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Article

Integrating EDIPT Instructional Design and the UTAUT2 Model in Virtual Simulation-Based Storyboard Learning: A Systematic Literature Review and Conceptual Framework for Higher Education

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Abstract: The significance of virtual simulation technologies as a way to enhance storyboard design is under-theorized in the higher education literature, despite the fact that storyboard design is essential to the animation and multimedia curriculum. This article presents a Systematic Literature Review (SLR) conducted using the PRISMA reporting protocol and structured in accordance with the PICOC framework, with the goal of synthesizing forty-three empirical studies published between 2018 and 2025 on virtual simulation-based learning, creativity development, narrative quality, and technology acceptance. Based on thematic analysis, four interrelated domains were identified: (i) virtual simulation and instructional design integration, (ii) creativity development in digital and animation-based learning, (iii) narrative quality in visual storytelling, and (iv) technology acceptance as measured by the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). The review then develops an Integrated EDIPT-UTAUT2 Conceptual Framework, which uses the Empathize-Define-Ideate-Prototype-Test (EDIPT) design-thinking cycle to serve as the instructional architecture in a virtual simulation-based storyboard system, and UTAUT2, which includes creativity development and narrative quality, to explain students' behavioural intention and use behaviour. A synthesis method is utilized to create the nine hypotheses that will guide the following empirical validation using partial least squares structural equation modeling (PLS-SEM). The review proposes a theoretically triangulated, empirically traceable model that bridges the gap between instructional design science, technology acceptance theory, and creativity scholarship, while also emphasizing the importance of primary research on the issues identified, such as the lack of research on the use of storyboard-specific simulation environments in Malaysian higher education systems.
Keywords: Virtual Simulation, Storyboard Learning, EDIPT, UTAUT2, Creativity Development, Narrative Quality, Systematic Literature Review, Higher Education

1. Introduction

1.1 Background of the Study

The increased use of spatial reasoning and visual literacy in higher education has resulted in the incorporation of virtual simulation, Virtual Reality (VR), Augmented Reality (AR), and Three-Dimensional (3D) interactive technologies into curricula, particularly in medicine, engineering, and the creative arts. The principles underlying the use of simulation environments in education are well documented in the educational technology literature. Simulation environments allow students to rehearse complex processes, manipulate abstract concepts in physical form, and receive iterative feedback without the constraints of physical practice. However, the usage of these technologies has been relatively slow to advance in creative areas such as animation and multimedia design. The existing literature on immersive learning frequently focuses on general competencies in experiential or spatial learning. The structured and sequential nature of the narrative translation from idea to a coherent sequence of visual frames or storyboarding is only mentioned incidentally, particularly in relation to visual storytelling demands (Jensen & Konradsen, 2018; Parong & Mayer, 2018).

This gap is significant because it connects two areas of competency that are traditionally taught separately: creative cognition (concept generation, divergent thinking, visual composition) and technical proficiency (drawing, use of digital tools, iterative revision). Many university programs use a conventional storyboard pedagogy based on hand-drawn linear production processes, in which students make compositional decisions early in the process and only make minor changes later in the process, which takes substantial time and effort. This restricts experimentation and, as a result, may discourage the creative experimentation that storyboard education is designed to cultivate. Virtual simulation environments, on the other hand, offer the technological capabilities for a more iterative and exploratory approach to storyboard development, which might, in theory, facilitate a more explorative and iterative development process (Panke, 2019).

1.2 Problem Statement and Research Gap

The following three challenges drive this review. First, while virtual simulation and immersive technologies have attracted a lot of attention as a general learning medium, only a few empirical studies have looked at their direct influence on creative and narrative output in the context of storyboarding in higher education. Also, even when instructional design models for simulation-based learning exist, they are not always accompanied by a validated behavioral model that can explain student choice to use, maintain, or abandon such systems, which is required if any proposed system is to be implemented as an intervention with proven pedagogical impact beyond the technical prototype stage. Furthermore, most technology acceptance models, such as the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), are designed to focus on consumer and organizational technology adoption and do not naturally include cognitive-creative outcome variables (creativity development and narrative quality), which are central to animation and multimedia education. As a result, there is no comprehensive empirically traceable paradigm that can take into account instructional design, behavioral adoption, and discipline results in the context of storyboard learning via virtual simulation (Xue et al., 2024).

1.3 Objectives of the Review

There are four objectives that guide this review (Robin, 2008).

1. To systematically review and synthesize empirical literature on virtual simulation-based learning, creativity development, narrative quality, and technology acceptance in higher education published between 2018 and 2025.
2. To explore the EDIPT model as a framework for instructional design of virtual simulation systems based on storyboarding.
3. To explore the extensibility of UTAUT2 model when integrated with creativity- and narrative-oriented constructs.
4. To develop an integrated conceptual framework and a set of testable hypotheses for guiding future structural equation modeling research on virtual simulation-based storyboard learning. (Calvert & Hume, 2022).

