

Extending The Project Win Game™: Teaching Real Options and Moral AI Project Decision-making

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Abstract This study addresses the following research question: What design principles enable a structured serious game canvas to operationalize complex quantitative and qualitative project management concepts as experiential learning environments? The concept for this work was inspired by observations of how practitioners engaged with The Project Win Game™, a board game designed to simulate project management decision-making. Building on this experience, the game was extended with two gameplay options for corporate training and adult education: Real Options Analysis (ROA) to support disciplined investment decisions under uncertainty, and moral AI. This unconventional pairing of a quantitative financial decision model and a qualitative ethics module within the same game framework expands the range of complex decision topics addressed through games. Conventional project management education often overlooks structured stop-or-scale decisions and the broader societal consequences of project outcomes. The first gameplay option integrates ROA, a financial modelling method that applies option-pricing to staged investment decisions under uncertainty. ROA is advanced for many project managers, so the game teaches it through gameplay. Players simulate phased investments, reassess continuation decisions, and manage downside exposure as project uncertainty unfolds. Serious games are particularly suited for teaching decision-making under uncertainty because they allow participants to experiment in a simulated environment where trade-offs and delayed consequences can be experienced directly rather than explained abstractly. The second gameplay option shifts from financial to ethical complexity and focuses on AI implementation projects in a healthcare context. Participants confront ethical risks arising from algorithmic decision-making, including bias, misidentification, and unintended harm. Through simulated project events, players identify ethical risks, evaluate stakeholder impacts, and recognize how early project decisions shape societal outcomes. The design approach was validated through pilot sessions and is illustrated through ROA and Moral AI extensions.

Keywords: Gamification, Serious games, AI, Real options

1. Introduction

Project management is facing a significant and growing talent challenge. There are currently nearly 40 million project professionals worldwide, yet projections indicate that by 2035, the global shortfall could reach up to 30 million additional professionals (PMI 2025). This widening gap is expanding faster than overall global economic growth, highlighting a critical imbalance between demand and available expertise.

At the same time, higher education institutions face persistent challenges in preparing graduates for the realities of complex project environments (Tumpa et al. 2024, Daniels et al. 2025). Existing programs are often criticized for emphasizing methodologies and tools while insufficiently developing the soft and transferable skills—such as communication, leadership, and adaptability—that are required to manage dynamic, multi-stakeholder projects. As noted by Tumpa et al. (2024), the development of project management practitioners remains “narrow and shallow,” failing to reflect the multidimensional demands of contemporary project environments. This limitation is compounded by the difficulty students face in transferring theoretical knowledge to real-world contexts characterized by uncertainty, ambiguity, and evolving stakeholder dynamics (Daniels et al. 2025).

Consequently, graduates are often underprepared to navigate the complexity, interdependencies, and ethical considerations inherent in modern projects.

These challenges underscore the urgent need for more effective approaches to training, reskilling, and upskilling project professionals. Serious games have emerged as a promising mechanism for addressing this gap by immersing participants in realistic, decision-driven environments that support experiential learning (Tumpa et al. 2024, Daniels et al. 2025, Miller & Vaca Núñez 2022). Through interactive gameplay, participants develop critical project management competencies, including communication, leadership, collaboration, negotiation, and problem-solving. The dynamic and uncertain nature of serious games enables learners to practice decision-making under ambiguity, evaluate trade-offs, and experience the consequences of their actions in a safe environment. Empirical evidence further supports their effectiveness; Rumeser & Emsley (2019) found that serious games improve decision-making in project management contexts, and that relatively simple game designs can achieve learning outcomes comparable to more complex implementations.

Recent advances in AI-enhanced game-based learning (AI-GBL) further extend these capabilities by enabling adaptive, scenario-driven learning environments that support ethical reasoning, reflection, and the development of adaptive expertise (Daniels et al. 2025). By leveraging generative AI, AI-GBL creates context-sensitive simulations that help address the persistent theory–practice gap in project leadership development. However, while AI-GBL provides strong pedagogical capabilities, it lacks a structured, repeatable design framework for constructing and implementing serious games, limiting its scalability and consistency in practice.

