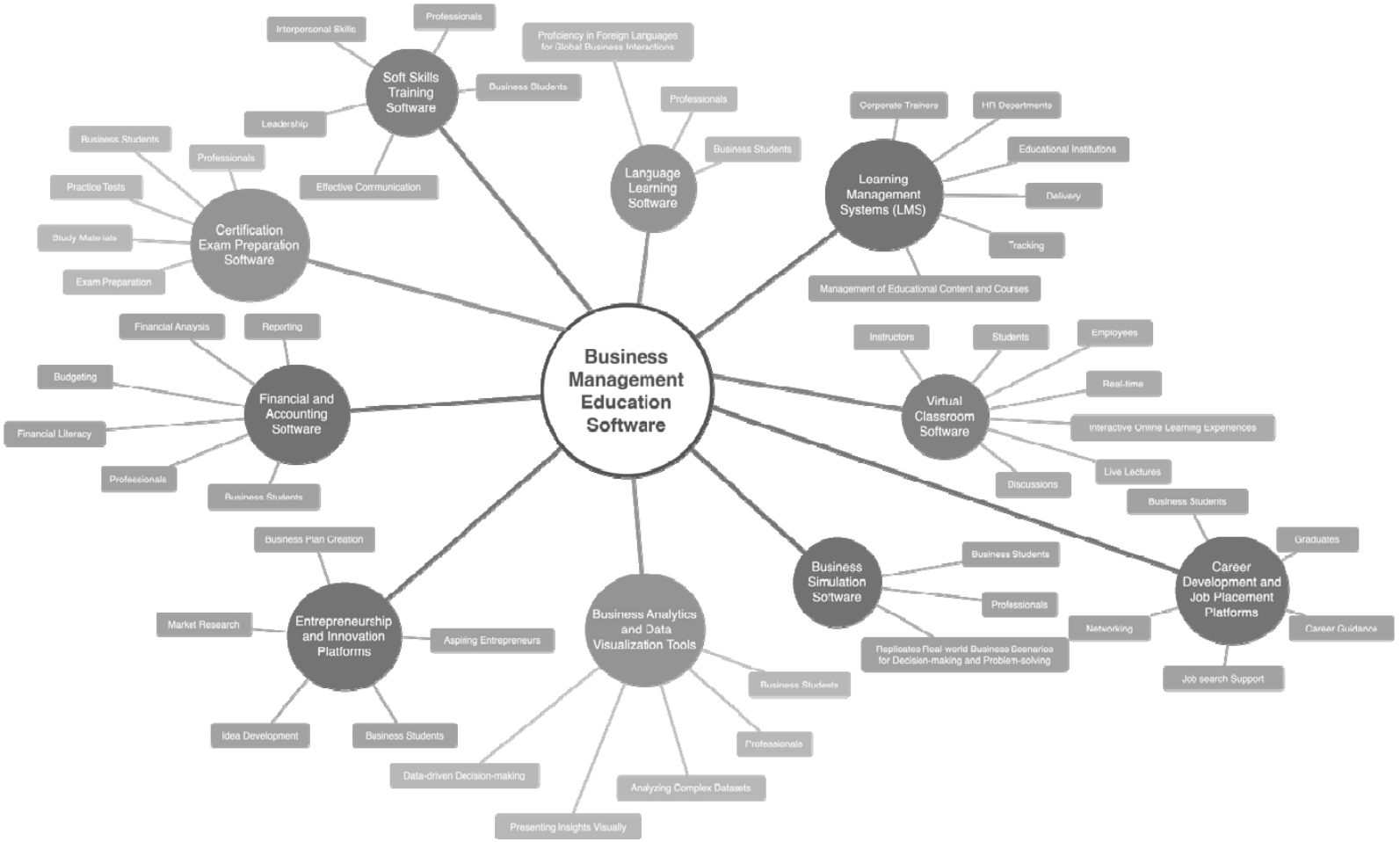

Figure 1: The Ecosystem of Business Management Education Software

Source: Compiled from this study.

Lastly, outdated content in specific software platforms hampers students' preparation for the ever-changing business landscape, as relevant industry trends may not be adequately covered. Addressing these limitations is vital to improving the overall effectiveness and accessibility of Business Management Education Software.

3. TRIZ METHODOLOGY FOR SOLVING MANAGEMENT PROBLEMS

TRIZ is a problem-solving methodology widely used in engineering and process management, but its application extends beyond those fields to areas like education and business management (Cavallucci 2017; Ekmekçi & Koksal 2015; Souchkov 2010).

In Business Management Education Software institutions, TRIZ can be used to resolve conflicts and improve educational delivery. It helps identify the root cause of a problem and find a generalized problem that matches it. This allows for the development of a tailored solution while maintaining consistency, addressing conflicts like standardization versus personalization.

