Adapt and Thrive: Management Perceptions and Behaviors That Affect Double-Loop Learning in a Federal Organization

by Samuel E. Odom Jr.

B.A. in African American Studies, May 2003, San Jose State University
B.S. in Administration of Justice, May 2003, San Jose State University
M.A. in Interdisciplinary Studies, August 2007, San Jose State University

A Dissertation submitted to

The Faculty of
The Graduate School of Education and Human Development
of The George Washington University
in partial fulfillment of the requirements
for the degree of Doctor of Education

January 6, 2023

Dissertation directed by

Russell Korte
Associate Professor of Human and Organizational Learning

The Graduate School of Education and Human Development of The George Washington University certifies that Samuel E. Odom Jr. has passed the Final Examination for the degree of Doctor of Education as of November 1, 2022. This is the final and approved form of the dissertation.

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Samuel E. Odom Jr.

Dissertation Research Committee:

Russell Korte, Associate Professor of Human and Organizational Learning

Toby Egan, Adjunct Professor of Human and Organizational Learning

Elizabeth Benton, Lecturer; Professor of English, Montgomery College; Lecturer, University of Maryland

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Abstract of Dissertation

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The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. The organization is the Air Traffic Organization of the Federal Aviation Administration (FAA). A basic qualitative approach was used with semistructured interviews of senior managers employed or retired from the FAA. I interviewed nine current or retired senior managers from the FAA Air Traffic Organization and FAA headquarters. Participants offered rich data, which were categorized into nine themes related to single-loop learning, double-loop learning, and defensive routines. Management perceptions of behaviors, policies, and practices that promote double-loop learning in the FAA included that the Air Traffic Safety Action Program (ATSAP) promotes a judgment-free environment for identifying and learning about mistakes and safety risks. However, managers also felt the program was perceived as or even misused as a "get-out-of-jail-free card" to avoid individual accountability. The FAA shows adaptability to constant change. However, more two-way communication will develop a more adaptive safety culture. Gathering input from all levels of the organization, increasing dialog and two-way communication, and decreasing defensive behaviors such as a need for unilateral control could help the organization increase learning and become more adaptive.

Table of Contents

Abstract of Dissertation ..... **iv**

List of Figures ..... **x**

List of Tables ..... **xi**

Chapter 1: Introduction 1

Overview 1

Organizational Learning 7

Single- and Double-Loop Learning 8

Benefits of Double-Loop Learning 11

Defensive Routines 12

Problem Statement 14

Purpose of the Study and Research Questions 16

Statement of Potential Significance 16

Conceptual Framework 19

Summary of the Methodology 20

Limitations and Delimitations 21

Definition of Key Terms 24

Chapter 2: Review of Literature 27

Methods of the Literature Review 27

Organizational Learning 32

Why Organizational Learning Is Important 34

Individual- and Organizational-Level Learning in the Organization 35

Challenges and Differences in Organizational Learning 38

Single-Loop Learning 40

Definition of Single-Loop Learning 40
Model I Behaviors 41
Advantages of Single-Loop Learning 42
Double-Loop Learning 44
Definition of Double-Loop Learning 44
Model II Behaviors 46
Advantages of Double-Loop Learning 52
Interconnectivity of Single- and Double-Loop Learning 54
When to Use Single-Loop Learning 57
When to Use Double-Loop Learning 58
Barriers to Double-Loop Learning 60
Defensive Routines 62
Antecedents of Defensive Behaviors and Routines 63
Types of Defensive Routines 66
Gaps in the Research on Double-Loop Learning 72
Conceptual Framework 76
Insights 79
Chapter 3: Methodology 82
Qualitative Research 82
Procedures 85
Setting 85
Participants 86
Data Collection 87
Trustworthiness 92
Data Analysis 92

Data Management 96

Human Participants and Ethics Precautions 96

Assumptions and Limitations 97

Summary 99

Chapter 4: Results 101

Analysis 101

Results for Research Question 1 105

Theme 1: Managers Stressed Continuous Learning, Including Staff Development and Support to Ensure Collaboration 106

Theme 2: Change Is Constant, Requiring Adapting, Monitoring, Creativity, and Reflection 109

Theme 3: Managers Build Trust With Staff Through Transparency, Leading by Example, and Two-Way Communication 113

Theme 4: Managers Stress Compliance With Safety Procedures 115

Theme 5: Managers Perceived ATSAP Improved Information Gathering but Reduced Employee Accountability 117

Summary for Research Question 1 118

Results for Research Question 2 119

Theme 6: Defensive Routines Prevented or Reduced Double-Loop Learning in the Organization 120

Summary for Research Question 2 128

Results for Research Question 3 128

Theme 7: ATSAP Promotes a Judgment-Free Environment for Learning 129

Theme 8: The Organization Shows Adaptability to Constant Change 130

Theme 9: Two-Way Communication Will Develop an Adaptive Safety Culture 132

Summary for Research Question 3 133

Summary 133

Chapter 5: Interpretations, Conclusions, and Recommendations 136

Brief Review of Findings 138

Interpretation of Results 141

Single-Loop Learning 142

Double-Loop Learning 144

Defensive Behaviors and Routines 150

ATSAP: A Double-Loop Learning Project Implemented in a Single-Loop Culture 154

Conclusions 162

Recommendations for Practice 168

Changing Mindsets for Better Safety Reporting 169

Increase Two-Way Communication to Promote Double-Loop Learning 172

Continue to Revise and Expand ATSAP 174

More Organizations Should Adopt Voluntary Safety Reporting Systems 174

Recommendations for Future Research 175

Replicate This Study With More Participants at All Levels of the Organization 175

More Practical Research on Defensive Routines 176

More Research on Double-Loop Learning and Adaptive Leadership 177

References 180

Appendix A: Informed Consent Form 226

Appendix B: Interview Protocol 229

Appendix C: Rev Software Security and Privacy Policy 231

Appendix D: Authorization From FAA Representatives 234

Appendix E: Detailed Codes and Categories.....236

Appendix F: Initial Code Spreadsheet and Sample Quotes.....239

List of Figures

Figure 1. Single-Loop Learning 8

Figure 2. Double-Loop Learning 9

Figure 3. Model of Double-Loop Learning and Defensive Routines 19

Figure 4. Single-Loop Learning Conceptual Framework 44

Figure 5. Double-Loop Learning Conceptual Framework 45

Figure 6. Data Analysis Process 95

Figure 7. Research Process Flowchart 100

Figure 8. Final Conceptual Framework 139

List of Tables

Table 1. Overview of Selected Studies Reviewed 29

Table 2. Single-Loop Learning Categories 102

Table 3. Double-Loop Learning Categories 103

Table 4. Defensive Routines Categories 104

Table 5. Research Questions and Themes 105

Table 6. Interview Questions to Answer Research Question 1 106

Table 7. Interview Question to Answer Research Question 2 120

Table 8. Interview Questions to Answer Research Question 3 129

Chapter 1: Introduction

Overview

Every day, people in organizations must solve highly complex problems in challenging environments (Blake & Mouton, 1988; Brown, 1991). Learning is essential to any organization's success (Adler & Zirger, 1998; Akanpaadgi, 2020; Allameh & Moghaddami, 2010; Argyris & Schön, 1978; Fiol & Lyles, 1985; Huber, 1991; Liker, 2004; Marquardt, 2002; Saadat & Saadat, 2016; Senge, 1990). Leaders can enhance an organization's competitiveness and adaptability by supporting organizational learning (Argyris & Schön, 1996; V. Johnson, 2019). Organizational learning may involve increasing employee knowledge and skills as well as creating a flexible, dynamic organizational learning culture (Saadat & Saadat, 2016). As the needs of organizations are ever changing, leaders and employees also must change and adapt.

Like other organizations using learning for problem-solving and adaptation (Koornneef et al., 2009), the Federal Aviation Administration (FAA) is continuously looking for ways to learn and improve the air traffic control system. As a global leader in aviation, the FAA continuously engages with the International Civil Aviation Organization to increase global safety standards (FAA, 2019a). Moreover, the FAA has obligations to set safety standards while providing oversight around the world for air traffic. The FAA collaborates with industry, federal agencies, and international partners to develop bilateral agreements and set safety standards (FAA, 2019a).

Within the FAA, the Air Traffic Organization includes approximately 35,000 employees, of whom 14,000 are air traffic controllers (FAA, 2020a, 2021b). The purpose of air traffic control service is "to prevent a collision involving aircraft operating in the

system"; provide "a safe, orderly, and expeditious flow of air traffic"; and support missions of national security and homeland defense (FAA, 2019b, § 2-1-1). Air traffic controllers have a first duty priority to separate aircraft and issue safety alerts while exercising good judgment (FAA, 2019b). Air traffic controllers work in three types of air traffic facilities: air traffic control towers, terminal radar approach control facilities, and air route (or en route) traffic control centers (FAA, 2020b). Facilities work together to provide safety services to the users of the system through flight phases (FAA, 2020b). The towers guide take-off and landing, terminal radar approach control guides approach to and from airports, and air route traffic control centers guide aircraft while en route.

The FAA has conceptualized air traffic control as a "complex life-and-death system" (Air Traffic Control Association, 2020, p. 27). Due to the multiple factors such as weather, runway configurations, taxiways, air traffic controllers, aircraft, and drones, Jarrar and Balouki (2018) stated air traffic control is complex and unpredictable, requiring adaptive learning and management to maintain safety. The National Airspace System is a complex, dynamic, event-driven world, and thus the FAA is challenged to continuously search for methods or procedures to increase organizational learning leading to effective problem-solving (Air Traffic Control Association, 2020). Additionally, new entrants into the National Airspace System, such as unmanned aircraft systems and commercial space aircraft, have made managing air traffic operations increasingly complex, requiring new methods, procedures, and multiple response strategies to deal with system demand (FAA, 2016a). Air traffic management is facing "rapid change" (Whitley & Leone, 2020, p. 92).

As air traffic controllers are an adaptive element in a system environment, continuous learning is needed to improve safety and efficiency. The Future National Airspace System, as described in the FAA 2035 vision for air traffic management services, is a fully shared information environment that will evolve the National Airspace System in three fundamental areas: infrastructure, operations, and safety assurance (Whitley & Leone, 2020). Researchers for the FAA described this as a community effort involving internal and external stakeholders and learning systems (Whitley & Leone, 2020).

Safety in aviation affects travelers throughout the world (Huerta, 2015). From a global aviation perspective, the International Civil Aviation Organization (n.d.-a) is a United Nations Specialized Agency, funded and directed by 193 national governments in support of global diplomacy and cooperation in air transport. Additionally, the International Civil Aviation Organization (n.d.-a) has a core business function to maintain an expert bureaucracy, research new air transport policy, and standardize innovations to provide governments with the best results, advice, and recommendations to establish new international standards and recommended practices for civil aviation internationally.

It is paramount to the flying public that organizations involved in aviation establish and continuously improve their safety culture (Holguin et al., 2007). Strong safety cultures depend on efforts to understand root causes and underlying assumptions (Holguin et al., 2007). A strong safety culture is important not only to the FAA but also to the International Civil Aviation Organization (Huerta, 2015) and the National Transportation Safety Board (NTSB, 2020, 2021). All three of the organizations work to

achieve a global safety culture that improves flight safety and mitigates tragic events and the loss of human life (FAA, 2020f; Huerta, 2015). A safety culture is a high-level initiative that impacts the future of aviation (Huerta, 2015).

As the FAA is responsible for the safeguarding the National Airspace System, the FAA continues to look for ways to evolve and enhance its safety culture and performance (Air Traffic Control Association, 2021). Results of the National Commission on Military Aviation Safety (2020) indicated military aviation losses 2013–2020 included the lives of 224 pilots and crew members, 186 aircraft, and $11.6 billion in damages. The FAA implemented a safety management system to monitor, assess, and address the associated risk within the operation. A safety management system is a systemic, formal structure designed to reduce risk and increase safety through system-wide procedures and practices (FAA, n.d.-d). The NTSB (2020, 2021) advised all aircraft operators to participate in the FAA's voluntary safety management system; lack of a safety management system increases risk to the flying public.

The FAA (n.d.-a) continuously looks for ways to manage risk and provide safety risk information to internal stakeholders (air traffic controllers) and external stakeholders (flying public). Risk management requires a systems approach modeling appropriate employee behavior and processes (Rasmussen, 1997). In accordance with Rasmussen's view, "risk management should be goal-oriented at all organizational levels with strong and fast feedback loops between them" (Ek et al., 2003, p. 2). Improvements to safety at the FAA are essential to a proactive safety management system that supports domestic and global aviation (FAA, n.d.-a). As the FAA is the largest aviation agency and governmental body within the United States, it is of the utmost importance that

continuous learning and improvement upon safety measures and culture be studied and advanced. According to researchers (Air Safety Support International, n.d.; Önen, 2016; Piers et al., 2009), the most important element in a safety management system is the safety culture in an organization.

In their study of aviation safety and air traffic control, Ek et al. (2003) noted the importance of a learning culture to produce safety. The FAA safety management system is part of such an organizational learning culture. The FAA (2017a) stated,

> The FAA's mission is to provide the safest, most efficient aerospace system in the world. In support of this mission, the FAA uses a Safety Management System (SMS) to integrate the management of safety risk into operations, acquisitions, rulemaking, and decision making. The SMS enhances the safety of the flying public and strengthens the FAA's worldwide leadership in aviation safety. (p. 1)

The FAA (2021a) has referred to the need for a just safety culture allowing for "self-disclosure of errors" and "due consideration of honest mistakes, especially in a complex environment like the National Airspace System" (para. 2). Voluntary, nonpunitive programs allow FAA employees to report safety issues. According to the FAA (2021d), such voluntary reporting programs such as the Safety Review Process and the Air Traffic Safety Action Program (ATSAP) have improved safety, training, and maintenance procedures. As an example, in collaboration with the FAA, the National Air Traffic Controllers Association created ATSAP, a voluntary safety reporting program. ATSAP helps resolve safety issues that otherwise might not have been identified or resolved (FAA, 2018, 2021h). To that end, employees are promised that no punitive or disciplinary actions will be taken as a result of reporting errors that could impact safety (National Air Traffic Controllers Association, 2017). ATSAP removes actual and potential problems from the sole purview of FAA headquarters and allows day-to-day air traffic control practitioners to safely report risks and errors to the National Airspace

System. From there, the data and individual performance are analyzed by both the headquarters members and subject-matter experts from the field to determine the root cause of the problem. They seek to recreate generative learning continuously from actual performance before and after safety events to determine the optimum course of action moving forward (see Blake & Mouton, 1985). Positive results of the program are published in bulletins (e.g., FAA, 2018, 2021h).