This paper poses the following research question to address this gap: *What design principles enable a structured serious game canvas to operationalize complex quantitative and qualitative project management concepts as experiential learning environments?* It proposes a project management serious game canvas that operationalizes three core design principles—decision-centered learning, consequence-based feedback, and project-management-specific design—into a systematic approach for translating learning objectives into game components, mechanics, and dynamics. The canvas was developed through iterative design and validation using The Project Win Game™, a serious board game designed to simulate project management decision-making (Miller & Vaca Núñez 2022). The canvas links learning objectives to gameplay elements and expected behaviors, structured to engage participants in problem-solving, financial decision discipline, and ethical accountability through experiential learning.

The paper illustrates the application of the canvas through two gameplay extensions: (1) Real Options Analysis (ROA), supporting disciplined investment decisions under uncertainty, and (2) moral artificial intelligence (AI) (ethical and societal risk management in AI projects). These extensions target project managers and team members operating in complex, high-stakes environments that extend beyond traditional scope, cost, and schedule constraints.

The remainder of the paper presents the game canvas, two illustrative applications, lessons learned from design and validation, practical implications, a future AI-assisted extension, and directions for future research.

2. Project Management Serious Game Canvas

The Project Management Serious Game Canvas operationalizes these design principles through an eight-stage methodology, providing a practical tool that can be used to develop, evaluate, and refine project management serious games.

2.1 Distinguishing Features of the Project Management Serious Game Canvas

The Project Management Serious Game Canvas differs from generic game design frameworks through three principles: decision-centered learning, consequence-based feedback, and project-management-specific design.

Decision-centered learning places project decisions at the core of gameplay. Rather than focusing on abstract knowledge acquisition, players are required to make realistic project choices involving uncertainty, trade-offs, and competing stakeholder interests.

Consequence-based feedback ensures that decisions produce observable outcomes that influence future gameplay, so that players experience both the immediate and longer-term consequences of their choices.

Project-management-specific design grounds gameplay in realistic project environments. Risk and opportunity events, stakeholder impacts, governance challenges, resource constraints, and value outcomes are structured around authentic project scenarios, ensuring that learning activities remain directly connected to project management practice.

These three principles form the foundation of the eight-stage design methodology described in the following section.

2.2 Game Canvas

The methodology defines the sequence of design activities, and the canvas provides a structured one-page template that guides designers through the key decisions required at each stage. Table 1 presents the complete canvas, including guidance, examples, and recommended practices to support the translation of project management concepts into game-based learning experiences.

Although the methodology is presented as a sequence of eight stages, serious game development is inherently iterative. Insights gained through testing and validation frequently require designers to revisit earlier decisions relating to learning objectives, game mechanics, balancing, or facilitation. Figure 1 therefore complements the

canvas by illustrating the iterative relationships between the stages and highlighting the continuous refinement process that underpins effective serious game design.

First, the methodology begins by identifying a complex project management topic that involves meaningful decision-making, uncertainty, and trade-offs between project constraints such as time, cost, quality, risk, value, and scope.

Second, the topic is decomposed into specific learning objectives. Each learning objective is translated into observable player behaviors, gameplay decisions, and supporting learning mechanisms. This follows the structure used in *The Project Win Game™*, where behaviors such as selecting a methodology, building a team, budgeting, managing change, focusing on value, and managing risks were mapped to decisions and game components (Miller & Vaca Núñez 2022).

Third, the design team determines where serious game mechanisms provide additional learning value by assessing whether the topic involves sufficient uncertainty, interaction, and consequence to benefit from gameplay.

Fourth, the game is designed using the serious game canvas. This stage integrates platform, players, and the core game design elements. The platform defines the delivery format (e.g., board game, digital simulation, or hybrid), while players define the target audience and roles during gameplay. The game design elements include:

- Components: the physical or digital elements (e.g., boards, cards, tokens)
- Mechanics: the rules governing interactions and decisions
- Behaviors: the actions and decisions players are expected to perform
- Aesthetics: the intended emotional experience (e.g., tension, urgency, collaboration)
- Dynamics: the progression of gameplay over time (e.g., planning, execution, disruption, adaptation)

These elements collectively translate learning objectives into a structured and interactive gameplay system.

Fifth, a low-fidelity prototype is developed to test the learning logic, rules, and interactions. The focus at this stage is on functionality rather than visual design, using simple materials such as paper boards, draft cards, and generic tokens.

Sixth, the game is tested and validated through repeated play sessions with different participant profiles. Observations and feedback are used to refine rules, components, balancing, timing, and facilitation. In *The Project Win Game™* development process, iterative testing led to changes such as replacing a spinning wheel with issue and opportunity cards, revising the board structure, introducing a colored die, and refining gameplay rules (Miller & Vaca Núñez 2022).

