SCIENTIFIC LEARNING:
SYSTEMATIZING ERROR DETECTION & CORRECTION IN ORGANIZATIONS

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by
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CERTIFICATION OF APPROVAL

I certify that I have read Scientific Learning: Systematizing Error Detection & Correction in Organizations by Tory Diana Alexandra Taylor, and that in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirement for the degree Master of Public Administration at San Francisco State University.

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There are contrasting views on what organizational learning (OL) means and further, what explains the similarities and differences in how organizations learn. This thesis conducts a meta-synthesis of 17 case studies describing error detection and correction in organizations of varying types, sizes, locations, and industries to identify themes in organizational learning, with emphasis on the design of action. Findings indicate that the design of action is driven by a comprehensive set of factors, and that while similarities and differences among organizations existed, the set of factors driving the design of action was largely unique for each organization. The thesis contributes to a gap in the OL literature by analyzing the design of action in a wide range of organizations.

I certify that the Abstract is a correct representation of the content of this thesis.

Chair, Thesis Committee

12/5/18
Date

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1. INTRODUCTION

Organizational learning (OL) can be thought of as the detection and correction of error in organizations (Argyris, 1995; Argyris & Schön, 1974; Visser, 2007; March 1991). In that context, an *error* is a mismatch between the intended and actual consequences of action (Argyris, 1985; Argyris & Schön, 1978). Error can also be a mismatch between what the market demands and what an organization produces or intends to produce. An error is detected when there is awareness of such a mismatch and an error is corrected when the mismatch is resolved such that the organization produces its intended consequences in accordance with market demands (Visser August 2017 email). An organization's capacity to learn is characterized by its ability (or inability) to detect and correct errors, i.e. to design actions that successfully resolve errors.

While OL research is abundant and a popular topic among researchers and practitioners, the OL literature does not usually delve into the intricacies of how organizations decide which actions they take or what they intend the consequences of their actions to be. While the separate field of decision-making has arguably made significant progress in related areas, including fleshing out many of the challenges presented by classical theories in related disciplines, this thesis is concerned with the status and development of the OL literature specifically. Overall, the development of OL

concepts is incomplete with respect to the design of action in organizations. This is problematic because it inhibits a deeper study of OL, which in turn limits the tools available for engaging and supporting OL in practice (Visser, 2007). This thesis seeks to contribute to the OL literature by expanding the understanding of the design of action in organizations.

Through a meta-review of 17 cases describing error detection and correction across a relatively diverse set of organizations, this thesis aims to answer the following research question: *What similarities or differences exist in how organizations design responses to errors?* The study is rooted primarily in the action-oriented frameworks developed by organizational theorists Chris Argyris, Donald Schön, and James March, who place emphasis on an interdependent relationship between knowledge and action. In that context, the design of action can be thought of as the logic used to apply knowledge to action.

This thesis begins with a focused review of OL literature, followed by a discussion of the research design and analytic methods. Next, the results of the analysis and a discussion of key findings are provided. The thesis concludes by outlining the limitations and implications of the study and providing recommendations for future research. The leading conclusion of the research is that while there are notable similarities and differences in how organizations design action, the degree to which these similarities and differences exist is relatively low. Overall, there is an absence of a set of

pervasive, widespread similarities and differences attributed to the design of action across organizations.

This research expands upon existing material on the nuances of the design of action in organizations and contributes to an overall understanding of the factors shaping OL in organizations. Examples of similarities and differences identified include whether agents' levels of education, use of technology, or funding will influence the design of action, although, as described above the identified similarities and differences are relatively weak. The research also reveals an absence of a means of deconstructing and systematizing the design of action in organizations and proposes a new OL concept, *scientific learning*, to serve that purpose. This research should be of interest to scholars, managers, organizational leaders, and others seeking greater understanding of the factors shaping learning in organizations and tools to more effectively engage OL in practice.

2. LITERATURE REVIEW

The literature review begins by defining key concepts, including organization, learning, and organizational learning (OL). This is followed by a more focused review of material relating to the design of action in organizations, including theories of action, defensive reasoning mindsets, and Model I and Model II organizations.

2.1. Overview of organizations and learning

Organizations are complex systems (Argyris, 1960) created and maintained by people (Argyris, 1971) who collectively form an entity (the *organization*) that engages in achieving its objectives while maintaining an internal climate and adapting to the external environment (Argyris, 1964, p. 120). The organization is its own entity comprising, but not limited to, the abilities and actions of individual agents. An organization's identity and purpose include, but extend well beyond, the sum of agents' abilities and actions. If, for example, an agent leaves his position, the organization—and its ongoing capacity to learn—still exist.

In an organization, learning takes place when knowledge and action intersect. In essence, the study of OL is an attempt to make sense of organizational processes and outcomes (Easterby-Smith, Burgoyne, & Araujo, 1999, p. 67). The term *learning* typically holds a positive connotation, as in leading to "improvement, intelligence and wisdom" (Easterby-Smith, Burgoyne, & Araujo, 1999, p. 62). However, learning can also be pathological, producing undesirable conditions (Easterby-Smith, Burgoyne, & Araujo,

1999, p. 63). For example, an organization can become perpetually resistant to change when agents continually observe that leadership is unwilling to consider adopting innovative practices, even in cases in which those practices are likely suitable.

There are many theories of OL, but most of them generally align with one of three OL frameworks: Argote and Miron-Spektor's (2011) learning-curve-based framework, which emphasizes rates of learning and productivity; March's (1991) performance-based framework, which focuses on the relationship between behavior and performance; and Argyris and Schön's (1978) action-based framework, which emphasizes the relationship between knowledge and action. The following paragraphs review these three frameworks in greater detail.

Argote's (2011) framework has positioned OL through a lens of learning curves and productivity, expanding on concepts that earlier researchers developed. The design of action is primarily shaped by organizational capabilities derived from formal mechanisms such as transactive memory systems, which are transaction-based (versus static) systems used to encode, store, and retrieve organizational knowledge. While Argote and other researchers comprehensively describe the proposed mechanisms underlying such systems, a clear explanation of how the *existence* of these systems translates to certain quality of information or usefulness is not usually offered.

March's (1991) performance-based framework emphasizes adaptive processes and, as a result, performance. For example, if an organization's sales have declined, adaptation might involve implementing a more aggressive sales strategy or creating a

new product to meet demand. The design of action is shaped explicitly through the calculation and comparison of risk, investment, and competitive strategies; and implicitly through the organizational climate, including organizational norms, rules, and culture.

Argyris and Schön's (1974, 1978) action-based framework focuses on organizational behavior and psychology. The design of action is shaped primarily by agents' self-fulfilling tendencies according to the following four governing variables (Argyris & Schön, 1978):

1. Perceived ability to fulfill one's intended purpose
2. Desire to maximize 'winning' and minimize 'losing'
3. Suppression of negative feelings
4. Behaving according to what the agent considers rational

According to an action-based perspective, OL can be thought of as the detection and correction of errors in organizations (Argyris, 1995; Argyris & Schön, 1974; Visser, 2007; March 1991).

An error is defined as a mismatch between the intended and actual consequences of action (Argyris, 1985)—when *what we intended the consequences of action to be* is different from *what the consequences of action actually were* (Hofmann & Frese, 2011, p. 3). Errors can also be a mismatch between what the market demands and what an organization produces or intends to produce (through action). Errors are corrected by resolving the mismatch, i.e. by successfully *producing the consequences we intended to produce* (Argyris, 1985). There is no agreed-upon method of measuring an organization's

ability to detect and correct errors, including measuring the existence of errors or the efficacy of the design of action (Argyris, 1971; Argyris & Schön, 1974).

As Argyris and Schön (1974) discussed, the processes and outcomes of detecting and correcting errors in organizations are nonlinear but typically involve the following stages: discovering and diagnosing an organizational error, formulating a solution, implementing the solution, and appraising the action taken. Learning occurs when the associations between actions and consequences are observed and, in turn, lead to changes in the design of action (March, 2010, p. 13). In other words, learning is achieved when the mismatch underlying the error is intentionally resolved: "How do you know when you have learned something? When you can produce in the form of action whatever you claim that you know" (Argyris, 2003, p. 1178).

2.2. Error detection and correction in organizations

In organizations, an error is the unintended but avoidable deviation from an "external goal, standard of behavior, or truth" (Hofmann & Frese, 2011, p. 2). Errors can generally be classified as either strategic or operational, with strategic errors relating to an organization's overarching, long-term objectives and operational errors relating to shorter-term, lower-level tasks (Hofmann & Frese, 2011). Errors are problematic because they prevent an organization from achieving its objectives. This leads to negative consequences ranging from relatively minor inefficiencies to extreme failure such as organizational demise.

