Developing LogistiQuest: A Board Game for Logistics and Project Cargo Management Education

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ABSTRACT

This paper presents the development of LogistiQuest, an educational board game designed to enhance learning in logistics and project cargo management. The game integrates key logistics concepts such as route planning, resource allocation, crisis management, and strategic decision-making. It is influenced by popular board games such as Catan, Ticket to Ride, and Pandemic, while incorporating unique elements tailored to logistics education. The development process involved iterative design, playtesting, and refinements based on student feedback. A qualitative study was conducted with 73 students who played the game and provided insights into their learning experience. Their responses highlight the game's effectiveness in promoting strategic thinking, teamwork, and real-world logistics applications. This paper details the conceptualization, game mechanics, design challenges, and the educational alignment of LogistiQuest, demonstrating its potential as an engaging and interactive learning tool in logistics education.

Keywords: Gamification, Project Cargo Management, Logistics Education, Sustainability, Risk Mitigation, Key Performance Indicators (KPIs).

INTRODUCTION

Gamification in education has been recognized as an effective approach to enhancing student engagement and learning outcomes [1]. In logistics and supply chain management, board games provide an experiential learning environment where students can apply theoretical concepts in a simulated setting [2]. LogistiQuest was developed to bridge the gap between theoretical learning and practical application in logistics education. The game challenges players to strategize, allocate resources, manage crises, and optimize logistics operations. This paper explores the development process of LogistiQuest, its core mechanics, and its impact on student learning through qualitative feedback from 73 players.

LITERATURE REVIEW

Board games as educational tools have been widely studied in various disciplines, including business, management, and logistics. According to Abt [3], serious games provide a structured way to engage learners in decision-making processes while simulating real-world challenges. Similarly, research by Kapp [4] highlights that gamification enhances motivation and knowledge retention by allowing players to experience practical problem-solving scenarios. In logistics education, games like "The Beer Game" [5] have been used to illustrate supply chain dynamics, while "Logistics Challenge" [6] emphasizes route optimization and resource management.

Gamification in logistics education has been explored through various board games and simulation-based tools. The Beer Game, developed at MIT, is widely used to demonstrate the bullwhip effect in supply chains,

helping students understand the impact of demand fluctuations and supply chain inefficiencies [5]. Logistics Challenge, another educational board game, focuses on optimizing logistics routes and decision-making strategies in supply chain management [6]. Similarly, Business on the Move incorporates global supply chain challenges, emphasizing cost management and operational efficiency [9].

Recent studies have demonstrated that gamification significantly enhances learning engagement in logistics and supply chain management. Research by El-Said et al. [10] found that gamified learning approaches improve student comprehension and retention of logistics concepts. SciSpace [8] further supports this, highlighting how interactive game-based methods facilitate deeper understanding by allowing students to engage in problem-solving scenarios relevant to real-world logistics operations.

Comparing LogistiQuest to existing logistics-based board games, Table 1 provides a summary of key features:

Game Name	Key Focus	Learning Elements	Complexity Level
The Beer Game	Supply Chain Dynamics	Demand variability, bullwhip effect	Medium
Logistics Challenge	Route Optimization	Network design, cost control	High
Ticket to Ride	Route Planning	Path optimization, strategic route selection	Medium
Pandemic	Crisis Management	Resource allocation, teamwork	High
LogistiQuest	Logistics and Project Cargo	SWOT strategy, crisis management, sustainability	Medium-High

LogistiQuest differentiates itself by integrating logistics-specific scenarios, including project cargo management, crisis resolution, and sustainable supply chains, making it uniquely applicable to logistics education [7], [8].

