An Enterprise Model for Implementing a Game-Based Approach in Employee Training: Mergers and Acquisitions Case

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Abstract

Post-merger integration, particularly in information system integration, requires specialized expertise that is often lacking among practitioners. Existing decision-support methods, such as AMILI (identification of system groups to be integrated) and AMILP (evaluation and recommendation of integration options), address specific integration tasks but face low adoptions due to steep learning curves and limited motivation. This paper proposes an enterprise modeling approach to implement game-based learning to enhance motivation and support rapid skill acquisition in post-merger contexts. Building on earlier work that defined requirements for such a framework, this study extends the scope to include the broader enterprise context and transformation processes. The proposed approach integrated instructional and game design principles with enterprise modeling and requirements engineering, resulting in a structured process and data model. These models guide practitioners through analysis, design, development, and evaluation of game-based employee learning in the context of mergers and acquisitions.

Keywords

game-based learning, enterprise modeling, post-merger integration, information systems, instructional design

1. Introduction

Post-merger integration (PMI), particularly in the context of information system (IS) integration, requires specialized expertise that influences the overall success of the integration process. However, professionals involved in PMI often lack such expertise, making it essential to establish effective mechanisms for quickly acquiring and applying the require knowledge and skills [1]. While methods such as AMILI and AMILP provide structured decision support for PMI IS integration tasks – AMILI assisting in the identification of system groups to be integrated, and AMILP supporting the evaluation and recommendation of integration options ranging from preservation to full refinement of systems – their practical adoption has proven challenging. Surveys of practitioners involved in PMI showed that both methods require a steep learning curve which, when combined with low motivation and time constraints, often results in limited use or complete abandonment of these methods [2]. The authors of this paper hypothesize that game-based learning can address the identified challenges by providing additional motivation for learners. To balance educational content with engaging game elements, the authors propose synthesizing existing educational design and game design frameworks into a closely integrated approach. This approach is conceptualized as a structured transformation process, taking serious subject matter as input and producing learning experiences that both achieve defined learning objectives and maintain a high level of learner engagement throughout the process [3]. The authors apply the design science methodology, beginning with problem and requirements definition, followed by solution design, implementation

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and validation. In this paper, the authors expand the scope of their proposed approach by considering the broader enterprise context in which the approach is to be applied, as well as the enterprise transformation processes to which it should contribute. Implementing such a framework in real-world enterprise contexts requires a structured process model that guides practitioners through design, implementation and application of the learning experience. This research is grounded in enterprise architecture and enterprise modeling solutions that have been developed for purposes similar to those of the proposed approach.

Accordingly, the paper presents an extended approach framed as an enterprise model for implementing game-based learning in employee training, particularly in the context of mergers and acquisitions. Building on earlier work, where requirements were defined for both the process and the resulting learning experience [3], this research advances the contribution by proposing a process model and a data model of the transformation process as well as of the resulting learning experience. This paper is structured as follows. After the introduction, the second section reviews relevant learning, instructional, game design, and enterprise modeling theories that form the foundation for the implementation model. The third section outlines the methodology applied to construct the enterprise model. The fourth section presents the proposed model and its implementation logic, linking specific requirements to corresponding model components. In the fifth section the model is validated through a simulation exercise. Finally, the sixth section provides conclusions and identifies directions for future research.

2. Literature review

Existing research has produced a variety of frameworks and models for serious game design. Earlier educational game design frameworks [4] combine pedagogy and game design but lack explicit procedural detail for aligning instructional goals with concrete game artefacts. The SCHEMA process [5], which was proposed as a more structured model for serious game creation and evaluation, remains high level, focusing on phases and principles rather than specifying concrete artefacts or detailed guidance for practitioners. Other frameworks emphasize primarily the development of the game itself rather than the learning experience [6], [7]. What is still lacking is a structured and detailed process that specifies concrete artefacts and their relationships. There is also a need for a stronger focus on the design of the learning experience, rather than primarily on game production. Finally, an enterprise implementation perspective should be incorporated, aligning organizational and instructional requirements in the broader context.