2.2.1. Error detection

The detection of an error in organizations begins with the discovery of that error (Hofmann & Frese, 2011). This is followed by a period of assessment and response formulation, consisting of "considerable effort aimed at both assessing and understanding the situation and developing a response" (Hofmann & Frese, 2011, p. 26). The stages of error detection can generally be categorized as follows: discovery, assessment, and the design of action. These stages are reviewed in greater detail below.

First, the error must be discovered, meaning that a mismatch between the espoused and actual consequences of action is realized. There are several ways in which an error can be discovered. Most commonly, an error is first revealed when an agent identifies his own mistake in action. Sometimes, an error is discovered by those other than the agent who committed the erroneous action. Such a discovery occurs through an external error signal such as direct observation or customer feedback. Errors can also be discovered when the result of an error is experienced, for example, when a product fails to sell as expected or when competitive advantage diminishes (Hofmann & Frese, 2011).

After an error is discovered, it is assessed through a period of inquiry and reflection, which includes a review of diverse sources of information pertinent to the error. This period of assessment may entail a joint, collaborative effort undertaken by diverse organizational agents. Sources of information used to assess an error may include internal reflection, observation, feedback, and review of organizational documentation. Often, however, a *defensive reasoning* mindset (in which agent actions are governed by

self-fulfilling, self-sealing, and protective strategies rather than by an intrinsic, unfettered commitment to organizational objectives) can disrupt constructive error assessment. In this case, a pathological cycle is supported: "not only will an incorrect solution be implemented but also we may have reinforced and strengthened the defensive routines [which led to the original error]" (Argyris, 1985, p. 133).

Finally, once the error's context has been established, and assuming that a decision has been made to correct the mismatch, the organization decides how to respond to it. An approach toward resolving the error is selected by either exploiting existing models or exploring new designs. The OL literature contains two commonly referenced models of corrective action: single-loop (SL) and double-loop (DL). An SL response, comparable to March's (1991) concept of the *exploitation*[1], involves making incremental adjustments to existing assumptions underlying the offending action. Notably absent from the SL process is a consideration of the assumptions underlying the *theory* of action. Conversely, a DL response, comparable to March's (1991) concept of *exploration*[2], is formulated by questioning—and, as called for, adjusting—the assumptions underlying the theory of action.

There is little understanding of how and why organizational agents choose between SL and DL models when attempting to correct organizational errors, or whether this selection involves an active decision at all. Further, there is limited study of when SL

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[1] For the remainder of the thesis, the concepts of *single-loop models* and *exploitation* are collectively referred to as *SL*

[2] For the remainder of the thesis, the concepts of *double-loop models* and *exploration* are collectively referred to as *DL*

or DL responses are most appropriate, including how to effectively balance the known and unknown risks and gains potentially associated with each model. The circumstances of any particular error are complicated; for example, there is a lack of complete information about the error or possible ways to respond to it, along with a limited understanding of each possible response's current and future efficacy (March, 1994).

2.2.2. Error correction

Correcting an error involves implementing and appraising the action model selected during error detection. Through implementation, organizations attempt to resolve the error by eliminating either the mismatch between the expected and actual consequences of action (Argyris & Schön, 1978) or the mismatch between what the market demands and the organization produces. Implementation confirms or disconfirms the suitability of the response, which allows agents to study the impact of the action model selected and can lead to an improved understanding for future designs (Argyris & Schön, 1978).

During implementation, action is taken in an effort to produce the intended consequences. If the action taken produces the intended consequences, the selected model will be confirmed (Argyris & Schön, 1978). If the consequences of action do not match the intended consequences, the model may be disconfirmed upon appraisal—the final step of error correction (Argyris & Schön, 1978).

Appraisal involves reviewing the production of the action model as designed to determine its suitability for correcting the error at hand. If the consequences of action do

not match the intended consequences but the mismatch can be attributed to a flaw in implementation, a failure to resolve the original error does not indicate a failed action model (Argyris & Schön, 1978). However, if the consequences of action do not match the intended consequences and the mismatch cannot be attributed to a flaw in implementation, the model is disconfirmed. If the consequences of action match the intended consequences and there were no implementation flaws, only then can the model be confirmed.

2.3. The design of action

Action is deliberate human behavior (Argyris & Schön, 1974, p. 5). As such, the design of action involves the design of human behavior. In the OL literature, the *theory of action* concept is frequently used to deconstruct the design of action in organizations.

2.3.1. Theories of action

A theory is a "vehicle for explanation, prediction, or control" (Argyris & Schön, 1974, p. 5) and action is deliberate human behavior. A *theory of action* is a concept used to explain, predict, or control deliberate human behavior, i.e. the models which govern action (Argyris, 1995). All theories of action share the same basic structure, which relies on a comprehensive set of assumptions, or "conditions under which you would expect the action to produce the desired result" (Argyris & Schön, 1974, p. 5):

> in situation S,
> if you want to achieve consequence C,
> do A.

There are two types of theories of action. The first is an *espoused* theory of action, which is what individuals and organizations aim to achieve through action and "comprise[s] their beliefs, attitudes, and values" (Argyris, 1995, p. 1). There are many espoused theories of action; in other words, there are many ways in which individuals and organizations justify action. Notably, an espoused theory of action can be (and usually is) quite different from the theory *actually used* during the course of action (Argyris & Schön, 1974).

The second type of theory of action represents the actions actually taken and is commonly referred to as the *theory-in-use*. Theory-in-use, i.e. the theory manifested during action, offers a true explanation for the behavior of humans in organizations. While there is an exponential number of espoused theories of action, in practice there is only one theory-in-use (Argyris, 1995, p. 1). Argyris and Schön categorize organizations that abide by this single theory-in-use as *Model I* and, in contrast, propose an alternative, ideological type of organization. Section 2.3.3 reviews Argyris and Schön's theory of Model I and Model II organizations in greater detail.

2.3.2. Defensive reasoning and Model I/Model II organizations

People tend to hold "deeply cynical and gloomy views about human nature" (Argyris, 1971, p. 4). This pervasive view of the world affects how people behave in organizations, shaping the manner in which they engage as agents of the OL (i.e. error detection and correction) process. "There are strong fears about the consequences of human growth and a deep pessimism about human beings changing their behavior"

(Argyris, 1971, p. 3). These fears inhibit learning and lead to what Argyris and Schön call *defensive reasoning* mindsets, characterized by agents whose actions are governed by self-fulfilling, self-sealing, and protective strategies rather than by models that prioritize objective information, free choice, and an intrinsic commitment to organizational (rather than personal) objectives (Argyris, 1977). Defensive reasoning mindsets lead to defensive routines that become embedded and perpetuated within the organization's climate.

Argyris and Schön (1978) propose that, in most cases, the following four governing values underlie action in Model I organizations:

(1) Achieve your intended purpose.
(2) Maximize winning and minimize losing.
(3) Suppress negative feelings.
(4) Behave according to what you consider rational.

In a later work that expands upon this concept, Argyris (1995) proposes that individuals fulfill these governing values by advocating for their position, evaluating the thoughts and actions of themselves and others, and attributing causes to consequences. As a result, Argyris concludes that Model I organizations are prevalent and that these patterns lead to pathological conditions in organizations, including "defensiveness, misunderstanding, and self-fulfilling and self-sealing processes" (1995, p. 2). Self-sealing processes are those that protect the agent's reputation while concealing mistakes or other issues that may embarrass or threaten the agent.

In contrast to an organization whose members abide by Model I governing values, Argyris and Schön propose a largely hypothetical Model II organization, whose members instead manifest the following principles: "Give and get valid information; …Create the

conditions for free and informed choice; [and] …Select objectives that challenge one's capacities within a tolerable range (Schön, 1983, p. 230). Model II organizations are desirable because they embody governing variables that are likely to promote healthy OL on a sustainable basis, thereby leading to increased effectiveness and fewer injustices (Argyris, 2003). However, while organizations may *espouse* a value system in line with Model II principles, in reality Model II organizations are rare (Argyris, 2003). Argyris explains that defensive reasoning mindsets and the *inhibiting loops* they cause prevent organizations from attaining Model II conditions.

Due to defensive reasoning mindsets, agents tend to withhold information that may be pertinent to an organization but that is potentially self-incriminating (Argyris, 1977). For example, when a mistake is made (i.e. when an agent's actions lead to an unfavorable consequence), an agent might correct or conceal the mistake without making others aware of its existence or the factors that produced it. This tendency is 'undiscussable' according to Model I organizational norms. This creates what Argyris (1977) calls a *primary* inhibiting loop. The lack of discussability is perpetuated by an organizational climate that tolerates the undiscussability of such issues. This creates what Argyris (1977) calls a *secondary* inhibiting loop. Secondary inhibiting loops result from a pathological group dynamic that reinforces primary inhibiting loops and embeds them in an organization's climate (Argyris, 1977, p. 121).