The Commercial Aviation Safety Team, a government–industry working group established in 1997 to reduce commercial aviation risk in the United States, uses safety information from voluntary safety programs like ATSAP to help identify and proactively mitigate risk (FAA, 2020c). Members of the Commercial Aviation Safety Team include the FAA, NASA, Transport Canada Civil Aviation, and the U.S. Department of Defense. Information from voluntary safety programs like ATSAP is used to implement safety improvements, track those improvements, and continue to improve aviation as a system (FAA, 2020c). The success of the Commercial Aviation Safety Team led the U.S. Department of Defense to conclude the need for a similar program specific for the department. During Fiscal Years 2007–2018, the U.S. Department of Defense lost 450 lives and nearly $17 billion through aviation accidents (National Commission on Military Aviation Safety, 2020).

The use of ATSAP and similar programs could create organizational and cultural developments that serve as blueprints for the next generation of safety. A positive safety culture encourages reports on accidents and incidents (reactive) and potential hazards and threats (proactive) to create an organizational learning culture that helps individuals throughout the organization learn from others and their own mistakes (Houston, 2015).

Organizational Learning

Organizational leaders responding to new challenges and changing contexts profit from a culture of organizational learning. Adaptation through organizational learning contributes to long-term success of an organization by improving its systems (Argote & Miron-Spektor, 2011). Organizations should promote learning to be adaptable and competitive (Argyris & Schön, 1996; V. Johnson, 2019; Sisaye & Birnberg, 2010). Organizational learning including reflection and adaptation maximizes impact on organizational success (Makuwira, 2013).

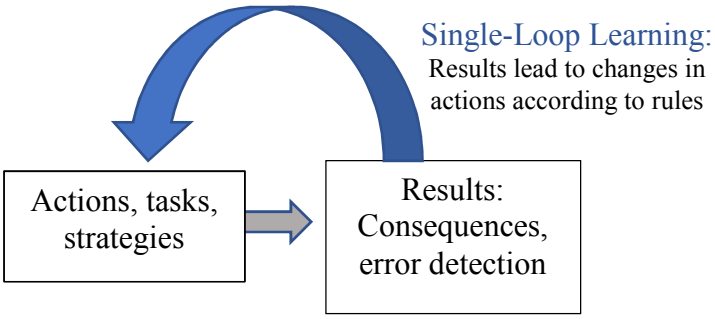
Organizational learning can vary from single-loop learning, which is simply learning from mistakes to improve practices, as well as more complex double-loop learning, which involves critical reflection and rethinking organizational assumptions and goals (Argyris & Schön, 1978), as in the example of ATSAP. Another topic relevant to organizational learning is defensive routines, which block organizational learning; such routines include efforts to maintain the status quo and avoid embarrassment or admission of error. This study was designed to investigate FAA manager perceptions of behaviors, policies, and practices that promote organizational learning as well as those defensive routines that inhibit organizational learning; findings in the form of themes may be used to create professional development to improve the use of ATSAP and other forms of learning in the organization to increase air traffic safety. The following sections define single- and double-loop learning, describe the benefits of double-loop learning, and explain how defensive routines prevent organizational learning.

Single- and Double-Loop Learning

Argyris and Schön (1978) described two types of organizational learning: single- and double-loop learning. Single-loop learning is basic learning from experience. This single loop of testing is basic detection and error correction. Single-loop learning answers the question, "Will my action lead to the desired result?" (Bremmer et al., 2020, p. 2). If a strategy or procedure does not result in the expected outcomes, the strategy or procedure is revised. The new strategy is then tried and outcomes observed in hopes of a new result. Figure 1 illustrates the single-loop process.

Figure 1

Single-Loop Learning

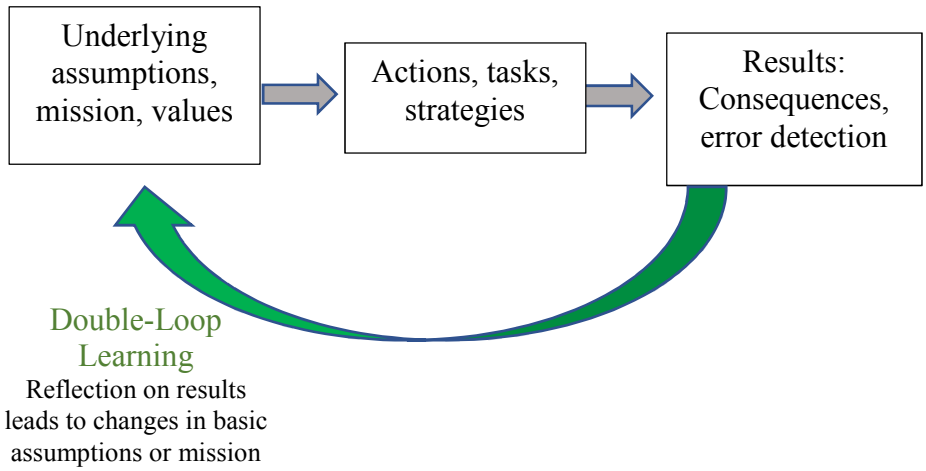


Double-loop learning adds an additional loop of reconsidering the basic foundation on which the procedure is based. Double-loop learning asks the question, "Why do I desire these results?" (Bremmer et al., 2020, p. 3). Objectives, policies, and the status quo may be questioned and adapted (Raajalakshmi & Rajam, 2020). In single-loop learning, organizational members respond to mistakes by reformatting processes and strategies to address flaws they think caused the mistakes (see Figure 1). In double-loop

learning, the underlying values and mission of the organization may be challenged (see Figure 2).

Figure 2

Double-Loop Learning



Stakeholders engaged in double-loop learning ask intentional, reflective, relevant questions to rethink traditional policies and processes to increase adaptability (Raajalakshmi & Rajam, 2020). The literature has associated double-loop learning with improved organizational performance (Aragon, 2018; Argyris, 1977; Freeman & Knight, 2011; Fürstenberg & Görzig, 2020; Jaaron & Backhouse, 2017; Sekelova & Lalis, 2019; Wijethilake & Upadhaya, 2020).

As a concrete example, Wooten and James (2005) described workplace lawsuits based on disability discrimination; the single-loop response was adapting a workplace to accommodate a single individual with a disability or offering a legal settlement, whereas double-loop learning resulted in rethinking company norms to instill universal design and

a more inclusive culture. Mohmoud et al. (2019) stated double-loop learning added value to purchasing processes in a health care organization. The researchers explained single-loop learning was transactional, and employees and leaders took actions based on goals and targets while exerting control over others and the situation. In the double-loop model, leaders lacked unilateral control, resulting in more honesty rather than self-protective behaviors. Rather than competing, employees welcomed decision-making input by those with the most relevant information.

In an example specific to the FAA (2020d), air navigation service providers produce a Lessons Learned document for detection and correction of error. The Lessons Learned document emphasizes a single point of error to determine where to assign blame, in a single-loop approach. After pinpointing the failure, a new rule or procedure is created to mitigate the causation of the failure. To enhance safety and production, strict compliance to all applicable rules, orders, regulations, and policies is evaluated and ordered by management to ensure a mistake is not repeated. The goal of this approach is to solve the problem with no regard for group dynamics or morale; a direct micromanaging approach will ensure that the mission is accomplished. This is an example of single-loop learning, solving routine, repetitive issues in a rule-based context (Argyris, 1977; Matsuo & Nagata, 2020; Pentland & Haerem, 2015; Phelan, 2015). In comparison, in ATSAP described earlier, air traffic control practitioners can report risks and errors so basic approaches to problems may be addressed without assignment of blame (FAA, 2018). ATSAP provides an example of double-loop learning. Single-loop learning is beneficial when rules-based quick decisions are needed. The benefits of double-loop learning are described in the next section.

Benefits of Double-Loop Learning

Double-loop learning involves individuals reflecting on underlying normative behavior, beliefs, or defensive thoughts and actions that create barriers to success (Argyris & Schön, 1996). This type of learning in an organization enables employees to improve system processes in an organization (Jaaron & Backhouse, 2017). For example, rather than continuing to follow existing organizational hierarchies, the basic foundation of service may become more oriented to customer needs. Jaaron and Backhouse (2017) connected double-loop learning to the Vanguard method (Seddon, 2003), which is used to redesign service based on customer needs. The practical application of double-loop learning through the Vanguard method is a three-step philosophy of "check-plan-do" (Jaaron & Backhouse, 2017, p. 323). Check includes analysis of the current system, asking "why" questions (Jaaron & Backhouse, 2017). Ultimately, the system can be redesigned after examining the basic assumptions and beliefs underlying the organization or department. Notably, this type of practical step-by-step description of methods of double-loop learning is rare in the literature.

Double-loop learning offers a continuous learning approach to adapt to complex real-world challenges and variable conditions. Double-loop learning is appropriate for complex problems that require creative solutions and potentially new processes or goals (Argyris, 1982). For example, Abouraia (2018) advocated airlines use double-loop learning in instrumental and policy issues to improve crisis management. Compared to single-loop learning, according to Abouraia, double-loop learning allows airlines to more quickly recover from uncertainties or crises. Richardson (2014) concurred that double-loop learning decreases "decision latency and increases decision quality" (p. 9). The FAA

(2003) stated, “A team approach in reviewing input data, assumptions and judgment is most effective” (p. 16). An organizational environment promoting double-loop learning allows highly skilled professionals like pilots to overcome defensiveness based on their expert status and reexamine errors through reflection (St. George, 2019). Throughout the literature, organizational learning and double-loop learning in particular have been presented as ideal to keep organizations competitive, adaptive, and sustainable (e.g., Argyris, 2004; Mano, 2010; Rist & Joyce, 1995). Nicolaides and McCallum (2013) described double-loop learning as “increasingly necessary to adapt and thrive” (p. 250). However, organizational defensive routines, a common problem in organizations, prevent double-loop learning.

Defensive Routines

Argyris (1990) defined organizational defensive routines as individual actions and organizational policies that protect employees or leaders from embarrassment or potential threat. Whether through policy or actions, defensive routines create a bubble around an organization to mitigate risk and achieve unilateral control. “Every day, defensive routines cripple organizations, resulting in the loss of productivity, a dispirited work force, and a cultural malaise of dissatisfaction” (Noonan, 2018, para. 4).

Alvesson and Spicer (2012) described managers as becoming “trapped into patterns” (p. 1197) of defensive routines, which disrupt two-way communication, prevent critical scrutiny and reflection, and thus inhibit learning. In one example, employees were told not to discuss problems unless they also had developed proposals for solving the problems, which limited discussion on potential solutions (Alvesson & Spicer, 2012). Argyris (1977) offered an example of employees being afraid to report to management

that a product is a failure or a vice president being reluctant to admit to a company president that a division is not performing well. An illuminating example was of a company with a failing product that cost the company millions before finally halting production. Employees at lower levels knew the product was a failure years in advance. However, without a process in place to examine the company mission and goals, employees kept trying to learn from errors in production.

> But the more they struggled, the more they realized the massiveness of the original mistake. The next task was to communicate the bad news so that it would be heard above. They knew that, in their company, bad news would not be well received at the upper levels if it was not accompanied by suggestions for positive action. They also knew that top management was enthusiastically describing Product X as a new leader in its field. Therefore, they spent much time in composing memos that communicated the realities yet would not be too shocking to top managers. (Argyris, 1977, para. 2)

The fragmented, delayed information meant company leaders did not understand the true problem with the product, a problem of defensive routines. Only when managers began to confront the fundamental problem with the product did double-loop learning begin (Argyris, 1977). To show double-loop learning, the organization could have had a system of trusting, judgment-free workshops or meetings where employees could voice concerns without fear of repercussion (Argyris, 1977).

Defensive routines include avoidance of action, delayed decision-making, avoidance of blame or responsibility (leading to interorganizational tension), unreliable evaluations, and risk avoidance (Ashforth & Lee, 1990). Argyris's (1977) example of employees waiting for years to reveal to management the ultimate problems with a much-touted yet failing product illustrates defensive routines through delayed decision-making and risk avoidance. Discovering and examining how organizational defense routines prohibit double-loop learning could help leaders discontinue such practices. Stańczyk-

Hugiet (2018) described the need for identifying defensive routines and "recognizing how they inhibit organizations from detecting and correcting errors—and from knowing when they are not able to do it. Determining what individuals can do to correct and reduce defensive routines and achieve maximum potential is essential" (p. 7). This process is related to the problem addressed by the study, presented in the next section.

