

The management laboratory blueprint: an integrative theoretical framework for dimensions and functions

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Abstract

Purpose – This study aims to address the conceptual understanding of Management Laboratories (MLabs) in literature by proposing an integrative conceptual-theoretical framework. The framework unifies MLabs' composition, core functions and underlying mechanisms, bridging their research, educational and practical applications.

Design/methodology/approach – Drawing on a systematic synthesis of multidisciplinary literature, the study identifies five core dimensions of MLabs – simulations, experimental methods, gamification, physical models and case studies – and four key functions: education, research, assessment and consulting. The framework conceptualizes MLabs as dynamic systems, explicitly linking dimensions to functions through mechanisms like experiential learning, feedback loops, and data-driven iteration, while acknowledging boundary conditions such as resource availability, stakeholder alignment and institutional constraints.

Findings – The framework reveals MLabs as adaptive systems where dimensions interact dynamically to serve diverse functions. For example, simulations enable experiential training, experimental methods ensure research validity, and gamification enhances engagement in educational contexts. Interconnected mechanisms, such as iterative prototyping and real-time feedback, amplify MLabs' adaptability across settings. Boundary conditions, including technological infrastructure and organizational culture, critically influence their effectiveness.

Originality/value – This study offers the first unified framework integrating MLabs' fragmented conceptualizations, advancing theoretical coherence. By mapping dimensions, functions, mechanisms and boundary conditions, it provides a blueprint for designing context-specific MLabs. The framework's novelty lies in its dynamic systems perspective, which fosters interdisciplinary collaboration. Practically, it delivers actionable strategies for deploying MLabs in education (e.g. immersive learning), research (e.g. controlled experimentation), assessment (e.g. competency evaluation and behavioural diagnostics) and consulting (e.g. scenario planning). This work consolidates disparate research streams, invites empirical validation and enhances MLabs' strategic value for academics and practitioners.

Keywords Game-based learning, Experimental research, Educational technologies, Behavioural labs, Cognitive management

Paper type Conceptual paper

1. Introduction

Modern scholars often associate “experiment”, “laboratory” and “experimental research” with the natural sciences, yet the term has a multifaceted linguistic and historical trajectory. As [Dittrich \(2015\)](#) notes, it etymologically denotes a site for inquiry and scientific method, with early usages linked to seventeenth-century alchemists and apothecaries ([Dupré, 2014](#)). By the late eighteenth and early nineteenth centuries, universities institutionalized laboratories for chemistry, physics and biology, initiating the “laboratory revolution” that reshaped modern research universities ([Sharif Ahmadian et al., 2022](#)). Over time, the concept expanded beyond physical laboratories to include virtual environments that enable interaction with phenomena, data engagement and controlled testing – developments rendering many traditional definitions increasingly obsolete ([Webster and Sell, 2014](#)). Although observation, surveys, and mixed approaches remain common in



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behavioural and social sciences, the foundational role of experimental and laboratory methods in rigorous management research has gained renewed emphasis. Their growing adoption is supported by new technologies, interdisciplinary research topics, and emerging behavioural facilities across business schools. Rooted in psychology's early studies of biological responses (e.g. [Pavlov, 1897](#)), laboratory approaches now span marketing, consumer and organizational behaviour, behavioural economics, operations management and policy research. [Goodarzi and Ghorbani \(2019\)](#) describe humanities labs as collaborative arenas linking academia, industry, education, and public institutions – an evolution that sets the stage for modern Management Laboratories.

Building on these historical and disciplinary developments, the Management Laboratory is defined as a structured environment – whether physical, virtual, or hybrid – facilitating experiential learning, organizational experimentation and evidence-based decision-making ([Bristot and Erdmann, 2019](#); [da Silva et al., 2019](#)), while also hosting assessment and development centres beyond academia ([Alikhanzadeh et al., 2020](#); [Holder et al., 2020](#)). However, the integration of laboratory logics into management scholarship has not been without debate. Concerns regarding real-world applicability, reliance on student samples and limited external validity ([Greenberg and Tomlinson, 2004](#)) have historically shaped discussions around laboratory experiments in management and leadership studies. Yet such concerns can be mitigated through careful design, field experiments, diverse participant pools, and replication across contexts. More importantly, the contemporary landscape of Management Laboratories demonstrates substantial diversification: simulations, gamification, cognitive experiments, case discussions and physical mock-ups are now deployed across universities and organizations worldwide. Experiential and experimental methods such as computer-based simulations, case studies, group discussions, gamification and structured experiments have increasingly become essential tools in both research and practice ([Farashahi and Tajeddin, 2018](#); [Hendijani, 2019](#); [Kutergina, 2017](#); [Mtshali et al., 2020](#); [Podsakoff and Podsakoff, 2019](#)). Prestigious institutions – including *Laboratory for Economics, Management and Auctions* (The Pennsylvania State University) [1], *Hanken Business Lab* (Hanken School of Economics) [2], *NYU Shanghai behaviour and Experimental Economics Laboratory* (New York University Shanghai) [3] and *Business Behavioural Laboratory* (Monash Business School) [4] – demonstrate the global rise of facilities intended to support management and business research while also serving firms, organizations, and broader societal stakeholders. Yet despite this proliferation, systematic scientific inquiry into the design principles, classification logics, and rationale behind similarities and differences among such laboratories remains limited.

This gap becomes more pressing amidst the rapid rise of artificial intelligence (AI)-driven managerial training, simulation-based learning and hybrid experiential environments. Without a cohesive conceptual foundation, advances risk fragmentation, narrow applicability and conceptual ambiguity. Although methods within “Management Laboratories” are increasingly adopted, existing studies tend to analyse individual components in isolation (e.g. simulations, case methods, behavioural experiments) ([Ahmadi and Hendijani, 2023](#)), leaving no coherent model that conceptualizes the laboratory as a multi-dimensional entity. This fragmentation restricts our ability to:

- systematically design and configure Management Laboratories for optimal effectiveness;
- rigorously evaluate their impact by linking components to intended outcomes; and
- establish a robust theoretical foundation to guide future research and practice.

A clear integrative model is therefore needed to unify experiential management research and extend the nomological network (Cronbach and Meehl, 1955). This paper addresses the gap by synthesizing multidisciplinary literature to identify the core dimensions of Management Laboratories, delineate their functions, and propose a conceptual-theoretical model clarifying how these dimensions relate to functions. It further explores causal mechanisms, mediators and boundary conditions, aiming to unify fragmented research, clarify the concept and provide actionable guidance for design and implementation in academic and organizational contexts.

This manuscript is based on a systematic synthesis of multidisciplinary literature to propose a conceptual framework. The five dimensions and four functions of Management Laboratories were identified through thematic synthesis, selecting sources based on their relevance to management education and laboratory-based research. A comprehensive search was conducted in academic databases (aimed at identifying books and articles) as well as practical sources (focused on reviewing tools such as simulations and business games). The criteria for selecting research data were based on the credibility and reputation of the sources, as well as their maximum relevance to the five proposed dimensions and four functions of the framework. Although no empirical data or expert interviews were formally conducted, the model was constructed by categorizing and integrating key theoretical perspectives, such as experiential learning theory and behavioural economics. This approach ensures a systematic and transparent framework development process, providing a foundation for future empirical validation while offering conceptual clarity to scholars and practitioners.

2. Theoretical foundations and literature review

The study synthesizes multidisciplinary literature on Management Laboratories (MLabs), outlining five core dimensions – simulations, experimental methods, gamification, case studies and physical models. Each dimension is discussed in terms of its conceptual foundations and adoption across management and related fields. The analysis then shifts to a practical perspective, identifying four key functions of MLabs – education, assessment, research and consulting – and exploring how these functions operationalize the identified dimensions. This synthesis situates the MLabs framework within existing scholarship and highlights its theoretical and practical significance.

2.1 Core dimensions of management laboratories

2.1.1 Computer-Based simulations and scenario design. Simulations are structured, rule-based representations of real or hypothetical systems that allow participants to experience dynamic decision-making in controlled environments (Salas *et al.*, 2009). In management education and organizational research, computer-based simulations replicate complex managerial situations by modelling interactions among variables, enabling learners to test strategies, observe outcomes and refine decisions without real-world consequences (Garvin, 2000). Such simulations may vary in fidelity – from abstract models to highly immersive scenario-based platforms – but all aim to support experiential learning by compressing time, reducing risk and making causal relationships more transparent.

Simulations and experiential methods in management education have evolved across four phases: military origins, cognitive revolution, digital transformation and hybrid integration:

- (1) Military origins and early business adaptations (1900–1950s): Simulations originated in military “war games” for testing battlefield strategies (West *et al.*, 2018; Tavallaei *et al.*, 2020). For example, the Prussian Kriegsspiel (war game) of the early 19th century trained tactical decision-making using maps and dice (Somes, 1991) (See Figure 1 for an illustration of the Prussian Kriegsspiel map at

the German Command and Staff College). By the 1950s, businesses adapted these principles to management training, with Rand Corporation pioneering the first business war games in aerospace (Cohen, 2004).