Attempts to substantially improve OL in Model I organizations without addressing the prevailing pathological norms will likely not succeed. Instead, efforts to

improve error detection and correction must incorporate mechanisms that counteract these conditions, moving organizations in the direction of Model II status.

2.3.3. The future of OL research

Argyris (2003) argues that OL research would benefit from a continuation of the emphases listed in Table 1. These emphases are essentially the values that Model II organizations espouse, with a particular focus on producing actionable knowledge.

Table 1: Argyris' (2003) proposed emphases in OL research

From an emphasis on:	**Toward an emphasis that includes:**
single-loop learning	double-loop learning
internal and external validity	implementable validity
normal science causality	design causality
understanding and explaining	producing action
describing the universe as is	creating new and rare universes
propositions that are descriptive	propositions that are normative and prescriptive
generalizable propositions	propositions that are applicable in the individual case
seeking knowledge that is as complete as possible	seeking knowledge that is designedly incomplete, supported by theory and methods to fill in the gaps

2.4. Gap in the literature

Commonly used OL concepts such as single-loop (SL) and double-loop (DL) learning were first introduced by prominent scholars in the mid-20th century but have not been significantly developed since the 1990's. Organizations of all types tend to habitually under-innovate in some cases and over-innovate in others. Both scenarios are

problematic because they are wasteful and unproductive by design. On the one hand, an overabundance of DL-type responses is costly yet unlikely to net positive gains: "decision systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits" (March, 1994, p. 238). In contrast, an overabundance of SL-type responses inhibits the innovation that accompanies DL-type action models; if the marketplace demands a degree of innovation that an organization cannot supply, the organization may ultimately become obsolete (March, 1994, p. 238).

Overall, there is a lack of specificity, let alone empirical testing, of mainstream OL concepts. For example, no model explains how to test or even define SL or DL in practice. While this research does not illuminate possible definitional distinctions between SL and DL per se, it sheds light on learning in organizations through a nuanced examination of the similarities and differences in how organizations design responses to errors. By examining the factors that shape the design of action and identifying similarities in, and differences between, factors across organizations, this research intends to contribute to a broader understanding of error detection and correction from an OL perspective. In keeping with March's (1994, p. 271) suggestion that a better understanding of the design of action can be fruitful ("It is possible to apply thought to the problems of intelligence, to profit from an understanding of how decisions happen in order to make them happen better"), the thesis contributes to a foundation of understanding aimed at improving learning in organizations.

This thesis answers the following question using a meta-review of error detection and correction in 17 case studies: *What similarities or differences exist in how organizations design responses to errors?* Specifically:

1. *Which inputs inform the design of action?* Examples of inputs that may inform the design of action include an agent's professional experience, educational background, or use of technology.
2. *What influences how action is designed?* An agent's individual characteristics—such as age or personal values—are examples of factors that may influence the way in which action is designed in an organization.
3. *What are challenges to designing action?* Examples of challenges to designing action may include insufficient organizational knowledge or resistance to change.
4. *How does the design process influence the outcome of action?* Design processes may influence the design of action, for example, by improving an organization's ability to align with organizational strategies or better meet customer demands.

The exploratory research asks whether similarities or differences exist in how organizations design responses to errors, in order to systematically develop an inventory of factors that may (or may not) shape the way organizations design action. It could be possible that each organization studied designs action in a completely distinct fashion, with no distinguishable similarities and differences present. It could alternatively be possible that the manner in which action is designed is relatively similar or significantly

different (i.e. contradictory) across organizations. The analysis has revealed that, overall, there is no universal system that organizations use to design action.

3. RESEARCH DESIGN & METHODS

This research seeks to shed light on factors that shape the design of action in organizations. To that end, it conducts an exploratory qualitative meta-review of 17 case studies that describe error detection and correction in organizations of varying types, sizes, locations, and industries. A qualitative analysis is most suitable given its distinct propensity for examining human experiences—those that are difficult or impossible to quantify and that are usually out of reach for quantitative methods (Sandelowski & Barroso, 2006, p. 2). Additionally, because there is no agreed-upon typology of OL concepts (Shipton 2006), a quantitative study would have been inappropriate. A typology provides structure, consistency, and consensus; quantifying the material in the absence of an agreed-upon typology would have been subject to bias.

3.1 Data

The thesis is a meta-review of 17 published case studies from a range of disciplines. The indices in Table 2 were used to locate these articles; the indices were appropriate because they contain a wide breadth of leading academic journals in the social sciences and empirical studies relevant to the research question. When searching the indices to identify suitable articles, the researcher used universal terms related to the design of action rather than OL-specific concepts.

Table 2: Indices used to locate case studies suitable for this research

Index name	Acronym
Science Citation Index Expanded	SCI-EXPANDED
Social Sciences Citation Index	SSCI
Arts & Humanities Citation Index	A&HCI
Conference Proceedings Citation Index – Science	CPCI-S
Conference Proceedings Citation Index – Social Science & Humanities	CPCI-SSH
Book Citation Index– Science	BKCI-S
Book Citation Index– Social Sciences & Humanities	BKCI-SSH
Emerging Sources Citation Index	ESCI

Within these indices, documents were located as follows:

1. The topic keyword *organizational* yielded 151,847 results; this term distinguishes articles relating to an organizational setting.
2. Of these, the keyword *learning* yielded 15,571 results; this term distinguishes articles relating to some form of learning.
3. Of these, the keyword *information* yielded 3,543 results; this term distinguishes articles likely to align with the action-based framework in which this thesis is grounded, emphasizing the relationship between knowledge and action. While the terms *information* and *knowledge* are frequently used interchangeably, the term *information* was selected because *knowledge* has a narrow meaning that differs from the topics this thesis studies.

4. Of these, the keyword *decision* yielded 639 results; this term distinguishes articles likely to describe decision-making processes, an element of the design of action.
5. Of these, the document type was limited to *article*, *proceedings paper*, or *book chapter*, which yielded 582 results. These additional filters were applied in an effort to distinguish material likely to contain a high degree of academic rigor.
6. Of these, the publication date was limited to *7/1/2015-6/30/2017*, which yielded 93 results; this filter was applied to narrow the sample to cases likely to describe a current or recent state of error detection and correction in organizations.

A search of these articles by *exact* title was conducted using the San Francisco State University (SFSU) library's web-based portal. The following exclusions were made:

7. Articles not found in SFSU's library database; 23 (24%) of the 93 articles were not found, yielding 70 results.
8. Articles found but whose full text is unavailable through the SFSU database; 11 (16%) of the 70 articles are unavailable in their full text, yielding 59 results.
9. Articles not written in English; 2 (4%) of the 59 articles are written in a language other than English, yielding 57 results.

Once these exclusions were made, the researcher reviewed each article's abstract, methods, and results sections, screening them for evidence that the study (a) was a primary case study and (b) described error detection or correction in organizations. Terms such as *case study* and *primary sources* were sought to indicate a primary case study, and terms such as *decision-making and action strategy* were sought to indicate that the article

sufficiently describes error detection and correction. The following additional exclusions were made:

10. Articles that are not empirical case studies (e.g. conceptual or theoretical); 26 (46%) of the 57 articles are not, yielding 31 results.
11. Articles that do not substantially describe error detection or correction; 9 (29%) of the 31 articles do not, yielding 22 results.
12. Articles that do not describe error detection or correction in detail; 5 (23%) of the 22 articles do not, yielding 17 results.

Once articles were selected, each was reviewed to develop a general coding scheme for patterns present in the sample. In line with a thematic survey approach (Sandelowski & Barroso, 2006, p. 145), the coding scheme included everyday terms or concepts commonly used in the OL literature or within the articles included in the sample, such as learning, information, and knowledge.

A thematic survey is suitable because it allows for a particularly nuanced, descriptive examination of qualitative data, which in turn permits a richer interpretation of human experiences (Sandelowski & Barroso, 2006, p. 145). Table 3 outlines the coding scheme used to locate data points in each article, i.e. factors related to the OL topics listed in the table's first column. For example, to identify factors related to the OL topic *absorptive capacity*, the author sought terms such as *institutionalize, assimilate,* and *standardize,* as these are commonly used to describe an organization's absorptive capacity.