Seventh, the design is revised based on testing outcomes. This includes simplifying rules, improving balance between costs and value, and strengthening interactions between game components to ensure meaningful decision-making and engagement.

Eighth, the game is finalized and prepared for deployment as a repeatable workshop or learning tool. This includes the development of complete game materials, rules, facilitator guidance, and optional scenario variations.

Overall, this methodology treats serious game development as an iterative learning design process in which project management concepts are progressively translated into decisions, mechanics, consequences, and reflective learning experiences.

Table 1: Structured one-page canvas for designing a project management serious game aligned with the design methodology

Project Management Serious Game Design Canvas (Structured with Guidance)	
1. Complex Topic	Describe the project problem. <i>Examples:</i> AI ethics, project recovery, portfolio prioritization <i>Do:</i> Select topics with uncertainty, trade-offs, and stakeholder impact <i>Don't:</i> Use purely theoretical or linear topics
2. Learning Objectives	Define decisions players must make. <i>Examples:</i> Allocate budget, manage risk, prioritize scope <i>Do:</i> Frame objectives as decisions and behaviors <i>Don't:</i> List abstract knowledge (e.g., "understand concepts")
3. Serious Game Fit	Where does gameplay add value? <i>Examples:</i> uncertainty, trade-offs, stakeholder conflict <i>Do:</i> Use games for dynamic, ambiguous environments <i>Don't:</i> Use games for static or procedural content
4. Platform and Players	Define delivery format and participants. <i>Platform Examples:</i> board game, workshop, digital simulation <i>Players Examples:</i> project manager, team, stakeholders <i>Do:</i> Align platform with audience and learning context <i>Don't:</i> Overcomplicate technology or assign passive roles
5. Game Design	Design the gameplay system (Components, Mechanics, Behaviors, Aesthetics, Dynamics). <i>Components:</i> cards (product, issue, opportunity), tokens, board <i>Mechanics:</i> resource allocation, scoring, event triggers <i>Behaviors:</i> planning, negotiating, adapting <i>Aesthetics:</i> tension, urgency, collaboration <i>Dynamics:</i> planning → execution → disruption → adaptation <i>Do:</i> Ensure all elements support learning objectives and create trade-offs <i>Don't:</i> Add unnecessary complexity or disconnected features
6. Testing and Validation	Evaluate gameplay and learning. <i>Examples:</i> playtesting sessions, observation, feedback loops <i>Do:</i> Test with diverse users and iterate frequently <i>Don't:</i> Rely on a single test or ignore player behavior
7. Revision	Refine the design. <i>Examples:</i> rebalance costs, simplify rules, adjust components <i>Do:</i> Focus on clarity, balance, and engagement <i>Don't:</i> Assume the initial design is optimal
8. Finalization and Deployment	Prepare for delivery and use. <i>Includes:</i> finalized rules, game materials, facilitator guide, session plan <i>Do:</i> Create clear instructions, debrief questions, and timing guidance <i>Don't:</i> Deploy without facilitator support or structured reflection