Problem Statement

The problem is that organizations struggle to improve creativity, risk taking, learning, and adaptability, which are essential for survival in continuously changing and competitive environments. Contributing to this struggle are defensive routines, which block organizational learning, creativity, risk, and adaptability (Alvesson & Spicer, 2012; Ashforth & Lee, 1990). To survive in a knowledge economy, according to Jaaron and Backhouse (2017), organizations and leaders need to build highly effective learning systems, which is accomplished by rethinking goals and underlying foundations, part of the double-loop learning process (Nicolaides & McCallum, 2013). In the current world context, organizations face complex challenges that require adaptive leadership, which requires critical reflection as in double-loop learning (Nicolaides & McCallum, 2013). Due to the difficulty and complexity of organizational challenges, it is necessary to develop a more robust understanding of organizational learning. Defensive routines and a lack of double-loop learning affect the entire organization (Argyris, 1994; Argyris & Schön, 1978). Yet, the research is limited on the practical use of double-loop learning in organizations. As a result, leaders may not understand how to transition double-loop learning from theory to practice in the workplace, where real-world dynamics and obstacles exist (Rigg & Trehan, 2008). This study was designed to help fill that gap.

Specific to the FAA, the site of the study and the researcher's employer, the problem was an inadequate safety culture (FAA, 2018) and a need for improved organizational learning leading to better air traffic safety. Examples of FAA single- and double-loop learning systems have been described (e.g., Lessons Learned documents and ATSAP) to improve safety. However, 3 years after implementation of ATSAP, Guzzetti (2013) noted, "FAA had not effectively communicated and implemented changes to performance management under ATSAP" (p. 3), and system improvements were needed. Despite use of ATSAP, and 181,288 submitter reports, the FAA (2021h) reported safety culture as the top systemic safety problem, identified in 42.5% of the systemic problem reports. The top causal factor for safety culture problems was supervisory and organizational factors, particularly "lack of safety culture" (FAA, 2021h, p. 8). This trend has remained consistent with previous ATSAP data and quarterly reports (FAA, 2021h). For example, the FAA (2018) reported safety culture was the top system problem identified in the first quarter of Fiscal Year 2019, based on 303 of 813 reports (37.3%) in the quarter. The top causal factor for a problem with safety culture was "supervisory and organizational factors" (FAA, 2018, p. 15) reported in 213 of the 303 reports. Supervisory and organizational factors included an inadequate safety culture, inadequate or out-of-date policy, staffing shortage, employees not held accountable, management distractions, and unrealistic supervisory expectations. Individual factors included individual failure to execute procedures, create a plan, interpret information, or communicate. Although "the ATSAP database is widely regarded as a valuable source of experiential information about risk" (FAA, 2018, p. 19), a safety culture in the organization could be improved (FAA, 2018, 2021h). Therefore, this study was designed

to help determine ways to improve the use of ATSAP and other forms of double-loop and organizational learning in the organization to increase safety and promote safety culture.

Purpose of the Study and Research Questions

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning as well as the defensive routines that inhibit learning—in a large federal government organization. The findings could inform professional development to improve double-loop learning and the FAA safety management system. Resultant findings also may help fill a gap in the literature, which is limited in real-world practical examination of double-loop learning in organizations. A basic qualitative approach was used to answer the following research questions:

1. How do managers perceive organizational learning (including single- and double-loop learning and defensive routines)?
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?
3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?

Statement of Potential Significance

The goal of the research was to understand managerial use of double-loop learning as well as defensive routines. Findings may be used to create professional development or a roadmap for leaders to minimize defensive behavior in organizations and promote double-loop learning. In the case of the FAA, findings may improve the use

of ATSAP and other forms of organizational learning to increase air traffic safety. The usefulness of the strategy of double-loop learning for leadership education and development comes from its potential to extract tacit knowledge from individuals and convert it to explicit knowledge (Cartwright, 2002). The broader significance of the study is to help leaders understand how defensive routines prevent the use of double-loop learning. Gribbin et al. (2016) stated, "Double-loop learning can therefore be used to help both organisations and practitioners better understand the underlying beliefs and assumptions that govern their actions" (p. 7) to increase innovation. Double-loop learning can be used to make tacit, or intuitive, organizational knowledge explicit and recorded for use systemwide (Nonaka & Takeuchi, 1995). Nicolaides and McCallum (2013) noted the importance of unlearning old assumptions through adaptive leadership to meet the current complex challenges in a global society. Additionally, understanding organizational defensive routines can help leaders understand how defensive routines hinder double loop learning (Argyris, 1977). Studying organizational defensive routines is critical to organizational success, as managers and organizational leaders who do not employ double-loop learning hamper organizational development (Argyris & Schön, 1978, 1996; Jacucci, 2019).

The findings also fill a gap in the research, which is limited on practical examination of double-loop learning in real-world use. As double-loop learning is described as a theory and reflective practice that helps address learning, problem-solving, and goal attainment in any organization, some researchers have pointed out the need for continued research on its application in the real world. Double-loop learning, although a sound conceptual theory, still has not yielded a practical roadmap or lesson plan for direct

application. Executives may still be afraid to change the status quo; researchers may face the same opposition, yielding difficulty in implementing and studying double-loop learning (Argyris, 1996). Rigg and Trehan (2008) noted critical reflection in organizational learning was simpler to theorize about in academia, whereas in practice in the workplace, different dynamics and resistance create obstacles. Practitioners still may confuse their role or not be able to describe double-loop learning (Clegg & Bailey, 2008).

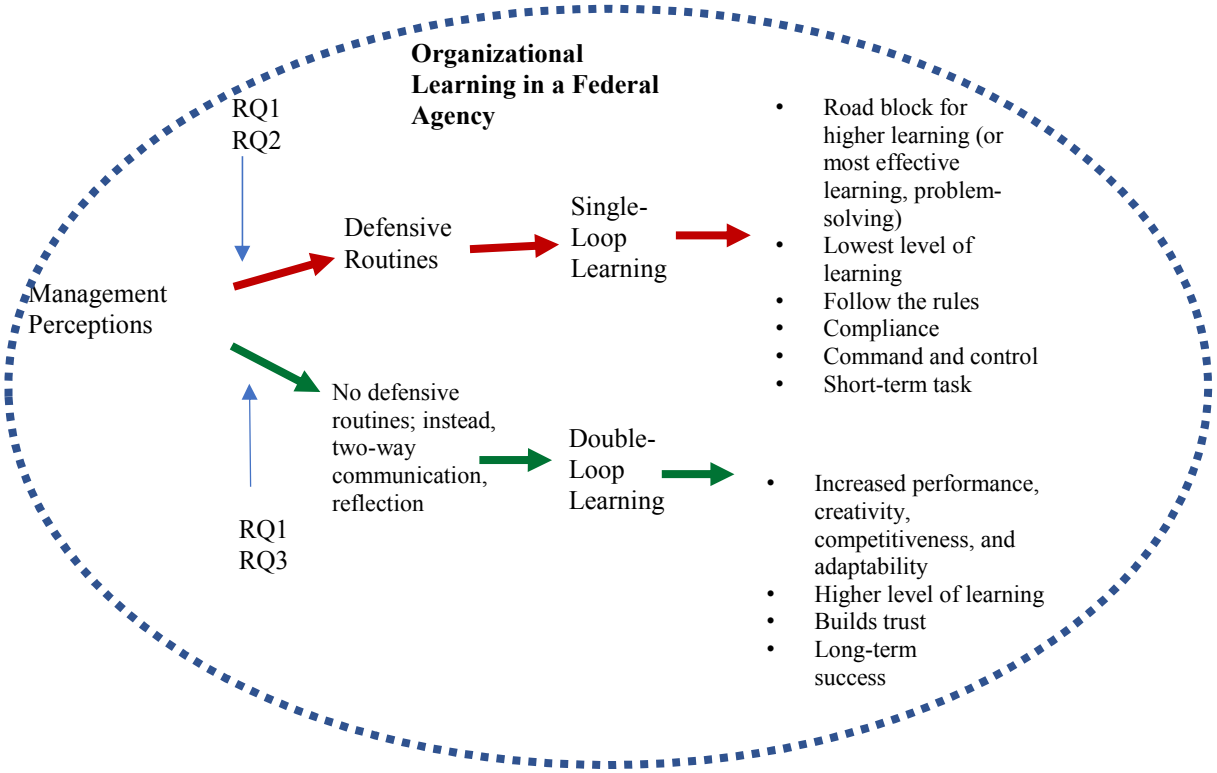
This research also helps fill a gap in safety and aviation research. The International Civil Aviation Organization (n.d.-b) noted research gaps in civil aviation, aviation management, and case studies related to standards and recommended practices. The International Civil Aviation Organization (n.d.-b) created the Next Generation of Aviation Professionals initiative in 2009 to ensure that aviation professionals will have access to training and education that supports aviation education. The mission of the initiative is to develop strategies, best practices, tools, standards and guidelines as applicable and to facilitate information sharing activities that assist the global aviation community in attracting, educating, and retaining the next generation of aviation professionals (International Civil Aviation Organization, n.d.-b). Additional research is needed to develop best practices and training. In a review of the published research on civil aviation, Kira et al. (2019) also noted a significant shortage on aviation management research. Kira et al. argued that aviation management research is needed to address critical industry challenges, to adapt to changing technology and operational philosophies in aviation, and to advance aviation management. Findings from this study may be used to develop professional development at the study site or other organizations to help promote double-loop learning and prevent defensive routines.

Conceptual Framework

Miles and Huberman (1994) defined a conceptual framework as explaining the major concepts or variables studied and their relationships. I developed a conceptual framework to help me explore double-loop learning and defensive routines. Figure 3 illustrates the conceptual framework of the study, double-loop learning and defensive routines.

Figure 3

Model of Double-Loop Learning and Defensive Routines



Note. Research Question (RQ) 1 was "How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines?" RQ2 was "What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?" RQ3 was "What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?"

Summary of the Methodology

A qualitative approach was utilized for the research study as perceptions related to double-loop learning and organizational defensive routines were described and studied. Maxwell (1998) described how a qualitative methodology is useful because of a focus on people in terms of a specific context or phenomenon and the emphasis on participants' words rather than numerical statistics. The study organization was the FAA (n.d.-a), particularly the Air Traffic Organization. The goal of the Air Traffic Organization is to provide safe and efficient air traffic to 29.4 million square miles of airspace, representing 17% of the world's airspace. The Air Traffic Organization also endeavors to have a "robust safety culture" (FAA, n.d.-a, para. 4).

The sample was nine current or retired senior managers from the Air Traffic Organization or other areas within the FAA as well as other aviation professionals from aviation associations such as the Air Traffic Control Association, Professional Women Controllers, and the International Civil Aviation Organization. These professionals participated in semistructured interviews via Zoom videoconference. Creswell and Plano Clark (2011) recommended purposeful selection of participants who can provide appropriate information to answer the research questions. The interviews represent a small number of participants to gain in-depth, rich data (Creswell & Plano Clark, 2011).

I used interviewing as a technique because it allows the voice of the participants to be heard and expressed in ways that quantitative analysis does not allow. Participants were assured of anonymity. Interviews are the primary data collection source in qualitative research (Merriam, 2009). I engaged participants in a semistructured conversation related to the research questions of the study (see DeMarrais, 2004).

All participants answered the same interview questions. Using the Rev software, the interviews were recorded and transcribed onto a Microsoft Word document for coding. Codes and emergent themes were analyzed to answer the research questions (Creswell & Plano Clark, 2011; van Manen, 2016). The theoretical lens of double-loop learning guided the initial coding process as sensitizing concepts. Charmaz (2003) referred to sensitizing concepts as "those background ideas that inform the overall research problem" (p. 259). For example, sensitizing concepts related to double-loop learning included change in mental models, two-way communication, and collaboration. Sensitizing concepts related to defensive routines included control, saving face, and blame. The remaining phases of coding involved inductive analysis, meaning the codes and themes emerged directly from the data rather than from predecided constructs (Patton, 2015). Chunks of text or words were represented by an initial code word or phrase. In vivo codes were based on the actual words or language of the interviewees (Saldaña, 2015). Descriptive codes summarized the topic of the interview excerpt (Saldaña, 2015). Codes became classified into categories, and from these categories I developed a set of themes to answer the research questions (Saldaña, 2015).

Limitations and Delimitations

The limitations of the study are both a guideline for future research and present the bounded nature of the research. The senior managers interviewed were all located within one U.S. region, a delimitation of the study.

Techniques to establish trustworthiness in this research included member checking, peer debriefing, and an audit trail. Creswell (2014) recommended using multiple strategies for trustworthiness and accuracy. Creswell also observed that a

strength of qualitative research is validity, with the findings being accurate according to participants. Validity was enhanced using member checking through transcript review. Each interviewee received a copy of their transcribed interview to check for accuracy.

Bias is always a potential limitation in research. Qualitative analysis of interview data requires a focus on the language and meanings of the interviewee rather than the researcher (Josselson, 2013). I conducted research in a geographic area other than where I worked at the time of the study. However, I interviewed a few individuals with whom I have worked. Conducting interviews within my organization was useful as I am familiar with the atmosphere and culture of the organization. In this sense I was not stepping into an unfamiliar territory but an organization where I have spent over 12 years of my career. However, I did have to remember Josselson's (2013) recommendation to avoid bias and focus on the words of the interviewees rather than my own preconceptions. By recognizing my preconceptions and biases in advance, and creating the following subjectivity statement, I could bracket out those biases to avoid interference with data collection and analysis.

Professionally, I completed a multitude of leadership development programs from the FAA. These leadership programs include the Air Traffic Organization Succession Planning Program, Air Traffic Leadership Development Program, Southern California Terminal Radar Approach Control Facility Management and Leadership Development Program, and the National Mentor Program. I currently serve as an operations manager at the New York Terminal Radar Approach Facility. Additionally, I have been employed by the organization under study for 12 years; I have been a manager for 8 of those years. I am also a member of the FAA Managers Association.