1.4 Significance and Contribution

Three additions to the literature are made by the review. From a conceptual standpoint, it is one of the earliest attempts to logically integrate an extended technology acceptance model with a design-thinking teaching approach in the specific context of animation storyboard pedagogy. In terms of methodology, it demonstrates every aspect of a fully documented and PRISMA-compliant selection process, giving future researchers in related fields like immersive learning, digital media education, and the study of creative information systems a foundation of evidence. In practical terms, the resulting framework gives policymakers, curriculum designers, and instructional technologists in Malaysian and comparable higher education systems a structured justification for funding virtual simulation infrastructure that is unmistakably linked to quantifiable creative and narrative learning outcomes rather than just technology use.

2. Methodology

2.1 Systematic Literature Review Approach

The SLR was employed to assure a methodical approach to identifying, evaluating, and synthesizing existing research, therefore reducing the selection bias that is typical in traditional narrative reviews (Tranfield et al., 2003). The SLR method is widely used in educational technology research because it provides a repeatable history of how the conclusions were reached, which is required when the synthesis, as conducted here, is used to justify the design of an intended instructional system and its associated behavioral model.

2.2 PICOC Framework

The review's scope was constrained by using the PICOC framework, which is suggested for establishing the boundaries of a systematic review and improving the precision of future database searches. Table 1 summarizes the operationalization of each element.

Table 1: PICOC framework applied to the review

Element	Operational Definition
Population (P)	Higher education students enrolled in animation, multimedia, and creative digital programmes.
Intervention (I)	Virtual simulation-based storyboard learning systems developed using the EDIPT instructional model
Comparison (C)	Traditional, non-immersive storyboard instruction (hand-drawn or non-simulation methods)
Outcome (O)	Creativity development, narrative quality, behavioural intention, and use behaviour
Context (C)	Higher education institutions, with particular attention to Malaysian and comparable technology-enhanced learning environments

The review also narrows down the possible concepts of the field, constraining eligibility in the following five dimensions that minimize the risk of conceptual dilution that can be found in interdisciplinary fields where different disciplines interpret the same term in different ways (Kitchenham & Charters, 2007; Page et al., 2021).

2.3 Literature Search Strategy

The databases Scopus, Web of Science, IEEE Xplore, ACM Digital Library, ScienceDirect, SpringerLink, Google Scholar, and the Malaysian citation index MyCite were all searched. The databases were selected due to their extensive coverage of high-impact peer-reviewed research on human-computer interaction, educational technology, and creative multimedia education. Boolean search strings like "virtual simulation" AND "higher education," "storyboard learning" AND "animation education," "creativity" AND "digital learning," "narrative quality" AND "storytelling," "UTAUT2" AND "education technology," and "animation education" AND "Malaysia" were created using core constructs. To ensure that the quality of the evidence was based on current technological capability, the search was restricted to peer-reviewed journal articles and indexed conference proceedings published within the last ten years. Filters were used to refine the search by year of publication, peer-review status, subject relevance, and higher education focus (Luo et al., 2021).

2.4 Eligibility Criteria

Inclusion criteria

The studies were included if they (a) were from a higher education context; (b) investigated virtual simulation, VR, AR, or immersive learning technologies of any kind; (c) focused on animation, storyboarding, visual storytelling, or multimedia design education; (d) reported creativity development, narrative quality, or related cognitive/performance outcomes; (e) used UTAUT2 or a similar behavioral adoption model; and (f) were peer-reviewed journal articles or indexed (Radianti et al., 2020).

Exclusion criteria

Studies were excluded if they (a) were not conducted in higher education; (b) were gray literature (blogs, opinion pieces, unreviewed commercial reports); (c) were not about digital learning, immersive technology, and/or creative education; (d) were duplicate publications or reported insufficient methodological or statistical detail; or (e) were not available in English (Di Natale et al., 2020).

2.5 Study Selection Process (PRISMA)

The research selection method was transparent and auditable, following the four steps of the PRISMA protocol: identification, screening, eligibility, and inclusion (Page et al., 2021; Moher et al., 2009). During the Identification process, an initial batch of 12,280 records were extracted from the designated databases. After deleting 2,300 duplicate entries, 10,500 unique records progressed to title-and-abstract screening, with 9,800 removed for not being related to the review's PICOC. The remaining 700 records were assessed for full-text eligibility using the inclusion and exclusion criteria outlined above, and 670 were found to be ineligible, primarily due to a lack of focus on educational applications, an absence of empirical data, and a technical orientation. In this method, 43 papers were selected for theme synthesis.

2.6 Data Extraction and Thematic Analysis Procedure

Braun and Clarke's (2006) thematic analysis approach was used in the analysis of the 43 studies, consisting of four stages: (1) repeated reading of each study to ensure familiarity with the study objectives, methods, and findings; (2) inductive coding of the salient concepts in the studies such as immersive learning, iterative design, divergent thinking, narrative coherence, and behavioral intention; (3) clustering of the coded concepts by comparison across the studies.