Moreover, TRIZ supports the systematic generation of inventive ideas and breakthrough solutions. This is valuable for Business Management Education Software institutions facing resource constraints and limited funding. For instance, TRIZ can automate operating procedures, provide accessibility to educational process information, and streamline operations to reduce costs while maintaining quality.

3.1 Establishment of the TRIZ Research Expert Panel

Business Management Education Software offers a dedicated platform to empower business students and professionals in overcoming educational challenges and reaching their full potential. These software solutions provide personalized attention, innovative teaching methods, and a supportive virtual environment to facilitate compelling learning experiences. The curriculum offered by such software combines traditional business subjects with specialized programs, tailoring instruction in key areas such as business concepts, strategy, finance, marketing, and critical thinking. Regular updates in the curriculum ensure that the latest industry research and educational practices are incorporated, delivering relevant and practical instruction for learners.

This study explores the operational status and challenges of Business Management Education Software. This research will involve interviews with various stakeholders from different backgrounds to gather insights into the software's effectiveness and impact on business education.

The interviewees will include executives from software developers and providers, educational institutions, heads of business management education software providers, employers and business organizations, regulatory bodies and accreditation agencies,

educators and instructors, students, and learners. This diverse selection of interviewees ensures a well-rounded perspective on the operational aspects, industry trends, and user experiences of Business Management Education Software. When selecting interviewees, this study adopts the following principles (Table 1):

Table 1: TRIZ Expert Panelist in This Study

Code	*Identity*	*Area of Expertise*	*Qualifications*
P1	Software Developers and Providers	Crucial for creating and maintaining the software, impacting usability and effectiveness.	20 years
P2	Educational Institutions	Adopt and integrate the software, ensuring its effective use in delivering content and monitoring student progress.	30 years
P3	Employers and Business Organizations	Have a vested interest in software effectiveness, ensuring graduates possess relevant skills.	20 years
P4	Regulatory Bodies and Accreditation Agencies	Oversee quality and standards, evaluating software efficacy and adding credibility.	15 years
P5	Educators and Instructors	Key users, facilitating interactive learning experiences and influencing student outcomes.	10 years
P6	Students and Learners	Primary beneficiaries, their engagement and success determine software effectiveness.	5 years

Source: Compiled from this study

3.2 The TRIZ Innovation Model in Business Management Education Software

The TRIZ innovation model in Business Management Education Software provides a structured and organized approach to problem-solving, which can help Business Management Education Software providers identify the root causes of their profitability challenges and develop innovative solutions to address them. The model includes the following steps: problem identification, root cause analysis, ideation, solution selection, and implementation.

By incorporating TRIZ principles into Business Management Education Software, providers can develop more effective instruction and support programs that address the root causes of students' academic difficulties. This can lead to increased student engagement, improved academic outcomes, and increased profitability for Business Management Education Software providers.

3.2.1Function Analysis of Business Management Education Software

This study conducted an analysis of the ecosystem in the Business Management Education Software industry, identifying 11 key components, including "BME Software Developers," "E-Learning Specialists," "Educational Content Providers," "Educational Technology Consultants," "Industry Experts," "Corporate Trainers," "Administrators," "Human Resources (Fresner et al. 2010) Departments,"

"Educational Institutions," "Business Professionals," "Business Students." Based on these 11 components, an interactive matrix table was created for further analysis of their interaction functions. In the interactive matrix table, if there is a direct interaction between two components, an "X" symbol is marked at the intersection point (Table 2).

Table 2: Interaction Matrix

Interaction Matrix	BME Software Developers	E-Learning Specialists	Educational Content Providers	Educational Technology Consultants	Industry Experts	Corporate Trainers	Administrators	HR Departments	Educational Institutions	Business Professionals	Business Students
BME Software Developers		X	X	X	X	X	X	X	X	X	X
E-Learning Specialists	X		X		X	X	X	X	X	X	X
Educational Content Providers	X	X		X	X	X	X	X	X	X	X
Educational Technology Consultants	X		X						X	X	X
Industry Experts	X	X	X			X		X	X	X	X
Corporate Trainers	X	X	X		X				X	X	X
Administrators	X	X	X								X
Human Resources (Fresner et al. 2010) Departments	X	X	X		X						
Educational Institutions	X	X	X	X	X	X				X	X
Business Professionals	X	X	X	X	X	X			X		X
Business Students	X	X	X	X	X	X	X		X	X	

Source: Compiled from this study

Through the interactive matrix table, we can determine which components should establish close interactive relationships. The following is an explanation of the interactions among the components:

(a). System Components:

- Software Developers: Companies or individuals involved in designing, developing, and maintaining business management education software.
- E-Learning Specialists: Professionals specializing in online education and technology, who provide expertise in optimizing the software for effective e-learning experiences.