I lead at the FAA's most high-profile and complex facilities. Most notably, I served as a Supervisory Air Traffic Control Specialist at Joint Base Andrews Air Traffic Control Tower. While there, I functioned as a component of National Security; provided Air Traffic Services for Air Force 1 and Air Force 2; provided specialized support to Distinguished Visitors and high-ranking military personnel; and liaised with the U.S. Secret Service, U.S. Air Force Security Forces, and White House officials during air traffic operations. Prior to that assignment, I served as an executive technical representative in the Washington Headquarters Air Traffic Services Labor Group at the FAA. I provided technical expertise in interpreting the Air Traffic Organization contracts, representing the Air Traffic Organization in labor issues, and practicing policy and bargaining unit agreements. I served as a primary the Air Traffic Organization point of contact in term and midterm bargaining at the national level. Prior to this position, I was air traffic control specialist in the Air Traffic Organization Safety and Technical Training Service Unit, Training Policy and Requirements Team, where I provided air traffic control technical training and conducted staff research responsive to internal and external stakeholder requests. Additionally, I developed national-level unmanned aircraft system training for the entire air traffic control workforce.

Due to my vast amount of managerial experience and my personal networks in the managerial ranks, I might be biased towards a promanagement point of view. Because of my managerial training, I likely have a confirmation bias. A confirmation bias is the tendency to look for information and justification that confirms one's viewpoint (Fliek et al., 2019). As a current manager I might tend to view organizations as driven from top down. This viewpoint might consider employee compliance as favorable (see Blake &

Mouton, 1985) and support a management bias that emphasizes management needs and concerns over the needs of the employees (see Látalová & Gottfried, 2016).

I view single-loop learning as the quickest way to accomplish daily tasks. Practically, single-loop learning supports swift procedures when there is no time to consult (Blake & Mouton, 1985). At my work, I have observed the perception that there is no time to change past practices. Further, defensive routines allow for a siloed thinking approach that defends the status quo (see Bäck & Lindholm, 2014). However, I do believe that double-loop learning is superior and the most advanced form of organizational learning. Although double-loop learning does take more time and energy because of its reliance on self-reflection, it does create the environment for team-based solutions and dialog that help organizations strategically move forward.

Definition of Key Terms

Air Traffic Safety Action Program (ATSAP): In collaboration with the FAA, the National Air Traffic Controllers Association created this voluntary safety reporting program (FAA, 2018). Employees are promised that no punitive or disciplinary actions will be taken as a result of reporting errors that could impact safety (National Air Traffic Controllers Association, 2017). ATSAP removes actual and potential problems from the sole purview of FAA headquarters and allows day-to-day air traffic control practitioners to safely report risks and errors to the National Airspace System.

Complex safety system: Air traffic control and the National Airspace System comprise a complex safety system due to the numerous elements involved, including aircraft, controllers, runway conditions, and weather (Jarrar & Balouki, 2019). Additional elements are new vehicles and technologies and related infrastructure, security,

information sharing, and analytics (Air Traffic Control Association, 2020). Finally, unpredictable weather and anomalous events or emergencies require real-time management of a dynamic situation (Air Traffic Control Association, 2020; Jarrar & Balouki, 2019).

Defensive routines: Argyris (2001) described defensive routines as "any action, policy or practice that prevents organizational participants from experiencing embarrassment or threat and, at the same time, prevents them from discussing the causes of the embarrassment or threat" (p. 58). Whether through policy or actions, defensive routines can be viewed as a buffer or overprotection of an organization to prevent the threat of embarrassment. Examples include face saving, antilearning, avoidance of action, and unilateral control (Argyris, 1990, 2001).

Double-loop learning: Double-loop learning, as developed by Argyris and Schön (1974), is an organizational learning theory that represents a continuous cycle of generative and reflective knowledge for organization s through inquiry, root-cause analysis. Double-loop learning moves from initial error detection (single-loop learning) to underlying causal analysis to learn through critical examination, reflection, and an internal commitment to learning, including potential changes to underlying goals and mission (Argyris & Schön, 1974).

Organizational learning: Crossan et al. (1999) described organizational learning as an organizational-level phenomenon that develops new knowledge into new strategies, processes, and structures. Organizational learning can vary from single-loop learning, which is simply learning from mistakes to improve practices, as well as more complex double-loop learning, which involves critical reflection and rethinking organizational

assumptions and goals (Argyris & Schön, 1978). Organizational learning includes reflection and adaptation (Makuwira, 2013). Popova-Nowak and Cseh (2015) described organizational learning as the interaction of individual learning with collective analysis to achieve the organization's goals. Vera and Crossan (2004) described organizational learning as a process of changing thought and action for individuals in the organization and having that change become embedded within the institution.

Safety culture: In a safety culture, every member of the organization values and prioritizes safety, which is reflected in organizational norms (Civil Air Navigation Services Organisation, 2008). Reason (1997) defined a good safety culture as being informed, involving reporting, involving learning, being flexible, and being just. The FAA (2021a) noted a just safety culture provides transparency and a nonpunitive system to disclose errors. A safety culture is nonpunitive (Houston, 2015) and particularly effective in complex systems (Sorensen, 2002).

Safety management system: The FAA (n.d.-d) defined its safety management system as "the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk" (para. 1). The safety management system affects decision-making, ideally leading to proactive steps to promote safety and prevent problems.

Single-loop learning: Single-loop learning is simple error detection and problem-solving through rules (Argyris, 1976). Goals are accomplished through standardized procedures (Argyris, 1982).

Chapter 2: Review of Literature

In this study, I examined managers' perceptions of behaviors, policies, and practices that affect double-loop learning in a large, federal government organization. The literature has associated double-loop learning with organizational performance (Jaaron & Backhouse, 2017; McClory et al., 2017; Vallat et al., 2017). The problem is that organizations struggle to improve creativity, risk taking, learning, and adaptability, which are essential for survival in continuously changing and competitive environments. Contributing to this struggle are defensive routines, which block or at least hamper organizational learning. This chapter provides a review of the literature on organizational learning, including single- and double-loop learning and defensive routines. Following a general discussion of organizational learning, the literature review explores the Argyris (1977) framework of double-loop learning and defensive routines within organizations. This study explored how defensive routines inhibit double-loop learning, the conceptual framework of the study. This literature review was designed to analyze and synthesize the literature to develop conclusive inferences related to the current study. The review encompasses theoretical and empirical literature on organizational learning, single- and double-loop learning, and defensive routines.

Methods of the Literature Review

The time scope of the literature review begins with Argyris's 1976 seminal work on double-loop learning, adds Argyris's 1986 seminal work on defensive routines, and includes the most recent work on defensive routines in 2020 as well as 2021 and 2022 documents from the FAA and other aviation organizations. The content scope begins with organizational learning, progressing to single- and double-loop learning and

defensive routines. For the purpose of this review, the search terms were *double-loop learning, organizational learning, organizational defensive routines*, *defense routines,* and *defensive routines*. English was selected as the language, and the date parameter was set from 1976 with Argyris's seminal work on double-loop learning. Articles reviewed were available online and peer reviewed. The main search was conducted using The George Washington University Library Consortium Catalog. The Consortium Catalog includes JSTOR, ProQuest, ABI/Inform, Emerald Insight, and SciTech, among others. Additionally, individual searches were done using Google Scholar and Web of Science. The search produced 557 results.

Article abstracts and references were carefully studied to determine additional articles appropriate for the research topic. The articles that did not fit the criteria of the research topic were not used for the literature review. For example, articles that used *double-loop teaming*, *double-loop patterning*, and *open-loop feedback systems* were not relevant to the topic of study. Moreover, terms such as *feedback loops* and *closed-loop* continued to populate the search but did not have any relevance to the literature review because they are associated with engineering processes and mathematical computations. After conducting a cursory review of the articles produced during the initial search to narrow down the selections, I reviewed the articles related to the purpose of the study and the research questions. The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large federal government organization. The research questions were the following:

1. How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)?
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?
3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?

Moving forward, I continued to conduct additional searches using the original terms to expand my current knowledge of the literature and keep abreast of new findings adding to my depth of knowledge and enabling me to produce a more detailed literature review for my dissertation. Based on my additional searches, I used articles as recent as 2022 to include current literature. Research on organizational learning is presented first, followed by a discussion of single-loop learning and double-loop learning. Defensive routines are described. I then explain the gap in existing research on double-loop learning and present the conceptual framework of the study. First, Table 1 presents an overview of selected important studies used in this literature review and to inform the research study.

Table 1

Overview of Selected Studies Reviewed

Author & date	Title	How used

Author & date	Title	How used
Abdullah et al. (2018)	"Application of a Double-Loop Learning Approach for Healthcare Systems Design in an Emerging Market"	Critical reflection and other concepts of double-loop learning
Abouraia (2018)	"Organizational Learning: An Assessment of its Impact on Crisis Management in the United Arab Emirates"	How airlines use double-loop learning
Air Traffic Control Association (2020)	"Outsourcing the Mind: The Digital Controller"	Explaining air traffic control and the context of the Federal Aviation Administration
Alvesson & Spicer (2012)	"A Stupidity-Based Theory of Organizations"	Communication in single- and double-loop learning
Argote & Miron-Spektor (2011)	"Organizational Learning: From Experience to Knowledge"	Relationship between single- and double-loop learning; culture of learning
Argyris (1976)	"Single-Loop and Double-Loop Models in Research on Decision Making"	Defining double- and single-loop learning as well as defensive routine behaviors
Argyris (1977)	"Double Loop Learning in Organizations"	Defining single- and double-loop learning
Argyris (1986)	"Reinforcing Organizational Defensive Routines"	Defensive routines
Argyris (1990)	*Overcoming Organizational Defenses*	Defensive routines and behaviors
Argyris (1994)	"Good Communication That Blocks Learning"	Defensive routines vs. double-loop learning
Argyris (2001)	*On Organizational Learning* (2nd ed.)	Definition of and types of defensive routines
Argyris & Schön (1974)	*Theory in Practice: Increasing Professional Effectiveness*	Double-loop learning and critical self-reflections, dialog, collaboration, mental models; defining single- and double-loop learning
Argyris & Schön (1996)	*Organizational Learning II: Theory, Method, and Practice*	Benefits of double-loop learning, types of defensive routines (e.g., antilearning)
Ashforth & Lee (1990)	"Defensive Behavior in Organizations"	Explaining types of defensive routines
Blake & Mouton (1985)	*The Managerial Grid III*	Organizational learning to promote safety; when to use single- vs. double-loop learning
Bremmer et al. (2020)	"Nutrient Cycle Assessment Tool"	When to use single- vs. double-loop learning
Burt & Nair (2020)	"Rigidities of Imagination in Scenario Planning"	Unlearning and mental models; example of empirical study on double-loop learning
Carroll et al. (2002)	"Learning From Experience in High-Hazard Organizations"	Double-loop learning as causal analysis
Clegg & Bailey (2008)	*International Encyclopedia of Organization Studies*	Benefits yet obstacles to double-loop learning in organizations
DeRue (2011)	"Adaptive Leadership Theory"	Adaptive leadership and double-loop learning
Edmondson & Moingeon (1999)	"Learning Trust and Organizational Change"	Defensive behaviors and how they inhibit double-loop learning
Ek et al. (2003)	*Safety Culture in Air Traffic Management: Air Traffic Control*	Aviation safety, air traffic control, risk management, and a learning culture
Federal Aviation Administration (FAA) (2016b)	*Safety Management System: SMS Explained*	Safety management system

Author & date	Title	How used
FAA (2016a)	*FAA Top Policy Issues*	Complexity and changing nature of air traffic control
FAA (n.d.-a)	*Air Traffic Organization*	Proactive safety management, priority of safety culture
FAA (2017a)	*Order 8040.4b: Safety Risk Management Policy*	FAA mission; aviation safety, safety management system
FAA (2018)	*ATSAP Quarterly Report: October-November-December 2018*	Safety culture as FAA priority; example of ATSAP
FAA (2020d)	*Lessons Learned From Civil Aviation Accidents*	Lessons Learned document, example of single-loop learning in aviation organization
Fiol & Lyles (1985)	"Organizational Learning"	Double-loop as a higher form of learning; critical reflection; when to use single- vs. double-loop learning
Hasanudin et al. (2019)	"Management Control System, Corporate Social Responsibility, and Firm Performance"	Difference between single- and double-loop learning; benefits of double-loop learning
Heifetz et al. (2009)	*The Practice of Adaptive Leadership*	Adaptive leadership and double-loop learning
Homburg & Fürst (2007)	"See No Evil, Hear No Evil, Speak No Evil: A Study of Defensive Organizational Behavior Towards Customer Complaints"	Defensive routines and organizational behavior
Huerta (2015)	*A Global Safety Culture*	Importance of aviation safety culture
Hytönen et al. (2016)	"Defensive Routines in Land Use Policy Steering in Finnish Urban Regions"	Empirical study of negative impact of defensive routines
Jaaron & Backhouse (2017)	"Operationalising 'Double-Loop' Learning in Service Organisations"	How double-loop learning benefits organizations
Johannessen et al. (2019)	"Transforming Urban Water Governance Through Social (Triple□Loop) Learning"	Double-loop learning and connection to crisis or disruption in the organization
Kim (1993)	"The Link Between Individual and Organizational Learning"	Organizational learning, double-loop learning, defensive routines, antilearning
Korte (2012)	"Exploring the Social Foundations of Human Resource Development"	When to use single- vs. double-loop learning
J. C. Lee & Myers (2004)	"Enterprise Systems Implementation Failure: The Role of Organizational Defensive Routines"	Defensive routines, antilearning.
Levinthal & March (1993)	"The Myopia of Learning"	Organizational learning
Makuwira (2013)	*Organizational Learning: Project-Based Approach In Non-Governmental Development Organizations*	Reflection in organizational learning
Mano (2010)	"Past Organizational Change and Managerial Evaluations of Crisis: A Case of Double-Loop Learning Effects in Non-Profit Organizations"	Benefits of double-loop organizational learning
Matsuo & Nagata (2020)	"A Revised Model of Experiential Learning With a Debriefing Checklist"	Single-loop learning
Mohmoud et al. (2019)	"Enhancing Learning Process Using Double-Loop Theory in Purchasing Process of Healthcare Organization Toward Cutting Unnecessary Costs"	Empirical study of double-loop learning
Nicolaides & McCallum (2013).	"Inquiry in Action for Leadership in Turbulent Times"	Importance & benefits of double-loop learning
Nonaka & Takeuchi (1995)	*The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*	Individual vs. organizational learning
Noonan (2018)	"Overcoming Defensive Routines in the Workplace"	How defensive routines inhibit