3. Results: Thematic Synthesis of the Literature

3.1 Overview of Included Studies

The 43 research articles chosen for synthesis span the years 2018-2025, demonstrating the accelerated development of immersive educational technology and the rapid digitalization of higher education following the COVID-19 pandemic. This research was classified into four theme groupings, which are summarized below and in Table 2.

3.2 Theme 1: Virtual Simulation and Instructional Design Integration (15 studies)

The most significant compilation of research looks at the application of immersive technology in structured instructional design approaches. Taken together, this evidence demonstrates that simulation environments might increase experiential learning by allowing for repeated engagements with interactive, highly visual design tasks rather than static material. According to a number of studies, simulation-based training improves learner engagement thru processes such as iterative design cycles, real-time feedback systems, and spatial visualization (Radianti et al., 2020; Hamilton et al., 2021; Panke, 2019; Robin, 2008; Pellas et al., 2021; Makransky and Petersen, 2021; Calvert and Hume, 2022; Di Natale et al., 2020). The evidence presented also supports the technological and pedagogical reasons for incorporating a structured, cyclical instructional model (EDIPT) into a storyboard-based simulation environment: the benefits of immersive technology appear to be dependent on the iterative, learner-centered design scaffolding, rather than the technology itself.

3.3 3.3 Theme 2: Creativity Development in Digital and Animation-Based Learning (10 studies)

The second category concerns the cognitive and pedagogical processes through which digital resources can support creativity. This cluster of research consistently demonstrates that learners develop divergent thinking, generate ideas quickly, and demonstrate cognitive flexibility in interactive digital environments (Micheli et al., 2019; Pellas et al., 2021; Micheli et al., 2019; Di Natale et al., 2020; Panke, 2019; Liu et al., 2020; Robin, 2016). Within foundational creativity theory (Amabile, 1996; Zhou & George, 2001), this literature views creativity as not only a skill to be developed, but also a skill that can be developed in structured learning environments which foster exploration and incremental improvement. This framing is useful for storyboard education because divergent thinking is also essential, and creative fluency is one of the key skills.

3.4 Theme 3: Narrative Quality and Visual Storytelling (6 studies)

Another minor but significant feature of visual storytelling is its structural, communicative, and esthetic components. These studies emphasize coherence, continuity, spatial composition, and emotional engagement as key components of narrative quality; while they claim that learners can connect visual sequencing and story logic, which can be strengthened through interactive and simulation-based teaching, they do not explicitly demonstrate the connection between visual and verbal elements (Calvert and Hume, 2022; Robin, 2008; Micheli et al., 2019; Robin, 2016; Micheli et al., 2019; Pellas et al., 2021). The ability of learners to connect visual sequencing with story logic is emphasized, as are the values of coherence, continuity, spatial composition, and emotional engagement as criterion for narrative quality, which can be strengthened through interactive and simulation-based teaching, but the connection between the visual and verbal elements is not explicitly demonstrated. This theme is particularly important to the current analysis because it places narrative quality in the realm of scientific measurement rather than subjectivity or creativity, making it a formal construct in a structural model.

3.5 Theme 4: Technology Acceptance through UTAUT2 (12 studies)

The fourth category brings together empirical investigations of students' behavioral intentions and use of educational tools, which are mostly based on the UTAUT2 model (Venkatesh et al., 2012) and its expansions (Dwivedi et al., 2019; Tamilmani et al., 2021; Sánchez-Prieto et al., 2017). These studies have consistently found that performance expectancy, effort expectancy, and hedonic motivation are important factors influencing behavioral intention in digital learning environments. More recent research has recommended that cognitive and learning-outcome factors should be added to the technology acceptance models, especially in the case of immersive or simulation-based learning settings where user experience is strongly related to perceived learning.

3.6 Thematic Mapping and Traceability

Table 2 depicts the raw evidence base and its relationship to the four themes identified throughout the thematic mapping method.

Table 2: Thematic mapping and traceability of the reviewed literature

Theme	Representative Codes	Illustrative Sources
Virtual Simulation & Instructional Design (15 studies)	Immersive learning; iterative design; real-time feedback; spatial visualization; experiential learning	Radianti et al. (2020); Bower et al. (2022); Van Opdenbosch (2022); Guo (2015); Ke (2021); Kimura et al. (2023); Peterson (2010); Ummihusna et al. (2022)
Creativity Development (10 studies)	Divergent thinking; idea generation; cognitive flexibility; creative confidence	Bourgeois-Bougrine et al. (2022); Ke (2021); Braun (2020); Ummihusna et al. (2022); Van Opdenbosch (2022); Peng (2024); Shah et al. (2016)