- Educational Content Providers: Companies or organizations that create and supply educational content, such as courses, lectures, and study materials, for the software.
- Educational Technology Consultants: Experts who offer guidance and consultancy services to educational institutions and organizations on selecting and implementing business management education software.
- Industry Experts: Business professionals, entrepreneurs, and subject matter experts who contribute to the development of specialized content and course materials.
- Corporate Trainers: Professionals responsible for providing training and development programs to employees within organizations.
- Administrators: Individuals responsible for managing the software's functionalities, user accounts, and access permissions within educational institutions or corporate settings.

(b). Supersystem Components:

- Human Resources (Fresner et al. 2010) Departments: HR teams within companies that use the software for employee training, onboarding, and professional development.
- Educational Institutions: Universities, colleges, and business schools that use the software for delivering business management courses and training programs.
- Business Professionals: Working professionals seeking to enhance their business management knowledge and skills through online courses and training.
- Business Students: Individuals pursuing business management education who directly interact with the software for learning and skill development.

The interactions among these components play an important role in the business model. Through these interactions, Business Management Education Software institutions can provide better educational services, enhance student, and parent satisfaction, and improve overall operational efficiency.

Based on the current investigation, it has been found that the interactive functions of certain elements are insufficient. (Figure 2)

Regarding the analysis of interactive functions in this case, based on Figure 2 of the interactive function analysis, it can be observed that there are 7 ineffective or insufficient interactive functions in the system components and 3 in the supersystem components (Table3). These findings highlight the weaknesses in the interactive relationships within the case, which can contribute to proposing improvement strategies to enhance the business model and operational efficiency of the Business Management Education Software institution.

