



From Senge to Silicon: A Critical Review of Learning Organizations Theory in an AI-Driven World

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ABSTRACT

This paper critically examines Peter Senge's learning organization theory and its relevance in today's complex, AI-driven world. Employing a mixed-methods approach to analyze the theory's core assumptions, concepts, and prescriptive elements. The research aims to assess the theory's strengths and limitations in the face of contemporary challenges, specifically the impact of rapid technological advancements, globalization, and increasing uncertainty. While the learning organization framework offers a valuable paradigm for organizational development, research identifies gaps in addressing contemporary realities. Specifically, the paper explores the theory's adaptability to the rise of artificial intelligence and its impact on organizational learning processes, revealing how AI integration both facilitates and challenges traditional learning dynamics. By highlighting these limitations and presenting empirical findings on AI's influence, the study proposes avenues for theoretical refinement to enhance the learning organization concept for scholars and practitioners navigating the complexities of the modern organizational landscape. It contributes to a more nuanced understanding of how organizations can effectively learn and adapt in the 21st century.

Keywords

Learning organizations theory, Mixed-methods research, Critical theory, Theoretical refinement.

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1. Introduction

The rapid proliferation of artificial intelligence (AI) has fundamentally altered the business landscape, introducing unprecedented opportunities and challenges for organizational learning. While AI enables data-driven insights, predictive analytics, and automated decision-making, it also demands agility and redefined learning paradigms. Peter Senge's theory of learning organizations, a long-standing cornerstone for understanding organizational adaptation through systemic learning, may not fully address these new realities. Specifically, the increasing integration of AI into organizational processes raises a critical question: to what extent does Senge's foundational framework remain relevant and sufficient in guiding organizational learning in this AI-dominated era? This study critically evaluates the enduring relevance of Senge's theory in this context. It interrogates whether core concepts such as "systems thinking" and "shared vision" retain their utility when AI reshapes knowledge acquisition, collaboration, and adaptability. Critics like [Hsu and Lamb \(2020\)](#) argue that Senge's model risks reducing learning to a superficial, process-oriented ideal, ill-equipped to navigate the complexities of AI-driven systems, including algorithmic bias and real-time data flux. Similarly, [Caldwell \(2012\)](#) highlights gaps in the explanations of modern organizational structures—now increasingly decentralized and AI-integrated—that challenge Senge's original prescriptions. Therefore, the central concern of this research is to examine the continued applicability and limitations of Senge's theory amid pervasive AI adoption and to explore how it might be adapted or supplemented to effectively guide organizational learning in this evolving landscape. This research aims to provide a comprehensive and critical evaluation of Peter Senge's theory of learning organizations. The study not only identifies the theory's strengths and weaknesses and determines the barriers to its implementation but also offers practical recommendations for improving and developing the theory. The findings of this research can assist researchers, managers, and policymakers in management and organizational development in gaining a deeper understanding of learning organizations and in using them to enhance organizational performance. The study concludes with actionable recommendations for evolving Senge's framework, advocating for hybrid models that integrate AI's analytical strengths while preserving human creativity and ethical governance. By bridging decades-old theory with Silicon Valley innovation, this work equips researchers and practitioners to reimagine learning organizations as adaptive, ethically grounded entities in the AI age.

2. Literature review

2.1. Theoretical foundations of the research

Critique, a powerful tool for analyzing and evaluating ideas and theories, has deep roots in the history of human thought. From antiquity to the present, critique has played a pivotal role in fields such as philosophy, literature, and the social sciences. Philosophers like Kant, Feuerbach, and Marx have significantly contributed to the development and deepening of this concept. Critique has always been recognized as a dynamic and multifaceted process that not only evaluates but also recreates and transforms knowledge (Adler et al., 2007).

The critique of management theories is not limited to examining theoretical aspects but also assesses their practical and applied dimensions. In fact, critique is used to evaluate and improve management theories and models. Critiquing research theories based on their ontological, epistemological, and methodological foundations is a complex issue that has been explored in various disciplines. It is referred to as paradigmatic critique .

Given the widespread influence of the learning organization theory in management and the emergence of new technologies such as artificial intelligence and machine learning, this theory has been selected as a key topic for in-depth critique and analysis. This research aims to examine the alignment of this theory with contemporary organizations' needs and to identify strategies to strengthen organizational learning in the digital age.

2.2. Evaluating theories through the lens of Bacharach

Bacharach (1989) offers a framework for evaluating theories, structured as a matrix. This matrix (table 1) is organized around two primary criteria: falsifiability and utility. Falsifiability, the capacity of a theory to be disproven through empirical testing, is assessed via measurement issues, construct validity, and logical and empirical adequacy, applied across variables, constructs, and relationships. Utility, the practical value and applicability of a theory, is evaluated through variable and construct scope, and explanatory and predictive adequacy.

Table 1. Criteria for evaluating theory

Variables Constructs Relationships	Falsifiability		Utility	
	Measurement Issues		Variable scope	
	Construct validity		Construct scope	
	Logical adequacy		Explanatory potential	
	Empirical adequacy		Predictive adequacy	

- **Measurement Issues:** Concerns the accurate and reliable measurement of variables. Addresses how variables are operationalized and whether they truly reflect the intended construct.
- **Construct Validity:** Focuses on whether the constructs themselves are valid. It includes convergent validity (different measures of the same construct correlate) and discriminant validity (the construct is distinct from other constructs).
- **Logical Adequacy, Empirical Adequacy:** These relate to the relationships between constructs and variables. Logical adequacy assesses the clarity and non-tautological nature of the propositions. Empirical adequacy assesses whether the relationships can be operationalized and empirically tested.
- **Variable Scope:** Concerns the breadth of the variables used. Do they adequately capture the full domain of the construct they are intended to measure? A variable with limited scope may not fully represent the construct, thus limiting the explanatory power of the theory.
- **Construct Scope:** Similar to variable scope, but at the construct level. Does the construct adequately capture the phenomenon it's intended to represent? A construct with limited scope will restrict the theory's ability to explain the broader phenomenon.
- **Explanatory Potential, Predictive Adequacy:** These relate to the utility of the theory. Explanatory potential concerns the theory's ability to account for the existence of relationships. Predictive adequacy concerns the theory's ability to accurately predict outcomes. A useful theory should both explain and predict.