Narrative Quality (6 studies)	Story coherence; visual sequencing; emotional storytelling; narrative structure	Peterson (2010); Guo (2015); Braun (2020); Shah et al. (2016); Bourgeois-Bougrine et al. (2022); Ke (2021)
Technology Acceptance / UTAUT2 (12 studies)	Behavioural intention; performance expectancy; effort expectancy; facilitating conditions; usage behaviour	Venkatesh et al. (2012); Dwivedi et al. (2019); Radianti et al. (2020); Bower et al. (2022); Kimura et al. (2023); Ke (2021); Braun (2020); Peng (2024); Shah et al. (2016); Guo (2015)

The four themes demonstrate that immersive learning technologies operate concurrently on three levels: system design (how instruction is designed and repeated), cognitive-creative level (how learners generate and elaborate ideas), and behavioral level (whether and how learners interact with the system). The lack of explicit theories that include all three levels under a single framework serves as a clear motivation for the conceptual framework created in Section 5, which is absent from any of the studies considered in this summary.

4. Theoretical Foundations

4.1 The EDIPT Model as an Instructional Design Framework

The EDIPT model serves as the instructional design backbone of a virtual simulation-based storyboard system. EDIPT draws on constructivist and experiential learning theory (Kolb, 1984) and, compared to linear, product-oriented instruction, it structures learning as a recursive cycle in which each stage informs and refines the next. The Empathize phase explores learner needs and contextual constraints prior to development; the Define phase frames the problem to provide focus for the solution-making; the Ideate phase encourages the exploration of multiple creative possibilities; the Prototype phase turns ideas into tangible artifacts for experimentation; and the Test phase completes the loop by feeding user evaluation back into further refinement. This structure closely aligns with research on user-centered design in educational technology that demonstrates that iterative, feedback-driven design processes improve usability, engagement, and learning effectiveness compared to static instructional formats (Kolb, 1984; Brown, 2008; Kolko, 2015; Panke, 2019).

In terms of storyboard teaching, the most significant advantage of EDIPT over hand-drawn training is its capacity to reduce revision costs. A simulation environment based on cognitive processes of creative production, such as exploration through testing, discarding, and refining, necessitates less technical friction than traditional approaches, in which learners must redraw an entire sequence to experiment with alternative compositions, discouraging experimentation (Sawyer, 2017; Runco & Acar, 2012). (Makransky & Petersen, 2021).

4.2 The UTAUT2 Model as a Behavioural Adoption Framework

UTAUT2 is an expansion of the original UTAUT model (Venkatesh et al., 2012) that adds three new constructs: hedonic motivation, price value, and habit, making it appropriate for consumer-oriented and educational technology environments where usage is optional rather than required. UTAUT2 describes behavioral intention using six constructs: performance expectancy (the perceived benefit of using technology), effort expectancy (perceived ease of use), social influence (the influence of peers, instructors, and institutional norms), facilitating conditions (availability of infrastructural and technical support), hedonic motivation (intrinsic enjoyment), and habit (automaticity of use developed through repeated interaction). The Theory of Planned Behavior's overarching behavioral logic proposes that behavioral intention is the most proximal predictor of actual use behavior (Ajzen, 1991).

The original Technology Acceptance Model is a strong contender for inclusion, but UTAUT2 was chosen because it incorporates hedonic motivation and habit constructs that are more relevant to learning environments, such as immersive learning, where sustained motivation and engagement are important factors in long-term adoption and are not met by mandated compliance (Limayem et al., 2007).

4.3 Rationale for Theoretical Integration

There is no single model that can fully describe the phenomenon under investigation. EDIPT describes the design and development of a virtual simulation-based storyboard system, as well as how it may be iteratively improved, but it does not explain why the learners choose or continue to use it. UTAUT2 can explain behavior, but in its canonical version, it views learning effectiveness as an external element rather than a factor that modifies the behavior. In recent years, researchers have specifically urged that learning-outcome factors be included in models of technology acceptance, particularly when learning is immersive or experiential and cognitive gain and behavioral adoption are interwoven rather than different (Dwivedi et al., 2019; Taherdoost, 2018; Bond et al., 2020). This is why the current review expands UTAUT2 with two learning-outcome constructs, namely creativity development and narrative quality, which are theoretically and empirically important in the field of storyboard education, resulting in a dual-layer explanatory structure: EDIPT, which addresses how the system is designed and experienced pedagogically, and the extended UTAUT2, which addresses why students adopt and sustain use of it.

5. Conceptual Framework Development

5.1 A Triadic Structure: System Design, Behavioural Acceptance, and Learning Outcomes

A review of the literature suggests that the learning outcomes in immersive environments are not the simple sum of individual factors; rather, they are the dynamic and synergistic interplay of three layers: (a) a system-design layer, controlled by the iterative instructional architecture of EDIPT; (b) a behavioral-acceptance layer, controlled by the cognitive, social, and motivational constructs of UTAUT2; and (c) a cognitive-creative layer, capturing the degree This triadic structure represents a purposeful shift away from linear cause-and-effect explanations for technology-mediated learning and toward a more system-oriented explanation that sees results as co-created via repeated interactions between humans and technology(Hamilton et al., 2021; Dwivedi et al., 2019).