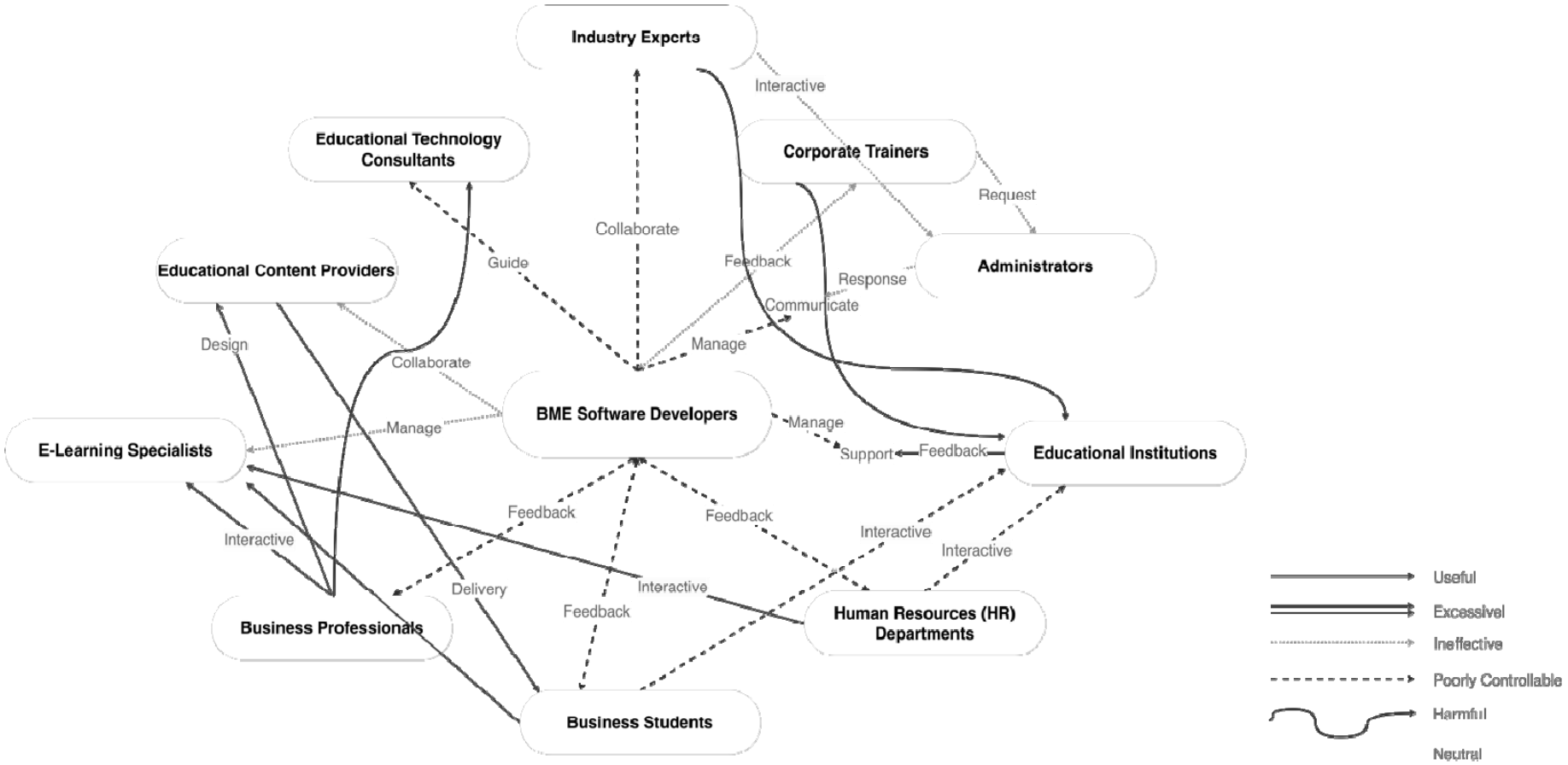

Figure 2: Functional Interaction Model of Business Management Education Software

Source: Compiled from this study

Table 3: Function Issue List

Property	*Code*	*Issue Extraction*
System Component Interaction Issues	A1	Ineffective content curation and quality control can arise between educational content providers and industry experts, potentially leading to irrelevant or outdated course materials: Ineffective
	A2	Poorly controllable technical requirements and preferences of e-learning specialists and educational technology consultants may lead to compatibility issues and development challenges for BME software developers: Poorly Controllable
	A3	Balancing instructional design principles and content presentation can become ineffective when differing user experience design perspectives emerge between e-learning specialists, educational content providers, and BME software developers: Ineffective
	A4	Misaligned prioritization of features and functionalities between corporate trainers, administrators, and educational content providers can result in harmful resource allocation and potentially diminish the software's overall effectiveness: Harmful
	A5	Insufficient attention to data security and privacy concerns can be harmful when implementing the software, raising potential risks for administrators and educational technology consultants and jeopardizing user trust: Harmful
	A6	Miscommunication and misalignment on implementation timelines can render project management ineffective, leading to delays and misunderstandings between stakeholders and BME software developers: Ineffective
	A7	Lack of comprehensive training and responsive support services for corporate trainers and administrators can render the software's usability ineffective and impede its successful implementation: Ineffective
Supersystem Component Interaction Issues	B1	Ineffective BME software development can arise due to misalignment in learning objectives between HR departments, educational institutions, and business professionals, leading to challenges in meeting diverse learner needs and organizational context: Ineffective
	B2	Poorly controllable user preferences and expectations among business students, HR departments, and business professionals may result in usability issues and challenges in creating a seamless user experience within the BME software: Poorly Controllable
	B3	Compatibility issues and hindrance in software adoption may arise when integrating BME software into existing learning management systems or organizational platforms due to different technical requirements and systems among HR departments, educational institutions, and business professionals: Harmful

Source: Compiled from this study

3.2.2Current Issue Analysis of Business Management Education Software

By combining the responses to the above questionnaire with Delphi method, we can obtain the following list of questions about the current status of Business Management Education Software institutions (Table 4).

Table 4: Function Issue List

Code	*Current Issue*	*Property*
I1	Business management education software operation is in a bottleneck	Surface Cause
I2	Challenges in Learning Assessment and Engagement	Underlying Cause
I3	Limited Assessment Methods	Underlying Cause
I4	Low Engagement and Motivation	Underlying Cause
I5	Ineffective Gamification	Underlying Cause
I6	Inadequate Real-World Simulations	Underlying Cause
I7	Lack of Integration	Underlying Cause
I8	Insufficient Learning Support and Quality Assurance	Underlying Cause
I9	Inadequate Learning Analytics	Underlying Cause
I10	Inaccurate Content	Underlying Cause
I11	Limited Collaborative Features	Underlying Cause
I12	Incomplete Support and Training	Underlying Cause
I13	Insufficient Instructor Feedback	Underlying Cause
I14	Limited Effectiveness of Business Education Software	Underlying Cause
I15	Insufficient Personalization	Underlying Cause
I16	Inadequate Interactivity	Underlying Cause
I17	Accessibility Challenges	Underlying Cause
I18	Data Privacy Concerns	Underlying Cause
I19	Incomplete Course Offerings	Underlying Cause
I20	Technical Challenges and Compatibility Issues	Underlying Cause
I21	Compatibility Issues	Underlying Cause
I22	Security Vulnerabilities	Underlying Cause
I23	Language Barriers	Underlying Cause
I24	Financial Constraints and Resource Allocation	Underlying Cause
I25	High Costs and Budget Constraints	Underlying Cause
I26	Content Duplication	Underlying Cause
I27	Lack of Industry-Relevant Content	Underlying Cause