2.3. Evaluating theories through the lens of Thomas and Tymon

Thomas and Tymon (1982) proposed a framework for evaluating management theories that encompasses the following criteria:

- **Descriptive Relevance:** A sound theory should accurately and comprehensively describe phenomena within organizations. In other words, it should be able explaining the fundamental characteristics and nature of the phenomenon under investigation.
- **Goal Relevance:** A theory should be designed to enable the prediction and creation of desirable organizational changes. That is, the theory's dependent variables should align with managerial objectives.
- **Operational Validity:** A robust theory should be practically applicable and can guide decision-making and the design of organizational interventions. In essence, it should be transformable into practical tools and methods.
- **Non-obviousness:** A theory should present novel ideas and insights that extend beyond existing knowledge in the field. In other words, it should answer unanswered questions and deepen our understanding of the phenomenon under study. Moreover, it should effectively explain the complexities inherent in organizational environments.
- **Timeliness:** A sound theory should be relevant to contemporary organizational issues and challenges and applicable to addressing problems and opportunities in the dynamic business environment.

2.4. Evaluating theories through the lens of Weick

Weick (1989) proposed a set of criteria for evaluating theories that emphasize their cognitive and philosophical aspects. This approach includes the following criteria:

- **Cognizance of the Subject Matter:** A robust theory should define the subject matter precisely and clearly, delineating the boundaries of the research.
- **Non-linear and Iterative Progress:** The development of theories is not necessarily linear and often involves revisiting and refining previous ideas. Strong theories account for this complexity in the development process.
- **Creativity and Systematicity:** A good theory should not only be innovative and address new questions but also possess a logical and coherent structure

2.5. *Evaluating theories through the lens of Klimoski*

Klimoski (1991) introduced a comprehensive framework for assessing the quality of organizational theories. This framework comprises 14 primary criteria that any theory must meet to establish scientific credibility. These criteria can be examined as follows:

- **Phenomenon of Interest:** Clearly and concisely define the research focus, capturing the reader's attention within the domain of interest.
- **Units of Analysis:** Explicitly state the relevant units of analysis (e.g., individuals, groups, organizations).
- **Boundary Conditions:** Identify the limitations and scope of the theory.
 - **Temporal:** Specify the time frame within which the theory is expected to hold.
 - **Contextual:** Define the specific contexts or situations where the theory is applicable.
 - **Unit-specific:** Clarify the types of units to which the theory applies.
- **Assumptions:** Clearly articulate the theory's underlying assumptions and provide logical or empirical justification for each.
- **Theoretical Constructs:**
 - Clearly define all central constructs (causes, processes, outcomes).
 - Provide comprehensive and unambiguous definitions for each construct.
 - Offer evidence (empirical or logical) for the validity of each construct.
 - Specify criteria for falsifying the validity of each construct.
 - Justify the scope and boundaries of each construct's domain.
- **Theoretical Variables:** Identify observable indicators (variables) for each construct facilitate operationalization and empirical testing.
- **Propositions:**
 - Explicitly state the relationships between constructs, including the direction and strength of these relationships.
 - Clearly indicate whether relationships are contingent upon specific conditions.
- **Propositions Illustrated:** Utilize examples, diagrams, or other visual aids to enhance understanding and clarify the relationships between constructs.
- **Logical Adequacy:**
 - Ensure propositions are not tautological (self-evident).
 - Clearly specify whether antecedent conditions are necessary, sufficient, or both, for the predicted consequences.
- **Underlying Processes:** Explain the mechanisms and processes that link constructs, providing a deeper understanding of the "why" behind the proposed relationships.
- **Hypotheses:** Derive testable hypotheses from the propositions, stating the expected relationships between variables.
- **Value of New Theory:**

- Demonstrate the unique contribution of the theory by comparing it to existing theories in the literature.
- Clearly articulate how the new theory advances knowledge and addresses existing limitations.
- Overall Quality:
 - Ensure flawless internal logic and consistency throughout the theory.
 - Acknowledge and incorporate relevant literature.
 - Verify the accuracy and currency of all factual statements.
 - Maintain high standards of writing and presentation.
- Criteria for Retention:
 - Interesting: The theory should challenge existing assumptions and offer novel insights.
 - Relevant: The theory should address the concerns and interests of the intended audience.
 - Useful: The theory should have practical implications and guide meaningful action for researchers and practitioners.
 - Market Test: The theory should undergo iterative refinement through feedback and critical evaluation from the relevant scholarly community.

2.6. *Learning organizations theory*

The concept of learning organizations has been widely discussed but lacks a singular, universally agreed-upon definition (Örtenblad, 2019). Researchers have proposed various interpretations, emphasizing supportive learning cultures, continuous transformation, and sustainable development. As Dodgson (1993) notes, learning organizations are those that consciously adopt structures and strategies to foster learning at all levels (Ellinger et al., 1999). Flexible and dynamic structures, entrepreneurial cultures, and supportive leadership characterize these organizations.

Many researchers underscore the significance of systems thinking in learning organizations. Senge (2006), and Marquandt and Reynolds (1994) argue that learning in these organizations occurs not merely at the individual level but throughout the entire organizational system. Gerard (2008) offers a comprehensive view, describing learning organizations as environments that embrace change, encourage experimentation, learn from mistakes, and reward learning at all levels.

Table 2. Definition of a learning organization

Definition of a learning organization	Author(s)
A learning organization possesses a supportive culture and structure that enable learning systems throughout the organization to continuously adapt and innovate, fostering sustainable development in complex and uncertain environments.	(Bui, 2019)
Emphasizes the role of collective employee learning in enhancing organizational performance.	(Yeo, 2006)
Organizations that consciously adopt structures and strategies to encourage learning at all levels.	(Okeeffe, 2002)
An organization where people continually expand their capacity to create the results, they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspirations ¹ are set free, and where people ² learn continuously how to learn together.	(Senge, 2006)
Where learning is ongoing and embedded, changing the very nature of the organization itself.	(Reynolds and Ablett, 1998)
A learning organization must acquire, share, and use knowledge so that its members can work together to change how the organization responds to challenges. Individuals must question old, socialized, and entrenched ways of thinking. Learning must occur and be supported in larger teams and groups where individuals can co-create new knowledge. And this process must be ongoing as becoming a learning organization is an endless journey.	(Marsick and Watkins, 1996)
An organization that continuously becomes more intelligent in an endless cycle. Organizational intelligence is constantly increasing.	(Hitt, 1995)
Learning organizations are those in which the entire organizational system focuses on learning.	(Marquardt and Reynolds, 1994)
Learning organizations are generally described as those that continuously learn, grow, and share knowledge about markets, products, technologies, and business processes.	(Slater and Narver, 1994)
Organizations that purposefully adopt structures and strategies that encourage learning.	(Dodgson, 1993)
A learning organization is skilled at creating, acquiring, and transferring knowledge, and modifying its behavior to reflect new knowledge ¹ and insights.	(Garvin, 1993)

As shown in Table 2, definitions of the learning organization vary considerably, emphasizing different aspects such as knowledge creation, collective learning, and supportive organizational structures.