Table 3: Coding scheme used to distinguish key concepts by topic

OL topic	Definition	Sample terms	Case example
Absorptive capacity	The degree to which an organization institutionalizes information	Institutionalize; assimilate; standardize	"Committees appeared to be overly **standardized** and suffered from inflexibility in banker's mental models, which combined to produce mindless patterns of decision making" (Eastburn & Boland, 2015, p. 169).
Agent actions	The quality or other measure of an agent's individual actions	Reflection; performance; action	"Over time, additional measurement points were placed into the process in order to more quickly identify **performance** degradations and intervene in a timely fashion" (Wright et al., 2015, p. 909).
Agent characteristics	The quality or other measure of an agent's individual characteristics	Experience; qualifications; behavior	"Banking executives attributed the surprise outcome of their decisions to specific **behaviors**, including their complacency and over-confidence, their over-trusting of others, their deviation from protocol, their habitual information reporting and decisioning efforts, and their deficient detection of warning signals" (Eastburn & Boland, 2015, p. 168).
Barriers	Conditions that may inhibit the design of action	Demanding; pressure; barrier	"Time **pressure** caused the single physician who worked at a smaller regional hospital to leave the group after attending only one meeting" (Hostgaard, Bertelsen, & Nohr, 2017, p. 8).
Change management	The degree to which change is effectively managed in an organization	Change; opportunity; flexibility; acceptance	"Our respondents believed that efforts to make the portal consistent with organizational and professional values **make it more likely that the portal will be widely used and promoted [i.e. accepted]** by physicians and other staff across the organization" (Otte-Trojel et al., 2015, p. 9).
Communication	The method by which information is exchanged	Information; terminology; translation	"Similarly, the sites had difficulty resolving **terminology issues** until terminologists, who were working on the mappings at each institution, had one-on-one discussions" (Wright et al., 2015, p. 906).
Context of error	The circumstances in which an error takes place	Situation; condition	"When challenged by unexpected **situations**, the HR managers used reflection-on-action and reflection-in-action to make decisions" (Walger, Roglio, De Dea, & Gustavo, 2016, p. 667).
Decision-making proficiency	The level of competency in	Discussion; mental model;	"Overall, over time both case companies have moved away from complete dependence on the

	which decisions are made	self-reliance	alliance partners to **self-reliance**, especially in the case of changes in models and technologies" (Haider & Mariotti, 2016, p. 1828).
Existing knowledge	An organization's existing skills, information, and experience	Repository; prior experience; existing processes	"With the passage of time, companies seemed to learn and develop their own **repositories of knowledge** and that led them to innovate and create knowledge internally" (Haider & Mariotti, 2016, p. 1828).
External environment	The external conditions in which an organization operates	Environmental signals; regulation; external sources	"For the construct in the organizational factor, the perceived degree to which the organization learns from **external sources** had no effect on VAT-compliant accounting system adoption" (Amzi, Sapiei, Mustapha, & Abdullah, 2015, p. 9).
External stakeholders	External parties that have an interest in an organization's activities	External stakeholders; community	"With relation to the **external stakeholders**, the interviewees were most evidently concerned about the community, employees' families, the press, unions, influential people in small towns (e.g. political and religious leaders), Brazilian laws, competitors and the images of their respective company's brands and products" (Walger, Roglio, De Dea, & Gustavo, 2016, p. 661).
Internal context	The internal conditions in which an organization operates	Organizational mindset; nature; climate	"While inclusion and transparency are considered as fundamental in open strategizing (Whittington et al., 2011), not all participants may automatically **feel a sense of** inclusion or will be interested in transparency merely because of their involvement" (Hutter, Nketia, & Fuller, 2017, p. 366).
Internal stakeholders	Internal parties that have an interest in an organization's activities	Internal agent; staff; unit	"Eighteen months later, the physicians' professional organization at the hospital objected to all medical specialties, age levels, and locations only being represented by two colleagues. They feared that **physicians'** professional interests were not adequately represented" (Hostgaard, Bertelsen, & Nohr, 2017, p. 8).
Logistics of design	The administrative or logistical details of the design process	Usability; reliability; scheduling	"This work was completed in **2 consecutive days. A week later** the group gathered again to review their efforts. A number of changes were made. It was agreed that the **1-week gap** had been helpful to the processes of reflection and revision" (Jessop, Parker, & Temple, 2016, p. 385).

New knowledge	Information an organization has newly acquired	Learning; acquiring; understanding; transfer (of knowledge)	"Once the company managed to develop the assembling capabilities, the top management changed alliance agreement with the focal partner again to include manufacturing know-how to be **transferred**, exhibiting another shift in their strategic thinking (self-reliance)" (Haider & Mariotti, 2016, p. 1828).
OL catalysts	The conditions that stimulate learning in organizations	Catalyst; leads	"An informal team who may not be responsible for the IT/IS development for the firm usually serves as **catalyst** and leads the Web development" (Gorla, Chiravuri, & Chinta, 2017, p. 660).
Organizational capabilities	An organization's level of ability	Control (i.e. ability to manage); capabilities; effectiveness	"Regenstrief's clinical site, Wishard Hospital, made operational decisions regarding new products and platforms that were developed and implemented… this was difficult for the informatics team that developed these products because they did not have complete **control [i.e. ability to manage]** over their implementation" (Wright et al., 2015, p. 907).
Organizational characteristics	The makeup of an organization, such as industry, size, or region	Location; type; life cycle; size	"Results of both models show that **location**, farm **type**, and the **life cycle** of the farm business are significant descriptors of the number of technologies and practices adopted in our sample" (Micheels & Nolan, 2016, p. 133).
Organizational strategy	An organization's planned actions and intended results	Strategic; operational; principles	"Our study found no significant relationship between perceived **operational** benefits of adopting B2B e-commerce and adoption decision" (Gorla, Chiravuri, & Chinta, 2017, p. 661).
Resources	The financial, material, time, or other assets of an organization	Funding; time; space; opportunity; resources	"The decisions analyzed here altered the course of organizations' activities, as they changed working practices; allowed for strategic alignment and **resource** optimization; and also led to organizations' improved relationships with their employees, communities and other institutions" (Walger, Roglio, De Dea, & Gustavo, 2016, p. 667).
Technology	An organization's technical resources, such as machines or computers	Web-based; functionality or usability of computer-based systems	"Despite the promising results, the level of acceptance leaves room for improvement in comparison to the maximum achievable rating especially regarding search **functionality**, results quality and social networking benefit" (Leyer, Schneider, & Claus, 2016, p. 101).

3.2 Analytic methods

As outlined in the literature review, the typical processes involved in error detection and correction in organizations are not necessarily linear. As a result, some of the excerpts analyzed in this study extend beyond the design of action exclusively.

Articles in the sample tend to focus on the processes and outcomes of responding to *strategic* rather than routine errors. In discussing these strategic errors and responses to them, articles also examine routine errors and responses. For example, while describing the design and implementation of an innovative knowledge management system, one article also discusses the separate (but related) issue of usability (Leyer, Schneider & Claus, 2016). The described knowledge management system is a response to a strategic error, while the usability issue describes a routine error arising during implementation. This research includes data related to the design of action for both operational and strategic errors.

To determine the context of each factor identified, the researcher found it necessary to disentangle errors and responses. This process was complex at times because it involved determining with which error each action was associated—a task further complicated by the limited information available in each article. The researcher addressed this challenge by thoroughly examining attributions and making logical inferences based

on the available information. A limitation of this approach is that it introduces a greater degree of subjectivity, as the researcher made assumptions to fill gaps in information.

Each article describes a number of operational and strategic errors. Table 4 outlines an example of the steps followed to identify errors in each article.

Table 4: Example A, process of identifying errors in articles

Citation indicating error	
"The study is based on data derived from a company-wide online platform set up by Siemens, a German multinational engineering and electronics company that sought strategies for creating and validating new sustainable business opportunities" (Hutter, Nketia, & Fuller, 2017, p. 359).	
Theory of action structure	**Sample theory of action**
in situation S	As a German multinational engineering and electronics company
if you want to achieve consequence C	Who wants to achieve business sustainability
do A	Use existing strategies for creating and validating new business opportunities

In Example A, the error (mismatch between *what we intended the consequences of action to be* and *what the consequences of action actually were*) lies in the action taken: before implementing a new system, the organization was erroneously using existing strategies, which were unsuccessful in achieving the desired consequences. In response to the error, the organization adjusted the action taken by developing and implementing a company-wide online platform to collect ideas for creating and validating new sustainable business opportunities from organizational staff. Table 5 provides a second example of the steps followed to identify errors in each article.

Table 5: Example B, process of identifying errors in articles

Citation representing strategic error	
The goal of the Clinical Decision Support Consortium [at SampleOrg in the medical field] was "to assess, define, demonstrate, and evaluate best practices for knowledge management and clinical decision support in healthcare information technology at scale—across multiple ambulatory care settings and EHR technology platforms" (Wright et al., 2015, p. 902).	
Theory of action structure	**Sample theory of action**
in situation S	As an organization in the medical field
if you want to achieve consequence C	Who wants to align with best practices for knowledge management and clinical depression support services
do A	*Use existing information technology practices*

In Example B, the error (mismatch between *what we intended the consequences of action to be* and *what the consequences of action actually were*) lies in the action taken ("do A"): before implementing a new system, the organization was erroneously using existing strategies, which were unsuccessful in achieving the desired consequences. In response to the error described, the organization adjusted the action taken ("do a") by developing and implementing new information technology practices to manage knowledge and support clinical decision-making.