Source: Compiled from this study

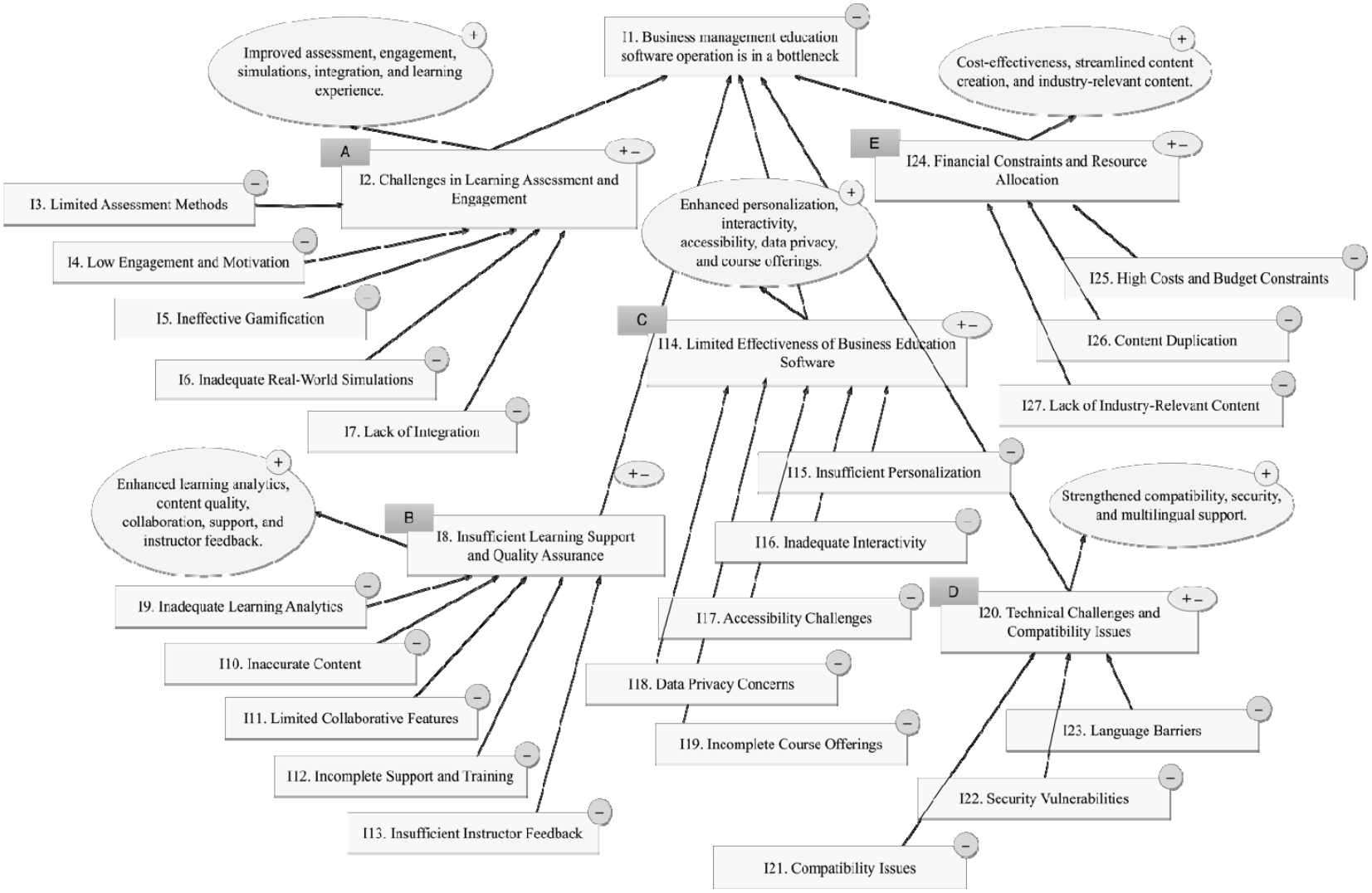

Figure 3: Root Conflict Analysis of BMES

Source: Compiled from this study

3.2.3Root Conflict Analysis of Business Management Education Software

During the causal analysis of negative outcomes, we identified problems that simultaneously bring positive benefits, which are known as root conflict issues. In this study, a total of five root conflict issues were identified and illustrated in the root conflict analysis diagram (Figure 3).According to Figure 3, this study integrates the root conflict analysis diagram with the business model canvas, revealing that the root conflicts are primarily reflected in the key resources and customer relationships aspects.