The concept of a learning organization has been defined in various ways. While some definitions emphasize the organization's ability to create, acquire, and transfer knowledge, others underscore the importance of individual and collective learning. Still others focus on the organizational structures and cultures that facilitate learning. A significant portion of the discourse on organizational learning and the construction of learning organizations is essentially descriptive, with authors more inclined to provide metaphorical descriptions of learning organizations than to offer operational details (Talbot et al., 2015). Consequently, there has been limited attention to how to create a learning organization in terms of a framework for action or practical steps. Except Ellinger and others (1999), the literature has tended to be highly abstract in explaining the importance of learning, without providing experience-based guidance on how leaders can develop learning capabilities in organizations (Thomas and Allen, 2006).

Learning organizations, as a new generation of organizations with a distinct approach to learning and innovation, are transforming the business landscape. The table 3 systematically compares learning and traditional organizations across various dimensions.

Table 3. Comparative characteristics of learning organizations and traditional organizations

Feature	Learning organization	Traditional organization	Reference
Leadership and management	Leaders act as teachers, coaches, and facilitators, fostering autonomy and trust.	Leaders often employ autocratic and command-and-control styles that hinder learning and innovation.	(Andjelkovic and Boolaky, 2015)
Organizational structure	Flat, decentralized structures that facilitate open communication and information flow.	Hierarchical, bureaucratic structures can impede knowledge transfer and learning.	(Andjelkovic and Boolaky, 2015)
Culture and environment	A highly caring environment characterized by trust and respect, allowing flexibility and the free expression of ideas.	Competitive and power-oriented cultures that hinder collaboration and knowledge sharing.	(Andjelkovic and Boolaky, 2015)
Barriers to learning	Actively seeks to remove structural barriers to learning.	Often has structural barriers that impede the transfer and application of knowledge.	(Andjelkovic and Boolaky, 2015)
Innovation and adaptability	Continuously seeks innovative solutions and adapts rapidly to change.	May struggle with change due to entrenched practices and resistance to new ideas.	(Anttila and Jussila, 2018; Armstrong, 2016)
Knowledge management	Actively manages competencies and fosters a dynamic cycle of knowledge creation and application.	Less active in knowledge management and may rely on tacit knowledge and informal learning.	(King and Ko, 2001)

2.7. Five disciplines of learning organizations

Peter Senge identified five key disciplines that transform organizations into learning environments. These interconnected disciplines are: personal mastery, mental models, shared vision, team learning, and systems thinking.

1. **Personal Mastery:** As defined by Senge (2006), personal mastery is an ongoing process of self-assessment, goal setting, and skill development. This concept underscores the importance of individual responsibility for learning and growth. By focusing on personal mastery, individuals can enhance their abilities to contribute to organizational learning and innovation.
2. **Mental Models:** As internal cognitive structures, mental models play a pivotal role in shaping individuals' perceptions, thoughts, and actions. These models, comprising beliefs, assumptions, and interpretations, provide a framework for understanding the world. To foster learning and innovation within organizations, it is essential to examine existing mental models and revise them as needed. Cultivating a culture of open dialogue and critical thinking is crucial for identifying and challenging limiting mental models. Furthermore, developing the capacity for inquiry and the pursuit of new knowledge can help organizational members update their mental models and adapt to changing environments.
3. **Shared Vision:** A shared vision is a collective picture of the future that motivates rather than imposes commitment. In this process, leaders facilitate rather than dictate, encouraging collective decision-making about the vision. This participatory approach fosters a sense of ownership among organizational members, motivating them to strive toward its realization.
4. **Team Learning:** In contemporary organizations, teams, rather than individuals, are the primary units of learning. If teams cannot learn, the entire organization will be unable to learn. In group settings, individuals learn from each other, pose shared questions, and

receive mutual feedback. Significant decisions are often made at the team level. Thus, team learning is grounded in collaboration, shared use of skills, and effective team formation. To foster such a culture, organizations must value and reward collaboration and teamwork (Watkins and Marsick, 1993; Marsick and Watkins, 1996).

5. **Systems Thinking:** As the cornerstone of learning organizations, systems thinking helps individuals see the bigger picture. This approach reveals the relationships among the various components of an organization, enabling individuals to identify patterns of behavior and focus on systemic processes rather than linear cause-and-effect relationships. With systems thinking, individuals develop a deeper understanding of the organization as a whole and their role within it. This systemic awareness empowers individuals to comprehend the consequences of their actions on other parts of the organization. Systems thinking also facilitates collaboration among organizational members and can extend across organizations (Hodgkinson, 2000). Studies have shown that systems thinking can facilitate learning. For example, Zulauf's (2007) study found that students familiar with systems thinking could better understand the connections between their decisions and their consequences, identify delays in the system, and avoid blaming others. Systems thinking integrates the other four disciplines, forming a complete system. Without systems thinking, the other four disciplines operate in isolation. For instance, by highlighting the relationships between individuals and organizational parts, individuals can understand the consequences of their actions on other parts. This understanding of "connectedness" can contribute to the development of a shared vision and team learning. Nair (2001) argues that managers who view organizations as thinking and creative systems are more likely to encourage experimentation, creativity, questioning assumptions and methods, and reinforce double-loop learning

2.8. Examining the paradigm of learning organizations: An interpretive perspective

The interpretive paradigm, with its emphasis on meaning, interpretation, and social interactions, offers a compelling framework for studying learning organizations. This perspective enables us to comprehensively understand learning processes, the construction of shared meanings, and the complexities inherent in organizations (Kim, 2003). By employing qualitative research methods, we can delve deeper into the experiences of individuals within learning organizations, gaining valuable insights to enhance their performance.