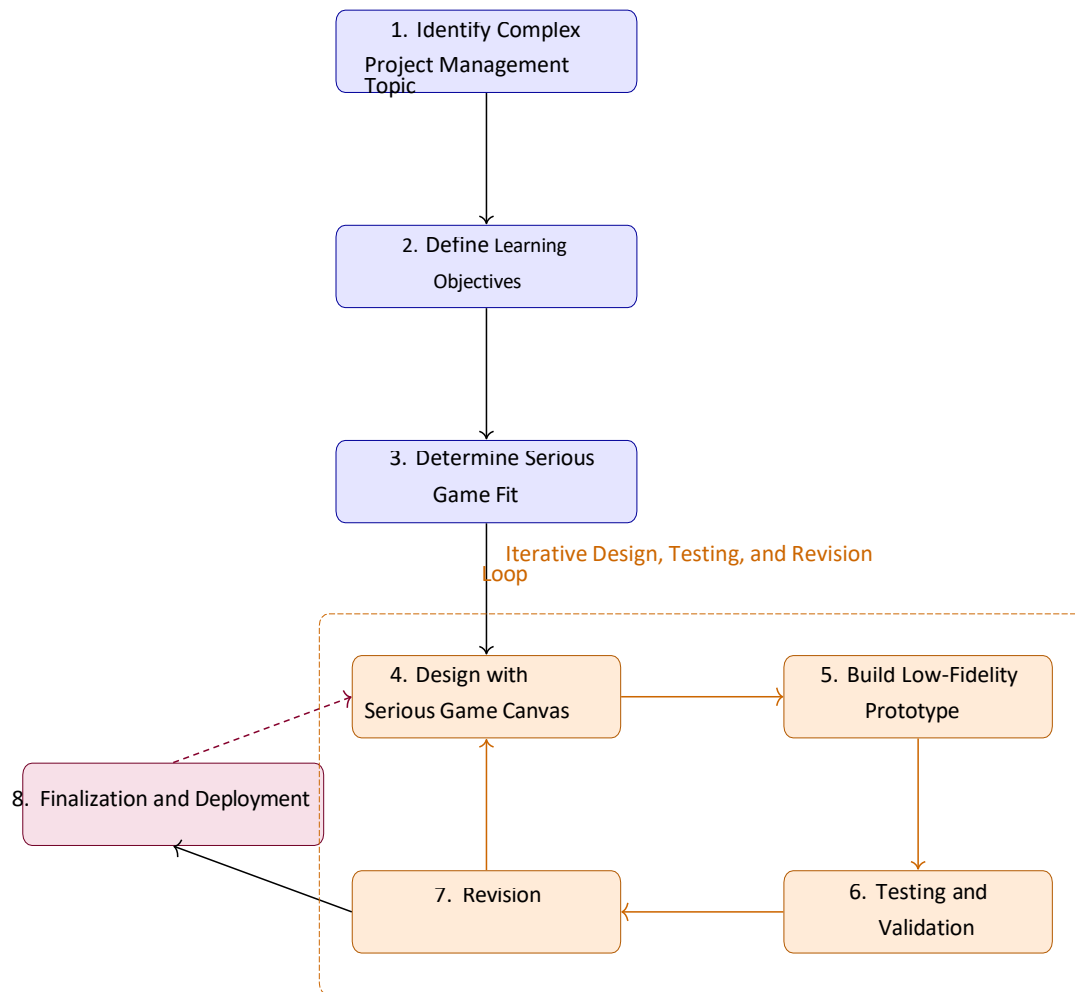


Figure 1: Iterative framework for developing project management serious games

3. Illustrative Applications of the Serious Game Canvas

In The Project Win Game™, players design a project by selecting team members, allocating budgets, and defining product scope. Players then progress through a project lifecycle, responding to issue and opportunity events that affect project cost, risk, and value. The objective is to maximize the value generated by the project, with the winner being the player or team that accumulates the highest value at the end of the game.

Building on this foundation, the game was extended in two illustrative ways. The first extension applies Real Options Analysis (ROA) to teach investment flexibility and decision-making under uncertainty, while the second introduces Moral AI concepts to explore ethical risks, governance, and stakeholder impacts in AI-enabled projects. These cases demonstrate how the serious game canvas can be used to translate distinct project management domains into structured learning experiences.

3.1 Case 1: Real Options and Flexible Projects

3.1.1 Complexity of real options and flexible project design (canvas stages 1-3)

The following section identifies the complex topic, defines the learning objectives, and assesses serious game fit, which are the first three stages of the canvas. Real options require project managers to make staged investment decisions under uncertainty and determine when to adapt, defer, expand, or terminate investments (Miller 2026a).

Project decisions are inherently path-dependent, where early commitments constrain or enable future options. Behavioral factors further complicate decision-making. Risk aversion, overconfidence, and the sunk cost fallacy can lead to suboptimal choices, particularly when decisions involve abandoning or deferring investments. These characteristics make real options difficult to convey through traditional instructional approaches and highlight the need for experiential learning environments.

3.1.2 Learning objectives, game design, and serious game fit

The serious game canvas was then applied at Stage 4 to translate real options concepts into interactive gameplay by aligning learning objectives, mechanics, and player behaviors, with the resulting mapping presented as a low-fidelity design specification (Stage 5) in Table 2.

The extension of The Project Win Game™ embeds flexibility into the project lifecycle by introducing mechanism cards that represent project organizational aspects such as flexible contracts, (re-)investment decisions, and concurrent engineering. These mechanisms enable the application of real options, including switching, deferring, expanding, and abandoning. An alternative mode was introduced in which real options are available without the explicit use of mechanism cards. In this mode, each option is defined with characteristics consistent with its theoretical description, and players select among options directly when responding to changing project conditions. This reduces cognitive load and allows players to focus on understanding real options decision-making before engaging with the additional complexity of mechanism design.