- (2) Cognitive Revolution and Structured Pedagogy (1960s–1980s): The 1960s saw Bloom’s taxonomy emphasize higher-order cognitive skills (Bloom, 1956), driving experiential learning. Kolb’s theory (1984) provided a framework for designing simulations (concrete experience → reflective observation → abstract conceptualization → active experimentation). MIT’s *Management Flight Simulators* [5] enabled managers to test supply chain decisions, revealing biases like the “bullwhip effect” (Stermann, 1994). Harvard’s case method institutionalized experiential learning through group discussions (Garvin, 2000).
- (3) Digital transformation and virtual labs (1990s–2010s): The rise of personal computing and the internet revolutionized simulations. Virtual labs emerged for real-time collaboration (Wagner and Tutas, 2001). *Forio Custom Simulations for Training and Higher Education* [6] introduced web-based platforms for marketing and financial strategies (Cannon-Bowers and Bowers, 2009). Gamification (Deterding et al., 2011) was integrated into simulations, like leadership games. Behavioural economics (List, 2011) expanded research applications, with labs like *The Decision Lab* [7] combining economic games (e.g. prisoner’s dilemma simulations) with neuroscience tools to study decision-making.

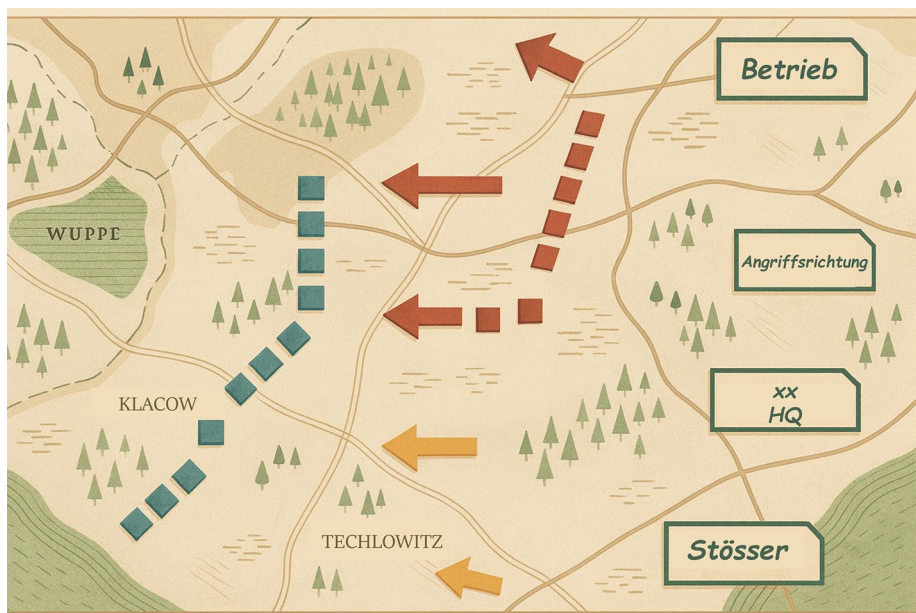


Figure 1. Schematic illustration of Prussian Kriegsspiel map at the German Command and Staff College
Source: Authors’ own work, inspired by original photographs at the German Command and Staff College, <https://kriegsspiel.org/kriegsspiel-at-the-german-command-and-staff-college/>, accessed 1 December 2025)

- (4) Hybrid integration and ai-driven labs (2020s–Present): Today, Management Laboratories blend physical mock-ups (e.g. Store shelves) with digital simulations, augmented reality (AR) and AI-driven platforms. MIT’s *Learning Edge* platform uses machine learning to simulate stakeholder negotiations (Brynjolfsson and McAfee, 2017). The COVID-19 pandemic accelerated VR labs like INSEAD’s *VR Leadership Simulations* [8] for crisis management practice. This evolution reflects a broader theoretical shift from behaviourism (focused on observable actions) to constructivism (emphasizing knowledge co-creation) (Lave and Wenger, 1991). Modern simulations emphasize high fidelity and adaptability, using AI to tailor scenarios and fostering collaboration across virtual-physical spaces (Rash *et al.*, 2023).

Computer-based simulations are a fundamental dimension of Management Laboratories (MLabs), offering structured environments for exploring complex dynamics (see Figure 2). However, the ambiguity around terms like “simulations”, “games” and “models” necessitates a clear conceptual foundation.

Simulations are dynamic representations of real-world systems designed to replicate relationships and behavioural patterns under controlled conditions, prioritizing predictive accuracy over engagement (Banks *et al.*, 2009). For example, discrete-event simulations in operations management model production bottlenecks by incorporating variables like downtime and workforce variability (Law, 2014). Games, defined by Ellington *et al.* (1981), are rule-based activities for achieving predefined goals, focusing on skill development rather than system replication. For example, *Cesim Global Challenge (Strategy and International Business Management Simulation)* [9] involves teams managing multinational corporations,



Figure 2. Production line: car factory simulation used in production management education and analysis (Screenshot from the game Production Line by Positech Games, www.positech.co.uk/productionline/, accessed 1 December 2025)

emphasizing strategic decision-making under competition. Flight simulators exemplify the integration of game-like progression with accurate cockpit dynamics (Stermann, 1994).

Models are the foundational backbone of simulations, serving as abstracted, simplified representations of a system's key components and their interrelationships (e.g. system dynamics models in sustainability research) (Stermann, 2000). Their value lies in isolating critical variables while filtering out extraneous noise (Hall, 2003). However, over-simplification can lead to the “toy model” syndrome, where simulations lose practical relevance (Pasin and Giroux, 2011).

Gamified simulations integrate competitive mechanics and feedback loops to foster active learning and decision-making agility in Management Laboratories. Key applications include:

- Business strategy simulators: replicate market dynamics to train managers in competitive strategy, with real-time dashboards tracking metrics like ROI (e.g. *Capsim Simulations* [10]) (Deterding *et al.*, 2011).
- Market simulators: model consumer behaviour to test pricing or marketing strategies by allowing players to adjust variables and receive immediate feedback (e.g. *Markstrat* [11]) (Larreché and Gatignon, 1990).
- Institutional simulators: explore organizational governance and policy compliance through role-playing scenarios like regulatory audits or mergers (e.g. The MIT Sloan School's *Climate Pathways Project* [12]) (Stermann, 2000).
- Crisis management simulators: build rapid decision-making skills under uncertainty in scenarios like PR crises or supply chain collapses (e.g. *Cranfield University's Crisis Simulation* [13],[14]) (Kayes *et al.*, 2005).

These approaches are effective due to elements like scoring systems, immediate feedback loops that reinforce Kolb's (1984) experiential learning cycle, and integrated competition.

2.1.1.1 Theoretical challenges and criticisms. The application of computer-based simulations faces a significant trade-off between generalizability vs precision. Critiques from Greenberg and Tomlinson (2004) highlight concerns about using student samples instead of experienced C-suite executives. An overemphasis on scoring can also trivialize complex decisions, leading participants to prioritize short-term “wins” over sustainable long-term strategy (Salas *et al.*, 2009). Finally, working with stressful scenarios (e.g. simulated layoffs) can induce psychological stress, underscoring the need for adherence to ethical boundaries and oversight by Institutional Review Boards (IRB) (American Psychological Association, 2017).

2.1.2 *Experimental, behavioural and cognitive research methods.* Classical rational models posit humans as fully rational actors, but empirical evidence from managerial settings consistently reveals systematic deviations from these assumptions (Fehr and Schmidt, 1999; Langevoort, 2010; Simon, 1956).

Three critical limitations of these models are:

- (1) Firstly, cognitive constraints such as limited attention and memory, leading managers to use “satisficing” heuristics rather than exhaustive optimization (Schilirò, 2018).
- (2) Secondly, emotional influences like the fear of failure or overconfidence, which can distort judgement and directly impact risk aversion levels (Knutson *et al.*, 2007).
- (3) Thirdly, social embeddedness, as decisions are shaped by social norms and group dynamics (Takac *et al.*, 2011).

Cognitive science, behavioural economics and social psychology provide robust frameworks to model these complexities, enabling researchers to predict how managers actually behave (Thaler and Sunstein, 2008). Understanding these principles allows for the design of effective interventions, such as choice architecture for nudging.

The key classical cognitive-behavioural theories that inform management research are summarized below in Table 1.

Within this theoretical landscape, experimentation stands out as a powerful methodology. It enables rigorous causal inference by isolating specific variables through controlled manipulations, directly testing predictions from cognitive and behavioural theories. For example, to test Prospect Theory, a lab experiment might frame identical decisions differently to measure shifts in risk preferences (Kahneman, 2011). Similarly, randomized trials can experimentally uncover implicit biases in hiring decisions (Moss-Racusin et al., 2012).

Compared to observational methods, experimentation offers significant advantages for management research. It provides a high degree of control to hold extraneous variables constant, precision in measurement (e.g. fMRI), and standardized protocols that facilitate replicability (Levine et al., 2023).