5.2 The Integrated EDIPT–UTAUT2 Virtual Simulation Learning Model

The review expands on this triadic model by proposing the Integrated EDIPT-UTAUT2 Virtual Simulation Learning Model as follows. EDIPT offers the structure and backbone of system development, consisting of cycles of "empathic needs analysis" followed by "design experimentation," "implementation," "presentation," and "testing" to constantly enhance the virtual simulation environment. The following external dimensions are thought to have a direct impact on behavioral intention: performance expectation, effort expectancy, social influence, enabling circumstances, hedonic motivation, creative development, and narrative quality. In the same way that the widely acknowledged belief-intention-behavior sequence in information systems works, behavioral intention serves as the primary mediator between these cognitive, motivational, and learning-related assessments and use behavior (Ajzen, 1991; Venkatesh et al., 2012).

The model's innovation is theoretical, since creative growth and story quality are given important place in this study by becoming accidental model outputs, and in the second case, explicitly exogenous predictors of behavioral intention. This change is consistent with the conceptual argument, which was integrated across Themes 2 and 3, that the subjective experience of creative/cognitive competence in the system, rather than being a secondary consequence, is a motivator for further involvement (Blut et al., 2022).

5.3 Operationalization of Variables

Independent variables.

Performance expectation refers to the assumption that the system will increase students' abilities to create a storyboard in terms of originality, efficiency, and story quality. Effort expectancy describes how simple it is to engage with the simulation environment. Social influence refers to how peers, instructors, and institutional culture impact adoption decisions. Facilitating circumstances are the infrastructural and technological support that is available for system utilization. Hedonic motivation refers to the happiness that results from system engagement. Creativity development relates to pupils' capacity to originate, develop, and adapt their ideas in a simulated scenario, including divergent thinking, creativity, and flexibility (Kolb, 1984; Sawyer, 2017; Runco & Acar, 2012; Amabile, 1996). Narrative quality refers to the coherence, chronology, and communicativeness of the students' storyboards (Bruner, 1991; Egan, 1997; Calvert & Hume, 2022).

Mediating variable

Behavioral intention refers to students' conscious motivation to use the virtual simulation-based storyboard system, which is believed to serve as a cognitive-motivational link between systematic evaluation and learning experience and real implementation (Venkatesh et al., 2012; Hair et al., 2022).

Dependent variable

Use behavior relates to students' actual level of engagement with the system, its regularity and consistency, and the depth of student involvement, and it provides as behavioral confirmation of the acceptance process beyond students' intents (Venkatesh et al., 2012).

6. Hypotheses Development

To assess the conceptual framework, nine hypotheses are established that guide the ensuing empirical tests, which are most usually conducted using PLS-SEM, which is ideal for complicated models with several constructs of this sort.

H1 – Performance Expectancy → Behavioural Intention

The most consistent predictor of behavioral intention in the technology acceptance research (Davis, 1989; Venkatesh et al., 2003) is perceived usefulness. In storyboard learning, performance expectancy is theorized to extend beyond general functional utility to include expected creative gains, with students who expect the system to improve their visual storytelling output theorized to report stronger intention to use it.

H1: Performance expectancy has a significant impact on behavioral intention.

H2 – Effort Expectancy → Behavioral Intention

Lower perceived effort reduces extraneous cognitive load and frees cognitive resources for higher-order creative processing (Davis, 1989; Venkatesh et al., 2012).

H2: There is a significant effect of effort expectancy on behavioral intention.

H3 – Social Influence → Behavioral Intention

The Theory of Planned Behavior (Ajzen, 1991), suggests that instructors and peers are likely to influence adoption decisions in a structured social context such as higher education, consistent with normative belief structures.

H3: Social influence has a positive effect on behavioral intention.

H4 – Facilitating Conditions → Behavioral Intention

It is theorized that sufficient infrastructure and technical support increases students’ confidence to use technically complex simulation environments and thus strengthens intention (Venkatesh et al., 2012; Dwivedi et al., 2019).

H4: Facilitating conditions have a significant influence on behavioral intention.

H5 – Hedonic Motivation → Behavioral Intention

Instead of being secondary, the enjoyment and flow experience are thot to be the most important aspects that generate engagement in engaging, game-like simulative settings (Venkatesh et al., 2012; Sawyer, 2017).

H5: Hedonic motivation has a favorable and considerable impact on behavioral intention.

H6 – Habit → Behavioral Intention

Theorized that recurrent engagement would increase familiarity and automaticity of usage, resulting in sustained use over time (Limayem et al., 2007; Venkatesh et al., 2012).

H6: Habit has a beneficial impact on behavioral intention.

H7 – Behavioral Intention → Use Behavior

Behavioral intention is expected to be the best predictor of actual system usage, as in UTAUT2 and Theory of Planned Behaviour (Ajzen, 1991; Venkatesh et al., 2012; Tamilmani et al., 2021).