Ontology of learning organizations: In learning organizations, knowledge is not merely an individual asset but a collective resource, shaped and nurtured through shared interactions and collaborative learning (Antonacopoulou and Chiva, 2005). This perspective, in contrast to traditional views that treat knowledge as a fixed, measurable quantity, positions it as a dynamic, social phenomenon. Within this framework, absolute knowledge does not exist; different individuals and groups hold varying interpretations (akin to mental models). These disparities in perception arise from social, cultural, and historical factors that influence how individuals perceive and interpret reality. Moreover, knowledge within organizations is dynamic, continuously evolving in response to changing organizational conditions and needs

(Antonacopoulou and Chiva, 2005). Learning organizations are characterized as complex, self-organizing systems in which individual actions and decisions can have ripple effects throughout the system. This systems perspective underscores the importance of understanding the interactions between organizational components and their reciprocal influence. Organizations are viewed as living, dynamic entities that continually learn and adapt to their environments. This distinguishes learning organizations from traditional organizations that emphasize fixed structures and processes. Grasping this systemic nature is essential for designing and implementing effective learning strategies within organizations. (Vines and Hall, 2011)

Epistemology of learning organizations: In Peter Senge's theory of learning organizations, the epistemology governing knowledge creation diverges significantly from traditional research approaches such as positivism. While positivism emphasizes objectivity, researcher neutrality, and the discovery of objective truths, the epistemology underlying learning organizations adopts a constructivist and action-oriented approach. Within this framework, knowledge is not viewed as fixed and objective truth but as a product of social interactions and collective construction among individuals. Knowledge in learning organizations emerges through interactions, dialogues, and the exchange of experiences. The experiences, assumptions, and prior knowledge of each individual influence how phenomena are perceived and interpreted, consequently shaping the knowledge produced within the organization. In learning organizations, the researcher is not considered a detached and external observer but an integral part of the system. The researcher not only observes phenomena but also shapes the produced knowledge by participating in social interactions and learning. This reciprocal, action-oriented relationship implies that the knowledge generated within an organization is contingent on the values, beliefs, and goals of its members.

Methodology of the learning organization theory: While Peter Senge does not provide a specific methodology for creating learning organizations, he offers a framework of five fundamental disciplines to guide research in this field. Adopting a mixed-methods approach, Senge employs a variety of methods to examine and understand the learning process within organizations. In-depth case studies enable him to examine the complex nuances and social contexts that shape organizational learning. Quantitative and qualitative data analysis, including statistical analysis, modeling, and simulation, are used to identify patterns and trends in organizational learning. Additionally, dialogues and interviews with organizational members reveal individual and collective perspectives on the learning process. Direct observation of activities and interactions within organizations contributes to a better understanding of the

social and cultural contexts that shape learning. This mixed-methods approach allows researchers to gain a deeper understanding of the learning process within organizations and develop more comprehensive theoretical models.

3. Research methodology

This study adopts an interpretive approach to conduct an in-depth analysis and interpretation of the research topic. In contrast to traditional positivist methodologies, this approach emphasizes understanding the meanings and concepts embedded within the phenomenon under investigation.

- **Ontologically**, this research is grounded in idealism. Social reality is viewed as a social construct, shaped by human interactions. Rather than seeking universal laws, this study delves into the model's deep structure, its philosophical foundations, and the conditions of its emergence.
- **Epistemologically**, the researcher plays an active role in shaping and constructing knowledge. Knowledge in this study is the product of the interaction between the researcher and the research subject, and the researcher is considered an integral part of the research process.
- **Methodologically**, this research focuses on theory critique. By employing this method, the researcher evaluates and critiques existing models, identifying their strengths and weaknesses.

This study conducts a comprehensive examination of the learning organization theory using a critical and systemic approach. To comprehensively evaluate this theory, the criteria proposed by [Bacharach \(1989\)](#), [Thomas and Tymon \(1982\)](#), [Weick \(1989\)](#), and [Klimoski \(1991\)](#) are used. These criteria, by providing a precise and multifaceted framework, enable the assessment of the strengths and weaknesses of learning organization theory and its generalizability. This approach enables a deeper understanding of the theory's effectiveness and limitations in management and ultimately offers suggestions for its more practical application in contemporary organizations. In other words, this study seeks to contribute to the development of knowledge in this field by employing scientific critique, identifying the strengths of learning organization theory, challenging some of its assumptions, and offering solutions to improve and adapt it to new conditions.

4. Results

4.1. *A critique of the learning organization theory*

Before evaluating the theory of learning organizations through various criteria, it is essential to introduce Peter Senge, the primary architect of this theory. Born in 1947, Senge graduated from

Stanford with an engineering degree and subsequently earned a master's in social systems modeling from MIT before completing his doctorate in management. He is a senior lecturer at MIT and the founding chair of the Society for Organizational Learning.

An examination of Senge's published works reveals a gradual shift in his focus over the years, from the theoretical underpinnings and principles of learning organizations to more practical concerns, including creating learning environments, developing leadership, and addressing the complex challenges of the modern world. In his earlier works, he emphasized the conceptual framework of learning organizations. However, in his later writings, he delved into more practical issues such as fostering learning cultures, cultivating leadership, and confronting the intricate challenges of the contemporary world.

The numerous awards bestowed upon Peter Senge offer a clear picture of his prominent position in the fields of management and organizational development. Honors such as the Peter F. Drucker Award for Management Consulting in 2000, the International Sustainability Leadership Award in 2008, the Academy of Management's Organizational Behavior Division Lifetime Achievement Award in 2018, and multiple awards from the Society for Organizational Learning are just a few examples of his accolades. These awards attest to the widespread impact of his work on the broader field of management, his continuous intellectual leadership, his commitment to sustainable development, and his global renown.

4.2. A historical exploration of the learning organization theory

The concept of a learning organization, now widely recognized as a necessity for organizational survival and growth, is rooted in historical developments and the convergence of several intellectual currents. To fully grasp this concept, it is essential to examine the three primary streams that have shaped its formation:

1. **Organizational Development (OD)** Organizational Development can be considered one of the historical antecedents of the learning organization theory. With a focus on organizational change and improvement, OD seeks to create environments that foster continuous learning and growth. By emphasizing employee participation in change processes, skill development, and cultural transformation, OD has served as a foundational pillar of the learning organization concept. Researchers such as Donald Schön and Chris Argyris, with their emphasis on experiential learning and an organization's ability to adapt to new circumstances, have played a significant role in shaping this perspective (Fenwick, 1996).
2. **Economic Transformations of the 1980s** The 1980s witnessed profound changes in the global economy. Increased competition, globalization, and the emergence of new technologies presented organizations with unprecedented challenges. Under these conditions, the learning organization emerged as a response. Organizations capable of rapid

learning and adaptation to new circumstances were more likely to survive and thrive in the competitive marketplace.