Applying this cognitive-behavioural lens through experimentation has illuminated various management phenomena. In decision-making, studies have revealed framing effects and shown overconfident CEOs are more prone to value-destroying acquisitions (Malmendier and Tate, 2008). In leadership and ethics, experiments have explored moral licensing and used physiological measures to show how stressed leaders can transmit anxiety (Waters et al., 2014). Within HR practices, research has illustrated the anchoring effect in compensation (Kugler et al., 2018) and shown how identity-priming can reduce social loafing (Harkins and Petty, 1982).

Crucial theoretical considerations guide experimental design. A fundamental trade-off exists between internal validity (lab experiments) and external validity (field experiments) (Levitt and List, 2007; List, 2011). While behavioural outcomes might vary culturally, underlying mechanisms may remain universal (Cialdini, 2009). Conducting experiments with human participants also necessitates strict adherence to ethical guidelines and oversight by Institutional Review Boards (American Psychological Association, 2017).

Management Laboratories serve as dedicated environments for organizational experimentation. Experiments offer advantages such as clear, observable measures, high clarity without confounding variables, additional controls and replicability (Croson et al., 2007). Experimental research is widely used across fields including consumer and

Table 1. Key cognitive-behavioural theories in management

Theory	Core premise	Managerial relevance
Prospect Theory (Kahneman and Tversky, 1979)	Losses are perceived as more impactful than gains; decisions depend on reference points	Explains risk-averse R&D cuts post-losses or overpricing in M&A negotiations
Cognitive Dissonance (Festinger, 1957)	Individuals seek consistency between beliefs/actions, rejecting conflicting evidence	Predicts CEOs persisting with failing strategies to justify prior commitments (sunk-cost fallacy)
Attribution Theory (Weiner, 1985)	Success/failure is attributed to internal (skill) or external (luck) factors	Influences leadership responses to employee performance (e.g. punitive vs supportive feedback)
Heuristics and Biases (Tversky and Kahneman, 1974)	Systematic deviations from rationality due to mental shortcuts	Explains anchoring in salary negotiations or availability bias in crisis management

organizational behaviour and behavioural economics (Falk and Heckman, 2009; Jackson and Cox, 2013). Compared to field experiments, laboratory experiments offer greater control over extraneous variables (Ahmadi and Hendijani, 2023). Many are conducted in specialized university business schools (e.g. see Plate 1).

Modern behavioural science laboratories use advanced equipment and technologies for conducting experiments and collecting data, including personal computers; eye-tracking devices; neurofeedback devices like Electroencephalogram (EEG) systems; biofeedback sensors (TEMP, EMG, ECG, GSR, HBR); and virtual reality (VR) and augmented reality (AR) devices. A suite of software tools is also used, such as *MediaLab* from *Empirisoft* [15], *DirectRT* also from *Empirisoft*, *AcqKnowledge* from *BIOPAC* [16], *ZTree* from the University of Zurich [17], *E-Prime* from *Psychology Software Tools* [18], and *Tobii Pro Studio* from *Tobii* [19], as well as programming and statistical software like *Python*, *MATLAB* and *SPSS* (Ahmadi et al., 2020).

Experimental research has led to innovations across management science. The application of behavioural and cognitive equipment clarifies causal relationships and facilitates interdisciplinary studies, converging methods from cognitive science, neuroscience, psychology and sociology (Podsakoff and Podsakoff, 2019; Zellmer-Bruhn et al., 2016).

Among the dimensions of a Management Laboratory, experimental research serves as its core; fundamentally, the term “laboratory” signifies a place designed for conducting experiments.

2.1.3 Group discussions: case studies and best practices. Case analysis in Management Laboratories relies on structured best practices and collaborative group discussions to turn



Plate 1. The Bonn experimental economics laboratory (BonnEconLab) at the University of Bonn, illustrating a setting for behavioural economics experiments (Photo courtesy of the University of Bonn, www.econ.uni-bonn.de/bonneconlab/en/about/photographs-of-the-lab, accessed 1 December 2025) [14]

static case studies into dynamic platforms. Best practices, such as [Garvin's \(2003\)](#) guided inquiry and [Herreid's \(2007\)](#) structured debriefing, help mitigate cognitive overload ([Sweller, 1994](#)) and align with double-loop learning ([Argyris, 1991](#)).

Group discussions leverage social constructivism ([Vygotsky, 1978](#)) to expose biases and co-create solutions. Psychological safety ([Edmondson, 1999](#)) is pivotal, as teams with open dialogue achieve deeper cognitive engagement and generate more innovative outcomes ([Kayes et al., 2005](#)). Digital tools like virtual whiteboards can enhance this, though effective facilitation is needed to balance participation ([Brookfield, 2017](#)).

These two pillars create a feedback loop, positioning case analysis as a mechanism for both knowledge application and generation. The process typically follows three phases:

- (1) Preparation, where participants analyse cases using frameworks and tools like the *Harvard Business School's Case Study Portal* [20] ([Garvin, 2003](#));
- (2) Active Discussion, where facilitators use techniques like Socratic questioning and role rotation to stimulate critical thinking ([Mtshali et al., 2020](#)); and
- (3) Debriefing and Synthesis, where learnings are codified into best practices using methods like after-action reviews (AARs) ([Kayes et al., 2005](#)).

The effectiveness is driven by key mechanisms: cognitive diversity activation from heterogeneous groups ([Page, 2007](#)); feedback amplification via peer evaluations ([Salas et al., 2009](#)); and behavioural mirroring which fosters leadership skills ([Brookfield, 2017](#)).

This structured approach leads to several empirically validated benefits: enhanced critical thinking, as groups outperform individuals (Kahneman, 2011); accelerated expertise transfer from expert-led discussions ([Ericsson et al., 1993](#)); and cultural empathy building, shown to reduce ethnocentric biases ([Livermore and Soon, 2015](#)) (see [Figure 3](#)).

Collectively, this underscores the significance of Group Discussions, Case Studies, and Best Practices as a distinct and powerful dimension within the Management Laboratory blueprint.

2.1.4 Gamification in real-world and virtual settings. Gamification is an increasingly relevant element within Management Laboratories, defined as the application of game design techniques in non-game contexts to enhance engagement and influence behaviour ([Ahmadi, 2020](#)). Its foundations are rooted in psychology, management and economics, making it an interdisciplinary approach used by managers across various fields, from marketing to

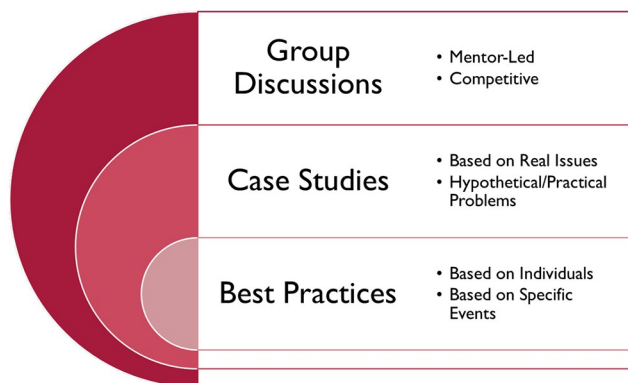


Figure 3. An overview of group discussions, case studies and best practices

Source: Authors' own work

organizational behaviour (Stieglitz *et al.*, 2017). Gamification's core purpose is to use game elements to make tasks more engaging and to improve goal achievement (Deterding *et al.*, 2011). Within Management Laboratories, it is applied in both real-world and virtual settings.

2.1.4.1 Real-world/physical gamification. Physical gamification involves integrating tangible game elements into real-world environments to motivate behavioural change (Deterding *et al.*, 2011; Sharif Ahmadian *et al.*, 2020). The concept's historical roots can be seen in the early 20th century with initiatives like Cracker Jack's use of surprise rewards (Zichermann and Cunningham, 2011) and the Boy Scouts of America's use of physical badges (Huizinga, 1950). Later, loyalty programs like McDonald's Monopoly (Werbach and Hunter, 2020) and workplace productivity boards (Pink, 2009) further developed these principles.

The effectiveness of this approach is supported by key psychological theories, including Self-Determination Theory (Ryan and Deci, 2000), which explains how tangible progress charts or team challenges amplify intrinsic motivators; Operant Conditioning (Skinner, 1965), which demonstrates how reinforcement schedules can shape long-term behaviour patterns; and Flow Theory (Csikszentmihalyi, 1990), which describes how physical challenges can be designed to match skill levels to induce a state of full immersion.

In Management Laboratories, physical gamification offers unique opportunities for hands-on learning. This includes gamified simulations of operational processes, such as warehouse simulations (Hamari *et al.*, 2014), and safety training that uses physical scavenger hunts for hazards (Grech *et al.*, 2024). The MIT Sustainable Urbanization Lab [21] uses a city-scale board game to simulate urban strategies, and leadership development can be conducted in physical Escape Room scenarios (Kayes *et al.*, 2005). Figure 4 provides an example of this in practice.