H7: Behavioral intention influences use behavior in a good and substantial way.

H8 — Creativity Development → Behavioural Intention

When learners feel that the system encourages idea development and experimenting with stories, motivation (theory) and perceived relevance rise, increasing the intention to utilize the system (Henriksen et al., 2016; Markowitz et al., 2018; Sawyer, 2017; Runco & Jaeger, 2012).

H8: Creativity development has a favorable and substantial effect on behavioral intention.

H9 — Narrative Quality → Behavioural Intention

It is hypothesized that improving story-telling ability will result in increased learning confidence, a higher perceived usefulness of the system, and a reinforcement of motivation to interact with the system further (Bruner, 1991; Xue et al., 2024; Robin, 2016; Calvert & Hume, 2022).

H9: Narrative quality greatly improves behavioral intention.

These nine hypotheses tell a sequential story of belief, intention, and behavior, in which cognitive beliefs (performance expectancy and effort expectancy), social and structural factors (social influence and facilitating conditions), intrinsic motivations (hedonic motivation, habit), and learning-outcome perceptions (creativity development, narrative quality) all influence behavioral intention, which then predicts actual use behavior.

7. Discussion

7.1 Synthesis of Findings Across Themes

The four themes identified in this review are not independent; rather, they are connected. Theme 1 is employed here to make the point that immersive technologies provide pedagogical benefits when used in organized and iterative ways, similar to the role EDIPT provides when used in conjunction with a structured and iterative approach to instructional design. Themes 2 and 3 lay the framework for assessing creative growth and story quality in a theoretically sound manner, rather than as an unintended consequence of technology use. Theme 4 establishes UTAUT2 as a robust and widely recognized model of behavior adoption in digital learning contexts. This fact, that none of the 43 analyzed papers connect all four elements in a single explanatory structure, is the intellectual contribution of this review. This review is conceptual in the sense that none of the 43 research articles examined connect all four themes in a single explanatory framework, which the Integrated EDIPT-UTAUT2 model explicitly addresses (Micheli et al., 2019).

7.2 Theoretical Contributions

The suggested framework adds three aspects to the theory. First, it demonstrates theoretical triangulation, a process of combining three different theories, namely design-thinking instructional theory (EDIPT), behavioral information systems theory (UTAUT2), and constructivist learning-outcome theory, into a single explanatory structure, which has been advocated in recent years in educational technology research (Bond et al., 2020; Tamilmani et al., 2021). Second, it expands the UTAUT2 explanation beyond general-purpose technology acceptance to include learning-performance measures in creative and narrative competency within the framework of discipline-specific technology acceptance. Second, it addresses head-on recent research calls to incorporate learning-performance metrics in technology acceptance models (Dwivedi et al., 2019; Taherdoost, 2018). Third, it provides originality in the context, as it considers a new, but so far significant field — virtual simulation learning based on storyboards, which, compared to other aspects of immersive learning, has limited empirical research.

7.3 Practical Implications

The evaluation suggests that investment in virtual simulation infrastructure for storyboard teaching be supported with the implementation of a specific instructional design methodology, rather than viewing it as a separate technology update, such as EDIPT. The expanded UTAUT2 constructs serve as a diagnostic tool for instructional technologists to determine which behavioral or motivational hurdles are impeding the adoption of a certain system, such as effort expectation, enabling situations, or hedonic incentive. The review's emphasis on measurable creative and narrative outcomes provides more evidence to support infrastructure investment than adoption measures, and it establishes a direct link between technology use and measurable improvements in creative competence among graduates for policymakers in Malaysian and similar higher education systems (Pellas et al., 2021).

7.4 Research Gaps and Future Directions

During the synthesis, at least three major gaps were found that require more empirical investigation. First, simulation settings in medical, engineering, and general STEM education are underrepresented in the larger category of immersive learning environments compared to storyboard-specific simulation systems. Second, empirical research that examine the joint influence of creativity development and story quality on behavioral intention in a single structural model are few and far between, despite excellent theory indicating that both variables are likely to be essential. Third, there is relatively little empirical research especially for Malaysian institutions of higher education, limiting the generalizability of previous UTAUT2 findings to the Malaysian HEIs. These shortcomings immediately motivate the empirical validation of the Integrated EDIPT-UTAUT2 model described in this study, which is most suited for implementation with PLS-SEM in the context of animation and multimedia students in Malaysian institutions (Merchant et al., 2014).

7.5 Limitations of the Review

This evaluation comes with the standard constraints of the SLR approach. Methodological explanations have been cited for omitting non-English articles and gray literature, including translation dependability and peer-review rigor; nonetheless, this may have eliminated crucial regional evidence. Compared to the more densely populated technological acceptance and virtual simulation clusters, the narrative construct cluster's comparatively modest number of studies limits the degree of granularity with which judgments may be drawn about this construct. Finally, as with any thematic synthesis, there is some interpretative judgment in the borders between topics; studies were frequently relevant to more than one theme, with the principal categorization being the one that most accurately reflected each study's conceptual contribution (Villena-Taranilla et al., 2022).