3. **Total Quality Management (TQM)** Numerous studies have shown a strong connection between TQM and learning organizations. By creating an environment conducive to organizational learning (Sohal and Morrison, 1995), TQM has been recognized as a foundation for developing learning organizations (Terziovski et al., 2000). TQM, through its emphasis on customer focus, employee empowerment, and a shift away from hierarchical structures, fosters a culture of learning within organizations (Luthans et al., 1995). By encouraging small-group work, collaborative learning, and problem-based learning, this approach fosters organizations capable of continuous learning and adaptation to environmental change. In fact, TQM is often viewed as a prerequisite for the creation of learning organizations, as both emphasize continuous improvement, customer focus, and organizational learning. Although the learning organization is seen as an evolution beyond TQM (Luthans et al., 1995), the principles of TQM continue to play a vital role in the creation and maintenance of learning organizations (Chang and Sun, 2007).

In this research, the theory of learning organizations is examined through Bacharach's evaluation framework. The subsequent section will present the overarching criteria of this framework for assessing the theory of learning organizations, including its explicit and implicit assumptions. (See Table 4)

Table 4. Critical evaluation of senge's learning organization theory based on Bacharach's criteria

Criteria	Critique of learning organization theory	Suggestion	References
Measurement issues	A significant weakness of learning organization theory lies in the operationalization and measurement of its core constructs, which hinder its falsifiability. While constructs such as "organizational learning," "shared vision," and "systems thinking" are frequently discussed, their translation into measurable variables lacks sufficient rigor. For example, "organizational learning" may be vaguely defined, making it difficult to specify how it differs from related concepts such as "knowledge management" or "organizational development." Similarly, "shared vision" may be assessed through surveys susceptible to social desirability bias, which may fail to capture the true extent of shared understanding and commitment. Furthermore, the time and space parameters of these variables are often poorly defined.	Leverage AI technologies to address measurement challenges by: (1) Developing machine learning algorithms that analyze multi-modal organizational data (e.g., communication patterns, workflow logs, and decision trails) to create behaviorally anchored indicators of core constructs; (2) Implementing natural language processing to quantify 'shared vision' through semantic analysis of strategic documents and meeting transcripts, reducing social desirability biases.	(Adzic, 2018; Garvin, 2000; Örtenblad, 2019; Snyder and Cummings, 1998)
Construct validity	The core construct of a "learning organization" is often vaguely defined and inconsistently operationalized across studies. For example, attempts to measure "organizational learning" vary widely, ranging from surveys of employee perceptions to assessments of knowledge management systems. This lack of convergent validity raises concerns about	Future research should prioritize developing clear, operational definitions of learning organization constructs and employing multiple measurement methods to establish both convergent and discriminant validity. This would	(Araujo and Easterby-Smith, 1996; Loe rmans, 2002; Snyder and Cummings, 1998)

Criteria	Critique of learning organization theory	Suggestion	References
	whether these measures are actually capturing the same underlying phenomenon. Furthermore, it's often unclear how the "learning organization" differs from related constructs such as "adaptive organization" or "innovative organization," which can lead to problems with discriminant validity. Until learning organization theory can establish more rigorous construct validity for its key concepts, its empirical testability and, ultimately, its scientific value will remain limited.	strengthen the theory's foundation and enable more meaningful empirical investigation	
Logical adequacy , empirical adequacy	Logically, the core propositions linking learning practices to organizational outcomes (e.g., increased adaptability, innovation) can be tautological. For instance, if "organizational learning" is defined by the very outcomes it purports to cause, the theory becomes self-verifying and unfalsifiable. Furthermore, the causal relationships are rarely specified with sufficient clarity. Is shared vision necessary, sufficient, or both for organizational learning? Such ambiguity makes empirical testing difficult. Empirically, measuring organizational learning and its impact is challenging.		(Adzic, 2018; Driver, 2002; Salaman, 2001)
Variable scope	Current learning organization theory exhibits limitations in its variable scope, hindering its explanatory power. The theory's reliance on a collection of somewhat isolated variables prevents the development of a truly integrated and parsimonious theoretical system. For instance, existing measures of organizational learning may overemphasize specific aspects, such as knowledge acquisition, while neglecting equally important dimensions like knowledge sharing or application. This narrow focus on a limited set of variables restricts the theory's ability to fully capture the complex dynamics of organizational learning. A broader scope of variables, encompassing a more comprehensive range of relevant factors, is necessary to enhance the theory's explanatory potential.	This could involve incorporating a wider range of learning processes, considering different levels of analysis (individual, team, organization), and exploring the interplay between formal and informal learning mechanisms. However, this expansion must be carefully balanced with the need for parsimony. The goal should be to develop a more comprehensive yet concise theoretical framework that can effectively explain and predict organizational learning outcomes.	(Adzic, 2018; Akella, 2008; Grieves, 2008)
Construct scope	The scope of the construct within learning organization theory also warrants attention. The theory currently suffers from a lack of integration among its constructs, resulting in a fragmented understanding of organizational learning. This fragmentation manifests logically as a collection of isolated constructs, which prevents the development of a cohesive and parsimonious theoretical framework. For	Expanding the scope of constructs to encompass the multifaceted nature of organizational learning and exploring the interrelationships between these constructs is crucial for advancing the theory.	(Adzic, 2018; Akella, 2008; Grieves, 2008)