While beneficial for enhancing team cohesion and reducing screen fatigue, physical gamification presents challenges such as high implementation costs and the risk of over-competition (Deterding *et al.*, 2011; Salas *et al.*, 2009; Salen and Zimmerman, 2004).

2.1.4.2 Virtual-environment gamification. In contrast, virtual-environment gamification uses digital platforms and mobile applications. The term "gamification" itself gained significant popularity starting around 2010, largely driven by the increased interest in internet-based applications. This period saw the proliferation of businesses offering gamification services. Approximately from the same time, major corporations such as SAP, Microsoft, IBM, LiveOps and Deloitte began incorporating gamification into various internal programs and processes with the aim of improving different functional and operational areas. This trend led to the development of numerous management games brought to market by reputable industrial companies like Germany's Siemens and IT companies such as SAP and IBM. Furthermore, specialized companies dedicated to producing serious management and organizational games emerged, providing gamification services globally (Ahmadi, 2018).

Within Management Laboratories, this dimension is a powerful tool for learning and experimentation. It integrates online game elements like points, leaderboards and badges into platforms to enhance employee and consumer engagement (Deterding *et al.*, 2011; Hendijani and Ahmadi, 2024). This approach has a strong conceptual overlap with computer-based simulation, as many simulations are inherently gamified to enhance learning, while many games are designed to simulate real-world situations, directly aligning with the core concept of gamification.

2.1.5 Exhibitions, physical models and mock-ups. Exhibitions, physical models and mock-ups are a fundamental dimension within the Management Laboratory blueprint, providing a tangible interface for complex systems and environments (Longo *et al.*, 2021; Lu *et al.*, 2022). These components enable learners to engage directly with complex organizational scenarios. Physical mock-up units (PMUs), from scale-models to full-size replicas of environments like hospital rooms or factory floors, offer an embodied simulation of real-world



Figure 4. Real-world gamification in practice, “Office olympics” held by Fun Events Asia Co., Ltd in Thailand for team building and competency enhancement (Photo courtesy of Fun Events Asia Co., Ltd, <https://funeventsasia.com/office-olympics/>, accessed 1 December 2025)

contexts. This allows participants to test spatial designs and workflows in a safe setting before full-scale implementation (Longo *et al.*, 2021). Such mock-ups can surface latent design issues that purely digital simulations might miss and foster deep cognitive engagement through tactile interaction (Gerber and Carroll, 2012). For example, physical prototyping studies have shown that users interacting with mock-ups report greater insight into ergonomic and process bottlenecks compared to using only screen-based models (Gerber and Carroll, 2012). In management education, simple materials can effectively replicate production systems; the *Lean Lego Game* [22] has teams assemble and reconfigure miniature assembly lines to internalize lean principles. A *Poka-Yoke Lego* exercise further challenges participants to design error-proof fixtures. Similarly, branded-packaging mock-ups immerse marketing students in the process of product presentation, from concept sketches to prototypes.

Many Management Labs now incorporate prototyping labs and maker spaces, often configured as exhibition-style galleries (Troxler, 2016). These spaces, equipped with tools like three-dimensional (3D) printers and CNC routers, empower cross-disciplinary teams to rapidly materialize ideas, test assumptions and iterate on solutions (Troxler, 2016). The *Segal Prototyping and Fabrication Lab* 23 at Northwestern University is an example where students and faculty translate abstract theories into tangible artefacts. Such exhibition spaces create a “proof-of-concept” environment where hypotheses about organizational processes can be validated in real time. This dimension increasingly converges with the Fab-Lab movement, where ideas become prototypes and prototypes become pilot products for market trials. Similarly, purpose-built innovation labs blend educational objectives with hands-on prototyping, enabling learners to iterate on hardware, software and business models within the same physical environment (Radfar and Bagheri, 2024).

Scientific toys and game-based physical mock-ups represent another form of this dimension. The classic *Beer Game* – available in both physical board-game and digital formats – uses beer cartons to simulate supply chains, illustrating the Bullwhip Effect

(Martinez-Moyano, 2024). More playful enactments use wave amplifiers or spring-toy variants to demonstrate inventory oscillations. Retail-infrastructure mock-ups with shelving systems and point-of-sale displays underpin neuromarketing and consumer-behaviour research. Companies like *Unravel Neuromarketing Research* [24] create physical shelf-layout tests where consumers' eye movements are tracked in simulated supermarket aisles. Similarly, *iMotions* [25] labs integrate mobile eye-tracking, EEG and biometric sensors in mock stores to quantify emotional responses to shelf placement. Even low-tech "mini-market" setups with real products enable rich in-store experiments on visual salience and impulse buying.

Despite their pedagogical power, physical mock-ups also present challenges. High-fidelity mock-up constructions demand substantial investment in space, materials and labour (Lu *et al.*, 2022). This limits their scalability, making them difficult to replicate. Furthermore, if physical constructs lack fidelity, they may convey misleading insights (Longo *et al.*, 2021). Nonetheless, when carefully designed, exhibitions and physical mock-ups are indispensable for translating theoretical frameworks into actionable learning experiences.

2.2 Integrated structure of management laboratory dimensions

Building on the preceding review, Management laboratories can be conceptualized as holistic environments that synthesize multiple pedagogical and research traditions into a coherent construct. Rather than treating simulations, experiments, case discussions, gamification and physical models as discrete tools, MLabs integrate these dimensions into a unified framework designed to advance learning, assessment, research and consulting functions. This integrative perspective highlights MLabs not merely as collections of methods, but as structured ecosystems where digital, behavioural, cognitive and physical elements converge to foster experiential engagement and evidence-based decision-making.

The five dimensions together create a continuum of experiential depth. Computer-based simulations provide structured and scalable models of complex systems, offering predictive insights into organizational dynamics (Banks *et al.*, 2009; Sterman, 1994). Experimental and cognitive-behavioural methods add causal precision, enabling researchers and practitioners to test theories under controlled conditions (Kahneman, 2011; Levine *et al.*, 2023). Group discussions and case-based inquiry situate these experiences within collaborative and socially constructed contexts, amplifying critical reflection and collective problem-solving (Edmondson, 1999; Vygotsky, 1978). Gamification bridges these domains by infusing motivational structures and feedback loops that sustain engagement and adaptive learning (Deterding *et al.*, 2011). Finally, exhibitions and physical mock-ups ground these experiences in tangible, embodied interactions, allowing participants to test designs, prototypes and workflows in realistic settings (Gerber and Carroll, 2012; Longo *et al.*, 2021).

When integrated, these dimensions transform MLabs into adaptive platforms that transcend the limitations of any single methodology. The fusion of digital simulations with behavioural experimentation and physical modelling, for instance, enables multi-layered analysis where theoretical constructs can be observed, tested and iteratively refined. The incorporation of gamified mechanisms ensures sustained participation, while collaborative discussions provide a mechanism for double-loop learning and the codification of best practices (Argyris, 1991; Kayes *et al.*, 2005). This interweaving of methods positions MLabs as a nexus of innovation that balances rigor and relevance, bridging academic inquiry with managerial practice.

Accordingly, an MLab can be defined as a purposefully designed environment that integrates computer-based simulations, behavioural experimentation, collaborative case methods, gamification and physical modelling into a coherent system. Through this synthesis, MLabs create a multi-dimensional space for experiential learning, rigorous

research and applied consulting. By aligning technological, psychological and organizational perspectives, they provide both a conceptual framework and a practical infrastructure for advancing management scholarship and practice in complex and uncertain environments.

2.3 Key functions of management laboratories

In the following, building on the core dimensions, the functions of Management Laboratories are outlined. These functions encompass a variety of academic and organizational needs, including education and development, assessment and talent identification, research and knowledge production, as well as consulting and management-contracting services.

2.3.1 *Education, development, coaching and mentoring.* The educational functions of the Management Laboratory can be traced from two perspectives:

- (1) *Experiential Learning:* Experiential learning is a foundational element, described by Kolb (1984) as a cyclical process of knowledge creation through action, reflection and adaptation. This theory is well-suited for a management lab, which fundamentally serves as an environment for experimenting and testing before real-world situations. Experiential learning theory (ELT) provides a holistic model of the learning process and adult development. The term “experiential” is used to differentiate ELT from cognitive and behavioural learning theories that downplay the role of subjective experience (Kolb *et al.*, 2014). (See Figure 5).
- (2) *Hybridity:* A distinguishing feature of contemporary Management Laboratories is their hybridity. Hybridity refers to the deliberate integration of digital technologies, such as virtual simulations and augmented reality, with physical elements like mock-ups and in-person workshops. This blend aims to create immersive and adaptive environments for learning (Lampropoulos and Kinshuk, 2024). This duality allows participants to engage with managerial challenges through both tactile and digital interfaces, mirroring real-world contexts. For instance, while business simulation platforms can model global supply chain disruptions, physical mock-ups of factory floors can provide hands-on practice in process optimization. Such hybrid designs align with situated learning theory (Lave and Wenger, 1991) and cognitive load theory (Sweller, 1994). Hybrid labs also address the theory-practice gap by enabling iterative testing of strategies; participants might first analyse a case digitally before role-playing stakeholder negotiations in a physical setting. However, hybridity introduces design challenges in balancing technological fidelity with pedagogical simplicity (Christopoulos *et al.*, 2018). This trait is particularly at the forefront of knowledge in fields such as educational administration and educational technology. While the integration of technology in Management Laboratories offers numerous advantages, it is important to consider the potential drawbacks of over-technologization. Excessive reliance on digital platforms may lead to screen fatigue, which can reduce participants’ engagement and cognitive performance over time (Ophir *et al.*, 2009). Furthermore, the emphasis on technology may result in diminished interpersonal interaction, limiting opportunities for face-to-face collaboration and the development of essential social skills (Turkle, 2011). Balancing technological tools with traditional, human-centred approaches is crucial for maintaining the effectiveness of hybrid learning environments.