Enterprise modeling provides tools and structures for formalizing organizational knowledge, processes, and system component. In the context of this research, enterprise modeling serves as a mechanism that systematically integrates learning design with organizational objectives and contextual requirements. It also facilitates traceability from abstract requirements to implementation components, making it suitable foundation for operationalizing training framework in complex domains such as PMI. In developing an enterprise model to support a game-based learning framework for post-merger information system integration, several existing enterprise architecture and enterprise modeling methodologies were reviewed. TOGAF (The Open Group Architecture Framework) [8] proposed structured architecture development method (ADM) was applied for the model development, as well as model structuring. A recent adaptation of TOGAF for e-learning environments demonstrated its relevance to digital education architecture and showcased how ADM stages can be used in structuring learning system transformations within enterprise environments [9]. In this research ADM process stages and ADDIE [10] process phases were mapped together to define framework phases. The Zachman Framework [11] is focused on ontology and classification of enterprise architecture elements, providing different views of it. Zachman Framework can be adjusted specifically for learning domain, mapping pedagogical intentions to questions that an enterprise is seeking to answer [12]. The same principle was used in this research, using interrogatives to define the developed artifacts and supporting the multidimensional representation of learning design process. While TOGAF and Zachman provide high-level structure and classification mechanisms, the detailed modeling layer of the proposed solution is grounded in three enterprise modeling methods: ArchiMate modeling language [13], MEMO (Multi-Perspective Enterprise Modeling) method [14] and the SOM (Semantic Object Model) method [15]. These methods support traceability between business goals, stakeholder needs, operational alignment, technological infrastructure and the broader context. The ArchiMate modeling language is a formal enterprise architecture modeling standard developed by The Open Group and closely aligned with TOGAF. ArchiMate provides a visual notation and conceptual language to describe the relationships between business processes, applications, and technology infrastructure. ArchiMate served as an inspiration for the visual structuring and viewpoint management of the proposed model. ArchiMate uses behavioral, structural, and motivational perspectives, which was used in the model for separation of process and class viewpoints. Additionally, ArchiMate uses color-coded layers and visual distinction between element types, which was used in the proposed model to distinguish different sources which formed the foundation of the model. MEMO supports the decomposition of enterprise goals into operational processes and system elements, which can be related to aligning high-level learning objectives with instructional tasks and technological components. Additionally, MEMO meta-models were used as validation checklists to ensure that the proposed model is conceptually complete and internally coherent. SOM complements MEMO by focusing on modeling of business objects and relationships in the solution context, which inspired how training PMI specific context elements such as content repositories were defined. MEMO and SOM are generic enterprise modeling approaches and do not address learning processes directly. This research builds upon their general principles to introduce a new enterprise model that represents business process aligned with enterprise goals and aware of the context. The resulting solution specifically supports learning design in the PMI context and enhances the alignment between training solutions and enterprise goals.

The enterprise architecture served as the foundation for structuring the overall model, providing high-level alignment between organizational goals, processes and context. To define specific components of the model in detail, requirements engineering practices were applied. The main approach is based on the International Requirements Engineering Board (IREB) framework [16], with additional guidance from the ISO/IEC/IEEE 29148:2018 standard [17].

The instructional design phases of the proposed model are based on the ADDIE (Analysis-Design-Development-Implementation-Evaluation) framework – linear framework for the sequential process from needs analysis to post-implementation evaluation. The SAM (Successive Approximation Model) model is an iterative framework proposing incremental prototyping based on stakeholder feedback [18]. It extends the model by introducing prototyping, iterative cycles, and feedback from stakeholders. The Ten Steps for Complex Learning model is a framework focused on whole-task learning for complex skill development [19]. Backward Design as a goal focused framework starting with identification of desired learning outcomes and only then designing corresponding instructional components [20], ensures that learning outcomes are defined early and guide learning tasks and content development.