Once the context of each error was established, the stage of the OL process being described was determined. Referring again to the Siemens example, the organization had already responded to the strategic error, but the article did not describe how the error was discovered or assessed. Nor did it describe the process of selecting such a platform during the design process or the nuances involved in its initial implementation. While the article's purpose is to explain how a strategic error had been addressed, the article

actually primarily describes a later stage of implementation relating to the routine errors borne out of implementation. Therefore, data retrieved from that particular article and many others relates mostly to routine errors encountered during the implementation of the strategic initiative. This proved to be a limitation of the research, discussed further in section 3.3.

Finally, data was located in each article. Every attempt was made to utilize the direct results of the inquiry in each case study rather than each original researcher's interpretation of data. However, because articles were selected from among a wide range of sources with varying standards and requirements, this was not always possible. Some articles provide only an interpretation of data; such articles either do not include the original data or include only a small preview. Many articles provide complex results that are impossible to consistently code in this context. Section 3.3 discusses these limitations in more detail.

3.2.2. Nature of the data

While recording data, careful attention was paid to distinguishing subjective from objective material in order to maximize the inclusion of objective data and minimize subjectivity. The distinction relied on whether claims are backed by empirical evidence. The following table provides an example from an article in the sample. In this case, both uninterpreted data and the original researcher's interpretation are listed, as is the manner in which the distinction between objective and subjective material was made. Table 6 outlines an example of the classification method of objective versus subjective material.

Table 6: Example A, identification of objective vs. subjective material

Uninterpreted data from the sample article	
The difference between the total and direct effects is the total indirect effect through the mediators with a point estimate of .1290 and a 95% BC bootstrap CI of .0605 and .2372. (Hutter, Nketia, & Fuller, 2017, p. 365).	
Original researcher's interpretation of results from the sample article	
First, we report that organizational actors' participation in open strategizing indirectly engenders a sense of organizational community (OSOC) via SOVC, specifically crucial for strategy development and management in general (Hutter, Nketia & Fuller, 2017, p. 365).	
Objective material	**Subjective material**
First, we report that organizational actors' participation in open strategizing indirectly engenders a sense of organizational community (OSOC) via SOVC. (This was a finding backed by the uninterpreted data, provided above, in the original article.)	Specifically crucial for strategy development and management in general. (Because no evidence was provided to support the statement that the finding is 'specifically crucial' for the organization, this statement appears to be the opinion of the original researcher.)

Table 7 offers a second example of the manner in which data was classified as either objective or subjective. In classifying data, the following scale of objectivity was used: highly subjective, somewhat subjective, somewhat objective, highly objective. The analysis uses only data determined to be highly objective or somewhat objective.

Table 7: Example B, identification of objective vs. subjective material

Original material	Distinguishing terminology	Type of material
The decisions, after analysis, show that the managers drew on prior knowledge that was accumulated during their academic training, in professional experience and from training and conferences. (Walger, Roglio, De Dea, & Gustavo, 2016, p. 664)	"After analysis… show that"	Somewhat objective
This author believes that professionals fall back on familiar cases that they have experienced even when faced with different problems, finding references in their repertoires that provide examples, images, understandings and experiences from the past. (Walger, Roglio, De Dea, & Gustavo, 2016, p. 664).	"This author believes"	Highly subjective

Material related to the design of action is distinguished from other OL concepts according to the presence of discretion during the course of action, with discretion defined as deviation (or consideration of deviation) from existing governance structures underlying that action (or possible action). Once data was retrieved from each of the articles in the sample, it was aggregated, categorized, and analyzed. Some articles repeated the same point multiple times; this did not reliably indicate the importance of any particular factor. Therefore, repeat factors within the same article were consolidated into one.

3.3. Limitations

As is true of any research, this study has several limitations:

1. The findings of this research cannot be generalized because the sample is not representative. This thesis studies a small number of organizations through a limited number of articles selected using predetermined criteria. Each condition

increases the risk of bias, reduces reliability, and introduces a level of uncertainty. Some articles contain an abundance of information about the design of action, whereas others include only a handful of qualified data points.

2. The data as originally reported in the primary articles included are subject to bias, measurement, and translation error by the original researcher.
3. The data collected through the meta-review is similarly subject to the author's bias, measurement, and translation error, including bias in terms of how data was categorized—and, therefore, how data points were compared. This limitation is exacerbated by variations in style, terminology, methodology, and reporting standards across academic disciplines as well as divergent theoretical orientations of each article. As a result, it was necessary to identify and organize data systematically using coding schemes and carefully differentiate objective from subjective material in the sample, as described in section 3.3.

3.4. Distribution of data

From the 17 articles included in the sample, a total of 354 data points were collected. Table 8 provides the distribution of data points across research questions.

Table 8: Distribution of data across research questions

Research question	Count	% of all data points
Which inputs inform the design of action?	100	28%
What influences how action is designed?	104	29%
What are challenges to designing action?	115	32%
How does the design process influence the outcome action?	35	10%

Chart 1 depicts the number of similarities or differences identified in each topic. Because some factors share both similarities and differences, it is not possible to differentiate the number of similarities from differences in this summary of the data. However, Chapter 4 includes more nuanced results providing those details. Various factors are attributed to the design of action, with some categories more or less prevalent than others. For example, a relatively large number of factors relating to the categories internal context and new knowledge exist, whereas a relatively small number of factors relating to the categories communication or external stakeholders are present.

Chart 1: Similarities or differences in the design of action, by topic

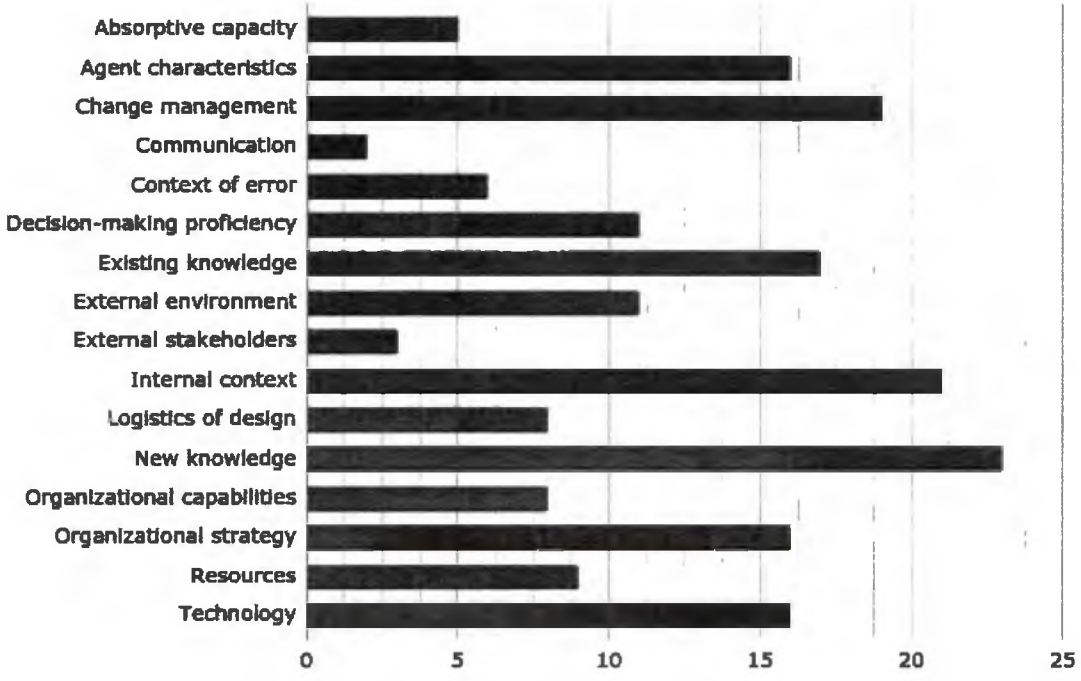
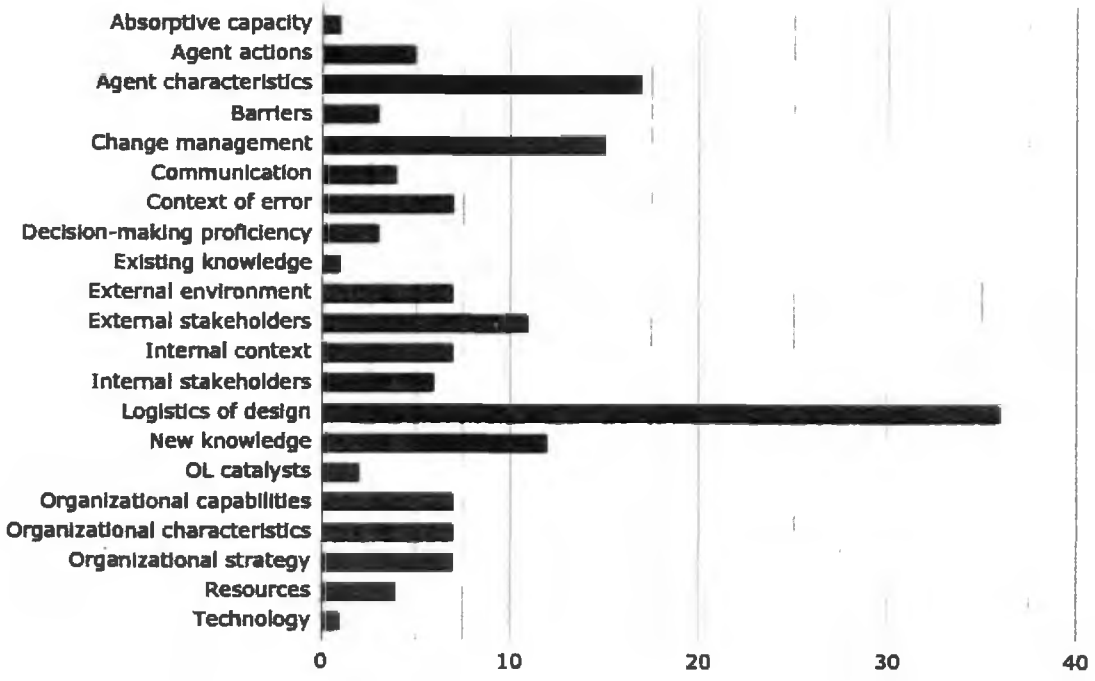