Criteria	Critique of learning organization theory	Suggestion	References
	example, the constructs of "knowledge acquisition," "knowledge sharing," and "knowledge application" are often treated as separate entities rather than interconnected components of a broader learning process. Empirically, this translates to a reliance on variable-driven analysis and empirical generalizations, rather than a robust, theory-driven approach.		
Explanatory potential, predictive adequacy	Regarding the "objects of analysis," it frequently fails to clearly define what constitutes a "learning organization." Is it a specific organizational structure, a culture, a set of processes, or some combination? This ambiguity makes it difficult to compare different learning organization models and hinders empirical testing. Furthermore, the "nature of the relationship" between learning mechanisms (e.g., knowledge sharing, systems thinking) and organizational outcomes (e.g., innovation, performance) is often underspecified. While learning organization theory posits that these mechanisms should lead to positive outcomes, it often lacks detail about how these linkages work, under what conditions they are strongest, and what potential mediating or moderating factors might exist. This lack of specificity weakens the theory's explanatory power. Regarding "scope and parsimony," while the theory aims to be broadly applicable, its propositions are sometimes too general, making it difficult to derive testable hypotheses. The sheer number of variables associated with learning organizations can also make it challenging to develop parsimonious models. Finally, concerning "predictive adequacy," learning organization theory often struggles to generate precise, testable predictions. While it might suggest that learning organizations are more likely to be innovative, it rarely specifies when or to what extent this will occur. This makes it difficult to empirically validate the theory and distinguish it from other explanations of organizational performance.	1) Develop a multi-faceted definition of "learning organization" with measurable indicators for structure, culture, processes, and leadership behaviors. 2) Specify how learning mechanisms link to outcomes by detailing the underlying processes and identifying mediating/moderating factors. 3) Formulate focused, testable propositions with clearly defined variables and consider contingency factors. 4) Improve predictive adequacy by generating precise hypotheses, employing longitudinal/comparative studies, and iteratively refining the theory based on empirical evidence.	(Adzic, 2018; Dixon, 1993; Driver, 2002; Fenwick, 1996; Garvin, 2000; Örtenblad, 2019)

4.3. Thomas and Tymon's criteria

Table 5 presents a critical evaluation of Senge's learning organization theory based on Thomas and Tymon's Criteria for evaluating theories. This analysis identifies key strengths and weaknesses of the theory, highlighting areas for improvement.

Table 5. Critical evaluation of senge's learning organization theory based on Thomas and Tymon's criteria

Criteria	Critique of learning organization theory	Suggestions for improvement	Source
Descriptive relevance	The concept of a learning organization oversimplifies the complex process of developing individual and social knowledge in the workplace, including the interplay between knowledge and organizational policies, interpersonal relationships, and complex human dimensions such as emotions, moods, and intuition. It reduces this complex process to an idealized image of honest dialogue and empathetic relationships. This approach overlooks the dynamic and multifaceted nature of learning processes in organizations and instead focuses on idealized and simplified aspects of this process. As a result, this concept is insufficient in describing the complex and dynamic realities of organizational learning.	To strengthen the description, it can be enriched by providing more detailed and in-depth case studies of successful learning organizations. Additionally, one could explore how this theory can be adapted to different types of organizations (such as small, medium, and large organizations, or organizations in different industries). Furthermore, future research should explicitly examine how the core tenets of a learning organization, such as knowledge acquisition and sharing, are being reshaped by the integration of artificial intelligence, and how organizations can leverage AI to overcome the inherent complexities of knowledge development and dissemination.	(Adzic, 2018; Driver, 2002; Fenwick, 1996; Garvin, 2000; Hsu and Lamb, 2020; Pedler and Burgoyne, 2017; Salaman, 2001)
Goal relevance	Although it describes a desirable state, it does not clearly establish a link between the five disciplines and specific organizational goals such as performance improvement or innovation. Despite significant investments in employee training and development at companies such as Rover, the company ultimately failed to achieve sustained financial success. This case highlights the potential gap between the theoretical concepts of learning organizations and practical business objectives.	It should be more clearly demonstrated how each of the five disciplines contributes to achieving specific organizational goals. For example, conceptual models can be developed to illustrate the relationships between these disciplines and organizational outcomes. Moreover, future work should articulate how the strategic adoption and integration of artificial intelligence tools and strategies can act as a catalyst or a barrier to achieving these goals within the framework of a learning organization.	(Adzic, 2018; Fenwick, 1996 ; Örtenblad, 2019)
Operational validity	While it provides a general framework, it offers insufficient practical guidance for implementing the five disciplines. While Senge's principles are valuable, they don't provide clear, observable characteristics or practical guidelines for implementing a learning organization. The theory lacks operational specificity and doesn't offer concrete tools or techniques for organizational change.	Providing step-by-step operational guidelines for implementing each of the five disciplines is essential. These guidelines can include tools, techniques, and practical examples. Crucially, these guidelines must be updated to incorporate actionable strategies for leveraging AI technologies in the implementation of each discipline. It includes specifying AI-powered tools for knowledge management, collaborative platforms enhanced by AI, and methods for fostering AI literacy and ethical AI application within the learning processes.	(Araujo and Easterby-Smith, 1996; Loermans, 2002; Snyder and Cummings, 1998)
Non obviousness	The theory of learning organizations introduces several innovative concepts, such as systems thinking, personal mastery, team learning, shared vision, continuous adaptation, and critical reflection, which collectively provide a more comprehensive framework for understanding and fostering	Further emphasize the nonobviousness by providing empirical evidence or case studies that demonstrate unique outcomes or insights generated by applying the learning organization theory. In the current context, highlight the non-obvious ways in which the challenges and opportunities presented by artificial intelligence necessitate a re-evaluation and potential augmentation of traditional learning organization principles. This could involve	(Adzic, 2018; Fenwick, 1996; Pedler and Burgoyne, 2017)

Criteria	Critique of learning organization theory	Suggestions for improvement	Source
	organizational learning.	exploring novel learning dynamics emerging from human-AI interaction and the ethical considerations unique to AI-driven organizational learning.	
Time liness	Although it emphasizes adaptability in dynamic environments, it may not adequately address new challenges, including digital transformation, workforce diversity, and climate change.	Given recent advances in management and learning, it should be updated to incorporate new ideas such as data-driven learning, artificial intelligence, and machine learning. Specifically, future research must directly address the challenges posed by the AI era to organizational learning. It includes investigating how organizations can learn to adapt to rapidly evolving AI technologies, address the skills gap created by AI-driven automation, foster a culture of continuous learning in the face of AI disruption, and ethically integrate AI into organizational learning processes. The theory needs to evolve to provide relevant guidance for organizations navigating the complexities of the artificial intelligence landscape.	(Adzic, 2018; Hsu and Lamb, 2020; Salaman, 2001; Yang et al., 2004)

4.4. Weick's criteria

Table 6 presents a critical evaluation of Senge's learning organization theory based on Weick's Criteria for evaluating theories. This analysis identifies key strengths and weaknesses of the theory, highlights areas for improvement.