3.2 Mapping Learning Objectives to Game Design for Real Options and Flexible Projects

To demonstrate how the canvas translates learning objectives into gameplay, Table 2 includes representative examples of player actions, decision points, and resulting consequences. Unlike traditional instructional approaches, the game requires participants to make explicit investment and adaptation decisions whose consequences emerge over multiple rounds.

Table 2: Mapping of learning objectives to player actions, game mechanics, and learning experiences for Real Options and Flexible Projects

Learning Objective	Player Action / Game Mechanic	Gameplay Consequence and Learning Experience
Understand flexibility as value	Purchase flexibility mechanisms (e.g., flexible contracts, modular architecture) during project setup	Upfront costs create future response options when uncertainty occurs
Apply real options strategies	Exercise switch, defer, expand, contract, or abandon options in response to events	Players experience the benefits and costs of different option choices
Manage uncertainty	Identify when an issue or opportunity event creates the conditions to exercise a real option	Players learn to distinguish between events that warrant option exercise and those requiring standard replanning
Balance cost versus value	Allocate budget across products and flexibility mechanisms	Trade-offs arise between short-term returns and future adaptability
Avoid sunk cost fallacy	Terminate or replace underperforming investments	Players experience the tension of abandoning prior investments
Make effective timing decisions	Activate options only when conditions permit	Early or delayed action affects project value
Design flexible project systems	Select flexibility mechanisms during project initiation	Early choices determine future strategic options
Compare alternative strategies	Select between options (e.g. defer, expand, contract, or abandon) in response to the same event	Players observe how different option choices produce divergent value and risk outcomes from identical starting conditions
Understand infrastructure trade-offs	Select cloud or on-premise solutions	Players balance flexibility, cost, scalability, and risk

3.3 Case 2: Moral AI Projects

3.3.1 Complexity of Moral AI Projects (Canvas Stages 1-3)

Artificial intelligence (AI) projects introduce additional layers of complexity arising from the interaction between technical uncertainty, ethical considerations, and societal impact. AI systems operate on probabilistic models, resulting in outcomes that vary across contexts and populations. Consequently, risks such as bias, misclassification, and model drift are systemic rather than isolated (Miller 2026b).

A defining feature of AI projects is the asymmetry of stakeholder impact. Decisions may generate value for some groups while causing harm to others, creating ethical trade-offs that extend beyond traditional project

constraints. In addition, AI projects exhibit delayed and compounding effects, where early decisions related to data, model design, and governance influence long-term outcomes such as fairness, compliance, and trust.

The diffusion of responsibility across multidisciplinary teams further complicates accountability, while evolving regulatory and societal expectations introduce additional uncertainty. These factors create a decision environment in which project managers must balance value creation with harm mitigation, innovation with compliance, and automation with human oversight.

3.3.2 Learning objectives, game design, and serious game fit

The serious game canvas was then applied at Stage 4 to translate moral AI concepts into interactive gameplay, with the resulting mapping presented as a low-fidelity design specification (Stage 5) in Table 3. A moral issue is defined as a situation in which a decision-maker's freely chosen actions have consequences (harms or benefits) for others (Jones 1991). Central to this definition is the presence of choice and its impact on stakeholders. In contrast, ethical decisions are evaluated against established legal frameworks or societal norms, distinguishing between acceptable and unacceptable conduct.

The game emphasizes decision-making under uncertainty, where actions may generate both value and harm. To operationalize these trade-offs, the project scope is extended beyond business and technical features to include ethical modules such as bias mitigation, explainability, and governance controls. Players must decide whether to invest in these safeguards, balancing their costs against potential reductions in risk exposure and improvements in long-term project outcomes.

Table 3 presents the mapping between learning objectives, player actions, and learning experiences for Moral AI projects.