Author & date	Title	How used
		organizational learning
Nussbaum & Dweck (2008)	"Defensiveness Versus Remediation: Self-Theories and Modes of Self-Esteem Maintenance"	Origin of defensive routines
Oeij et al. (2016)	"Defensive Behaviors in Innovation Teams"	Types of defensive routines
Pentland & Haerem (2015)	"Organizational Routines as Patterns of Action: Implications for Organizational Behavior"	Single- and double-loop learning
Putnam (2014)	"Double-Loop Learning"	Practical application of (and impediments to) double-loop learning
Reddick et al. (2017)	"A Social Media Text Analytics Framework for Double-Loop Learning for Citizen-Centric Public Services"	Empirical study of single- and double-loop learning in an organization
Reychav et al. (2016)	"Using Tablets in Medical Consultations: Single Loop and Double Loop Learning Processes"	Empirical study of single- and double-loop learning in an organization
Rigg & Trehan (2008)	"Critical Reflection in the Workplace: Is it Just too Difficult?"	Benefits of and obstacles to critical reflection in an organization
Schein (1993)	"How Can Organizations Learn Faster? The Challenges of Entering the Green Room"	How defensive routines impede organizational learning
Schön (1983)	*The Reflective Practitioner*	Reflection in problem-solving and learning
Senge (1990)	*The Fifth Discipline: The Art & Practice of the Learning Organization*	Organizational learning, mental models
Sisaye & Birnberg (2010)	"Organizational Development and Transformational Learning Approaches in Process Innovations"	Benefits of organizational learning, adaptability
Tagg (2010)	"The Learning-Paradigm Campus: From Single- to Double-Loop Learning"	Defining double-loop learning
Visser (2017)	"Learning and Unlearning: A Conceptual Note"	Double-loop learning, particularly in a crisis
Weick & Westley (1996)	"Organizational Learning: Affirming an Oxymoron"	Difficulty of implementing learning, including double-loop learning, in an organizational
Whitley & Leone (2020)	"The Future National Airspace System: The Federal Aviation Administration's 2035 Vision for Air Traffic Management Services"	Change in air traffic management
Williams & Brown (2018)	"Double-Loop Learning in Adaptive Management: The Need, the Challenge, and the Opportunity"	Adaptive management and double-loop learning
Yang et al. (2018b)	"Triggers and Damages of Organizational Defensive Routines"	Antecedents of defensive routines,
Yu et al. (2019)	"Learning for Resilience-Based Management: Generating Hypotheses from a Behavioral Study"	Empirical study of double-loop learning; monitoring; reflection

Organizational Learning

Organizational learning has been described in extensive literature reviews spanning decades (Popova-Nowak & Cseh, 2015; Vera & Crossan, 2004). The term *organizational learning* was introduced in 1963 by Cyert and March as a theory to guide organizations on how to use routines to create a logic of appropriateness by matching procedures to situations or contexts (Cyert & March, 1992). Argyris (1977) defined basic

organizational learning as error detection and correction. Organizational learning continues to be defined in various ways.

Organizational learning has been defined and described in terms of action, or moving the organization forward. Learning relates to action in the organization. Daft and Weick (1984) suggested that organizational learning is about the interconnectivity of the relationship between an organization's environment and action. Argyris and Schön (1978) and Senge (1990) argued that members of the organization should scrutinize the underlying assumptions and mental models associated with the organization and use what is revealed to influence action. Fiol and Lyles (1985) also viewed organizational learning as a route to improving actions via deeper understanding and advanced knowledge. Levitt and March (1988) defined organizational learning as a process of making inferences from history and lessons learned into "routines that guide behavior" (p. 320). Makuwira (2013) noted organizational learning is designed for impact, involving reflecting on lessons learned and acting on new knowledge.

Other definitions have stressed the complicated nature of organizational learning. Schwandt and Marquardt (2000) argued that organizational learning is an interconnected and complex relationship in an organization that involves processes, people, symbols, and actions. Levinthal and March (1993) explained it as a balancing act of competing goals that an organization grapples with to develop new knowledge while having to exploit current competencies. Throughout the literature, there is no single agreed-upon definition or concept of organizational learning (Easterby & Lyle, 2003). However, most researchers have stressed its importance to organizational success and sustainability. The following sections describe why organizational learning is important, the difference

between individual- and organizational-level learning, and challenges in and types of organizational learning.

Why Organizational Learning Is Important

Organizational leaders and employees frequently must solve highly complex problems in challenging environments. Adaptation and organizational learning are an important component of long-term success of an organization (Argote & Miron-Spektor, 2011). The success of an organization is never a final product; thus, organizations must avoid operating in a reactionary or siloed approach to accomplishing goals (Johannessen et al., 2019). Instead, organizational leaders must act in a continuous learning approach that advances thinking and adaptive decision-making though focusing on the promotion of critical thinking to better leverage the employees at all levels to succeed.

Organizations must promote learning to be adaptable and competitive (Argyris & Schön, 1996; V. Johnson, 2019; Sisaye & Birnberg, 2010). Change is a constant. Thus, plans that were once efficient and successful may no longer be effective; in successful organizations, learning is constant and continuous, as organizations must adapt to succeed (Nicolaides & McCallum, 2013). Schwandt and Marquardt (2000) emphasized the importance of speed and quality of organizational learning to compete in a shifting global economy.

In complex life-or-death systems such as aviation safety, continuous organizational learning is vital (Ek et al., 2003; Jarrar & Balouki, 2018). Air traffic control requires adaptability to a quickly changing set of factors, such as the increase in drones (Jarrar, 2018). Air traffic management involves continual change (Whitley &

Leone, 2020). As a result, new methods, procedures, and multiple response strategies are required to deal with system demand (FAA, 2016a).

The goal of organizational learning is to create and develop new knowledge so that available resources are used to create a wide range of strategic options (Harrison, 1997) to accomplish organizational missions and goals. Organizational learning is the building block and basic component of strategic advantage and long-term gains (March, 1991). Organizational learning is a continuous process that creates, reexamines, and develops a conducive climate for learning and goal attainment (Ismail et al., 2019). Tamunomiebi and Dienye (2019) described learning as the authentic tool for growth, adaptation, and sustainability in the 21st century. Internal and external stakeholders should be able to provide input to increase organizational learning (Whitley & Leone, 2020). The following section describes individual- and organizational-level input and learning.

Individual- and Organizational-Level Learning in the Organization

Argyris (1992) postulated that individuals in an organization execute the actions that generate organizational learning. Jarvis (2014) added that individual members contribute to organizational learning by error detection and correction in organizational theory-in-use, or actual practices, and embedding knowledge in organizational documents or processes. Using critical reflection, individuals can derive conclusions from work experiences and improve personal, interpersonal, and organizational procedures or behaviors (Rigg & Trehan, 2008). Individual employees gather and share knowledge through experience (Argote & Miron-Spektor, 2011) to contribute to organizational learning. In a practical sense, organizational learning improves organizational

performance to implement a collaborative and teamwork approach to improve performance through knowledge creation and sharing (Narver & Slater, 1990). Ideally, all resources are utilized to create optimal efficiency and outcome. As "learning begins with experience" (Argote & Miron-Spektor, 2011, p. 1126), a diverse pool of experience creates better organizational learning.

Popova-Nowak and Cseh (2015) described organizational learning as the interaction of individual learning with collective analysis to achieve the organization's goals. Thus, the basis of organizational learning is using experience to create positive change in the organization. Further, although individuals contribute to learning, organizational learning does not fully occur without knowledge retention within the organization (Argote & Miron-Spektor, 2011). Formalizing individual learning into structures and routines makes knowledge independent of the individual and protects knowledge from employee turnover (Levinthall & March, 1993). Employee turnover should not reduce the knowledge in an organization; the knowledge should be "embedded" in organizational routines and shared across employees (Argote & Miron-Spektor, 2011, p. 1124). Vera and Crossan (2004) described organizational learning as a process of changing thought and action for individuals in the organization and having that change become embedded within the institution. Thus individual learning can lead to organizational change in terms of rules, insights, and foundational principles (Ovesni & Alibabic, 2013). Crossan et al. (1999) described organizational learning as an organizational-level phenomenon that develops new knowledge into new strategies, processes, and structures.

An example of moving organizational learning from the individual to organizational level in action is the knowledge-creating process of socialization, externalization, combination, and internalization (Nonaka & Takeuchi, 1995; Wethyavivorn & Teerajetgul, 2020). Organizations include tacit, nonverbalized knowledge and explicit, written knowledge. Both types of knowledge should increase through organizational learning in the four categories of socialization, externalization, combination, and internalization. For example, explicit knowledge becomes tacit through internalization, as employees share mental models. Conversely, tacit knowledge becomes explicit through externalization. An example is employees at the ground level revealing their common knowledge of a process that may be unknown to executives. Individuals gain knowledge through direct experience, which is shared through socialization in the form of reflection and dialog (Nonaka & Takeuchi, 1995). Combination involves gathering and sharing knowledge through systems. During application of the new knowledge, a larger group of individuals in the organization may reflect on the process, yielding internalization. This process can create a spiraling effect leading to a learning organization (Nonaka & Takeuchi, 1995).

Organizational learning improves organizational performance through collaboration and teamwork and knowledge sharing (Narver & Slater, 1990). Additionally, such knowledge is formalized into the organization through routines and structures. However, successful organizational learning includes challenges and variations, as described in the following section.

Challenges and Differences in Organizational Learning

Despite the benefits of organizational learning, researchers and practitioners have noted challenges. Weick and Westley (1996) observed, "Organizing and learning are essentially antithetical. . . . To learn is to disorganize and increase variety. To organize is to forget and to reduce variety" (p. 440). Rigg and Trehan (2008) noted in the workplace, critical reflection can have "hazards" and create "dissonance" (p. 378). Organizational learning based on critical reflection, as in double-loop learning, involves disrupting or at least questioning the status quo (Rigg & Trehan, 2008). The disruptive nature of learning explains why learning and double-loop learning in particular (Johannessen et al., 2019) are more likely during a crisis or developing problem, when the organization already has experienced some level of disruption (Popper, 1999).

Levinthall and March (1993) described learning as imperfect and not always benefitting an organization. Noting that most new ideas are not good ones, Levinthall and March also described the pitfalls in interpreting outcomes. Even simple error detection requires determining the cause, and individuals may make incorrect inferences. Employees tend to view outcomes as good versus bad and rely on individual experience to interpret outcomes. Interpretation is also influenced by existing organizational routines and culture.

Learning is limited when a procedure or knowledge becomes routinized. For example, Levinthall and March (1993) described how organizations learning and refining the use of software still chose one software system over others at one point. At that point, the use of the single software system became established. In situations deemed successful, experimentation is not as likely, although successful organizational leaders

may have more self-confidence in risk-taking. Learning requires disruption, whereas continued processes may be cost effective, at least in the short term or with organizations with little competition (Levinthall & March, 1993). Learning by doing typically leads to decreased production costs. Critical reflection and learning thus may not occur in a situation with perceived successful outcomes.

Knowledge acquisition also may not lead to change in action (Schein, 1993) or appropriate change in routines (Levinthall & March, 1993). Schein (1993) noted the tendency to self-protect and save face—defensive routines—as an obstacle to organizational learning. Unlearning a routine requires practice, which implies error before mastery (Schein, 1993). Learning is also related to anxiety, as is any risk, potential for error, or change in the status quo. Anxiety makes people tend to fall back into familiar patterns or routines or create new defensive routines (Schein, 1993). Also, as with any learning, bad habits or routines can be learned as well as good (Huber, 1991).

Schein (1993) argued that organizational learning is restrained when miscalculations and errors due to innovation, investigation, and testing new ideas are punished, causing lack of psychological safety, anxiety, and an environment that depresses new ideas and experimentation. Ultimately, organizations that do not facilitate open dialog will have difficulty achieving high-level learning (Senge, 1999). The capacity for double-loop learning in particular is contingent on the dynamics that promote or inhibit organizational learning (Dibella & Nevis, 1998). Kezar (2005) argued that organizational learning is promoted when open dialog and information sharing occur, along with developmental training and trust between leaders and followers. Schein (1993) stated that to overcome the disruptive, anxiety-producing nature of risk-taking, learning,

and change, the need for the change and the admission of a problem must be communicated clearly.

Further, as noted in the discussion on individual versus organizational learning, an important aspect of organizational learning is to embed the knowledge in the organization. This process involves routines, which can over time become rigid or even defensive and prevent continued creativity (Huber, 1991). Argyris (1996) noted changes in the organization must be converted to routines to be embedded; however, routines are difficult to change once established.

Argyris (1977) described two types of organizational learning processes, single loop and double loop. Single-loop learning represents a more basic form of organizational learning, with double-loop learning considered a higher level (Pawlowsky, 2000). Both types of organizational learning are described in the following sections.

Single-Loop Learning

Definition of Single-Loop Learning

Single-loop learning is mainly concerned with error detection and correction (Argyris, 1977) and thus presents a very basic theoretical model for theory and practice. Single-loop learning answers the question, "Will my action lead to the desired result?" (Bremmer et al., 2020, p. 2). Single-loop learning is based on hypothesis testing. Shewhart in 1939 developed the Shewhart cycle, which changed the concept of specification, production, and inspection from a three-step linear process to a continuous, circular cycle (Moen & Norman, 2009). In 1950, Deming modified the cycle by adding a fourth step of redesign through marketing research (Moen & Norman, 2009). The Deming wheel thus involved designing a product through testing, creating and testing the

product, putting the product on the market, testing it through market research, and then redesigning the product based on consumer response (Moen & Norman, 2009). Deming continued to modify the cycle over decades.