Management Laboratories function as versatile hubs for fostering managerial expertise across academia and industry. These environments cater to dual audiences: management students and organizational leaders. By integrating simulations, case analyses and reflective exercises, participants navigate cyclical learning processes aligned with Kolb’s experiential learning theory (1984). Faculty and industry experts serve as mentors, guiding learners

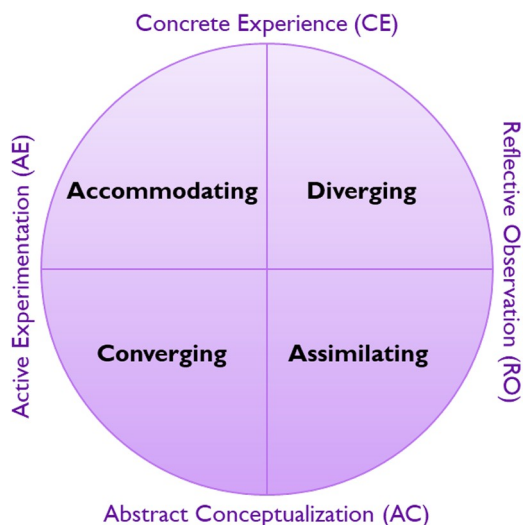


Figure 5. The experiential learning cycle and basic learning styles
Source: Authors’ own work, adapted from Kolb (1984)

through feedback loops and role-playing scenarios that mirror real-world challenges (Edmondson, 1999). Hybrid designs, which blend digital interfaces with physical interactions, further contextualize theoretical knowledge, enabling learners to internalize concepts such as ethical decision-making within controlled settings (Kolb et al., 2014). This dual focus ensures that laboratories serve as bridges between academic rigor and organizational praxis.

2.3.2 *Assessment and talent identification in human resource management.* Management Laboratories provide robust frameworks for modern assessment centres, using their infrastructure to evaluate talent with empirical precision. These labs use behavioural experiments, gamified scenarios and cognitive tasks to measure competencies such as leadership agility and stress resilience. For instance, simulated organizational crises allow evaluators to observe how candidates balance ethical considerations with operational demands, minimizing biases inherent in conventional appraisal methods (Hendijani and Ahmadi, 2024). Technological tools like biometric sensors and AI-driven analytics quantify subtle decision-making patterns, offering HR professionals actionable insights into potential hires or high-potential employees (Salas et al., 2009). By aligning assessment protocols with the labs’ core dimensions, organizations gain access to standardized, scalable evaluations that enhance both fairness and predictive validity in talent management.

In essence, Management Labs differ fundamentally from traditional classrooms by emphasizing praxis – the interplay of theory and practice – to address complex problems in management (Farashahi and Tajeddin, 2018). The Management Laboratory provides a unique environment where management knowledge, skills and experiences can be combined, simultaneously fostering the development of managerial talents (see Figure 6). The Management Laboratory serves as a platform where explicit management knowledge can be transformed into managerial skills; these skills, through practice, evolve into experience, which when tested and refined, contribute to the strengthening of managerial

competencies. Based on these competencies, new knowledge can be generated, and the process is renewed.

2.3.3 Research and new knowledge production. The experimental versatility of Management Laboratories enables cutting-edge research across diverse domains, including behavioural economics, organizational psychology and policy design. Researchers isolate variables in controlled settings to test hypotheses derived from theoretical frameworks such as prospect theory (Kahneman and Tversky, 1979) or attribution theory (Weiner, 1985). Longitudinal studies within these labs validate interventions like nudges to reduce workplace bias or optimize supply chain efficiency, generating insights that transcend laboratory boundaries (Podsakoff and Podsakoff, 2019). Globally, significant funding supports lab-based investigations into managerial decision-making, leadership dynamics and governance challenges, reflecting the growing recognition of experimental methods in advancing evidence-based management practices (Ahmadi *et al.*, 2020; List, 2011). Such research not only enriches academic discourse but also informs policy-making and organizational strategies, underscoring the labs' role as engines of interdisciplinary innovation.

2.3.4 Consulting and management-contracting services. At maturity, Management Laboratories can evolve into strategic partners for organizations, offering end-to-end solutions akin to management clinics. These labs can diagnose organizational ailments like cultural misalignment or operational inefficiencies through tailored simulations and data-driven audits. Multidisciplinary teams, comprising experts in behavioural science, operations and strategy, design and implement improvement initiatives, from gamified training modules to systemic overhauls (Zellmer-Bruhn *et al.*, 2016). For example, policy laboratories model the ripple effects of regulatory changes, enabling governments to anticipate stakeholder responses and mitigate unintended consequences (Ahmadi and Sharif Ahmadian, 2022). By



Figure 6. How the Management Lab supports the multifaceted nature of management

Source: Authors' own work

merging academic rigor with practical consultancy, these labs address complex challenges in both corporate and public sectors, positioning themselves as allies in navigating a volatile business landscape.

Collectively, the functions outlined – education, assessment, research and consulting – underscore the multifaceted value proposition of Management Laboratories. These diverse applications highlight how Management Labs serve as dynamic platforms capable of addressing a wide spectrum of academic and organizational needs. Enabled by the distinct dimensions discussed previously, these key functions form the practical outcomes that an integrated theoretical framework for Management Laboratories must seek to explain and optimize.

3. Conceptual-theoretical framework

Building upon the theoretical foundations discussed, the delineation of core dimensions, and the identification of key functions, below it will be explained the core conceptual-theoretical framework for understanding Management Laboratories. This framework integrates the preceding discussions into a coherent model, serving as a blueprint to explain how the various components of a Management Laboratory collectively enable its diverse purposes. Management Laboratories share conceptual and functional overlap with other types of laboratories found in the scientific world and modern business landscape. As discussed previously in this paper, examples include experimental economics laboratories, behavioural research laboratories, Fab Labs and simulation laboratories, all of which share missions and functions with management and business laboratories. Crucially, the configuration of dimensions and the prioritization of functions within Management Laboratories are guided by academic priorities and organizational and institutional needs.

Our proposed integrative framework conceptualizes the Management Laboratory as a dynamic system where the strategic configuration and interplay of specific dimensions collectively enable the achievement of key functions. [Figure 7](#) visually depicts this model.

The five core dimensions – Computer-Based Simulations and Scenario Design, Experimental and Behavioural Research Methods, Case Studies and Group Discussions, Gamification in virtual and real-world contexts and Physical Models and Mock-Ups – form the foundational inputs of a Management Laboratory. They provide experiential activities, structured data collection and interactive environments consistent with experiential learning ([Kolb, 1984](#)), instructional design ([Gagné, 1985](#); [Merrill, 2002](#)) and traditions of behavioural observation ([Skinner, 1965](#)). These dimensions are overlapping: simulations may incorporate gamified features that enhance engagement ([Deterding et al., 2011](#); [Huotari and Hamari, 2012](#)) while serving as experimental platforms for causal inference ([Shadish et al., 2002](#)). Likewise, case studies and group discussions promote collaborative knowledge-building, aligned with sociocultural learning theory ([Vygotsky, 1978](#)). The four core functions – Education and Development, Assessment and Talent Identification, Research and Knowledge Production and Consulting and Contracting Services – represent the main outputs and value propositions of MLabs. They often intersect, as projects can simultaneously yield publications and inform managerial practice. Their effectiveness depends on the integration of dimensions: gamified tasks enhance motivation and persistence in education ([Ryan and Deci, 2000](#)), while behavioural and experimental paradigms reinforce rigor in assessment and research. From a systems and contingency perspective ([Lawrence and Lorsch, 1967](#)), outcomes are shaped by moderators such as culture, resources, and facilitator expertise. Overall, MLabs emerge as socio-technical systems whose value derives from strategically aligning dimensions, functions, and contextual enablers.