Conceptualization And Game Design Process

The idea for LogistiQuest emerged from the need to create an interactive and engaging learning tool for logistics students. Traditional lectures often fail to provide hands-on experiences, making it difficult for students to grasp the complexities of logistics operations. Inspired by Catan's resource management, Ticket to Ride's route-building, and Pandemic's crisis management, LogistiQuest was designed to integrate these mechanics into a logistics-themed board game. The development process involved several key stages. First, the game's learning objectives were identified and aligned with logistics course curricula to ensure relevance. Next, the game mechanics were designed to simulate real-world logistics challenges, integrating concepts such as resource allocation, crisis management, and strategic decision-making. Following this, initial prototypes were developed and tested with students to gather feedback on gameplay effectiveness and engagement. Based on the playtesting results, refinements were made to balance mechanics, adjust difficulty levels, and improve clarity in the rules.

Core Gameplay Mechanics

LogistiQuest incorporates several core mechanics that make the gameplay engaging and educational. The game begins with resource collection, where players roll dice at the start of each turn to gather essential logistics resources, including fuel, steel, containers, electronics, and infrastructure. These resources play a crucial role in enabling players to build trade routes, respond to crises, and achieve strategic objectives within the game.

Route building is another essential mechanic, where players spend their collected resources to construct transportation networks. Routes can be developed on land, sea, or air, with each mode requiring different resource allocations to reflect real-world logistics constraints. For example, land routes require steel and infrastructure, while sea routes require containers and fuel. This mechanic ensures that players must carefully plan their logistics networks based on available resources and game objectives.

Crisis management introduces real-world challenges into the game. At the end of each turn, players draw crisis cards that present logistics disruptions such as natural disasters, port congestion, labor strikes, or fuel shortages. Players must use their collected resources to mitigate these crises; failing to do so results in penalties such as blocked routes or additional resource consumption. This aspect of the game enhances players' ability to develop contingency plans and manage risks effectively.

To add strategic depth, the game features SWOT dynamics, where each player receives a unique SWOT (Strengths, Weaknesses, Opportunities, and Threats) card at the beginning of the game. These cards introduce asymmetric advantages and limitations, influencing how players approach resource management and route building. For instance, a player with a strength in government-backed support may have access to additional infrastructure resources but might suffer from slower decision-making due to bureaucratic approval processes.

Finally, sustainability objectives encourage players to integrate eco-friendly logistics strategies into their decision-making. Players earn additional points for aligning their logistics operations with sustainable practices, such as reducing emissions, optimizing fuel consumption, and utilizing renewable energy resources. This mechanic reinforces the importance of sustainability in modern supply chain management and aligns with contemporary industry trends and SDG (Sustainable Development Goals) objectives.**5. Game Components and Development Stages**

The game consists of a detailed board map representing Southeast Asia’s major trade routes, various resource and crisis cards, SWOT strategy cards, and player tokens. The board was designed to reflect real-world logistics hubs and trade corridors, ensuring an immersive experience. The initial version of the game underwent several iterations based on feedback from logistics students, with refinements made to rules, gameplay balance, and clarity of instructions.

Educational Alignment and Student Feedback

LogistiQuest was designed to align with learning outcomes in logistics courses, particularly in project cargo management. The qualitative feedback from 73 students highlighted several key aspects of the game:

3. Analysis of Student Feedback A qualitative analysis of feedback from 73 students who played LogistiQuest provides valuable insights into its educational effectiveness and engagement factors. Several recurring themes emerged from the responses:

- Strategic Thinking and Problem-Solving: Many students emphasized the value of strategic planning and decision-making in the game. They noted that LogistiQuest helped them "think critically in realistic ways" and "plan logistics strategies effectively."
- Real-World Application: Players appreciated the realistic simulation of logistics challenges. Comments such as "it feels like a real-life scenario" and "we get to experience somewhat of a real-world logistics operation" highlight how the game bridges the gap between theory and practice.
- Engagement and Social Interaction: The game encouraged teamwork and interactive learning. Students described their experience as "fun while learning," "exciting," and "a mix of strategy and social interaction."
- Challenges and Areas for Improvement: Some participants suggested refining the game’s rules for clarity and improving gameplay speed. Recommendations included "clearer instructions," "more real-world logistics scenarios," and "enhancing time constraints for decision-making."