The game design section of the model is based on MDA model (Mechanics, Dynamics, Aesthetics) [21], as one of the foundational frameworks in the game design. It decomposes the game experience into three interconnected layers: mechanics (the formal structures and rules of the game), dynamics (run-time behavior that emerges when players interact with game mechanics), and aesthetics (emotional responses in players evoked by dynamics). The model then is extended by DPE model (Design, Play, Experience) [22], which is grounded in the MDA, perceiving design through mechanics, play as dynamics and experience as aesthetics. But this framework for each of layers provides the design elements to consider for serious games – learning, storytelling, gameplay and technology, which ensures that learning objectives align with player experience. DPE as well expands the process by adding definition of the narrative, user interface, and required technology. DDE model (Design, Development, Evaluation) [23] proposes the iterative design process where each iteration sequentially goes through design, development and evaluation. The LM-GM framework [24] is used to systematically map learning mechanics to game mechanics, ensuring educational and engagement elements reinforce each other. The model is adjusted to the post-merger integration context through integration of AMILI and AMILP methods, as well as post-merger integration specific use cases and their characteristics. These supports role-specific responsibilities and organizational context.

3. Methodology

The research follows a design science methodology and is based on the prior requirements definition phase [3]. The objective of the current research phase is to construct an enterprise implementation model that translates abstract requirements into an executable game-based learning design framework. The current research phase was structured as a sequence of interconnected process activities to progressively refine requirements, construct models and validate solutions (see Fig. 1): (1) requirements definition – solutions to instructional design requirements were first defined, followed by solutions to game-based design requirements, (2) process modeling – a main process flow was developed using the ADDIE framework and mapped to the TOGAF ADM, (3) process detailing – each phase of the flow was detailed into specific actions, (4) integration of additional frameworks – additional actions were incorporated into the process model based on the defined instructional and game-based solutions, (5) data modeling – a data model was constructed to represent data objects manipulated during process execution, (6) model analysis and refinement – the model was analyzed through Zachman interrogative to check completeness and through MEMO meta-model layers to ensure consistency across abstraction levels, (7) integration into post-merger context – solutions for information system integration in the context of post-merger integration requirements were defined, (8) final model consolidation – additional elements based on the defined solutions were incorporated into the data model.

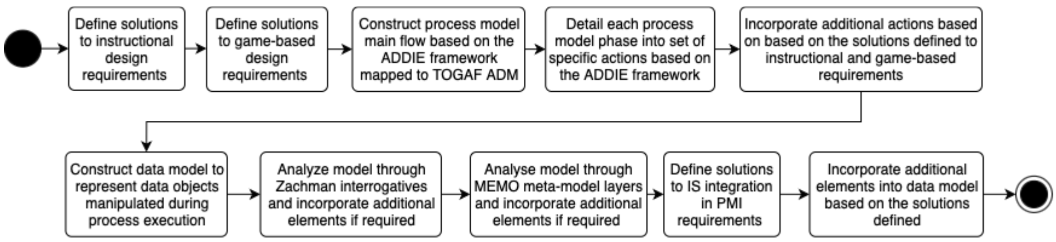

Figure 1. Research Process Steps

4. Enterprise model proposal

This research proposes that training is not an isolated function but part of an enterprise-wide adaptation following a merger. The "enterprise" being modeled consists of the information system integration training lifecycle, embedded within a broader merger-related transformation initiative. The enterprise model reflects the ArchiMate layered viewpoint framework and is represented through three interlinked artifacts: (1) Structured tables (see Table 1 – Table 3) – used instead of a traditional traceability matrix, following a "requirement vs. solution" format, including both the "what" (requirement) and "how" (solution) perspectives, (2) A process model diagram as UML activity diagram (see Fig. 2 - Fig. 7) – defining the activities required to design a game-based learning experience tailored to information system integration in the post-merger context, (3) A data model diagram as UML class diagram (see Fig. 8) – defining the data objects that are acquired, generated, or processed during the learning design process, along with their interdependencies. The set of requirements identified in the previous research is operationalized in both the process and data models. Functional requirements are mapped to model activities (actions) and related data structures (classes).