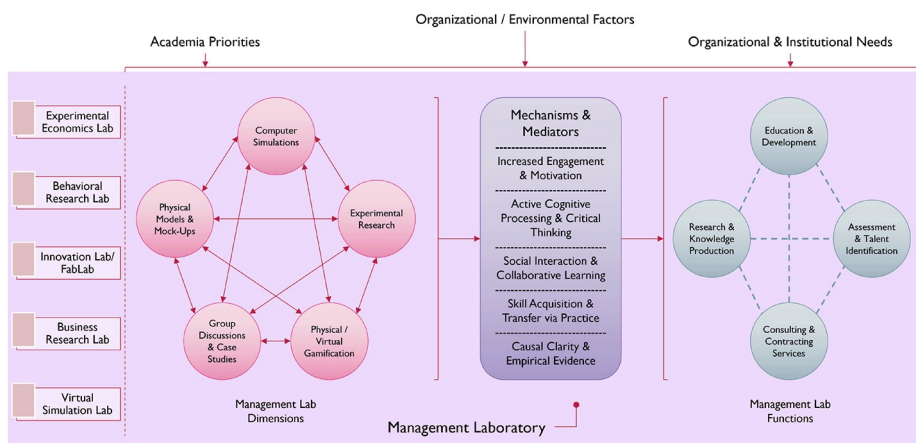


Figure 7. The Management Laboratory blueprint: an integrative conceptual framework linking dimensions and functions

Source: Authors' own work

Based on the proposed model, we outline several key relationships between the core dimensions and the main functions of Management Laboratories, expressed as testable propositions:

- P1. The comprehensiveness and coherent configuration of the five core dimensions within a Management Laboratory are positively related to the overall effectiveness of the laboratory in achieving its stated functions.
- P2. Dimensions that provide high-fidelity simulations and structured data collection (e.g. computer-based simulations, experimental methods) will be strong predictors of the quality and output of the Research and New Knowledge Production function.
- P3. Dimensions emphasizing interaction, feedback and the integration of diverse perspectives (e.g. case studies, group discussions, gamification) will significantly enhance learning outcomes and skill development within the Education, Development, Coaching and Mentoring function.
- P4. Dimensions designed for realistic task performance and direct behavioural observation (e.g. physical models, mock-ups, specific experimental tasks) will be particularly effective in supporting the Assessment and Talent Identification function.
- P5. The flexible combination and integration of multiple dimensions (e.g. simulations, case studies, experiments, gamified scenarios) will play a critical role in enabling the Consulting and management-contracting services function by facilitating problem diagnosis and solution testing.

These propositions suggest concrete pathways for empirical validation in future research. Understanding how and under what conditions these relationships operate is essential for refining the framework. The links are likely mediated by psychological, social and

contextual factors (e.g. motivation, thinking, practice) and moderated by boundary conditions such as organizational factors.

Table 2 provides a systematic mapping of the Management Laboratory dimensions to their corresponding functions by explicitly identifying the mediators and boundary conditions that shape each linkage. Rather than treating mechanisms generically, the table demonstrates how specific mediators – such as increased engagement and motivation, active cognitive processing and critical thinking, social interaction and collaborative learning, skill acquisition and transfer via practice and causal clarity and empirical evidence – operate in distinct pathways. Likewise, the boundary conditions – academia priorities, organizational/environmental factors and organizational and institutional needs – clarify the contextual circumstances under which each mechanism becomes more or less effective. This configuration highlights that the success of Management Laboratories depends not only on the presence of core dimensions but also on the targeted mechanisms they activate and the boundary conditions that enable or constrain their impact.

In conclusion, the proposed conceptual framework provides an integrated theoretical perspective on Management Laboratories by explicitly linking core dimensions to key functions through hypothesized relationships, mediated mechanisms and influencing boundary conditions. It offers a theoretical blueprint for understanding the composition and utility of these complex experiential environments, aiming to unify disparate research streams under a coherent meta-model. This framework not only provides conceptual clarity but also lays the groundwork for future empirical investigations into the specific pathways and contingencies that govern the effectiveness of Management Laboratories in practice.

4. Discussion and conclusion

In the following, while discussing the findings, comparative positioning of the MLab, the most important applications and limitations of the results are presented along with corresponding suggestions.

4.1 Comparative positioning of the management laboratory framework

The proposed Management Laboratory framework intersects with – but is conceptually distinct from – a range of established laboratory paradigms, including Living Labs, Innovation Labs, Design Science approaches, Fab Labs, Policy Labs, Learning Labs and Behavioural/Experimental Economics Laboratories. Living Labs emphasize user-driven co-creation in real-life settings (Hossain *et al.*, 2019), whereas MLabs prioritize structured experiential processes that combine both controlled experimentation and applied managerial learning. Innovation Labs focus primarily on ideation and organizational renewal (Schiuma and Santarsiero, 2023), lacking the integrated multi-method orientation – simulations, cognitive experiments, case discussions and physical mock-ups – that defines MLabs. Design Science research, while rigorous and solution-oriented (Hevner *et al.*, 2004), centres on artefact creation rather than on multi-dimensional talent development or consulting functions embedded in the MLab architecture. Fab Labs and Maker Spaces provide material prototyping infrastructures (Rayna and Striukova, 2021) but do not incorporate behavioural measurement, decision-making analysis or structured managerial assessment. Policy Labs aim to test public-sector interventions through simulation and experimentation (Hinrichs-Krapels *et al.*, 2020), yet their domain remains confined to governance innovation rather than holistic management capability-building. Similarly, Behavioural and Experimental Economics Labs (Falk and Heckman, 2009) offer causal testing environments but typically exclude pedagogical, gamified and consulting-oriented functions. By synthesizing these fragmented traditions, the MLab framework uniquely integrates digital simulations,

Table 2. Mechanisms and boundary conditions for dimension–function relationships

Dimension → function	Key mediators	Boundary conditions	Rationale
Computer-based simulations → education, development, coaching and mentoring	Increased engagement and motivation; active cognitive processing and critical thinking; skill acquisition and transfer via practice	Organizational/ environmental factors; organizational and institutional needs	Simulations increase motivation, stimulate cognitive processing and provide repeated practice; effectiveness depends on supportive infrastructure and organizational alignment
Computer-based simulations → assessment and talent identification	Skill acquisition and transfer via practice; causal clarity and empirical evidence	Academia priorities; organizational and institutional needs	Simulations allow direct observation of skills and generate clear empirical data; outcomes depend on academic evaluation standards and institutional needs
Computer-based simulations → research and new knowledge production	Causal clarity and empirical evidence; active cognitive processing and critical thinking	Academia priorities; organizational/ environmental factors	Simulations produce controlled evidence and foster critical analysis; effectiveness relies on research priorities and methodological resources
Computer-Based simulations → consulting and management-contracting services	Causal clarity and empirical evidence; increased engagement and motivation	Organizational/ environmental factors	Simulations test solutions and provide evidence for decision-making; moderated by client needs and organizational capacity
experimental, behavioural and cognitive methods → education, development, coaching and mentoring	active cognitive processing and critical thinking; increased engagement and motivation	Academia priorities; organizational/ environmental factors	Experimental tasks activate analytical thinking and maintain motivation; success depends on academic orientation and environmental support
Experimental, behavioural and cognitive methods → assessment and talent identification	Causal clarity and empirical evidence; skill acquisition and transfer via practice	Academia priorities; organizational and institutional needs	Experiments yield causal clarity and observable skill transfer; outcomes depend on institutional criteria and assessment goals

(continued)

Table 2. Continued

Dimension → function	Key mediators	Boundary conditions	Rationale
Experimental, behavioural and cognitive methods → research and new knowledge production	Causal clarity and empirical evidence; active cognitive processing and critical thinking	Academia priorities; organizational/ environmental factors	Experiments generate robust causal evidence and critical insights; effectiveness shaped by research focus and methodological infrastructure
Experimental, behavioural and cognitive methods → consulting and Management-Contracting services	Causal clarity and empirical evidence; skill acquisition and transfer via practice	Organizational and institutional needs; organizational/ environmental factors	Experimental results provide actionable evidence for consulting; impact depends on organizational requirements and resources
Case studies and group discussions → education, development, coaching and mentoring	Social interaction and collaborative learning; active cognitive processing and critical thinking	Organizational/ environmental factors; organizational and institutional needs	Case discussions enable collaborative learning and critical reflection; contingent on cultural support and institutional facilitation
Case studies and group discussions → assessment and talent identification	Social interaction and collaborative learning; skill acquisition and transfer via practice	Academia priorities; organizational and institutional needs	Peer interaction and observation foster accurate assessment; effectiveness depends on academic and organizational priorities
Case studies and group discussions → research and new knowledge production	Active cognitive processing and critical thinking; causal clarity and empirical evidence	Academia priorities	Case-based inquiry stimulates analytical insights and generates contextual evidence; moderated by academic research agendas
Case studies and group discussions → consulting and management-contracting services	Social interaction and collaborative learning; causal clarity and empirical evidence	Organizational and institutional needs; organizational/ environmental factors	Case methods provide diagnostic clarity and foster collective solution-finding; success relies on client needs and organizational openness

(continued)