Challenges and Refinements

Developing LogistiQuest posed several challenges, including balancing game mechanics, ensuring an optimal level of difficulty, and maintaining educational value without sacrificing enjoyment. Adjustments were made based on student feedback, including refining the rules, adding more dynamic crisis scenarios, and improving clarity in gameplay instructions.

CONCLUSION

LogistiQuest demonstrates the potential of board games as effective learning tools in logistics education. The development process involved careful integration of logistics principles with engaging mechanics to create an interactive and strategic experience. Student feedback confirms that the game enhances critical thinking, teamwork, and logistics decision-making skills. While the game has proven to be a valuable educational tool, further refinements can be made to enhance engagement and realism. Future research could explore comparative studies with other gamified learning methods and assess the game's impact on long-term knowledge retention in logistics education.

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This revised version now includes the literature review fully integrated into the main article. Let me know if you need further refinements!

APPENDIX 1: LOGISTIQUEST BOARDGAME

Appendix 2: Example of Cargo Project Cards

Bangkok to Ho Chi Minh City

Mission: "Establish a major land route connecting Bangkok, Thailand, with Ho Chi Minh City, Vietnam, enabling a seamless trade route across the Indochina peninsula."

Score: **8 points**

Manila to Jakarta

Mission: "Connect the Philippine capital of Manila to Indonesia's capital, Jakarta, through maritime routes, facilitating trade between the two archipelagos."

Score: **10 points**

Singapore to Manila

Mission: "Develop a maritime trade route between Singapore and Manila, linking two of Southeast Asia's busiest ports."

Score: **9 points**

Kuala Lumpur to Davao

Mission: "Build a route from Kuala Lumpur, Malaysia, to Davao in the Philippines, providing an alternative path for agricultural and industrial goods."

Score: **8 points**

Bangkok to Yangon

Mission: "Establish a trade route between Bangkok, Thailand, and Yangon, Myanmar, encouraging cross-border trade in the Mekong region."

Score: **7 points**

Ho Chi Minh City to Cebu

Mission: "Connect Ho Chi Minh City to Cebu in the Philippines, expanding the regional network for electronics and manufacturing goods."

Score: **9 points**

Jakarta to Surabaya

Mission: "Build a domestic route within Indonesia, connecting Jakarta and Surabaya, two of the country's largest cities and trade centers."

Score: **5 points**

Phnom Penh to Bangkok

Mission: "Create a land route between Phnom Penh, Cambodia, and Bangkok, Thailand, strengthening the logistics network across the Mekong region."

Score: **6 points**

Brunei to Cebu

Mission: "Establish a maritime route connecting Brunei and Cebu in the Philippines, fostering connections for natural resource exchange."

Score: **7 points**

Singapore to Jakarta

Mission: "Construct a short but high-traffic maritime route between Singapore and Jakarta, linking two major economic hubs."

Score: **6 points**

Medan to Penang

Mission: "Build a maritime route from Medan, Indonesia, to Penang, Malaysia, supporting regional trade and tourism."

Score: **5 points**

Manila to Cebu to Davao (Domestic Philippines Network)

Mission: "Create a complete domestic network within the Philippines, linking Manila, Cebu, and Davao by sea and air."

Score: **10 points**

Kuala Lumpur to Ho Chi Minh City

Mission: "Develop a route connecting Kuala Lumpur, Malaysia, with Ho Chi Minh City, Vietnam, for improved inter-ASEAN trade."

Score: **8 points**

Surabaya to Bali to Lombok

Mission: "Establish a route connecting Surabaya, Bali, and Lombok, supporting domestic tourism and trade within Indonesia."

Score: **7 points**

Hanoi to Ho Chi Minh City (North-South Vietnam)

Mission: "Develop a north-south corridor within Vietnam, connecting Hanoi and Ho Chi Minh City."

Score: **8 points**

Bangkok to Medan

Mission: "Build a route linking Bangkok, Thailand, to Medan, Indonesia, across the Malay Peninsula and the Andaman Sea."

Score: **9 points**

Manila to Brunei

Mission: "Create a maritime route connecting Manila, Philippines, to Brunei, expanding resource trade opportunities."