Table 2: Mapping of learning objectives to player actions, game mechanics, and learning experiences for Moral AI Projects

Learning Objective	Player Action / Game Mechanic	Gameplay Consequence and Learning Experience
Trade-off decision-making	Select products with different value–risk profiles under budget constraints	Players balance value creation against ethical risk
Stakeholder impact awareness	Track ethical scores and stakeholder impacts	Decisions affect outcomes beyond financial performance
Governance and control mechanisms	Invest in mitigation opportunities and safeguards	Safeguards reduce future risk but consume resources
Invest in ethical safeguards under budget pressure	Allocate limited budget between performance features (accuracy, speed) and ethical controls (bias mitigation, explainability, audit trails)	Players experience the tension between optimising model performance and funding governance safeguards that reduce long-term harm
Manage algorithmic uncertainty	Respond to issue cards representing moral issues (e.g. bias, environmental risks, model drift)	Players experience how probabilistic AI failures are systemic and context-dependent rather than isolated incidents
Value versus ethics balance	Manage both performance and ethical thresholds	Success requires balancing value and responsibility
Scope management (extended scope)	Select product features and ethical modules	Players balance delivery objectives with ethical safeguards
Recognise compounding ethical harm	Track how an early ungoverned data or model decision propagates into later bias, compliance, and trust failures across project phases	Players experience how delayed ethical consequences are harder and more costly to remediate than early intervention

3.4 Lessons Learned from Validation and Iterative Design

The validation of both extended games followed Stages 5–7 of the canvas methodology: prototyping (Stage 5), iterative testing (Stage 6), and revision (Stage 7). The findings are drawn from multiple playtesting cycles across both domains that refined component interactions, economic parameters, and gameplay complexity. While Stage 8 activities relating to finalization and deployment are ongoing, the validation process demonstrates how the canvas can be used to extend an existing serious game into new project management domains while maintaining gameplay coherence and educational value.

Across both adaptations, the extended versions remained structurally close to the original The Project Win Game™ and its flexible projects variant. This allowed domain-specific extensions to be introduced with minimal structural change. In the Real Options case, mechanism cards enabled the representation of flexibility decisions, while in the Moral AI case, issue and opportunity cards were adapted to capture ethical risks and societal impacts.

A key insight from testing was the importance of strengthening interactions between components so that flexibility, risk, and mitigation decisions produced visible effects on outcomes.

Balancing economic parameters was also critical. Player behavior was highly sensitive to the relationship between implementation costs, run costs, and value generation. Imbalances reduced decision tension, either discouraging investment or enabling unchecked expansion. Iterative adjustments established a stable equilibrium that reinforced meaningful trade-offs.

Simplification of gameplay was necessary to reduce cognitive load and improve usability. The introduction of a colored die streamlined event generation, while a simplified mode supported progressive learning by allowing players to engage with core concepts before introducing additional complexity.

Overall, the validation demonstrates that extending an established game framework can be achieved effectively through targeted, domain-specific adaptations. Iterative refinement is essential to balance complexity, usability, and educational value, ensuring that gameplay remains engaging while accurately reflecting real-world project decision environments.

4. Discussion

The project management serious game canvas and AI-GBL are complementary. While AI-GBL supports dynamic scenario generation and personalized learning (Daniels et al. 2025), the canvas provides a structured framework for translating project management concepts into repeatable gameplay experiences. Together, they combine adaptive learning with structured decision environments that support the development of project leaders capable of navigating complexity, uncertainty, and ethical challenges.

Unlike traditional project management games that focus primarily on scope, cost, schedule, and risk, the proposed canvas demonstrates how serious games can be systematically adapted to teach both quantitative decision models (ROA) and qualitative governance challenges (Moral AI) within a common project management framework.

The findings of this study are consistent with those reported by Rumeser & Emsley (2019), which indicate that the learning benefits of relatively simple games can be comparable to those of more complex designs. Although real options concepts are inherently complex when applied as financial models, players were able to understand the distinctions between different option types and their associated benefits through gameplay. This suggests that carefully designed game mechanics can effectively convey complex concepts without requiring overly complicated game structures.

Collectively, the findings demonstrate that the Project Management Serious Game Canvas can serve as a repeatable design framework for translating both quantitative project decision models and qualitative governance challenges into experiential learning environments.

4.1 Practical Applications

The proposed project management serious game canvas and the extension of The Project Win Game™ provide a structured approach for operationalizing both recommendations for authentic, group-based assessment design and the empirically identified benefits and challenges of game-based learning (GBL) in project management education. Prior research highlights the importance of realistic, challenging tasks, structured collaboration, and guided learning to develop employability skills (Tumpa et al. 2023), while also identifying challenges in GBL related to cognitive load, pedagogical alignment, technical reliability, and assessment (Jääskä & Aaltonen 2022).