Table 1
Solution Requirements for Instructional Design

Nr	Functional Requirement ("what")	Solution ("how")
1	ADDIE - The framework should support a structured, sequential process that guides designers from analysis toevaluation phase	Define the framework as a process model for learning design Establish the "Analyze" phase – specify learners, performance gap, and instructional goals, as well as identify required resources and create learning plan Establish the "Design" phase – create task inventory, define performance objectives, and outline testing strategies Establish the "Develop" phase – create content and media for the learning experience, develop gameplay for the game-based learning part, as well as create guidance for the learner and for the teacher Establish the "Implement" phase – prepare the learning environment, as well as prepare the teacher and learners Establish the "Evaluate" phase – define evaluation criteria, gather evaluation data, and perform evaluation
2	SAM - The framework should allow for iterative prototyping and continuous feedback loops with stakeholders	Incorporate into the "Analyze" phase a stakeholder specification activity For each of the "Design" and "Develop" phases, incorporate a pilot test execution activity in the end, and an additional phase iteration in case improvements are required
3	Ten Steps - The framework should enable whole-task learning strategies to build complex skills	For the "Design" phase – for the task repository, define whole tasks to learn and part-task practice as required For the "Develop" phase – for the content creation, consider the supportive and procedural content required
4	Backward Design - The framework should require definition of learning outcomes prior to instructional content development	Early in the "Analyze" phase, incorporate activities for the specification of desired results and acceptable evidence, as well as add an learning for outlining the experience after instructional goals are specified

Table 2

Solution Requirements for Game-Based Design

Nr	Functional Requirement ("what")	Solution ("how")
1	MDA - The framework should require definition of game mechanics, prediction of learning dynamics, and intentional design for aesthetics	Extend the process model with a game design section In the "Design" phase define game mechanics, dynamics, aesthetics
2	DPE - The framework should support design across four layers: learning goals, narrative, gameplay mechanics, and enabling technology	In the "Design" phase, before the definition of mechanics and the definition of learning goals, and after the mechanics definition, add the definition of storytelling In the "Develop" phase add activities for the definition of the user interface and technology
3	DDE – The framework should support iterative refinement based on evaluation of learning effectiveness and learner engagement	In the "Design" phase, between the definition of learning goals and mechanics, add an activity for defining micro-learning In the "Develop" phase, after the definition of the user interface, add an activity for integration of behavioral nudges
4	LM-GM - The framework should ensure that learning mechanics are effectively mapped to corresponding game mechanics	In the "Design" phase, after the definition of mechanics, add an activity for mapping learning and gamification In the "Develop" phase, after the integration of behavioral nudges, add an activity for integration of additional gamification

Table 3

Solution Requirements for IS Integration in PMI

Nr	Functional Requirement ("what")	Solution ("how")

1	AMILI/AMILP theory and practice - The framework should support accurate transformation of AMILI and AMILP methods descriptions into interactive modules for learner training	Provide the "AMILI and AMILP theory repository" for learning instructional goals and learning experience definition, as well as for game learning goals, micro-learning, mechanics, and gamification definition Provide the "AMILI and AMILP content repository" for learning content and media creation, as well as for game user interface and behavioral nudges definition, and additional gamification integration
2	PMI Stakeholder management – The framework should allow adaptation of training on role-specific responsibilities and knowledge levels of future learners	Provide the "PMI context repository" for learner, stakeholder, and desired results definition
3	Specific PMI challenge management – The framework should support secure transformation of real-world cases, managing confidentiality and adjusting complexity	Provide the "PMI case study repository" for learning task definition and game storytelling definition

The structure of the process model is grounded in the ADDIE instructional design framework and mapped to the corresponding phases of the TOGAF ADM, as follows (see Fig. 1): (1) Analyze – aligns with Preliminary and Architecture Vision phases, (2) Design – corresponds to Business and Information Systems Architecture, (3) Develop – reflects the Technology Architecture definition phase, (4) Implement – aligns with Opportunities & Solutions and Migration Planning, (5) Evaluate – corresponds to Implementation Governance and Change Management. Design and develop phases are differentiated into two perspectives – instructional design and game design – to ensure a balance between pedagogical effectiveness and player engagement.