4. STRATEGIC PLANNING OF TRIZ INNOVATION MODEL

4.1 Parameterization of Conflict Issues

Based on the analysis above, this study has identified five conflict problem points within the case. To address these five conflict problem points, the next step is to refer to the Business Contradiction Matrix table proposed by Mann (2018), which provides general business parameters. By considering these parameters, potential solution strategies can be discovered. For conflicts A to E, we have extracted the parameters related to both positive and negative benefits associated with each conflict (Table 5-9).Table 5: Contradiction Matrix Analysis of Conflict Issue A

Conflict Issue A: Challenges in Learning Assessment and Engagement				
Positive Effect \ Negative Effect		Limited assessment methods, low engagement and motivation, ineffective gamification, inadequate real-world simulations, and a lack of integration.		
		14. Strength	27. Reliability	35. Adaptability
Improved assessment, engagement, simulations, integration, and learning experience.	10. Force	6, 7, 8, 16	1, 9, 11, 25	12, 23, 33, 36
	21. Power	17, 19, 24, 32	22, 7, 25, 38	2, 6, 14, 27
	29. Accuracy of Manufacturing	18, 33, 31, 40	7, 16, 36, 39	6, 3, 14, 30
	Innovative Problem-solving Principles	6, 7, 25, 33		

Source: Compiled from this study

Table 6: Contradiction Matrix Analysis of Conflict Issue B

Conflict Issue B: Insufficient Learning Support and Quality Assurance				
Positive Effect \ Negative Effect		Inadequate learning analytics, inaccurate content, limited collaborative features, incomplete support and training, and insufficient instructor feedback.		
		35. Quantity of Harmful Substances	24. Loss of Information	37. Complexity of Control
Enhanced learning analytics, content quality, collaboration, support, and instructor feedback.	27. Reliability	11, 17, 24, 38	17, 24, 31, 38	13, 17, 22, 24
	36. Complexity of Device	27, 31, 35, 38	17, 21, 38	2, 5, 13
	37. Complexity of Control	1, 3, 11, 13	20, 31, 40	4, 10, 22
	Innovative Problem-solving Principles	11, 17, 22, 31		

Source: Compiled from this study

Table 7: Contradiction Matrix Analysis of Conflict Issue C

Conflict Issue C: Limited Effectiveness of Business Education Software				
Positive Effect \ Negative Effect		Insufficient personalization, inadequate interactivity, accessibility challenges, data privacy concerns, and incomplete course offerings.		
		11. Tension Pressure	36. Complexity of Device	37. Complexity of Control
Enhanced personalization, interactivity, accessibility, data privacy, and course offerings.	14. Strength	15, 32	22, 27	18, 36
	17. Temperature	23, 40	32, 40	17, 32
	18. Brightness	18, 35	23, 36	27, 22
	Innovative Problem-solving Principles	18, 27, 32, 36		

Source: Compiled from this study

Table 8: Contradiction Matrix Analysis of Conflict Issue D

Conflict Issue D: Technical Challenges and Compatibility Issues				
Positive Effect \ Negative Effect		Compatibility issues, security vulnerabilities, and language barriers.		
		18. Brightness	20. Energy Spent by Nonmoving Object	03. Length of Moving Object
Strengthened compatibility, security, and multilingual support.	13. Stability of Object	3, 7	12, 15	24, 32
	15. Durability of Moving Object	2, 24	8, 17	21, 28
	28. Accuracy of Measurement	2, 7	28, 35	1, 6
	Innovative Problem-solving Principles	2, 7, 24, 28		

Source: Compiled from this study

Table 9: Contradiction Matrix Analysis of Conflict Issue E

Conflict Issue E: Financial Constraints and Resource Allocation				
Positive Effect \ Negative Effect		High costs and budget constraints, content duplication, and a lack of industry-relevant content.		
		22. Turn Lemons into Lemonade	30. Flexible Shells and Thin Films	34. Discarding and Recovering
Cost-effectiveness, streamlined content creation, and industry-relevant content.	27. Cheap Short-Living Objects	1, 10, 39	6, 8, 36	2, 34, 39
	39. Inert Atmosphere	1, 19, 35	3, 6, 39	19, 23, 28
	Innovative Problem-solving Principles	1, 6, 19, 39		

Source: Compiled from this study

4.2 Inventive Principles to Innovate Solutions

Based on the analysis of the contradiction matrix (Table 5-9), we have extracted the most frequently occurring inventive principles. In this study, we have used these extracted inventive principles to engage in innovative solution development with a TRIZ expert panel (Tables 10-14).