The serious game canvas provides a structured mechanism for translating these requirements into practice. The Project Win Game™ extensions demonstrate how these principles can be applied through dynamic gameplay involving issues, opportunities, and stakeholder interactions.

The design leverages the strengths of GBL by promoting engagement, collaboration, and experiential learning while mitigating common challenges through progressive complexity, clear rules, structured facilitation, and guided debriefing (Jääskä & Aaltonen 2022).

From an instructional perspective, the serious game canvas provides a repeatable and scalable framework that integrates learning objectives, gameplay mechanics, and assessment considerations from the outset, reducing barriers related to time constraints, pedagogical uncertainty, and curriculum integration. Assessment is supported through observable behaviors, decision quality, and reflective insights rather than solely through game outcomes, addressing concerns regarding validity and fairness in GBL evaluation.

Operationally, the use of adaptable, low-technology or hybrid formats reduces reliance on complex infrastructure, improving reliability and accessibility. The structured design also supports effective session planning and time management, addressing concerns about unpredictability in gameplay duration.

Overall, the framework translates pedagogical recommendations and empirical insights into a coherent, practice-oriented solution that enhances experiential learning while addressing cognitive, pedagogical, and operational challenges.

4.2 Future Extension: Generative AI Assisted Game Configuration

Beyond the validated ROA and Moral AI extensions, the Project Management Serious Game Canvas could also be used as a framework for AI-assisted game configuration. Generative AI tools such as OpenAI ChatGPT and Anthropic Claude offer the potential to dynamically generate project-specific scenarios, events, and learning content in line with emerging AI-GBL principles.

By providing a description of a project scenario, AI can generate project-specific events, learning content, and facilitation support, enabling rapid configuration without redesigning the underlying game. The canvas structures the input provided to these tools, ensuring that generated content remains aligned with learning objectives, project constraints, stakeholder impacts, and decision-making requirements.

To support this flexibility, The Project Win Game™ incorporates blank cards that can be populated with AI-generated content or printed on standard card stock. Consequently, generative AI has the potential to transform the game from a fixed simulation into a dynamically configurable learning environment capable of supporting more adaptive and context-sensitive learning experiences.

4.3 Limitations and Future Research

This study has several limitations that should be considered when interpreting the findings. First, the integration of Real Options Analysis (ROA) concepts with AI ethics and governance introduces a broad range of learning objectives that may increase cognitive load for some participants, despite simplification mechanisms such as color-coded dice and structured decision frameworks. Second, maintaining an appropriate balance between economic, technical, and ethical game parameters proved challenging, and further refinement may be required to ensure consistent decision tension across different player groups. Third, while the canvas was designed to be scalable and adaptable, its effective implementation currently relies on facilitator guidance, which may limit accessibility and consistency of delivery in self-directed learning environments. Finally, validation activities were conducted primarily with voluntary participants, which may introduce selection bias and limit the generalizability of the findings to broader project management populations.

Future research should focus on extending the project management serious game canvas through the integration of an intelligent facilitation layer to enable more dynamic and adaptive gameplay. Incorporating AI capabilities, such as real-time scenario generation, personalized feedback, adaptive difficulty, and automated facilitation, could reduce cognitive load while supporting more consistent learning experiences. Such integration would allow issue and opportunity events to be dynamically generated based on player decisions, support targeted reflection aligned with ethical and leadership development, and continuously calibrate challenge levels to sustain engagement. Further studies should also evaluate the canvas with more diverse participant groups and compare facilitator-led and AI-assisted implementations to assess learning effectiveness, accessibility, and scalability. This direction aligns with emerging AI-GBL paradigms and positions the canvas as a foundation for intelligent, human-centered learning environments that combine structure, adaptability, and reflective facilitation.

Ethical Declaration: This study did not involve human subjects research requiring formal ethical approval. The development and validation of the serious game were conducted as part of educational design and evaluation activities. Where playtesting involved participants, participation was voluntary and based on informed consent. No personally identifiable information was collected, and all data was analyzed in aggregated and anonymized form. The authors declare no conflicts of interest.

Artificial Intelligence Declaration; Artificial intelligence (AI)-based tools were used to support the editing and review of this manuscript, primarily to improve clarity, structure, and language. All content, analysis, and conclusions were developed by the authors, who take full responsibility for the integrity and accuracy of the work.

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