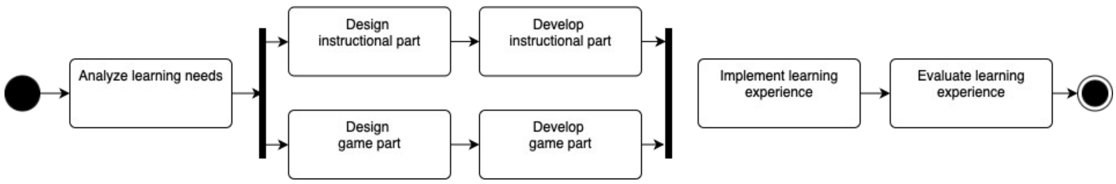

Figure 1. Process Model Diagram – Main Process Flow

In the subsequent step, each phase was operationalized as a detailed set of actions. The default process flow follows the ADDIE framework, however, based on the formulated requirements in "Solution Requirements for Instructional Design" and "Solution Requirements for Game-Based Design", supplementary activities were incorporated from other instructional and game design models. These integrations are explicitly highlighted in the diagrams with corresponding annotations. For instance, to address the functional requirement that "The framework should allow for iterative prototyping and continuous feedback loops with stakeholders", the following activities were added: (1) Analyze phase – stakeholder specification, (2) Design and Develop phases – pilot testing followed by an additional iteration, if necessary.