Table 2. Continued

Dimension → function	Key mediators	Boundary conditions	Rationale
Gamification → education, development, coaching and mentoring	Increased engagement and motivation; skill acquisition and transfer via practice	Organizational/ environmental factors; organizational and institutional needs	Gamification boosts engagement and persistence while offering practice opportunities; moderated by cultural fit and institutional resources
Gamification → assessment and talent identification	Increased engagement and motivation; causal clarity and empirical evidence	Academia priorities; organizational/ environmental factors	Gamified assessments increase participation and generate empirical data; acceptance depends on academic standards and environmental context
Gamification → research and new knowledge production	Increased engagement and motivation; causal clarity and empirical evidence	Academia priorities; organizational/ environmental factors	Gamified approaches support research by enhancing participation and producing evidence; outcomes depend on research priorities and infrastructure
Gamification → consulting and management-contracting services	Increased engagement and motivation; social interaction and collaborative learning	Organizational and institutional needs; organizational/ environmental factors	Gamification facilitates team engagement and collaborative problem-solving in consulting; moderated by organizational culture and resources
Physical models and mock-ups → education, development, coaching and mentoring	Skill acquisition and transfer via practice; active cognitive processing and critical thinking	Organizational/ environmental factors; organizational and institutional needs	Physical models create hands-on environments for practicing and developing skills; effectiveness relies on available infrastructure and institutional priorities
Physical models and mock-ups → assessment and talent identification	Skill acquisition and transfer via practice; causal clarity and empirical evidence	Academia priorities; organizational and institutional needs	Mock-ups allow realistic performance assessment and produce empirical evidence; moderated by institutional needs and academic criteria

(continued)



Table 2. Continued

Dimension → function	Key mediators	Boundary conditions	Rationale
Physical models and mock-ups → research and new knowledge production	Causal clarity and empirical evidence; active cognitive processing and critical thinking	Academia priorities; organizational/ environmental factors	Physical models provide realistic contexts for generating evidence and critical insights; outcomes shaped by academic goals and environmental support
Physical models and mock-ups → consulting and management-contracting services	Skill acquisition and transfer via practice; causal clarity and empirical evidence	Organizational and institutional needs; organizational/ environmental factors	Models and mock-ups enable practical solution testing and demonstration of evidence-based practices; moderated by organizational needs and resource constraints

experimental and cognitive methods, collaborative case inquiry, gamification mechanisms and physical modelling within a unified socio-technical system. This breadth enables MLabs to simultaneously support education, assessment, research and consulting – offering a more comprehensive platform than existing specialized laboratory paradigms.

4.2 Theoretical implications

Management Laboratories represent a significant, albeit complex, evolution in the methodologies available for management research, education, and practice. Originating from diverse historical roots in natural sciences, military simulations and behavioural studies, and shaped by pedagogical and technological advancements, these environments have emerged as multifaceted platforms. However, despite their growing adoption and the array of activities conducted within them – encompassing computer-based simulations, experimental methods, case analyses, gamification and physical models – a unified, integrative theoretical framework has been notably absent in the existing literature. This fragmentation has hindered a systematic understanding of their composition, underlying mechanisms and potential to serve various functions effectively. This paper aimed to address this critical gap by proposing such a framework.

The core contribution of this research is the conceptual-theoretical framework, which serves as a blueprint for understanding Management Laboratories as dynamic systems. This framework explicitly links the five core dimensions (Computer-Based Simulations and Scenario Design; Experimental, Behavioural and Cognitive Research Methods; Case Studies, Best Practices and Group Discussions; Gamification in Virtual and Real-World Settings; and Exhibitions, Physical Models and Mock-Ups) to the four key functions they enable (Education, Development, Coaching and Mentoring; Assessment and Talent Identification in HR Management; Research and New Knowledge Production; and Consulting and Management-Contracting Services). Acknowledging the complexity, the framework further posits that these links are influenced by various psychological, social, and contextual mechanisms and mediators, and are contingent upon specific boundary conditions.

Importantly, the framework contributes to established theory by integrating and extending multiple foundational perspectives. For instance, it operationalizes Kolb's (1984) experiential learning cycle by showing how simulations, gamification and physical models can move learners across the stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation. At the same time, it extends this model by incorporating outcomes beyond individual learning – such as talent assessment and consulting functions – which broaden the scope of experiential learning in management contexts. Similarly, by emphasizing mechanisms such as engagement and motivation, the framework connects directly to self-determination theory (Ryan and Deci, 2000) and goal-setting theory (Locke and Latham, 2013), highlighting how Management Laboratories can sustain intrinsic motivation while structuring performance feedback loops.

The framework also helps reconcile contradictions in the literature. Research on management education has sometimes framed simulations and experiments as rigorous but overly narrow methods, contrasted with case discussions or group learning, which emphasize social and contextual richness (Brookfield, 2017; Lave and Wenger, 1991; Vygotsky, 1978). By demonstrating that these dimensions are not mutually exclusive but instead overlapping and complementary, the framework offers a systematic rationale for multi-method environments. This integration clarifies how Management Laboratories can simultaneously activate cognitive mechanisms of critical thinking, promote collaborative learning and generate causal clarity through experimentation.

Moreover, the framework introduces new conceptual variables and relationships into established bodies of theory. Instructional design perspectives (Merrill, 2002) are enriched through the explicit incorporation of boundary conditions such as academic priorities, organizational cultures, and institutional needs, which clarify when and why particular instructional strategies are most effective. Gamification research, which often highlights engagement as a primary outcome (Deterding *et al.*, 2011), is advanced here by demonstrating its dual role in both enhancing motivation and providing structured behavioural data that can serve assessment and research functions. Similarly, the inclusion of consulting and management-contracting services as functions extends the implications of experiential and sociocultural learning theories (Lave and Wenger, 1991) beyond education into organizational problem-solving and policy testing.

To illustrate these theoretical linkages in a systematic manner, Table 3 presents a matrix mapping each dimension to its potential functions, together with illustrative examples drawn from the literature and practice. This matrix not only exemplifies the overlapping and interconnected nature of the dimensions and functions but also provides a tangible basis for empirical testing of the propositions embedded in the framework.

4.3 Practical implications

Beyond academic inquiry, the proposed framework holds significant practical implications for both academia and industry, offering crucial implementation guidelines. For academic institutions and business schools, the framework serves as a guide for strategically designing and investing in Management Laboratories. Instead of adding dimensions in a piecemeal fashion, institutions can configure their labs based on the specific functions they aim to prioritize (e.g. emphasizing experimental setups and data analysis tools for a research-focused lab, or investing in versatile simulation platforms and collaborative physical spaces for an education-focused lab). The framework underscores the need for appropriate investment in facilitator training, recognizing the critical role of human guidance in leveraging dimensions like case discussions or gamified scenarios effectively (Brookfield, 2017; Holder *et al.*, 2020). Furthermore, it suggests that the value of a Management Lab is maximized when different dimensions are integrated, creating hybrid environments that offer richer experiential learning opportunities (Durham and Kenyon, 2019).

In the following, the practical applications of Management Laboratories are elaborated across two distinct contexts – higher education and organizational/industry settings – to illustrate how their design and implementation may vary depending on priorities, resources and intended outcomes:

- (1) *Higher education context.* In universities and business schools, Management Laboratories can be designed to reinforce research capacity and experiential pedagogy. For instance, labs can integrate experimental methods to train students in research design, apply gamification to enhance engagement in theoretical courses, or use simulations to explore system-level concepts such as supply chains or financial markets. The framework highlights that academic labs should align their design with scholarly objectives, such as producing publications, generating evidence for teaching innovations or supporting doctoral training. In this context, long-term outcomes like skill development, research productivity and knowledge dissemination are central, and the boundary conditions are shaped by academic priorities, faculty expertise, and the technological infrastructure of the institution.
- (2) *Corporate training and industry context.* In contrast, organizations and firms can apply the framework to design Management Laboratories with a focus on

Table 3. Management laboratory dimensions and functions matrix with illustrative examples