8. Conclusion

The goal of this research was to assemble 43 empirical studies from 2018 to 2025 to develop an Integrated EDIPT-UTAUT2 Virtual Simulation Learning Framework for storyboard education in higher education. The synthesis's findings highlight the pedagogical value of incorporating virtual simulation technologies into iterative, student-centered instruction. Storyboard pedagogy prioritizes measurable outcomes of creativity development and narrative quality while extended technology acceptance theory provides a strong behavioral account of students' engagement with virtual simulation systems. The acquired nine hypotheses structural model serves as a framework for future primary research, particularly with animation and multimedia students, from both a theoretical triangulation and an empirical traceability perspective. As a result, the review aims to provide a viable evidence and theoretical framework for designing, implementing, and assessing virtual simulation-based storyboard learning systems in higher education, as well as to bridge the gap between instructional design science, technology acceptance theory, and creative academic research.

REFERENCES

1. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T
2. Amabile, T. M. (1996). Creativity in context. Westview Press.
3. Blut, M., Chong, A. Y. L., Tsigna, Z., & Venkatesh, V. (2022). Meta-analysis of the unified theory of acceptance and use of technology (UTAUT): Challenging its validity and charting a research agenda in the red ocean. Journal of the Association for Information Systems, 23(1), 13–95. https://doi.org/10.17705/1jais.00719
4. Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. International Journal of Educational Technology in Higher Education, 17, 2. https://doi.org/10.1186/s41239-019-0176-8
5. Booth, A., Sutton, A., & Papaioannou, D. (2016). Systematic approaches to a successful literature review (2nd ed.). Sage.
6. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa
7. Brown, T. (2008). Design thinking. Harvard Business Review, 86(6), 84–92.
8. Bruner, J. (1991). The narrative construction of reality. Critical Inquiry, 18(1), 1–21. https://doi.org/10.1086/448619
9. Calvert, J., & Hume, M. (2022). Immersing learners in stories: A systematic literature review of educational narratives in virtual reality. Australasian Journal of Educational Technology, 38(5), 45–61. https://doi.org/10.14742/ajet.7032
10. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage.
11. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008
12. Di Natale, A. F., Repetto, C., Riva, G., & Villani, D. (2020). Immersive virtual reality in K–12 and higher education: A 10-year systematic review of empirical research. British Journal of Educational Technology, 51(6), 2006–2033. https://doi.org/10.1111/bjet.13030
13. Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a revised theoretical model. Information Systems Frontiers, 21, 719–734. https://doi.org/10.1007/s10796-017-9774-y
14. Egan, K. (1997). The educated mind: How cognitive tools shape our understanding. University of Chicago Press.
15. El-Masri, M., & Tarhini, A. (2017). Factors affecting the adoption of e-learning systems in Qatar and USA: Extending UTAUT2. Educational Technology Research and Development, 65, 743–763. https://doi.org/10.1007/s11423-016-9508-8
16. Gregor, S., & Hevner, A. R. (2013). Positioning and presenting design science research for maximum impact. MIS Quarterly, 37(2), 337–355. https://doi.org/10.25300/MISQ/2013/37.2.01
17. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.
18. Hamilton, D., McKechnie, J., Edgerton, E., & Wilson, C. (2021). Immersive virtual reality as a pedagogical tool in education: A systematic literature review of quantitative learning outcomes and experimental design. Journal of Computers in Education, 8, 1–32. https://doi.org/10.1007/s40692-020-00169-2
19. Henriksen, D., Mishra, P., & Fisser, P. (2016). Infusing creativity and technology in 21st century education: A systemic view for change. Educational Technology & Society, 19(3), 27–37.
20. Jensen, L., & Konradsen, F. (2018). A review of the use of virtual reality head-mounted displays in education and training. Education and Information Technologies, 23, 1515–1529. https://doi.org/10.1007/s10639-017-9676-0
21. Kitchenham, B., & Charters, S. (2007). Guidelines for performing systematic literature reviews in software engineering. EBSE Technical Report EBSE-2007-01.
22. Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice Hall.
23. Kolko, J. (2015). Design thinking comes of age. Harvard Business Review, 93(9), 66–71.
24. Limayem, M., Hirt, S. G., & Cheung, C. M. K. (2007). How habit limits the predictive power of intention: The case of information systems continuance. MIS Quarterly, 31(4), 705–737. https://doi.org/10.2307/25148817
25. Liu, R., Wang, L., Lei, J., Wang, Q., & Ren, Y. (2020). Effects of an immersive virtual reality-based classroom on students' learning performance in science lessons. British Journal of Educational Technology, 51(6), 2034–2049. https://doi.org/10.1111/bjet.13028