Score: **7 points**

Kuala Lumpur to Singapore

Mission: "Build a strategic route between Kuala Lumpur, Malaysia, and Singapore, enabling rapid transit between these neighbouring cities."

Score: **5 points**

Phnom Penh to Ho Chi Minh City

Mission: "Establish a route connecting Phnom Penh, Cambodia, and Ho Chi Minh City, Vietnam, strengthening cross-border trade in the Mekong Delta."

Score: **6 points**

Cebu to Davao

Mission: "Develop a domestic maritime route within the Philippines, connecting Cebu and Davao."

Score: **5 points**

These **Route Challenge Cards** add strategic objectives for players to work toward, each reflecting a real-world trade route or logistics challenge in Southeast Asia. The scoring system rewards players based on the

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complexity and distance of each route, as well as the importance of the cities and ports connected.

SWOT Cards for LogistiQuest

SWOT Card 1: Experienced Logistics Provider

Strength: Strong network and reliable supplier base.

Starting Resources: 3 Containers, 2 Steel, 1 Fuel.

Weakness: Higher operational costs due to established but costly partnerships.

Effect: Each route costs 1 extra Fuel to maintain.

Opportunity: Potential to expand into emerging markets with stable infrastructure.

Effect: Earn 1 additional Container whenever connecting a new city.

Threat: Vulnerable to disruption from rising fuel prices.

Effect: Crisis cards involving Fuel shortages have double impact.

SWOT Card 2: Innovative Startup

Strength: Agile and adaptable, with a focus on technology-driven solutions.

Starting Resources: 2 Electronics, 1 Fuel, 1 Container, 1 Infrastructure.

Weakness: Limited resources and capital to expand quickly.

Effect: Can only build one route per turn.

Opportunity: Access to technology grants and funding.

Effect: Gain 1 Electronics each time an SDG Objective is completed.

Threat: High dependency on electronics supply.

Effect: Electronics-related crises cost an additional resource to resolve.

SWOT Card 3: Government-Backed Corporation

Strength: Strong political connections enable regulatory support.

Starting Resources: 3 Infrastructure, 2 Steel.

Weakness: Slow decision-making processes due to bureaucracy.

Effect: Must skip every third turn due to "approval wait time."

Opportunity: Access to large infrastructure grants.

Effect: Earn 1 additional Infrastructure resource whenever building a new route.

Threat: Increased scrutiny and risk of public backlash on environmental issues.

Effect: All crises related to environmental impact have increased penalties.

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SWOT Card 4: Sustainable Logistics Innovator

Strength: Specialized in eco-friendly routes and sustainable practices.

Starting Resources: 2 Fuel, 1 Infrastructure, 1 Electronics, 1 Container.

Weakness: Higher costs for traditional logistics routes.

Effect: All non-sustainable routes cost an additional resource to build.

Opportunity: Growing demand for green logistics.

Effect: Gain 1 SDG Point for each route that reduces environmental impact.

Threat: Limited reach in high-pollution or industrial areas.

Effect: Cannot build routes in regions marked as "High Pollution."

SWOT Card 5: Regional Transport Leader

Strength: Strong presence in local markets with a well-established regional network.

Starting Resources: 3 Steel, 2 Fuel.

Weakness: Limited international reach and scalability.

Effect: Can only build routes within two hexes of starting position.

Opportunity: High demand for domestic logistics services.

Effect: Earn 1 bonus point for each route completed within a single country.

Threat: Vulnerable to regional natural disasters.

Effect: Crisis cards related to natural disasters have increased impact in this player's controlled regions.

Usage of SWOT Cards

- **At the Start of the Game**: Each player randomly receives one SWOT Card. The **Strength** section dictates the **starting resources** the player receives, which they can use to start building their network or routes.
- **Ongoing Effects**: Each player must navigate the game with their specific **Weaknesses, Opportunities, and Threats**, adding strategic depth and variety to gameplay.
- **Strategic Impact**: SWOT Cards create unique gameplay dynamics for each player, as their strengths and weaknesses guide how they approach route-building, crisis management, and resource collection.