Argyris (1977) described single-loop learning as a process that allows an organization to continue with current policies and meet current goals. Decision makers focus on the actions needed for correction of error. Argyris (1977) explained,

> When the process enables the organization to carry on its present policies or achieve its objectives, the process may be called single loop learning. Single loop learning can be compared with a thermostat that learns when it is too hot or too cold and then turns the heat on or off. (p. 116)

Single-loop learning is generally viewed as the accomplishment of goals through following the rules or compliance with standardized operating procedures. The goal of single-loop learning is to learn from experience to modify a strategy or action to better accomplish the task (H. Kim et al., 2013). Single-loop learning is the most rational and satisfactory solution that people can agree to and is typically based on simply following the rules and showing what are known as Model I behaviors (Argyris & Schön, 1974).

Model I Behaviors

Single-loop learning is based on Model I behaviors: achieving outcomes defined by self-interest, winning at all costs, suppressing emotions, and being rational (Argyris & Schön, 1974, 1978). Model I behaviors act as a theory in use (Argyris, 1980; Visser, 2017) because they are part of an action strategy to keep leader and employee behavior in an accepted or tolerated range. The specific outcomes of Model I behaviors, as described by Argyris and Schön (1974, 1978), are limited learning, decreased organizational and leadership effectiveness, and defensive routines. Model I behaviors and actions act as a shield, create limited options, and protect the self at all times. Lastly, Model I theory in

use is the ultimate form of command and control, seeking to control the environment and de-value creativity. However, such control is advantageous in certain situations, as described in the following section.

Advantages of Single-Loop Learning

Schön (1983) described formal organizations as task systems that function with rules, roles, and regulations. In organizations, single-loop learning can be expressed through one-way conversations from leader to follower (Alvesson & Spicer, 2012). Most employees look to their managers for a solution, and single-loop learning provides that solution in the fastest way. Individuals in organizations are good at single-loop learning, which focuses on narrow practices and activities (Matsuo & Nagata, 2020). One-way, top-down communication yields less organizational friction and efficient task completion (Alvesson & Spicer, 2012). Phelan (2015) described single-loop learning as the simple, quick, and easy way to address problems and improve a process. Notably, the "operating belief is not questioned" (Phelan, 2015, p. 11).

Single-loop learning has certain advantages. As beliefs and operations are not questioned, single-loop learning can contribute to stability in an organization, based on the functionalist view (Korte, 2012). In this view, cohesion maintains stability through compliance to dominant norms and structures, whereas conflict threatens such stability (Korte, 2012). Organizations that are hierarchical and require conformation to organizational processes and procedures tend to use single-loop learning; an advantage is that turnover results in less knowledge loss in such a system (Argote & Miron-Spektor, 2011). Fiol and Lyles (1985) noted a bureaucratic, unchanging system could be appropriate in a company with a large market share and long history of success.

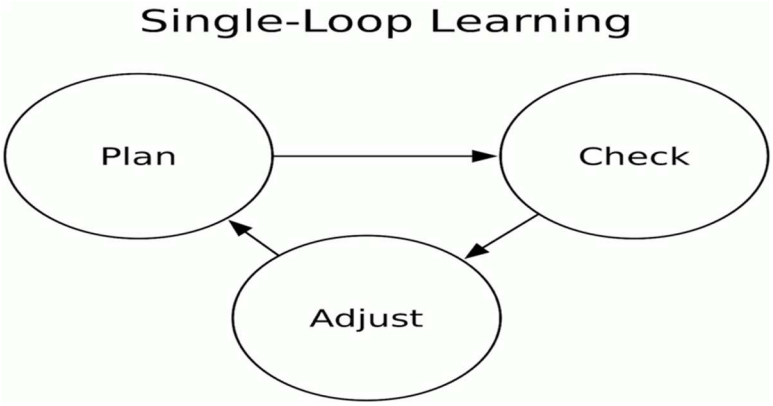
Another advantage relates to automated procedures, which may be used "when capabilities permit to reduce workload, duty related distractions, and potential errors" (FAA, 2018, p. 25). Pentland and Haerem (2015) described single-loop learning as routine, automatic, and "mindless" (p. 464) yet noted in some fields, routines are beneficial, such as medicine, accounting, engineering, and technical work. Such single-loop learning is based on standard operating procedures and is efficient (Pentland & Haerem, 2015).

Specific to the FAA (2020d), air navigation service providers produce a Lessons Learned document, an example of single-loop learning. The Lessons Learned document utilizes a fact-based approach to emphasize a single point of error or failure to determine where to assign blame. After pinpointing the failure, a new rule or procedure is created to mitigate the causation of the failure. To enhance safety and production, strict compliance to all applicable rules, orders, regulations, and policies is evaluated and ordered by management to ensure a mistake is not repeated. The goal of this approach is to solve the problem via a direct micromanaging approach to ensure that the mission is accomplished. This is an example of single-loop learning, which is acceptable when solving routine, repetitive issues in a rule-based context (Argyris, 1977; Matsuo & Nagata, 2020; Pentland & Haerem, 2015; Phelan, 2015).

Figure 4 illustrates the basic nature of single-loop learning. Simply stated, single-loop learning just means following the rules. Single-loop learning is organizational learning based on experience (Argote & Miron-Spektor, 2011). However, this type of learning is only concerned with the correct outcome, regardless of variables and underlying assumptions (double-loop learning).

Figure 4

Single-Loop Learning Conceptual Framework



Note. From *Organizational Learning,* by C. Argyris and D. Schön, 1978, Addison-Wesley.

Double-Loop Learning

Definition of Double-Loop Learning

Like single-loop learning, double-loop learning also involves error detection and correction; however, double-loop learning involves adjustment in goals and decision-making strategies based on new situations or unexpected outcomes (Alba et al., 2020; Johannessen et al., 2019; Williams & Brown, 2018). Double-loop learning is a theory of action (Argyris & Schön, 1978) in organizational learning that focuses on questioning underlying behaviors, actions, traditions, and organizational status quo to create or invent new meaning that supports organizational learning. Double-loop learning "involves reflection on values and norms and the social structure in which these values and norms are practiced" (Hasanudin et al., 2019, p. 1355). Argyris (1977) continued using the thermostat metaphor:

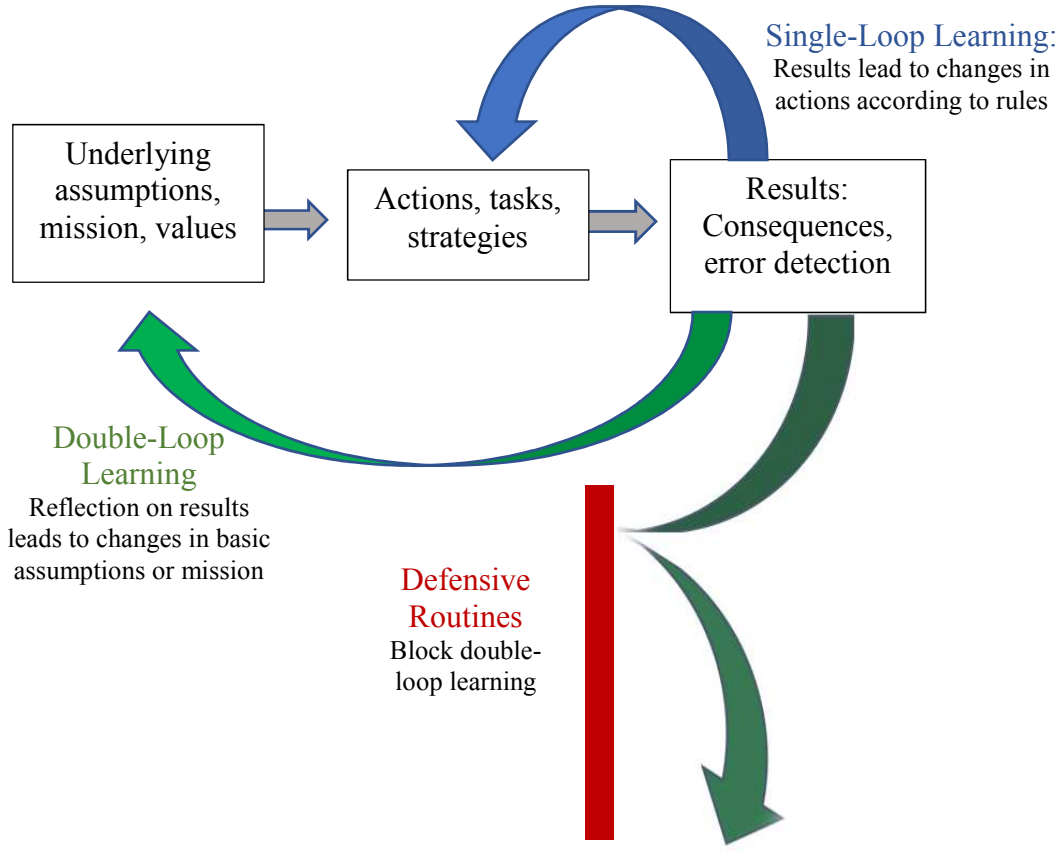
> If the thermostat could question itself about whether it should be set at 68 degrees, it would be capable not only of detecting error but of questioning the underlying

> policies and goals as well as its own program. That is a second and more comprehensive inquiry; hence it might be called double loop learning. (p. 116)

Tagg (2010) explained that double-loop learning can result in a shift in paradigm or the underlying values and mission of an organization. See Figure 5.

Figure 5

Double-Loop Learning Conceptual Framework



Researchers have referred to the concepts of double-loop learning using other terms, such as reflective or adaptive management. Double-loop learning has been explored through the lens and terminology of causal analysis (Carroll et al., 2002), unlearning (Burt & Nair, 2020), collective intuition (Akinci & Sadler-Smith, 2019),

adaptive management (Williams & Brown, 2018), collective learning (Rydstedt Nyman, 2019), and mindful processing (Argote & Miron-Spektor, 2011; Pentland & Haerem, 2015). Each of the aforementioned approaches is grounded in double-loop learning and related behaviors.

Model II Behaviors

Double-loop learning is based in Model II behaviors (Argyris, 1982; Visser, 2017). These behaviors are collaborative and include critical self-reflection and ultimately using the widest decision-making network possible. A higher level of organizational learning is created through freedom of choice, open source systems, creativity, and validation processes and efforts (Argyris & Schön, 1974). In double-loop learning, reflection enables employees to modify the underlying actions (Model II behaviors) needed for organizational learning (Reynolds, 2014). Reflection also allows mental models to adapt to experience. Specific Model II behaviors include change in mental models, two-way communication and collaboration, critical reflection, and monitoring. Each of these behaviors is described in detail in the following sections.

Change in Mental Models. Mental models are frames of reference or expectations about the effects of actions (Fürstenberg & Görzig, 2020). Such mental models may be changed in double-loop learning, based on empirical research (Burt & Nair, 2020; Houchens et al., 2012; Johannessen et al., 2019). Kwon and Nicolaides (2017) described the double-loop process as cognitive reframing, or transforming cognitive frames of reference. This process is different from single-loop learning, which encourages entities to change only to reduce the difference between expected and obtained results (Hasanudin et al., 2019). Double-loop learning is concerned with root

cause analysis and dynamic complexity (Argyris & Schön, 1996). Within leadership models, "double-loop learning goes further and involves modification of the management team's mental model or the theory that underlies the action" (H. Kim et al., 2013, p. 291). In doing so, double-loop learning creates an environment of positive, proactive, and prosocial behavior that improves individual and teamwide performance (Mano, 2010).

Further, espoused values create artifacts that are visible and overtly displayed within organizations. In the Houchens et al. (2012) study, a double-loop coaching protocol provided structure for leaders to reflect and potentially reframe those visible products of their theories of action. Their multicase study examined how school principals dramatically revised core assumptions based on the reflective coaching protocol, illustrating double-loop learning in practice. Burt and Nair (2020) described the process as "unlearning" (p. 1) to enable employees to let go of assumptions and change their mental models. Nicolaides and McCallum (2013) described the process of teaching employees to open up to double-loop learning as "transformative learning" (p. 250). Sharing power is necessary for such learning to take place and to allow adaptive leadership and double-loop learning.

Two-Way Communication and Collaboration. Two-way communication and shared viewpoints enhance double-loop learning to create a community of practice (Vallat et al., 2017). In a community of practice, all members of the organization collaborate to increase learning. The FAA (2003) stated, "A team approach in reviewing input data, assumptions and judgment is most effective" (p. 16). Argote and Miron-Spektor (2011) noted the importance of learning processes being distributed to all employees. Learning that is bottom-up is based primarily on experience, whereas top-

down learning is based on goals and task demands (Argote & Miron-Spektor, 2011). Both dimensions complement one another in two-way communication. Reychav et al. (2016) provided a real-world example of using two-way communication in double-loop learning:

> A double-loop learning model can avoid the shortcomings of a single-loop learning model. In double-loop learning, patients and doctors have access to similar content and discuss the situation through dialogue, and share viewpoints and ideas. The treatment decisions evaluate all available information through an iterative process of information sharing and seeking between patients and doctors. (p. 417)

Through a collaborative and self-reflective approach, double-loop learning creates a sense of purpose built from mutual influence from follower and leader (George & Sims, 2007); such learning creates forward momentum and synergy to move the organization to the most effective, efficient, and collaborative state. The mutual influence needed by teams to solve tactical or strategic problems is paramount to organizational success. When employees and management are working together collaboratively, a synergistic and teamwork-based approach allows organizations to predict systemic challenges and adapt to tactical challenges through innovation. Nicolaides and McCallum (2013) noted the shift from a top-down management style to distributed leadership and communication to reframe problems. Akinci and Sadler-Smith (2019) even described a type of collective intuition for decision-making emerging. Specifically, double-loop learning utilizes the process of shared participation to create effective leadership. Bohanec et al. (2017) noted transparency in open-source models supported double-loop learning through collaboration, supporting quicker application.