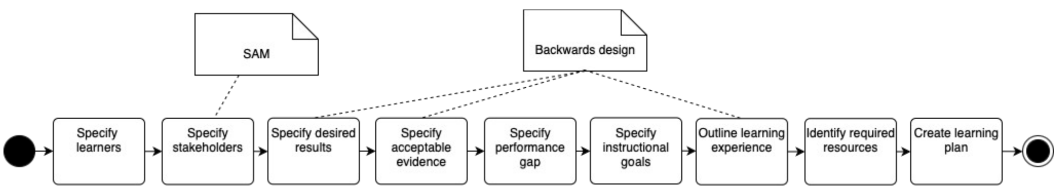

Figure 1. Process Model Diagram – "Analyze" Phase

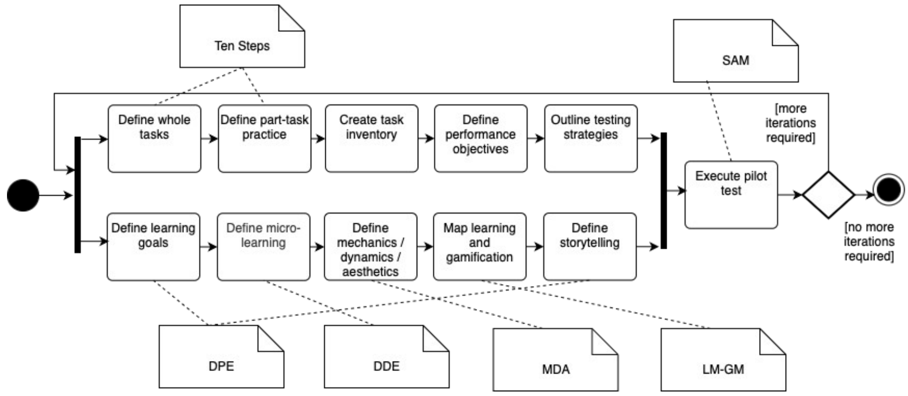

Figure 1. Process Model Diagram – “Design” Phase

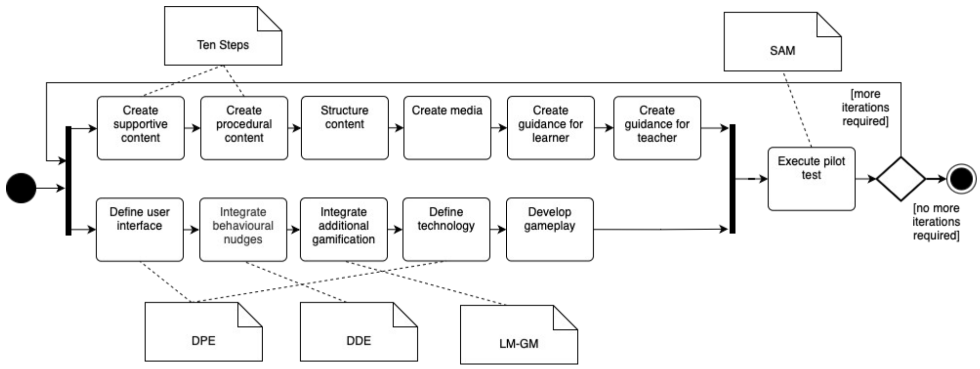

Figure 1. Process Model Diagram – “Develop” Phase

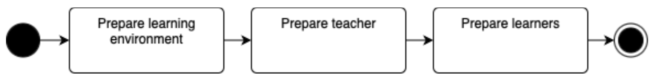

Figure 1. Process Model Diagram – “Implementation” Phase

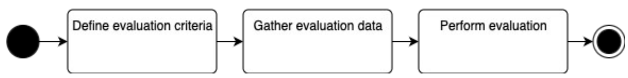

Figure 1. Process Model Diagram – “Evaluate” Phase

The data model was constructed to represent the data objects that are created, utilized or transformed throughout the design process. To ensure completeness from both instructional and game design perspectives, its definition was guide by the Zachman framework interrogatives, which provide a comprehensive set of architectural viewpoints: (1) why – desired results, linked to acceptance evidence, performance gap, and instructional goals, (2) what – the learning experience, represented through a task inventory that encompasses both whole tasks and part-task practices, (3) how – the required resources, mechanics, dynamics and aesthetics, related to micro-learning activities, storytelling elements, and gameplay components, instantiated through user interface elements, linked to gamification features and behavioral nudges, including procedural and supportive content and media, pilot testing with testing strategy, performance objective and evaluation criteria, linked to evaluation data forming the final evaluation, (4) who – learners and stakeholders, but teacher element was added, (5) where – the learning environment with guidance for learner and teacher, but the learning environment was decomposed into virtual and physical environments, (6) when – according to the learning plan, but the learning schedule element was added.