Table 6. Critical evaluation of senge's learning organization theory based on Weick's criteria

Criteria	Critique of learning organization theory	Suggestions for improvement	References
Recognition of the subject matter	The theory effectively identifies the problem of organizations' inability to adapt to rapid change and provides a framework for addressing it.	To further strengthen this, a deeper exploration of different types of organizational changes and how learning organizations respond to each could be conducted.	(Adzic, 2018; Fenwick, 1996; Garvin, 2000; Hsu and Lamb, 2020; Pedler and Burgoyne, 2017)
Nonlinear and iterative progress	The theory acknowledges the complex, interconnected nature of organizations and necessitates a holistic, systems-thinking approach aligned with nonlinear, iterative processes.	(1) Utilize network analysis algorithms to visualize knowledge flows and feedback loops in real-time, (2) Implement adaptive computational models that simulate learning trajectories under varying environmental conditions. These AI applications can reveal hidden patterns in organizational learning processes that traditional linear models cannot detect.	(Fenwick, 1996; Snyder and Cummings, 1998)
Creativity and systematicity	The theory introduces innovative concepts such as mental models, systems thinking, and learning teams, but it may sometimes lack the specificity required for rigorous empirical testing and simplification of complex organizational phenomena.	(1) Developing hybrid AI systems that combine generative models for creative ideation with constrained optimization algorithms for systematic implementation, (2) Applying natural language processing to quantify and track the evolution of mental models through organizational discourse, and (3) Creating AI-assisted diagnostic tools that maintain the richness of systems thinking while providing measurable indicators of team learning effectiveness. This approach preserves the theory's innovative concepts while enabling rigorous empirical validation through computational social science methods.	(Adzic, 2018; Salaman, 2001)

4.5. Klimoski 's criteria

Table 7 presents a critical evaluation of Senge's learning organization theory based on Klimoski's criteria for evaluating theories. This analysis identifies key strengths and weaknesses of the theory, highlights areas for improvement

Table 7. Critical evaluation of senge's learning organization theory based on Klimoski's criteria

Criteria	Critique of learning organization theory	Suggestions for improvement	Source
Transparency of the phenomenon under study	The theory is ambiguous in providing a precise and operational definition of organizational learning. Moreover, it has not adequately addressed the critical role of technology in facilitating organizational learning and its transformations. Additionally, an excessive focus on soft aspects and the neglect of the complex interaction between the organization and its external environment are other weaknesses of this theory.	Provide a comprehensive and measurable definition of organizational learning that encompasses individual, group, and organizational dimensions. It is also essential to specify the role of technology in this process.	(Dixon, 1993; Garvin, 2000; Salaman, 2001)
Definition of units of analysis	This criticism is based on the fact that the theory does not clearly specify whether the main focus is on individuals, small groups, departments, or the entire organization.	Reconceptualize units of analysis through an AI-augmented lens by: (1) employing network analytics to map dynamic learning interactions across hierarchical levels, (2) utilizing machine learning to identify emergent learning units that transcend traditional boundaries (e.g., algorithmically determined project teams or AI-mediated communities of practice), and (3) developing multi-level analytics frameworks that simultaneously capture individual, group, and organizational learning patterns through digital trace data. This approach should account for how AI systems themselves become active participants in organizational learning processes, creating hybrid human-AI learning units that require new theoretical consideration.	(Dixon, 1993; Driver, 2002; Garvin, 2000)
Determination of boundary conditions	Being limited to internal factors may lead to the overlooking of certain learning factors.	Expand the theory's boundary conditions to explicitly incorporate AI-driven environmental scanning capabilities. This should include: (1) real-time analysis of market dynamics through AI-powered predictive analytics, (2) automated monitoring of technological disruptions using machine learning algorithms, and (3) adaptive organizational learning mechanisms that leverage AI to process external big data streams.	(Adzic, 2018; Akella, 2008; Grieves, 2008)
Are the assumptions clearly stated?	Some of the theory's assumptions, particularly in individual and social psychology, are implicit and not sufficiently clear.	Clarify assumptions, particularly in individual and social psychology, and provide logical justifications for them.	(Driver, 2002; Salaman, 2001)

Criteria	Critique of learning organization theory	Suggestions for improvement	Source
Are the theoretical constructs identified?	The concepts presented often have abstract definitions and lack the precision necessary for robust empirical testing. The theory relies heavily on anecdotal evidence and case studies, making it difficult to establish strong causal links between the proposed constructs and desired organizational outcomes. Many constructs are difficult to falsify due to their broad and subjective nature. Defining clear criteria for when a learning organization has truly failed to achieve its goals is challenging.	Operationalize abstract concepts such as "systems thinking" and "team learning" and provide measurement indices for them.	(Snyder and Cummings, 1998)
Are theoretical variables identified?	Faces challenges in precisely identifying and quantifying theoretical variables.	Precisely identify independent and dependent variables and employ suitable statistical methods for data analysis.	(Snyder and Cummings, 1998)
Are propositions fully stated?	Senge's theory does not adequately explain how a change in one construct (e.g., mental models have. affects the state of other constructs, nor the mechanisms that facilitate such changes.	Develop dynamic models to illustrate how different constructs interact and change over time.	
Are propositions illustrated?	Despite its emphasis on systems thinking, the theory has been insufficiently successful in using diagrams and visual models to depict complex interactions among organizational components. This complicates understanding causal relationships and the dynamics of organizational systems.	Employ simulation models and system flow diagrams to visualize complex interactions in learning organizations.	
Logical adequacy of propositions	Its propositions linking learning mechanisms (e.g., systems thinking) to outcomes (e.g., performance) often lack clear causal explanations. Additionally, some propositions are tautological and offer little explanatory power.	Future research should prioritize establishing clear causal pathways between learning mechanisms and organizational outcomes. This involves specifying the processes and mediating factors involved. Furthermore, propositions should be carefully examined for tautologies and, where necessary, reformulated to provide substantive explanations.	(Adzic, 2018; Salaman, 2001)
Are the underlying processes explained?	There is sometimes ambiguity regarding the operational details and the practical implementation of these concepts. For instance, although Senge emphasizes the importance of systems thinking and team learning, the exact mechanisms for creating and reinforcing these concepts in organizations are not sufficiently clear.	Provide practical guidelines for implementing the theory's concepts in organizations, including training methods, team development, and the creation of a learning culture.	
Are hypotheses fully stated?	Senge's theory focuses more on describing the characteristics of learning organizations and providing a general model than on formulating precise, testable hypotheses. While this facilitates a general understanding of the concept, it limits the possibility of a precise and quantitative evaluation of the theory.	Develop precise, testable hypotheses to examine relationships among variables in the learning organization model.	