Table 10: Innovative Solutions for Conflict Issue A

	Inventive Principle	*Management Strategy*
Conflict Issue A: Challenges in Learning Assessment and Engagement	6. Universality	A-1: Gamified Learning Assessments: Transform assessments into interactive games with points, rewards, and competition to boost engagement and enjoyment.
	7. Nested Doll	A-2: Personalized Learning Pathways: Tailor learning materials based on students' interests, learning styles, and skill levels using data analytics.
	25. Self-service	A-3: Collaborative Learning and Peer Assessment: Encourage teamwork and peer feedback to create a supportive learning community.
	33. Homogeneity	A-4: Real-World Application of Knowledge: Connect theoretical learning to practical experiences, internships, and projects for increased relevance and motivation.

Source: Compiled from this study

Table 11: Innovative Solutions for Conflict Issue B

	Inventive Principle	*Management Strategy*
Conflict Issue B: Insufficient Learning Support and Quality Assurance	11. Beforehand Cushioning	B-1: AI-Powered Learning Support: Use AI for personalized tutoring and performance analysis.
	17. Another Dimension	B-2: Peer Mentoring and Tutoring Program: Establish peer support for struggling students.
	22. Turn Lemons into Lemonade	B-3: Continuous Quality Assessment and Improvement: Implement ongoing feedback and improvements.
	31. Porous Materials	B-4: Online Learning Platforms and Resources: Provide comprehensive online tools for self-paced learning.

Source: Compiled from this study

Table 12: Innovative Solutions for Conflict Issue C

	Inventive Principle	*Management Strategy*
Conflict Issue C: Limited Effectiveness of Business Education Software	18. Mechanical Vibration	C-1: Adaptive Learning Algorithms: Personalize content based on individual progress.
	27. Cheap Short-Living Objects	C-2: Virtual Reality (VR) Simulations: Provide immersive business scenarios for practical learning.
	32. Color Changes	C-3: Social Learning and Collaboration Features: Foster group interaction and knowledge-sharing.
	36. Phase Transitions	C-4: Data-Driven Learning Analytics: Utilize data for personalized recommendations and progress tracking.

Source: Compiled from this study

Table 13: Innovative Solutions for Conflict Issue D

	Inventive Principle	*Management Strategy*
Conflict Issue D: Technical Challenges and Compatibility Issues	1. Taking Out	D-1: Cross-Platform Compatibility: Ensure compatibility across devices and systems.
	7. Nested Doll	D-2: Cloud-Based Solutions: OPT for flexible and scalable cloud-based systems.
	24. Intermediary	D-3: API Integration and Interoperability: Foster seamless communication between software applications.
	28. Mechanics Substitution	D-4: Automated Compatibility Testing: Proactively detect and resolve compatibility issues through automated testing.

Source: Compiled from this study

Table 14: Innovative Solutions for Conflict Issue E

	Inventive Principle	*Management Strategy*
Conflict Issue E: Financial Constraints and Resource Allocation	1. Segmentation	E-1: Resource Sharing and Collaboration: Pool resources through partnerships.
	6. Universality	E-2: Technology-Enabled Efficiency: Use tech to optimize resource usage.
	19. Periodic Action	E-3: Crowdfunding and Community Support: Seek community funding and engagement.
	39. Inert Atmosphere	E-4: Outcome-Based Budgeting: Allocate resources based on specific goals.

Source: Compiled from this study

4.3 Strategic Period Planning for Business Management Education Software

Next, this study will conduct a TRIZ expert group meeting to address the conflict issues A to E. During the meeting, a multi-criteria decision-making framework will be developed, and the group members will be asked to rate the importance of five

conflict root management strategies using a rating scale (Table 15).

Table 15: Evaluation of the Decision-making Process

Panelist / *Solution*	*P1*	*P2*	*P3*	*P4*	*P5*	*P6*	*Period Weighted Score*			*Result*
Weight	3	3	3	2	1	5	S	M	L	
A-1	L	L	S	M	S	S	5	2	6	L
A-2	L	S	L	M	S	M	4	3	6	L
A-3	S	M	S	M	S	S	8	5	0	S
A-4	L	S	M	M	M	L	3	6	4	M
B-1	M	M	S	M	S	L	4	8	1	M
B-2	L	M	L	M	M	L	0	6	7	L
B-3	S	S	L	S	S	M	9	1	3	S
B-4	M	L	M	L	M	L	0	7	8	L
C-1	M	L	M	S	S	M	3	7	3	M
C-2	S	S	S	M	S	S	11	2	0	S
C-3	M	M	S	M	S	M	4	9	0	M
C-4	M	L	M	L	M	L	0	7	6	M
D-1	L	M	L	M	M	L	0	6	7	S
D-2	L	M	L	M	M	L	0	6	7	S
D-3	M	M	S	M	S	S	5	8	0	M
D-4	M	M	S	M	S	S	5	8	0	M
E-1	L	S	L	M	S	S	5	2	6	L
E-2	S	S	S	S	S	S	13	0	0	S
E-3	L	M	S	M	M	M	3	7	3	M
E-4	L	M	L	L	L	M	0	4	9	L