In their empirical study, Vallat et al. (2017) noted double-loop learning "allows the organization to improve the completion of organizational tasks as well as to search for

and redefine values and criteria for improved performance" (p. 5). Vallat et al. described a community of practice learning by doing in their study of 190 university students using simulation games in business. Double-loop learning increased the relevance of the learning game, thereby increasing perceived efficacy and student satisfaction. Students changed their goals, methods, and ways of thinking about opening a business, the simulation.

An example related to the study site, the FAA, showed double-loop learning resulting from bottom-up communication. The issue, reported from an air traffic controller in Chicago through ATSAP, was outdated information in the standard operating procedures guide (FAA, 2018). Using bottom-up communication from this employee, members of the organization met with facility leaders, formed a work group, reviewed the guide, and completely rewrote the standard operating procedures (FAA, 2018). Without a blame-free, nonpunitive program like ATSAP, this change in procedures might not have occurred. The FAA (2020g) also produces discussion sheets for use at individual facilities. For example, a sheet on unexpected wake turbulence contained the following suggested discussion questions:

> What conditions may be conducive to wake turbulence events, even when standard separation is maintained between aircraft? Describe any unexpected wake turbulence events you have seen. How can you prepare pilots for possible wake turbulence encounters? What do you do when an unexpected wake turbulence event occurs? (p. 1)

Whether managers at all facilities use the critical, self-reflective questions supplied on these sheets is unknown.

Critical Reflection. Double-loop learning requires organizations to reflect on beliefs and assumptions (Abdullah et al., 2018). Schön (1983) described reflection as a necessary component to organizational performance, effective learning, and innovation.

The reflective aspect of double-loop learning relates to Dewey's (1933) pragmatic learning theory, or theory of action (Argyris & Schön, 1978). As a theory of action, double-loop learning moves from initial error detection (single-loop learning) to underlying causal analysis (Carroll et al., 2002) to learn through critical examination, reflection, and an internal commitment to learning. Active reflection to solve problems is present in Dewey's (1933) theory as well as Schön's (1983). In his seminal work, *Experience and Education,* Dewey (1938) represented education and experience as part of identity and lifelong learning. His analysis of traditional and progressive education represented a foundational position on experiential learning. As such, knowledge is not something that is only acquired in the classroom, and experience is not gained by just living. The combination of an education, both traditional and progressive, and high-quality experience based in reflection, imaging, and understanding represents a continual "knowledge of doing" that maximizes true learning.

Schön (1983) explained an important part of design is not problem-solving but rather understanding the context of the problem as well. As noted earlier, Cyert and March (1992) described organizational learning as guiding the appropriateness of procedures to situations. Adaptive learning based on changing contexts, as in double-loop learning, contributes to long-term organizational success (Argote & Miron-Spektor, 2011) through competitive adaptability (Argyris & Schön, 1996; V. Johnson, 2019; Sisaye & Birnberg, 2010). An important part of adapting to context of the problem includes reflection (Makuwira, 2013; Schön, 1983). Reflective practice is learning from experience and during experience. An example he offered was regaining balance while riding a bike; someone who has ridden a bike could recover balance while riding but

might not be able to describe the actions needed (Schön, 1983). That type of tacit knowledge is knowing-in-action, or on-the-spot improvisation.

Critical reflection is a low-cost strategy that requires no structural changes in the organization, yet can produce long-lasting, strategic improvements (Faller et al., 2020). Di Stefano et al. (2016) stated reflection helps deepen and embed learning to increase performance. Reflection presents the opportunity to ask "why" and examine the underlying assumptions to a process or goal (Rassameethes, 2020).

Monitoring. Monitoring is a vital aspect of double-loop learning and adaptive management, as is stakeholder participation (Williams & Brown, 2018). Adapting to uncertainty or change is possible through double-loop learning to change goals and decision-making strategies. Williams and Brown (2018) demonstrated that principle through examples of wildlife management and natural resources protection. For example, in Florida, avoiding population declines in alligators was originally the goal; however, after populations increased, so did nuisance complaints, leading to a change in objective to keeping alligator populations within 25% of 1980s levels. The adaptive-management cycle consists of evaluating, adjusting, assessing the problem, designing, implementing, and monitoring (Williams & Brown, 2014, 2018).

Resilient, successful groups using double-loop learning also used monitoring and reflection to connect learning and doing (Yu et al., 2019). Broad participation of group members in the double-loop learning positively impacted decision-making in Yu et al.'s (2019) study. Monitoring and reflection led to revised goals.

Advantages of Double-Loop Learning

The current literature has described double-loop learning as a beneficial learning tool for organizations (e.g., Fürstenberg & Görzig, 2020; Mohmoud et al., 2019; Weiner & Lamb, 2020). Double-loop learning creates an advantage for organizations (Hasanudin et al., 2019) when they emphasize differences instead of suppressing or making them undiscussable (Noonan, 2007). Double-loop learning embraces creativity, fresh perspectives, and new ideas through creating a learning environment focused on a mutual, reciprocal relationship (Hassan & Ahmed, 2011; Yu et al., 2019; Zimmerman & Antoni, 2018), in which leaders and employees create a positive impact on production critical to mission success (Kofman, 1992; Mohmoud et al., 2019).

The positive outcomes of double-loop learning have been examined in many fields. According to Abouraia (2018), double-loop learning allows airlines to more quickly recover from crises. Richardson (2014) concurred that double-loop learning increases decision-making speed and quality. Mohmoud et al. (2019) studied purchasing processes in health care organizations; Reychav et al. (2016) studied double-loop learning in nursing practice, and Zhang et al. (2017) studied a medical practice. Double-loop learning has been studied in the context of instruction in elementary and secondary schools (Hwang & Wang, 2016; Weiner & Lamb, 2020) and at the university level (Ervin & Slife, 2019; Vallat et al., 2017). Researchers have studied double-loop learning in the maintenance of Norwegian hydrocarbon pipelines (Metallinou, 2017) and ship repair (Al-Raqadi et al., 2016). The positive outcomes of double-loop learning have been investigated in management of natural resources, including a shared irrigation infrastructure simulation at a university (Yu et al., 2019), urban water governance

(Johannessen et al., 2019), adaptive management of wildlife and natural resources (Williams & Brown, 2018), and an information technology system in the Swedish Forest Agency (Holmgren & Bodin, 2016). Additional empirical studies showing the positive use of double-loop learning included political organizations (Fürstenberg & Görzig, 2020; Raška & Dostál, 2017; Reddick et al., 2017), coaching (Houchens et al., 2012; Zimmerman & Antoni, 2018), sales (Viio & Nordin, 2017), human resources (Kwon & Nicolaides, 2017), project management (McClory et al., 2017), and a Scotch whiskey manufacturer (Burt & Nair, 2020). These studies confirmed, as Fürstenberg and Görzig (2020) stated, "Organizations consistently and fully committed to double-loop learning systems are essentially an ideal type" (p. 32).

In Al-Raqadi et al.'s (2016) study of ship repair, double-loop learning led to changes in behavior and problem-solving strategies and techniques. They investigated the use of double-loop learning in the context of systems thinking to improve organizational performance. Mohmoud et al. (2019) stated double-loop learning added value to purchasing processes in a health care organization by encouraging a holistic, organization-wide model of learning. Two-way dialog and employee involvement in decision-making increased efficiency as well as ethics in the organization. Metallinou (2017) analyzed risk assessment of pipelines using single- and double-loop learning. Double-loop learning led to a change in risk assessment, including improved communication among employees.

Fiol and Lyles (1985) noted critical reflection in organizational learning is vital to ensure adaptability and thus the long-term success of the organization. To move forward, all organizations must learn and adapt (Sisaye & Birnberg, 2010). Double-loop learning

allows leaders to increase their flexibility and operational understanding by finding optimal solutions through mutual influence and two-way communication; revisiting organizational goals through the reflection in double-loop learning may create a win-win situation for both employee and organization (D. H. Kim, 1993). In a practical sense, double-loop learning is a tool that can help guide scholars and practitioners towards implementation of a continuous learning process that improves learning within an organization and empowers leaders and employees to produce at a superior level together. Double-loop learning empowers organizational change and learning (Yang et al., 2018b). Deep and critical inquiry and well as creativity are supported in search for innovative thinking and actions. As individual learning facilitates organizational learning, the interconnectivity of the two creates a crescendo of transformative change that supports a collective community of higher level leadership and learning (Argyris, 1993).

Interconnectivity of Single- and Double-Loop Learning

Korte (2012) suggested researchers emphasize "the social realm that entangles" the field of human resources development (p. 19). In organizational learning, single- and double-loop learning are intertangled and interconnected in a complex relationship. Single- and double-loop learning both are used to achieve organizational objectives and goals. Yang (2017) noted criticism of Argyris's presentation of single- and double-loop learning as a dichotomy, with one inherently better for organizations with difficult problems. Gupta et al. (2006) noted organizations should balance both types of learning. Single-loop boosts productivity and efficiency. However, double-loop learning is more effective when organizations are going through change (Yang, 2017). Argyris (1996),

reflecting on his own theory, noted that technically effective processes that do not create embarrassment (and thus defensive routines) do not need double-loop learning.

In double-loop learning, the goal is to reframe (Schön, 1983) the problem and the situation to produce a more desirable outcome by asking "why?" Rather than just detecting and correcting error (Argyris, 1994), in double-loop learning the dominant knowledge is changed (Assalim & de Almeida, 2013) through reflection and causal analysis (Argyris, 1994; Carroll et al., 2002; Schön, 1983). Aragon (2018) explained that when task or project results continue to be unsatisfactory, organizational members have two choices: (a) use single-loop learning to continue to improve practices and procedures, likely incrementally, or (b) use double-loop learning to change the underlying theory and produce "possible breakthrough improvements" (p. 3). Single-loop learning helps organizations to obtain short-term goals, and double-loop learning helps organizations obtain long-term objectives (Korth, 2000).

Argote and Miron-Spektor (2011) described single- and double-loop learning as complementary, referring to mindful or attentive learning versus automatic, mindless learning. "Mindful processes [enable] the organization to shift between more automatic routines and routines embedding past experience and conserving cognitive capacity for greater mindfulness" (Argote & Miron-Spektor, 2011, p. 1128). Using similar terminology, Pentland and Haerem (2015) explained that mindless or routine processing (single-loop learning) is rapid, context dependent, affective, tacit, and automatic, based on experience. It is based on standard operative procedures. Conversely, mindful processing is useful in novel or unusual situations. Double-loop learning creates paths or procedures and is generative. Argote and Miron-Spektor noted routines are needed to

codify knowledge for knowledge retention in the organization. Such routines preserve individual learning as organizational learning (Fiol & Lyles, 1985).

The evolution of double-loop learning may continue to triple-loop learning, in which the organization develops a learning culture (Johannessen et al., 2019; Kwon & Nicolaides, 2017; McClory et al., 2017; Nicolaides & McCallum, 2013). Whereas double-loop learning questions frameworks, strategies, and methodologies, "triple-loop learning is deeper questioning of purpose and legitimacy (Should we be doing anything at all?)" (Alba et al., 2020, p. 3). Knowledge becomes embedded in every aspect of the organization's context, creating a culture of learning (Argote & Miron-Spektor, 2011) and making the difference between organizational learning and a learning organization. Nicolaides and McCallum (2013) described triple-loop learning as expanding individual and organizational creativity and innovation. Understanding double-loop learning, such as in the current study, may lead to development of learning cultures in organizations such as the FAA. Argote and Miron-Spektor (2011) concluded more research is needed on the interrelated nature of types of organizational learning.

Nicolaides and McCallum (2013) provided lists of example questions to indicate the types of questions and challenges solved by single-, double-, and triple-loop learning approaches. Single-loop questions included asking whether the rate or intensity of the task should be changed or whether guidelines and protocols are being followed. Single-loop-appropriate questions included asking whether the environment and conditions were conducive to success and whether other resources should be consulted. Double-loop-appropriate questions included asking what assumptions the strategy was based on, whether the assumptions were based on accurate data, whether key stakeholders needed

to be involved in decision-making, whether blind spots or biases were impacting the strategy, and whether defensive routines were hindering the goal. Triple-loop learning involved broader conceptual questions regarding individual and organizational purpose, whether the goal served a greater good, and embracing loss of control and ego in the interest of innovation and transformation (Nicolaides & McCallum, 2013). The different types of questions help outline when the different types of learning are appropriate, as described in the following sections.

When to Use Single-Loop Learning

Single-loop learning takes the quickest path of least resistance to accomplish a goal without inquiring into underlying assumptions. As noted previously, single-loop learning answers the question, "Will my action lead to the desired result?" (Bremmer et al., 2020, p. 2). Single-loop learning is much easier to practice than double-loop learning. Single-loop learning also lends itself to predictability, in which a standard playbook or checklist is used to take action. Single-loop learning does not address the root cause but does provide quick, short-term, easy wins that managers often look to in competitive environments. Phelan (2015) described single-loop learning as the easiest, quickest method of handling simple problems by the rules. Single-loop learning operates at a tactical and operational level to identify an easy answer to fix problems for employees and managers (Argyris 1977). The one-way, top-down communication in single-loop learning is efficient and yields little organizational friction (Alvesson & Spicer, 2012).