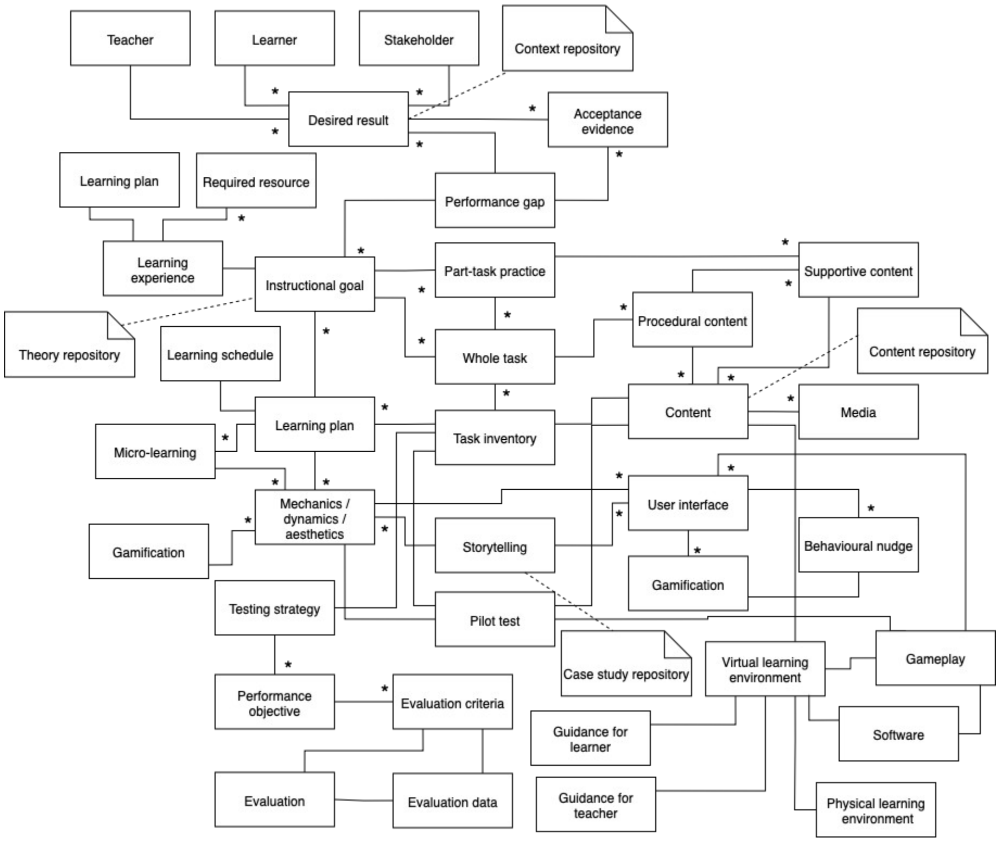

Figure 1. Class Model Diagram

In addition, the class model was aligned with the MEMO meta-model layers to guarantee conceptual integrity across abstraction levels: (1) strategy layer – include stakeholders, desired results, and instructional goals, (2) organization layer – captures the task inventory, learning plan and schedule, pilot test, and evaluation, (3) information system layer – represents content, media, gameplay, related user interface, virtual learning environment. Software element was added. Finally, the functional requirements defined under "Solution Requirements for IS integration in PMI" were instantiated as content repositories associated with specific data classes. In practice, these repositories serve as structured data sources that either provide predefined content reusable across multiple design cases, or act as classification mechanisms, enabling the selection of consistent values and supporting data quality: (1) context repository – contains options for defining learners, stakeholders and associated desired results, (2) theory repository – contains instructional goals and the corresponding task inventory, (3) content repository – contains procedural and supportive learning content, (4) case study repository – contains storytelling components derived from specific PMI scenarios.

5. Model validation

The proposed enterprise model was validated through a simulation exercise. The simulation was applied to the case of designing a game-based learning experience for teaching the theory of the AMILI method at first two levels of knowledge acquisition – "Remember" and "Understand" according to Bloom's taxonomy. At these knowledge levels, a special game design approach was selected, as learners lack the skills to apply concepts practically. The game is designed as a linear interactive storytelling experience. Players face clear, generic challenges that are related to, but not directly the same as, the practical tasks of the method. Each successfully completed challenge unlocks the next part of the story, which describes a case example of a university merger. In this way, engagement and learning are balances even for complete novice learners who cannon yet apply knowledge in the subject matter. The validation results are presented as artefacts that would be created during the process execution (see Table 4). These artefacts are aligned with the phases of the proposed model.

Table 4

Model Validation through Artefact Creation

Nr	Artefact Type	Created Artefact
1	Learner	IT professionals without prior experience in PMI IS integration
2	Teacher	Not applicable as it is self-teaching activity
3	Stakeholder	Head of IT responsible for PMI IS integration
4	Desired result	Identification of IS to be integrated Repository: list of predefined desired results related to learning AMILI and AMILP methods on different knowledge levels from remember till create
5	Acceptable evidence	IS supporting the same function in merging companies are identified and grouped together
6	Performance gap	No structured process how to approach identification of IS to be integrated
7	Instructional goal	Remember and understand AMILI terms (business unit, business function, information system, core information system) Remember and understand AMILI process phases Remember and understand stakeholders involved in the AMILI process (as input providers) Repository: list of predefined instructional goals linked to specific desired result
8	Learning experience	Gameplay accompanied by intro slides. Gameplay can be played several times in a row for repetition
9	Required resource	Gameplay developed and available online. Registration through corporate email.
10	Learning plan	Self-organised during few upcoming days before project official start
11	Learning schedule	Self-paced during the defined period. One full gameplay cycle not longer than 15 minutes
12	Whole task	Understand and remember AMILI method theory
13	Part-task practice	Learn AMILI terms Learn AMILI phases Learn AMILI stakeholders
14	Task inventory	Contains all part-task practices
15	Performance objective	Identify and link term with definition Identify and sequence AMILI phases
16	Testing strategy	Test-based
17	Micro-learning	Recall terms Recall phases
18	MDA design	Pixel art, player performs generic actions such as tapping stakeholders (Round 1), collecting useful sources and avoiding useless ones (Round 2), and collecting meetings with insights (Rounds 3). Each round limited to 30 seconds. After each, the next part of the theory through story follows
19	Learning-game mapping	Several game rounds performed to achieve required goal and unlock next part of the story
20	Storytelling	Merger of two universities, scope limited to one overlapping business function Repository: list of descriptions for different merger and acquisition case studies to be used as the context for the storyline