Source: Compiled from this study

5. CONCLUSION

5.1 Summary of Strategies

The operational challenges within the BMES industry reveal several root conflicts. These include learning assessment and engagement issues, learning support and quality assurance, software effectiveness, technical hurdles, and financial resource allocation. The study has identified a range of innovative strategies to tackle these bottlenecks:

- **Engagement and Personalization**: Integrating gamified learning assessments and personalized learning pathways can boost engagement and address individualized learning needs.
- **Collaborative Learning Environment**: Incorporating collaborative learning and peer assessment can foster a more supportive and interactive learning atmosphere.
- **Enhanced Software Effectiveness**: Leveraging adaptive learning algorithms, virtual reality simulations, and data-driven analytics can lead to more tailored and immersive learning experiences.

- **Technical Enhancements**: To address technical challenges, organizations can tackle them through cross-platform compatibility, adopting cloud-based options, integrating APIs, and implementing automated compatibility testing.
- **Resource Management**: Mitigating financial constraints and resource allocation issues can be achieved through resource sharing, technology-driven efficiency, crowdfunding, and outcome-based budgeting.

These strategies offer practical, medium-term solutions to address the identified challenges. While some strategies might require implementation, adoption, and optimization time, they provide a comprehensive approach to enhancing business management education software's operational efficiency and effectiveness.

5.2 Future Objectives

The future of business management education software is poised to achieve several significant objectives, further enriching the learning experience and meeting the evolving demands of the industry:

- **Personalization and Adaptive Learning**: Leveraging advanced algorithms and artificial intelligence will enable the software to personalize learning experiences based on individual preferences, learning styles, and progress.
- **Immersive Learning Environments:** Incorporating immersive technologies like virtual and augmented reality will create realistic learning scenarios, enhancing decision-making and problem-solving skills.
- **Continuous Skill Development:** Offering continuous access to up-to-date courses and resources ensures learners remain current with industry trends, equipping them to tackle real-world challenges effectively.
- **Learning Analytics Integration:** Data-driven insights will empower educators and learners to make informed decisions, bridging learning gaps and enhancing outcomes.
- **Collaboration and Engagement:** Robust features for teamwork, peer-to-peer learning, and group projects will foster essential communication and collaboration skills.
- **Gamification Elements:** Incorporating gamification elements like badges and rewards will motivate learners and create a more engaging learning environment.
- **Mobile-First Approach:** Optimizing for various devices will make the software accessible anytime and anywhere.
- **Microlearning and Focused Content:** Delivering concise learning modules through microlearning will cater to professionals' busy schedules.
- **Real-time Industry Insights:** Aligning course content with current industry challenges and trends will ensure learners receive relevant and timely information.

- **Global Collaboration Opportunities:** Connecting learners with peers, experts, and businesses worldwide will facilitate cross-cultural learning experiences.
- **Ethics and Sustainability:** Promoting ethical decision-making and sustainable business practices will prepare learners as responsible global leaders.
- **Emerging Technologies Integration:** Optimizing the software with emerging technologies like blockchain, artificial intelligence, and machine learning will enhance its functionality.
- **Continuous Evaluation and Improvement:** Continuous evaluation and feedback mechanisms will gauge course effectiveness and ensure the software remains relevant and impactful.
- **Industry:** Partnerships will bridge academia and industry, offering practical internships and projects and preparing learners for successful careers.

5.3 Research Limitations

There are various research limitations influence the study's scope, validity, and generalizability:

- Sample size and representativeness could restrict the applicability of findings.
- Data collection methods, such as self-reporting, can impact study reliability.
- Time constraints may limit capturing long-term effects or changes in software usage.
- Ethical considerations, data privacy, and consent can impact the research scope.
- Technology infrastructure availability and quality can influence software implementation.
- Specificity to a software vendor may limit relevance to other solutions.
- Restricted access to proprietary data can hinder in-depth analysis.
- Potential research bias can affect study design, analysis, or interpretations.
- Rapid technology evolution poses the risk of outdated research outcomes.
- External factors, like policies and industry trends, can influence software effectiveness.
- The choice of quantitative or qualitative approaches can have inherent limitations.
- Under-researched features may limit comprehensive analysis.
- Contextual factors may influence software implementation and outcomes.
- Longitudinal studies in educational technology pose challenges.
- Precisely measuring software intervention effectiveness can be difficult.
- External factors like economic conditions may impact the study.

By recognizing and addressing these limitations, scholars can enhance the accuracy of findings and gain a deeper understanding of the potential and impact of business management education software across diverse contexts.

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