Chart 2 depicts the number of factors with *no* identified similarities or differences.

Chart 2. No similarities or differences in the design of action, by topic



A relatively high number of distinct factors influence the design of action, meaning a high number of factors are unique to individual organizations and do not share any similarities or differences with other organizations. For example, a relatively large number of distinct factors relating to the categories logistics of design and agent characteristics have been identified, whereas a relatively small number of distinct factors relating to the categories technology or existing knowledge exist. Chapter 4 provides detailed results regarding the similarities and differences.

4. RESULTS

The findings of the analysis present mixed results. Overall, there are *some* similarities or differences in the factors affecting how organizations design action. Factors generally fall into one of three buckets:

1. **Distinct**: Factors distinctly shape the design of action in a specific organization; no similarities or differences with other organizations in the sample exist.
2. **Similar**: Factors similarly shape the design of action across two or more organizations in the sample.
3. **Different**: Factors differently (i.e. incompatibly) shape the design of action in two or more organizations

Of the 354 data points collected, 160 (45%) are distinct, meaning that no similarities or differences among organizations exist. Conversely, 194 (55%) are similar to or different from factors present in at least one other article.

The following results are organized first by research sub-question and then by topic. For each section, the narrative expands upon the strongest similarities and differences. Distinct factors do not appear in this section, as little can be said about those at this time.

4.1. Which inputs inform the design of action?

A total of 66 similarities or differences in which inputs inform the design of action have been identified. Those results appear in Table 9. The strongest similarity

involves factors related to the topic of *change management* and, specifically, linking new actions to existing designs; four articles describe linking new models to existing systems, such as using a new IT system to generate information needed for existing processes. The strongest difference involves factors related to the topic of *technology*, specifically, encouraging or inhibiting the use of technology in design processes. Four articles describe encouraging the use of technology during the design of action, whereas two describe intentionally inhibiting technology's use by disabling a web-based application's feature that would otherwise collect pertinent information from users, for example.

Table 9: Similarities and differences in inputs that inform the design of action

Topic	Description	Similarities	Differences
Agent characteristics	The type of experience design agents possess	Two articles describe intentionally assigning agents with a wide range of professional experience.	One article describes assigning agents who have relatively similar professional backgrounds to design processes.
Change management	Whether agents are assigned or volunteer to participate in design processes	Two articles indicate that key stakeholders are assigned to participate in design processes.	One article indicates that stakeholders volunteer to participate in design processes, rather than being assigned.
	Whether new agents are appointed to design processes (versus maintaining the current set of agents)	Two articles describe appointing new agents, such as an external manager or moderator, to facilitate the design of action.	No differences were identified.
	Whether, and how, existing designs are incorporated into new models	Four articles describe linking new design models to existing systems, such as using a new IT system to generate information needed for existing processes.	No differences were identified.

Communication	Method and nature of communication during the design of action	Two articles describe in-person, direct communication between agents as a method of designing action.	No differences were identified.
Existing knowledge	Whether existing knowledge is used during the design of action	Three articles describe utilizing existing knowledge as a method of designing action with two primary sources of knowledge: prior experience and prior training.	One article describes how the utilization of particular existing knowledge was not a method used to design action.
External environment	How designs are aligned with market conditions	Two articles describe manipulating internal practices to align with market conditions.	One article describes manipulating the market to better align with internal practices.
New knowledge	Whether new knowledge is used during the design of action	Three articles describe generating new knowledge as a method of designing action.	No differences were identified.
Organizational strategy	Whether there is a preference for existing models or new designs (according to an organization's strategy)	No similarities were identified	One article describes a strategy of prototyping new models. In contrast, another article describes a strategy of refraining from trying new models in favor of sustaining existing action models.
	Whether there is a preference for short-term or long-term planning (according to an organization's strategy)	No similarities were identified	One article describes a strategy of group reflection and long-term planning. In contrast, another article describes a strategy of producing immediate gains and short-term planning in lieu of long-term planning.
Technology	Whether technology is used or inhibited during design processes	Four articles describe the use of technology as a method of designing action, specifically, the utilization of a computer-based information management	Two articles describe intentionally inhibiting technology when it would otherwise be available as a method of designing action.

		system.	

4.2. What influences how action is designed?

A total of 52 similarities or differences in the ways in which factors influence the design of action have been identified. Those results appear in Table 10. The strongest similarity involves factors related to the topic *internal climate,* with three articles suggesting that an organization's internal climate—such as degree of social capital, organizational culture, or financial pressures—influences the design of action with a relatively high degree of prominence across organizations. The strongest difference involves factors related to *agent mindfulness*: agents do not necessarily use pertinent mindfulness skills when designing action, which can lead to unexpected and negative consequences.

Table 10: Similarities and differences in the ways in which factors influence the design of action

Topic	Description	Similarities	Differences
Agent characteristics	Agent's age	Two articles find that an agent's age influences how the agent designed action, but did *not* find that age consistently influences an agent's likelihood of using innovative action models.	One article finds that younger employees are more likely to use innovative action models than older employees.
	Agent's stage in career, educational background, or professional experience	Three articles find that an agent's stage in career, professional experience, or academic qualifications influences the likelihood of designing innovative action models.	One article finds that level of education or managerial experience does not influence the likelihood of designing innovative action models.

	Agent's personal characteristics, such as mindfulness, degree of caution, or analytical ability	Three articles find that agents' personal characteristics and tendencies, such as uncertainty, cautious behavior, or the ability to analyze the external environment, influence the agent's design of action. Relatedly, another article finds that an agent's preference for negative information (e.g. caution or skepticism) when designing action influences the likelihood of innovation.	One article finds that agents do not necessarily use important mindfulness skills when designing action, which leads to unexpected negative consequences.
Context of error	Complexity of the error at hand	Two articles find that particularly perplexing, challenging errors influence the design of action.	No differences were identified.
	Whether the error at hand aligns with an organization's strategy	Two articles find that alignment with strategic initiatives influences the design of action.	No differences were identified.
	Whether agents embrace innovative action models in relation to the error at hand	No similarities were identified.	One article finds that an agent's understanding of the potential benefits of innovative action models influences the design of action. On the other hand, another article finds that enthusiasm and support for an innovative action model did not sustain its successful design without external supports.
External environment	Pressure from competitors	Three articles find that pressure from competitors influences the design of action.	No differences were identified.
	Pressure from changes in government policy	Two articles find that changes in government policy influence the design of action.	No differences were identified.

External stakeholders	Pressure from powerful community members	Two articles find that powerful community members influence the design of action.	One article finds that coercive pressure did not necessarily influence the design of action.
Internal climate	Level of social capital	Two articles find that social capital influences the design of action.	No differences were identified.
	Organizational culture, nature, and atmosphere	Three articles find that an organization's culture, nature, and atmosphere influence the design of action.	No differences were identified.
	Financial pressures	No similarities were identified.	One article finds that financial matters (e.g. profits) influence the design of action. Somewhat dissimilarly, another article finds that tax compliance costs have no influence on the likelihood of adopting innovation.
Organizational capabilities	Organizational capabilities, such as proficiency in human resources, information technology, or knowledge management	Two articles find that organizational capabilities, including human resources and knowledge management, influence the design of action.	One article somewhat conversely finds no significant correlation between IT capabilities and the adoption of an innovative technology system.
Organizational strategy	An organization's learning orientation	No similarities identified	One article finds that a learning orientation (i.e. strategy) did not influence the design of action. Somewhat dissimilarly, another article finds that recognition of a need to change existing strategies influences the design of action.
Technology	Utilization of technology	Two articles find that technology influences the design of action.	No differences were identified.