Dimensions / functions	Education, development, coaching and mentoring	Assessment and talent identification	Research and new knowledge production	Consulting and management-contracting services
Computer-based simulations and scenario design	Strategic decision-making training, process understanding (supply chain, ops), crisis training, financial modelling sims, entrepreneurship venture sims	Evaluating decision-making under pressure, strategic thinking, scenario reactions, assessing entrepreneurial strategy	Testing system dynamics, decision biases, complex phenomena models, supply chain dynamics (bullwhip effect sims), policy impact modelling	Policy modelling, operational diagnosis, strategy testing, financial risk assessment sims, optimizing supply chain operations via simulation
Experimental, behavioural and cognitive research methods	Learning research methods, understanding behavioural principles via participation, teaching behavioural finance, experimental game theory (negotiation)	Competency measurement via controlled tasks, objective behavioural data (sensors), bias reduction, evaluating negotiation behaviour, assessing risk-taking for entrepreneurship	Establishing causality, testing theories (e.g. prospect theory), precise measurement, studying investor behaviour, trust in supply chains, biases in KM	Diagnosing behavioural issues, testing intervention effectiveness (e.g. nudges), experimentally evaluating KM adoption, testing policy messaging
Group discussions, case studies and best practices	Critical thinking, framework application (e.g. SWOT), communication/team skills, collaborative problem-solving, analysing financial crises, supply chain disruptions, KM implementation, policy development cases	Evaluating analysis, group dynamics, communication, leadership during discussion, assessing financial/supply chain problem-solving, KM sharing behaviours, pitching entrepreneurial ideas, analysing policy debates	Exploring group behaviour, decision processes, bias identification (e.g. gender bias), studying group decision-making in crises, KM creation/sharing processes, entrepreneurial team dynamics	Collaborative diagnosis, generating context-specific solutions, team problem-solving, diagnosing financial/supply chain/KM issues, entrepreneurial ecosystem analysis, policy stakeholder dialogue
Gamification (virtual and real-world)	Enhancing engagement and motivation, skill practice, immersive learning (e.g. escape rooms), gamified financial literacy, supply chain games, KM engagement games, entrepreneurial contests	Evaluating performance/behaviour in game contexts, using scores/leaderboards, assessing risk tolerance (finance), supply chain coordination, KM sharing behaviour, creativity/resilience (entrepreneurship), negotiation (policy games)	Studying impact of game elements on behaviour/motivation, testing related theories, studying saving behaviour, cooperation in supply chains, KM contribution, risk-taking (entrepreneurship)	Designing interventions for behaviour change, enhancing engagement in initiatives, gamifying financial wellness, supply chain performance, KM system adoption, innovation challenges, policy feedback
Exhibitions, physical models and mock-ups	Tangible/emodied learning (e.g. Lego, PMUs), prototyping skills, tactile concept demos (e.g., beer game), physical models of financial instruments, supply chain flows, KM processes, prototyping physical products (entrepreneurship)	Evaluating practical/physical task performance, spatial reasoning, physical team coordination, assessing understanding of financial models, ability to optimize supply chain layouts, user interaction with KM interfaces, physical prototyping skills	Studying human-product interaction, consumer behaviour (e.g. retail mock-ups), physical prototyping processes, ergonomics, studying interaction with financial product models, spatial decision-making (supply chain), KM tool usability, prototyping user experience (entrepreneurship), public perception of policy visualizations	Testing physical layouts/workflows (e.g. PMUs), prototyping tangible solutions (e.g. maker/fab labs), diagnosing physical process issues, designing layouts for financial institutions/supply chains, prototyping physical products, presenting policy options via exhibitions

immediate, actionable outcomes such as employee development, talent assessment, and strategic problem-solving. For example, physical mock-ups can be deployed for operational training in manufacturing or logistics, gamified assessments can be used to evaluate leadership potential or teamwork under pressure, and simulations can be customized to test crisis response or market entry strategies. Unlike academia, where the emphasis is on knowledge generation and cumulative learning, corporate laboratories prioritize efficiency, return on investment, and alignment with pressing organizational needs. Here, the boundary conditions include resource constraints, organizational culture and client objectives, which determine the design and scope of laboratory activities.

For organizations in industry more broadly, the framework highlights the potential of Management Laboratories as powerful tools for employee development, talent assessment, strategic problem-solving and organizational change initiatives. Companies can use the framework to design internal experiential programs or select external Management Lab providers that align with their specific needs and desired outcomes. Implementation guidelines should emphasize clearly defining objectives, selecting dimensions and methodologies appropriate for the target audience and goals (e.g. using physical mock-ups for operational training, virtual simulations for leadership strategy or gamified assessments for talent identification), and integrating Management Lab activities into broader HR and strategy processes. Policies within organizations should support the use of Management Lab insights for data-driven decision-making and foster a culture of continuous learning and experimentation. The overlap of Management Laboratories with concepts like corporate universities, innovation hubs and R&D centres suggests potential for synergy and integrated strategic approaches within organizations.

In light of the rise of digital and data-driven simulations, it is important to briefly address the ethical implications of such technologies. Specifically, data privacy, informed consent, and the potential misuse of data in decision-making processes should be carefully considered. Furthermore, the increasing reliance on simulations to inform policy or business decisions raises concerns about the accuracy and transparency of the models used. Ethical oversight and regular audits of digital simulations are necessary to ensure that these tools are used responsibly and do not unintentionally perpetuate biases or lead to unfair outcomes.

4.4 Limitations and future research directions

Methodologically, researching Management Laboratories presents unique challenges. Evaluating the effectiveness of a multifaceted Management Lab configuration requires complex research designs that can capture the impact of multiple interacting dimensions simultaneously, moving beyond studies focusing on single methods like simulations or case studies in isolation ([Ahmadi and Hendijani, 2023](#)). Longitudinal studies are needed to understand the long-term impact of Management Lab participation on skill development, career progression and organizational change. Developing standardized metrics for assessing outcomes across diverse functions and different Management Lab designs is also a methodological imperative. Furthermore, innovative research methods may be needed to capture the dynamics of hybrid (physical-virtual) environments and measure the impact of subtle mechanisms like behavioural mirroring or cognitive diversity activation within group settings ([Mtshali et al., 2020](#); [Page, 2007](#)). Methodological guidelines for conducting rigorous research within Management Labs, as well as using Management Labs as a method

Table 4. Suggested empirical validation methods for the Five propositions

Proposition	What it claims	Suitable validation methods	Example research designs
<i>P1</i> – Coherent configuration of Five dimensions → overall effectiveness	Configurational completeness improves lab performance + Simulation + experimentation improve research rigor	Case study, comparative case analysis, SEM, fs/QCA	Comparing institutions with different lab architectures; modelling dimension–outcome relationships
<i>P2</i> – High-fidelity simulations and experimental methods → better research outcomes	Social and feedback-rich methods improve learning	Experimental designs, mixed-methods, bibliometric/output analysis	Controlled experiments using simulations; tracking research output quality
<i>P3</i> – Interaction-rich dimensions (case study, discussion, gamification) → stronger learning outcomes	Embodied/realistic tasks enhance talent identification	SEM, learning analytics, longitudinal field studies	Measuring learning gains over repeated MLab participation
<i>P4</i> – Physical models and mock-ups → more accurate assessment	Integrated labs support diagnosis and solution testing	Assessment centre studies, observational coding, quasi-experiments	Comparing physical-task vs digital-task evaluations
<i>P5</i> – Hybrid combinations of dimensions → enhanced consulting value		Design-based research, action research, intervention studies	Iterative prototyping of solutions for organizations

for broader organizational research, need to be further developed and disseminated (List, 2011; Podsakoff and Podsakoff, 2019).

Based on the proposed framework and the identified gaps, we offer several recommendations for future empirical and conceptual studies. Future empirical research should prioritize testing the core propositions of the framework, investigating the causal links between different dimension configurations (e.g. high-tech vs low-tech labs, research-focused vs education-focused designs) and their impact on specific functions. Studies using advanced statistical techniques, such as structural equation modelling or regression analysis, can test the direct relationships. Experimental or quasi-experimental designs are needed to isolate the effects of specific dimensions or the presence of particular mediators or boundary conditions. Qualitative research, such as in-depth case studies of established Management Laboratories, can provide rich insights into the complex interplay of dimensions and the lived experience of facilitators and participants, complementing quantitative validation efforts. Conceptual studies are needed to refine the theoretical underpinnings of the framework, potentially incorporating insights from embodied cognition to better understand physical dimensions, or advancing theories of technology-enhanced learning in the context of virtual and hybrid environments. Future research should also explore the potential for Management Laboratories to address grand challenges in business and society by designing simulations and scenarios related to sustainability, ethical leadership or crisis response, and studying the resulting decision-making processes and outcomes. The outlook for future developments in Management Laboratories is bright, driven by technological advancements, evolving learning theories, and the increasing demand for evidence-based, experiential approaches to management challenges.

Building on these methodological considerations, it is also useful to provide a structured overview of potential empirical pathways for validating the propositions introduced in the conceptual framework. To facilitate empirical examination of the five propositions derived from the proposed Management Laboratory framework, Table 4 summarizes suitable research designs that can be used in future studies. These include qualitative approaches (e.g. case studies and comparative lab analyses), quantitative analytics (e.g. structural equation modelling), experimental and quasi-experimental designs, as well as design-based research for iterative intervention testing. This mapping provides researchers with a structured set of methodological pathways for validating the theoretical model across different institutional and organizational contexts.

In addition to these methodological limitations, several practical constraints should be acknowledged. The successful establishment and operation of Management Laboratories often depend on organizational readiness, as institutions lacking a supportive culture or strategic vision may struggle to integrate such initiatives effectively. Similarly, the expertise of faculty and facilitators plays a decisive role, because even advanced laboratory designs require skilled human guidance to translate dimensions into meaningful outcomes. Budgetary considerations are another limiting factor, given the costs associated with technological infrastructure, physical mock-ups, or simulation platforms. Finally, institutional support is essential for sustaining Management Laboratories over time, as alignment with organizational priorities and long-term investment significantly influence their impact. Recognizing these constraints enhances the utility of the framework for practitioners by clarifying the real-world conditions under which Management Laboratories are most likely to succeed.

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