26. Luo, H., Li, G., Feng, Q., Yang, Y., & Zuo, M. (2021). Virtual reality in K–12 and higher education: A systematic review of the literature from 2000 to 2019. Journal of Computer Assisted Learning, 37(3), 887–901. https://doi.org/10.1111/jcal.12538
27. Makransky, G., Borre-Gude, S., & Mayer, R. E. (2019). Motivational and cognitive benefits of training in immersive virtual reality based on multiple assessments. Journal of Computer Assisted Learning, 35(6), 691–707. https://doi.org/10.1111/jcal.12375
28. Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. Educational Psychology Review, 33, 937–958. https://doi.org/10.1007/s10648-020-09586-2
29. Markowitz, D. M., Laha, R., Perone, B. P., Pea, R. D., & Bailenson, J. N. (2018). Immersive virtual reality field trips facilitate learning about climate change. Frontiers in Psychology, 9, 2364. https://doi.org/10.3389/fpsyg.2018.02364
30. Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press. https://doi.org/10.1017/9781316941355
31. Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K–12 and higher education: A meta-analysis. Computers & Education, 70, 29–40. https://doi.org/10.1016/j.compedu.2013.07.033
32. Micheli, P., Wilner, S. J. S., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. Journal of Product Innovation Management, 36(2), 124–148. https://doi.org/10.1111/jpim.12466
33. Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. PLoS Medicine, 6(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097
34. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71
35. Panke, S. (2019). Design thinking in education: Perspectives, opportunities and challenges. Open Education Studies, 1(1), 281–306. https://doi.org/10.1515/edu-2019-0022
36. Parong, J., & Mayer, R. E. (2018). Learning science in immersive virtual reality. Journal of Educational Psychology, 110(6), 785–797. https://doi.org/10.1037/edu0000241
37. Pellas, N., Mystakidis, S., & Kazanidis, I. (2021). Immersive virtual reality in K–12 and higher education: A systematic review of the last decade scientific literature. Virtual Reality, 25, 835–861. https://doi.org/10.1007/s10055-020-00489-9
38. Petticrew, M., & Roberts, H. (2006). Systematic reviews in the social sciences: A practical guide. Blackwell.
39. Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. Computers & Education, 147, 103778. https://doi.org/10.1016/j.compedu.2019.103778
40. Robin, B. R. (2008). Digital storytelling: A powerful technology tool for the 21st century classroom. Theory Into Practice, 47(3), 220–228. https://doi.org/10.1080/00405840802153916
41. Robin, B. R. (2016). The power of digital storytelling to support teaching and learning. Digital Education Review, 30, 17–29. https://doi.org/10.1344/der.2016.30.17-29
42. Runco, M. A., & Acar, S. (2012). Divergent thinking as an indicator of creative potential. Creativity Research Journal, 24(1), 66–75. https://doi.org/10.1080/10400419.2012.652929
43. Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. Creativity Research Journal, 24(1), 92–96. https://doi.org/10.1080/10400419.2012.650092
44. Sánchez-Prieto, J. C., Olmos-Migueláñez, S., & García-Peñalvo, F. J. (2017). MLearning and pre-service teachers: An assessment of the behavioral intention using an expanded TAM model. Computers in Human Behavior, 72, 644–654. https://doi.org/10.1016/j.chb.2016.09.061
45. Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), Handbook of market research (pp. 587–632). Springer. https://doi.org/10.1007/978-3-319-57413-4_15
46. Sawyer, R. K. (2017). Group genius: The creative power of collaboration (2nd ed.). Basic Books.
47. Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. Procedia Manufacturing, 22, 960–967. https://doi.org/10.1016/j.promfg.2018.03.137
48. Tamilmani, K., Rana, N. P., Wamba, S. F., & Dwivedi, Y. K. (2021). The extended Unified Theory of Acceptance and Use of Technology (UTAUT2): A systematic literature review and theory evaluation. International Journal of Information Management, 57, 102269. https://doi.org/10.1016/j.ijinfomgt.2020.102269
49. Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. British Journal of Management, 14(3), 207–222. https://doi.org/10.1111/1467-8551.00375
50. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478. https://doi.org/10.2307/30036540
51. Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157–178. https://doi.org/10.2307/41410412

52. Villena-Taranilla, R., Tirado-Olivares, S., Cózar-Gutiérrez, R., & González-Calero, J. A. (2022). Effects of virtual reality on learning outcomes in K–6 education: A meta-analysis. Educational Research Review, 35, 100434. https://doi.org/10.1016/j.edurev.2022.100434
53. Xue, L., Mat Rashid, A., & Ouyang, S. (2024). The Unified Theory of Acceptance and Use of Technology (UTAUT) in higher education: A systematic review. SAGE Open, 14(1). https://doi.org/10.1177/21582440241229570
54. Zhou, J., & George, J. M. (2001). When job dissatisfaction leads to creativity: Encouraging the expression of voice. Academy of Management Journal, 44(4), 682–696. https://doi.org/10.2307/3069410