4.3. What are challenges to designing action?

A total of 60 similarities or differences in challenges to the design of action have been identified. Table 11 provides those results. The strongest similarity involves factors related to the topic of *change management*: difficulty with change challenges the effective design of action with a relatively high degree of prominence. The strongest difference involves factors related to the topic of *absorptive capacity*: designs that are thoroughly institutionalized and rarely reviewed lead to rigidity and inflexibility during implementation.

Table 11: Similarities or differences in what challenges the design of action

Topic	Description	Similarities	Differences
Absorptive capacity	Implementing and institutionalizing new action models	Two articles find difficulty implementing and institutionalizing new action models as challenges to designing action.	Conversely, one article describes how designs were too well-accepted and institutionalized.
	Collecting and utilizing information during design processes	Two articles find difficulty collecting and utilizing information as challenges to designing action.	No differences were identified.
Change management	Managing change	Five articles find that difficulty with change challenges the design of action.	No differences were identified.
Decision-making proficiency	Decision-making proficiency	Two articles find that difficulty with decision-making proficiency challenges the design of action.	No differences were identified.
Existing	Establishing a sufficient	Four articles find that	No differences were

knowledge	level of knowledge	difficulty establishing sufficient knowledge can challenge the design of action.	identified.
	Maintaining existing knowledge	Two articles find that difficulty maintaining existing knowledge can challenge the design of action.	No differences were identified.
External environment	Adapting to the external environment	Two articles find that difficulty adapting to the external environment challenges the design of action.	No differences were identified.
Internal context	Pathological internal conditions	Two articles find that an organization's internal context, (e.g. disparities in access to innovative systems) can challenge the design of action.	No differences were identified.
Logistics of design	Logistical difficulties	Two articles find that logistical concerns, such as overly-simplistic action models, challenge the design of action.	No differences were identified.
	Reliability of information	Two articles find that reliability concerns about information challenge the design of action.	No differences were identified.
Organizational strategy	Strategic difficulties	Three articles find that an organization's strategic difficulties can challenge the design of action.	No differences were identified.
Resources	Time or support allocated to the design of action	Three articles find that a lack of time or support challenges the design of action.	Somewhat conversely, a fourth article describes the benefit of sufficiently supporting design processes.
	Competing demands for resources	Two articles find that competing demands for resources are challenges to the design of action.	No differences were identified.

4.4. How does the design process influence the outcome of action?

A total of 16 instances of similarities in the ways in which the design process influences the outcome of action have been identified. Those results appear in Table 12. The strongest similarity involves a factor related to the topic of *organizational capabilities*: the successful design of action sets a precedent for successful learning in the future and helps organizations develop skills and knowledge, which can expand capabilities over time. For this research question, no differences have been identified in the data.

Table 12: Similarities in the ways in which the design process influences the outcome of action

Topic	Description	Similarities	Differences
Change management	Stakeholder relationships and ownership of decision-making processes	Two articles find that the design of action influences the outcome of action because it brings together stakeholders and builds ownership in decision-making processes.	No differences were identified.
Decision-making proficiency	Decision-making proficiency	Two articles find that the design of action influences the outcome of action because it improves decision-making proficiency.	No differences were identified.
Organizational capabilities	Supporting and building organizational capabilities	Four articles find that the design of action influences the outcome of action because of its role in supporting and building organizational capabilities.	No differences were identified.
Organizational strategy	Supporting organizational strategy	Two articles find that the design of action influences the outcome of action in supporting organizational strategy.	No differences were identified.

4.5. Most prominent similarities and differences

In the previous sections, similarities and differences in factors shaping the design of action among those organizations included in the sample were organized first by research subquestion and then by topic. Table 13 expands on the most prominent similarities and differences. It is organized first by topic and then by research subquestion. Where similarities exist, a factor is generally considered prominent only if it is present in at least 30% of case studies. Where differences exist, a factor is generally considered prominent only if it is incompatible with a similarity present.

Table 13: Most prominent similarities and differences

Topic	Subquestion	Finding
Change management	Which inputs inform the design of action?	Appointing new agents, such as external moderators, to design processes
		Asking employees (broadly) to volunteer to participate in design processes so that the team that designs action is self-selected
		Making new designs dependent on existing models
		Providing a financial incentive for the use of new designs, such as tying the successful use of a new computer system to bonus structures
	What are challenges to designing action?	Assuming that existing models are adequate and that new designs are unnecessary
		Reliance on pathological organizational norms
		Designing models which poorly address the issue at hand, such as a single-loop response when a double-loop response would be more suitable
Internal climate	What influences how action is designed?	Level of social capital has a positive correlation
		Providing visible support for an organization's culture has a positive correlation

		Minimizing staff turnover and maximizing retention has a positive correlation
		A sense of limited financial resources within the organization has a positive correlation
		Level of staff training has a positive correlation
Technology	Which inputs inform the design of action?	Integrating technology during design processes, such as the utilization of a computer-based information management system
		Intentionally inhibiting the integration of technology

As Table 14 shows, factors related to the topics *change management, internal climate, and technology* are most prominent across research questions, indicating that these factors may be particularly important. For example, *assuming that existing models are adequate and that new designs are unnecessary* is a factor related to the topic of *change management,* which prominently challenges the design of action across organizations. In one case, protecting existing models is prioritized: as one agent in the organization explained, "'weathering the storm is our way of retaining stability,' reinforcing a business-as-usual response in lieu of some flexible strategic action" (Eastburn & Boland, 2015, p. 175). In another case, existing action models are overly-standardized and inflexible, challenging the organization's ability to innovate: actions "suffered from inflexibility in banker's mental models, which combined to produce mindless patterns of decision making" (Eastburn & Boland, 2015, p. 169). In a third case different from the first two, *refraining from* assuming that existing models are adequate leads to the successful implementation of an innovative design: "The [initiative's] alignment with organizational…incentives and programs to improve [service] delivery, and the visibility

of that alignment, has allowed for large investments in and support of the use of the [initiative]" (Otte-Trojel et al., 2015, p. 9).

Related to the topic of *internal climate*, an organization has determined that the factor *level of social capital* positively influences the design of action in a setting where the adoption of new technology and practices is desirable. As one article notes: "We find that the level of reported social capital on the farm was a significant predictor of the number of new technologies and practices adopted" (Micheels & Nolan, 2016, p. 134). A second article finds a positive correlation between social capital and the adoption of technology that the organization considers desirable: "The results of our study support the hypothesis (H2) that a positive relationship exists between the presence of informal group linkages and the B2B e-commerce adoption" (Gorla, Chiravuri & Chinta, 2017, p. 660).

Related to the topic of *technology*, the factor *integrating technology during design processes* prominently informs the design of action. One article finds that use of a knowledge management system has a positive effect on design processes: "The results support hypotheses H1, H2, and H3, which state that BI system usage has a significantly positive effect on internal process performance, customer performance, and learning and growth" (Hou, 2016, p. 1557). Similarly, another article discusses the integration of a knowledge management system to inform the design of action, but not necessarily for all types of action: "Retrieving information about required knowledge in process execution is not necessary every day ... Thus, employees should not use a knowledge-management

system every day. This assumed behaviour is in line with the observed usage rate of the two knowledge systems" (Leyer, Schneider & Claus, 2016, p. 101).

While these prominent similarities and differences are certainly important when one seeks to understand how organizations design action, these similarities and differences are not necessarily indicative of the factors that organizations *should* emphasize. It is even possible that the prominence of particular factors represents a pathological trend across organizations. For example, it is possible that organizations overuse change management strategies, perhaps because those strategies happen to be popular at a given time.

5. DISCUSSION

The analysis produced four key findings. First, a small number of factors appear to shape the design of action across organizations in a somewhat prominent manner. It would be useful to test these factors across a larger sample of organizations. Second, while similarities or differences in factors attributed to the design of action exist in roughly half the data points collected, the degree to which similarities and differences exist is relatively low; no factor is present in more than six of the 17 articles in the sample. Overall, there is an absence of a set of pervasive, widespread similarities and differences attributed to the design of action across organizations. Third, other than the indicated similarities and differences, no reliable or consistent pattern is detected in terms of how particular factors influence the design of action across organizations. This implies that it may be unrealistic to expect particular factors to shape the design of actions across organizations in a consistent manner. Fourth, factors shaping the design of action usually depend on other factors, suggesting that sets of factors should be considered when deconstructing the design of action in organizations.