21	Pilot test	Prototypes in Figma reviewed with learner candidates
22	Content	Contains all supportive and procedural content Repository: predefined supportive and procedural content linked from one side to specific instructional goal, from the other side to specific case study
23	Supportive content	Not applicable, as in-house self-organised individual training does not require one
24	Procedural content	Theory on M&A and PMI Theory on AMILI AMILI terms and phases
25	Media	Theory presented as intro screens of the game. After theory, game starts automatically
26	Learner guidance	Instructions for learners on how learning is expected to happen
27	Teacher guidance	Not applicable as self-learning
28	User interface	Mobile portrait only. Specific screens to constructed later
29	Behavioural nudge	Motivational intro slides about M&A failure rates and importance of IS integration
30	Additional gamification	Players's tournament with leaderboard shown at the end of the game
31	Technology	GDevelop platform
32	Gameplay	Player progresses through story describing AMILI terms and phases via tasks not directly related to AMILI practice. Three rounds: (1) similar business functions identified, (2) similar information systems identified and grouped, (3) similar core information systems identified and grouped
33	Pilot playtest	Playtesting with selected IT specialists
34	Virtual learning environment	Intro screens with theory through story and game itself developed and available online
35	Physical learning environment	Not applicable as learning will be self-paced through online game
36	Prepared teacher	Not applicable as self-learning
37	Prepared learner	Prepared based on created learner instructions
38	Evaluation criteria	10-uestion MS Forms survey on PMI IS integration and AMILI method
39	Evaluation data	Number of correct survey answers
49	Evaluation	Based on survey data. Expected result = 90% accuracy

Based on the validation results, the model proved its applicability for designing game-based learning, but several improvement options were identified: (1) introduce optional artefacts to better reflect varying learning contexts (e.g. teacher related artefacts are not applicable to self-organised learning), (2) Specify which artefacts are created using other artefacts as inputs (e.g. instructional goals are derived from the performance gap), (3) specify which artefacts represent more detailed levels of other artefacts (e.g. part-task practices are decompositions of whole-task learning).

6. Conclusions and future work

This paper translates the conceptual requirements for a game-based learning framework in post-merger information system integration into validated enterprise implementation model. The model bridges enterprise architecture, instructional theory, game design frameworks, and PMI-specific needs into a structured design process model and data model, supporting repeatable and adaptable learning solution design. The validation through simulation demonstrated the model's applicability for designing recall-level learning experiences, while also revealing areas for improvement: introducing optional artefacts, making artefact dependencies explicit, and representing artefact decomposition. While the model is based on well-established frameworks, its novelty lies in how it orchestrates them into a layered, constraint-aware design model specifically tailored for the post-merger integration context. The main innovation of this model is how it combines different frameworks into one clear structure that works for post-merger training. First, it separates the design into layers – learning design, game design, and real-world context. Second, it uses enterprise modeling to link training tasks to business goals, as well as to represent the model visually. Third, it includes reusable content and tools, so the training can be easily adapted for different use case scenarios. The main practical value of the model is that it provides a clear and detailed process for practitioners on how to design training for post-merger IS integration. This goes beyond existing generic game-based learning design approaches, which are mostly conceptual, by giving step-by-step guidance and concrete artefacts to work with. Future research will focus on developing and testing this model for real learning experiences, covering also second part of the requirements initially stated for the learning experience itself. Based on results this enterprise model can be extended and adjusted to assure required requirements for the learning experience. It is also planned to implement toolkits for automated content generation and repository management to streamline learning experience design. In addition, future work will extend this research in two more directions: (1) apply the model in similar enterprise contexts such as digital transformation and change management to test generalizability, (2) define a formal ontology that represents the learning-game-enterprise integration logic. This ontology could support future meta-modeling and serve a research direction to interconnect different enterprise learning models.

Declaration on Generative AI

The authors have not employed any Generative AI tools.

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1.1.1.9 Research application No 1.1.1.9/LZP/1/24/067 of the Activity "Post-doctoral Research" "Development of a Gamified Tool to Enhance IS Integration Decision-Making in M&A: A Methodology-Driven Training Approach"