Criteria	Critique of learning organization theory	Suggestions for improvement	Source
Added value of the theory	The theory lacks a clear and explicit comparison with existing theories of organizational learning. This omission makes it difficult to accurately assess its unique contributions and potential improvements over existing frameworks.	Conduct a detailed comparison of Senge's theory with other theories of organizational learning and identify its strengths and weaknesses.	(Adzic, 2018; Fenwick, 1996; Pedler and Burgoyne, 2017; Salaman, 2001)
Connection of the theory to practical issues	Although it emphasizes the importance of learning, the theory does not sufficiently rely on providing empirical and quantitative evidence to prove the effectiveness of this model in organizations.	Conduct empirical studies to examine the effectiveness of the learning organization model in various organizations.	(Adzic, 2018; Fenwick, 1996; Örtenblad, 2019)
Testability of the theory	Full implementation of this theory in organizations requires time, resources, and fundamental changes in organizational culture, which may be difficult for some organizations.	Develop AI-powered assessment tools to operationalize and test the theory's components by: (1) creating machine learning algorithms that quantify learning culture metrics from digital trace data, (2) implementing natural language processing to analyze organizational discourse for learning indicators, and (3) designing predictive analytics models that correlate learning processes with performance outcomes. These technological solutions can reduce implementation barriers by providing real-time diagnostics and scalable measurement of learning-organization characteristics across contexts.	(Adzic, 2018; Fenwick, 1996; Örtenblad, 2019)

As previously discussed, a comprehensive evaluation of a complex theory such as the learning organization necessitates a multifaceted approach that relies on multiple criteria. Each of the four sets of criteria presented here examines distinct facets of the theory. By employing these criteria, we can conduct a more comprehensive assessment of learning organization theory. For instance, Thomas and Tymon's criteria assist in examining the theory's practical applications, while those of Wick and Klimosky enable us to evaluate its philosophical and methodological underpinnings. This multifaceted approach mitigates the risk of biased evaluation and enhances the credibility of our findings by demonstrating that our assessment is grounded in the established scientific standards of the research community. Ultimately, by synthesizing results across multiple criteria, we can gain a deeper understanding of the theory and make more informed decisions about its application and development.

5. Discussion and conclusion

This research has critically examined Peter Senge's learning organization theory, exploring its

enduring relevance in the context of a rapidly evolving, AI-driven world. By applying multiple established evaluation criteria ([Bacharach \(1989\)](#), [Thomas and Tymon \(1982\)](#), [Weick \(1989\)](#), and [Klimoski \(1991\)](#)), we have identified both strengths and weaknesses of the theory and offered concrete suggestions for its enhancement and modernization. Our analysis reveals that while Senge's framework offers valuable insights into systemic learning, shared vision, and mental models, its original conceptualization requires significant refinement to address the transformative challenges and opportunities presented by artificial intelligence.

Several key themes emerged from our evaluation:

Measurement Challenges and AI Solutions

The theory suffers from persistent operationalization issues, particularly with constructs like "organizational learning" and "shared vision." Emerging AI technologies can mitigate these limitations through (1) machine learning analysis of digital trace data (e.g., communication patterns, workflow logs) to quantify learning culture indicators; (2) NLP-based semantic analysis of strategic documents to assess shared vision objectively; and (3) predictive analytics linking learning processes to performance outcomes. These advancements address [Hsu and Lamb's \(2020\)](#) critique of the theory's empirical vagueness, thereby enabling more rigorous validation.

Expanding Theoretical Scope for AI Integration

The original framework inadequately addresses AI-driven learning modalities, including AI-curated knowledge acquisition, machine-learning-enabled adaptation, and algorithmic mediation of collaborative learning. Our findings suggest expanding the theory's constructs to include the evolving dynamics of human-AI team learning, the redefinition of mental models in algorithmic decision-making contexts, and ethical dimensions of AI-augmented learning (e.g., algorithmic bias, data privacy, and human judgment displacement). This aligns with [Caldwell's \(2012\)](#) call for the decentralization of learning structures but adds critical technological dimensions.

Strengthening Logical and Empirical Foundations

The causal mechanisms between learning practices and outcomes remain underspecified. AI can enhance theoretical precision through computational simulations of learning dynamics and data-driven identification of mediating variables (e.g., how AI tools mediate team learning-innovation relationships). This addresses [Driver's \(2002\)](#) critique about tautological reasoning by introducing empirically testable pathways.

AI's Dual Role: Enhancement vs. Ethical Risks

While AI enables personalized learning at scale, boundaryless knowledge sharing, and adaptive decision-making, overreliance risks eroding human-centric learning elements such as critical reflection and creative problem-solving. The revised theory must explicitly balance the analytical power of AI with the preservation of humanistic values, particularly in systems thinking and ethical governance. In conclusion, Senge's learning organization theory, while offering valuable foundational principles, requires significant evolution to remain relevant in the AI-driven world. By addressing measurement issues, expanding the scope of the construct and variables, strengthening logical and empirical adequacy, and explicitly integrating AI and its ethical implications, the theory can be transformed into a more robust and applicable framework. This research provides a roadmap for such evolution, advocating for hybrid models that leverage the analytical power of AI while preserving human creativity, ethical governance, and the core values of organizational learning.

5.1. Future research

Future research should empirically test the proposed hybrid model by examining the interplay between AI and human learning across diverse organizational contexts. Studies should explore how AI-powered tools can enhance specific learning processes, while simultaneously investigating and mitigating associated ethical risks such as algorithmic bias and data privacy concerns. Longitudinal research designs are needed to assess the long-term impact of AI integration on organizational learning and ethical governance. Further investigation into the evolving definitions of "systems thinking" and "shared vision" in the AI era is crucial. Comparative studies across industries and organizational structures can identify best practices and contextual factors that influence the success of AI-augmented learning organizations. Finally, research should refine the theoretical framework to ensure its continued relevance and applicability amidst ongoing technological advancements.

Disclosure statement

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