Overall, the results align with Argyris and Schön's assertion that Model I norms are prevalent in organizations. As reviewed in Chapter 2, most organizations can be classified as Model I, in which defensive reasoning, misinformation, and self-fulfilling mindsets underlie action. These Model I governing variables are evident in the results, in particular among the most prominent factors challenging the design of action in organizations. Restated, these most prominent challenges include *assuming that existing*

models are adequate and that new designs are unnecessary; relying on pathological organizational norms; and designing models that poorly address the issue at hand, such as a single-loop response when a double-loop response would be more suitable.

Aside from the challenges that organizations face, the other prominent factors related to the design of action do not appear to be inherently 'good' or 'bad.' Instead, the context of any factor establishes its nature. For example, the factor *appointing new agents, such as external moderators, to design processes* is a prominent input used to design action across organizations. In an organization where employees tend to be underutilized, appointing new agents to design processes might very well be pathological and in line with Model I conditions. In contrast, in an organization where employees tend to have heavy workloads, appointing new agents to design processes could be highly constructive and in line with Model II conditions. What appears to be missing from the studied cases is an explanation of how action is designed in light of context.

6. CONCLUSION

The thesis seeks to expand understanding of the design of action in organizations from an OL perspective. The results of the analysis point to three leading implications.

First, because factors that shape the design of action are usually dependent on other factors within the organizations, it is necessary to consider sets of factors (rather than individual factors) when deconstructing the design of action. To do this, organizations need certain capabilities, such as the ability to articulate and reflect upon organizational theories of action as well as a system of determining whether SL- or DL-type responses are most likely to address particular organizational errors or needs. These capabilities may be developed through meta learning-type exercises, such as a program evaluation, in which an organization reflects upon and aims to improve its actions. Examples of the conditions that most likely must exist include the allocation of sufficient time and resources and visible support of initiatives intended to develop these capabilities.

Second, a small number of factors relating to the categories *change management*, *internal climate*, and *technology* prominently shape the design of action across organizations. It is unclear what this result means. On the one hand, this may imply that these factors are particularly important and that organizations should pay more attention to these topics when trying to improve the design of action. On the other hand, it is possible that these factors are not particularly helpful—or that they are even pathological. What is *popular* within or across organizations is not necessarily what is healthy,

productive, or sustainable. An organization should act in a manner suitable for its particular situation; any deviation from an optimal theory of action (to, for example, align with a current fad) is wasteful and risky. Instead, organizations should systematically consider the theory underlying important actions, including the suitability of objectives according to climate, resources, and environmental factors and whether the planned actions achieve those consequences. This may be achieved, for example, through a program evaluation.

Third, it may be unrealistic to expect particular factors to shape the design of actions across organizations in a consistent manner. Other than the indicated similarities and differences, there is not necessarily reliability or consistency in terms of how particular factors influence the design of action across organizations. Consequently, organizations should avoid making assumptions about the suitability or efficacy of particular factors (e.g. more funding for a project). Instead, they should strive to systematically develop and maintain logical theories of action based on the context of each particular action. An example of how this may be achieved is through a program evaluation, which serves the purpose of objectively evaluating conditions so that they can be improved upon.

For each implication listed above, a recommended course of action is provided for organizations seeking to improve their ability to design action. Realistically, these recommendations are likely to be constructive only in conjunction with a broader effort

to improve learning in the organization. Currently, organizations do not have a tangible method of systematizing error detection and correction.

5.1. Scientific Learning

In light of the research findings, and given the absence of a tangible system that organizations can use to actively engage and improve learning, a new construct for future exploration is proposed: *scientific learning* (not to be confused with scientific management). The scientific learning construct is intended to facilitate the systematization of the error detection and correction process in organizations. As Argyris and Schön (1974) discuss, every action can be explained by a single theory of action:

> *in situation S*
> *to achieve consequence C*
> *do A*

In general, an action's theory is not discussed or even explicitly acknowledged during its formulation. When a theory of action is made explicit, exposure is maximized to the governing variables underlying decision-making. This increases the opportunity for reflection, deliberation, and (as needed) adjustment. Scientific learning proposes the following steps to deconstruct and systematize the design of any particular action:

1. Determine which organizational error or need the action is intended to address
2. Construct an optimal theory of action based on the context of the error or need, including organizational objectives, climate, resources, and environmental factors
3. Articulate the current theory-in-use, i.e. the theory underlying an action
4. Identify discrepancies between the optimal theory of action and theory-in-use

5. Determine why discrepancies exist, i.e. the factors leading to discrepancies or which portions of the theory of action model are invalid
6. Remedy discrepancies by adjusting the factors that underlie action and/or invalid theories of action

To successfully complete these steps, an organization must allocate sufficient resources to processes of inquiry and reflection and possess an unwavering commitment to organizational development. In practice, the steps may be facilitated by exercises such as those listed in Table 14. Due to the intrinsically defensive, self-sealing nature of organizations, the successful completion of these steps almost certainly requires skills and abilities beyond what is currently available within an organization. Such skills may be acquired through the use of an external consultant or by hiring staff who possess them.

Table 14: Examples of exercises which may facilitate scientific learning

Scientific learning step	Sample exercise
1. Determine which organizational error or need the action is intended to address	Create a logic model to articulate the relationships between organizational needs and actions
2. Construct an optimal theory of action	Perform market research to determine how other organizations are responding to the same or similar errors/organizational needs
3. Articulate the current theory-in-use	Conduct a program evaluation to form an objective, comprehensive picture of an organization's state
4. Identify discrepancies between the optimal theory of action and current theory-in-use	Hold a meeting among stakeholders to compare the optimal theory of action and current theory in use
5. Determine why discrepancies exist	Organize a staff retreat to discuss the reasons discrepancies exist and brainstorm possible solutions
6. Remedy discrepancies	Utilize an external consultant to help design processes which support the desired theory of action; for example, a performance management system which awards desirable values and penalizes undesirable values

Scientific learning has the potential to correct invalid theories of action and/or alter the variables governing action rather than changing action itself. An adjustment to action without an adjustment to the rationale underlying action is unsustainable because, ultimately, agents (and the organizations they form) act in accordance with how they believe they should act. Further, scientific learning is unique in that it proposes comparing an action's theory-in-use to an optimal theory. This is not a typical exercise. Often, when one is assessing the efficacy of a particular action, a comparison is made against the norms or status quo of the organization. This is done in lieu of what is most suitable given an organization's situation and what the intended consequences of action are.

Further study is needed to determine whether, and how, the factors shaping the design of action may be deconstructed and ultimately systematized to improve an organization's efficacy in practice. In particular, it would be useful to study the similarities and differences in how action is designed across a larger number of organizations in light of the context of each while exploring direct relationship between specific factors and the design of action.

This study is relevant because it expands upon existing material related to the factors which shape the design of action in organizations, which contributes to an overall understanding learning in organizations from an OL lens. The thesis also proposes a new construct for future exploration, *scientific learning*, to aid the systematization of detecting

and correcting errors in organizations. This thesis represents a modest step in the direction of better understanding an extremely complicated subject—one that researches across disciplines from OL to decision-making to economics have been working on tirelessly for decades and for which great strides have already been made. It is the author's hope that continuing to improve and expand upon understanding of the subject from an OL lens will help further the study of OL and ultimately facilitate better learning environments in organizations.

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8. APPENDICES

Appendix A: Definitions of Key Concepts

Concept	Definition
Organization	Complex systems (Argyris, 1960) created and maintained by people (Argyris, 1971) who collectively form an entity (the 'organization') which engages in achieving its objectives while maintaining the internal climate and adapting to the external environment.
Individual learning	Change at the individual level, regardless of whether the change leads to negative, neutral, or positive outcomes (Argyris & Schön, 1978).
Organizational learning	Change at the organizational level; i.e. in its positive form, the detection and correction of error in organizations (Argyris, 1995; Argyris & Schön, 1974, 1978; Visser, 2007; March 1991).
Error	The mismatch between the intended and actual consequences of action (Argyris, 1985); i.e. a "mismatch of outcome to expectation" (Argyris & Schön, 1978, p. 18).
Single-loop learning	When an error is corrected by making incremental adjustments to existing processes and objectives; i.e. without adjusting the governing variables underlying action (Argyris & Schön, 1978).
Double-loop learning	When an error is corrected by adjusting existing processes and objectives, i.e. the governing variables underlying action (Argyris & Schön, 1978).
Espoused theory of action	The explanation used to explain the rationale behind a particular action (Argyris & Schön, 1974).
Theory-in-use	The actual reason why a particular action is performed (Argyris & Schön, 1974).