Pentland and Haerem (2015) described single-loop learning as appropriate when routine, automatic, efficient processes are needed, such as in medicine, accounting, and engineering. Single-loop learning is easy for individuals in organizations and effective

when focusing on narrow practices and activities or standard operating procedures (Matsuo & Nagata, 2020; Pentland & Haerem, 2015). Single-loop learning involves automated procedures, which can reduce error and distractions in air-traffic-control tasks (FAA, 2018). FAA air navigation service providers produce a Lessons Learned document for detection and correction of error (Smith, 2013). The Lessons Learned document emphasizes a single point of error or failure; after pinpointing the failure, a new rule or procedure is created to mitigate the causation of the failure. Such single-loop learning is acceptable when solving routine, repetitive issues in a rule-based context (Argyris, 1977; Matsuo & Nagata, 2020; Pentland & Haerem, 2015; Phelan, 2015).

Argote and Miron-Spektor (2011) noted the effectiveness of single-loop learning in organizations with high rates of employee turnover. Turnover results in issues of loss of organizational learning or knowledge. In hierarchical, structured organizations where employees follow procedures, turnover has a less damaging effect on an organization (Argote & Miron-Spektor, 2011). Further, the procedures used in single-loop learning are effective in embedding knowledge in the organization and its systems.

Ek et al. (2001) described both single- and double-loop learning at all levels of an organization. Organizational leaders and staff used single-loop learning to improve procedures following accidents and incidents (Ek et al., 2011). Double-loop learning helped identify and resolve system weakness and allowed learning from human error.

When to Use Double-Loop Learning

Both single- and double-loop learning are beneficial and required for organizations to learn and move forward. Rouse et al. (2017) stated, “A key indicator that double□loop learning may be warranted is when single□loop learning is failing to

achieve desired performance goals. Then, it is likely that problem formulations need to be reconsidered along with the problem-solving rules" (p. 6).

Putnam (2014) offered some practical explanations of the need for double-loop learning. Organizational growth may require shifts from a traditional hierarchy to a more complex, broader structure. A technology-based approach on product development first and then marketing might shift to an approach based more on regional customer needs. Basic practices must be adapted and embedded in the growing organization and team structures (Putnam, 2014).

Much of the scholarly work concerning double-loop learning has promoted the benefit to the organization through a higher level of learning and the enhancement of critical thinking within organizations (Ervin & Slife, 2019; Fiol & Lyles, 1985; Pawlowsky, 2000), thus creating a continuous learning cycle (Hargrove, 1996) and long-term gains (March, 1991). Ervin and Slife (2019) described how to promote critical thinking in university students using double-loop learning:

> Research-based *how-to* strategies would be an example of single-loop learning. For example, first-year experience students often learn research-based strategies for *how-to* become financially literate. If students not only discussed *how-to* manage their loans, but also if students *should* be in debt to go to college, they would then be engaging double-loop learning, another form of critical thinking. (p. 1)

Yu et al. (2019) examined single- and double-loop learning in a university context as well. They explained single-loop learning can be used to fine-tune specific procedures to meet existing goals, but double-loop learning leads to changes in goals and assumptions. Their mixed-methods experiment involved 105 randomly selected undergraduates in groups of five to collaboratively problem-solve irrigation problems.

Resilient groups who successfully solved problems during environmental variability used double-loop learning, specifically, active monitoring and reflection to revise their goals.

Double-loop learning is particularly useful during a crisis. During times of stress or turbulence, double-loop learning is effective in helping organizations maintain resilience (Johannessen et al., 2019; Mano, 2010; Williams & Brown, 2018; Yu et al., 2019). Turbulent contexts require an adaptive leadership approach to create what Nicolaides and McCallum (2013) called transformative learning. Double-loop learning creates a hybrid atmosphere between tactical and strategic levels (Mano, 2010). Learners use past learning events and future projections to chart the ideal course ahead. Often a crisis creates the conditions for double-loop learning to emerge in an organization, as usual procedures are no longer adequate (Johannessen et al., 2019; Visser, 2017).

Moreover, double-loop learning is an effective response to a mismatch between intent and outcome (Visser, 2017). In organizations, this relates to espoused beliefs, artifacts, and underlying assumptions (Schein, 1991, 2017; Visser, 2017). Underlying assumptions are an unconscious-level phenomenon that permeates the structure of an organization (Schein 1991, 2017), whereas espoused values are the conscious level of an organization, as described in written documents such as the mission statement. The espoused values create the artifacts, which are visible and overtly displayed within organizations. Unlearning existing assumptions is required to meet complex challenges, resulting in adaptive leadership or double-loop learning (Nicolaides & McCallum, 2013).

Barriers to Double-Loop Learning

Double-loop learning represents a strategic approach to the complexity of organizational problems while remaining agile enough to adapt to internal and external

barriers that can inhibit individuals and organizations from learning. Empirical research has shown single-loop learning can be a barrier to double-loop learning. In an example, Johannessen et al. (2019) studied urban water governance. They studied cases in Colombia, the Philippines, South Africa, India, and Sweden, with no noted cultural differences in government response; in general, a crisis event was needed to produce double-loop learning. Johannessen et al. found single-loop learning was maintained through "siloed working cultures, which meant that related actions and measures that fell outside established norms were not even considered or even met with resistance" (p. 147). Thus, single□loop learning may inhibit double-loop learning (Johannessen et al., 2019).

In a study of government agency use of social media, Reddick et al. (2017) came to the same conclusion. Reddick et al. reported,

> Our findings indicate that the missed double-loop learning opportunity resulted from two factors. First, Facebook government-posts were primarily used to advocate the government agenda by educating citizens to change their recycling behaviors without efforts to learn citizens' needs/questions. Second, this single-loop learning orientation sustained the single-loop learning nature of Facebook citizens' posts, precluding their direct and meaningful participation in the city's recycling governance. (p. 110)

Pentland and Haerem (2015) noted single-loop learning, rule-based, top-down organizations are more likely to develop defensive routines, a barrier to double-loop learning. Organizational routines are unlikely to change if the context changes. "Thus, it is important to periodically review and revise established patterns. In other words, to remain adaptive and avoid competency traps, organizations need active metaroutines, routines for changing routines" (Pentland & Haerem, 2015, p. 481). Double-loop learning is not concerned with making mistakes or saving face; instead, learners thrive in the most challenging and dynamic situations (Argyris & Schön, 1974). Double-loop learning calls

for an internal commitment to creating a conducive atmosphere for support, open dialog, and nondefensive behavior. Such double-loop learning and reflection can minimize the continuation of defensive routines in organizations.

Defensive Routines

Defensive routines inhibit double-loop learning (Argyris, 1994; Fürstenberg & Görzig, 2020; Yu et al., 2019). Defensive routines have been described in terms of organizational learning by such theorists as Yau and Cheng (2011), Homburg and Fürst (2007), and Argyris (1986, 1990, 1992, 1994, 2004); they generally described defensive routines as a self-sealing process that insulates leaders from losing power and control while reinforcing the status quo. Other theorists such as Fontaine et al. (2012) described organizational defensive routines as a limitation to success based on a mental model of doing more of the same. Yu et al. (2019) stated, "Social groups can become limited in their thinking and action because of their own historic legacies and business-as-usual mental models" (p. 4). Nussbaum and Dweck (2008) described how low self-esteem may lead some people to avoid admitting to setbacks and thus fixing mistakes. Argyris (2001) described organizational defensive routines as actions or policies that protect members of the organization from embarrassment or threat while also preventing discussion of the causes of such embarrassment or threat.

Throughout the study of organizational learning, scholars of single- and double-loop learning have noted organizational defensive routines as the epitome of destructive and negative behavior (e.g., Argyris, 2001; Ashforth & Lee, 1990; Hytönen et al., 2016; Johannessen et al., 2019; Noonan, 2007, 2018; Yu et al., 2019). These behaviors are the mechanisms that stifle double-loop learning. Noonan (2018) described defensive routines

as inhibiting productivity and work force motivation. Alvesson and Spicer (2012) described "functional stupidity" (p. 1207) of management choosing unilateral power and status quo over two-way communication. Defensive routines create a harbor for stability over creativity and structure over shared responsibility and productivity (H. Kim et al., 2013). The following sections describe antecedents of defensive behaviors as well as specific types of defensive routines.

Antecedents of Defensive Behaviors and Routines

Ashforth and Lee (1990) and Yang et al. (2018b) described antecedents and defensive behaviors for individuals and organizations. Riley et al. (2013) noted, "Organizational defensive routines originate from individual defensive routines matriculating through an organization to the top levels of leadership" (p. 44). Organizational antecedents or triggers include bureaucratic red tape or cumbersome rules, formalization, organizational politics, and accountability and reward (Ashforth & Lee, 1990; Yang et al., 2018b). Resultant defensive behaviors to avoid action include overconforming, "passing the buck," playing dumb, de-personalizing, and stalling (Ashforth & Lee, 1990, p. 624). Overconforming refers to blaming the rules (Ashforth & Lee, 1990). Employees may be afraid of the consequences for reporting mistakes (Fürstenberg & Görzig, 2020). Argote and Miron-Spektor (2011) reported fear of punishment hindered creativity among employees. Organizational stressors such as threat, ambiguity, overload, and powerlessness lead to defensive behaviors to avoid blame, such as justifying, scapegoating, misrepresenting, and "playing safe" (Ashforth & Lee, 1990, p. 624). For the individual, antecedents of job insecurity, anxiety, emotional exhaustion (feeling drained), lack of self-efficacy (lacking confidence in being able to

perform job tasks), and alienation can lead to defensive behaviors to protect the individual's work space and responsibilities and resist change. Low self-esteem may lead individuals to be defensive, particularly when individuals are not aware of a direct path to repairing the mistake—and their self-esteem (Nussbaum & Dweck, 2008). Ambiguity, lack of job security, and feelings of powerlessness in the work environment lead to defensive behaviors (Ashforth & Lee, 1990). Employees who feel they have control over their job role and self-efficacy are less likely to create defensive routines in organizations (Yang et al., 2018b). A direct method of addressing mistakes decreases the likelihood of defensive routines (Nussbaum & Dweck, 2008).

Individual behaviors develop organizational routines. In a social context, individual actions lead to actions by others, which in turn have consequences and subsequent actions (Pentland & Haerem, 2015). Organizational routines, including defensive routines, involve more than one actor. Moreover, routines are patterns of action that may not align with the organizational mission (Pentland & Haerem, 2015). Defensive routines support a disconnect between espoused theory and theory in use, or actual activities (Hytönen et al., 2016). According to Hytönen et al. (2016), many layers of defensive routines may prevent the discussion of or identification of such a disconnect. Pentland and Haerem (2015) referred to defensive routines as a "lock-in" (p. 480) to rule following and noted the association with inertia in the organization.

As noted earlier, compliance offices are required in many instances, such as the FAA, to enhance safety and production. The goal of this approach is to solve the problem in a direct micromanaging approach without consideration of group dynamics or morale. Pentland and Haerem (2015) noted the tendency of single-loop learning, rule-based, top-

down organizations to succumb to defensive routines. When leaders and defense routines are aligned, organizations maintain the same practices even when the nature of the problem is complex and evolving (Hytönen et al., 2016). Within organizational learning, learning is at its best when communications is both upward and downward (Pickett, 2019); this type of learning climate stimulates both the manager and the subordinate so interaction is open and continuous. Argote and Miron-Spektor (2011) noted bottom-up, experience-based learning should be combined with top-down, goal- and task-based perspectives. Organizational defensive routines close two-way communication (Argyris, 1992). Defensive routines then become ingrained in the minds of the manager and employee (Argyris, 1992). Additionally, Argyris (1992) pointed out that defensive routines tend to strengthen and persist if not discussed. The undiscussable nature of defensive routines leads to their continuance (Oeij et al., 2016; Yang et al., 2018b).

Homburg and Fürst (2007) studied defensive organizational behavior to detect factors that triggered such behavior, which is rooted in defense mechanisms (Argyris, 1990). Homburg and Fürst agreed with Argyris (1990) that defense routines are counterproductive to organizational goals and lead to antilearning, overprotective behavior, and self-sealing. Their empirical work studied how defensive behavior towards customer complaints was based in organizational antecedents of employee behavior. The researchers collected data from 1,786 firms with at least 200 employees, $50 million in annual revenue, and origins in both the manufacturing and service sector. They interviewed 379 managers as well as complainants. The data analysis was based on 110 dyads. Each dyad was a managerial assessment of the antecedents to and types of defensive organizational behavior and five customer assessments of responses to

complaints (Homburg & Fürst, 2007). Findings suggested cognitive defenses such as "groupthink," a collective pattern of cognitive defenses to support and justify past decisions (Homburg & Fürst, 2007, p. 527), and the prevalence of defensive organizational behavior.

Types of Defensive Routines

Wooten and James (2005) described defensive routines as window dressing and reactive learning. The role of defensive routines is to stifle change so that all actions and thought process at an individual or organizational level are kept within a predictable and tolerable range (Argyris & Schön, 1974). Defensive routines sustain traditional behaviors, longstanding policies, and standard operating procedures (Argyris, 1990, 1994). Researchers have described a variety of behaviors that comprise defensive routines. Yang et al. (2018b) included bypassing problems and skipping to other tasks, protective sheltering of individuals from blame, and self-censoring, among others. The main types of defensive routines most often cited in literature are mixed messages, antilearning and self-sealing behavior, face saving, avoidance of action, and a unilateral control model (Argyris, 1990; Oeij et al., 2016; Wilson, 2001; Yang et al., 2018b). Each of these types of defensive routines is described in the following sections.

Mixed Messages. Organizational defensive routines create a closed-loop environment where learning is inhibited because of mixed messages (Argyris, 1992). Yang et al. (2018b) and Oeij et al. (2016) also identified mixed messages as a defensive routine. In this behavior, the messages delivered by organizations are illogical, inconsistent, and never up for discussion. Oeij et al. investigated defensive behaviors in project teams and offered an example of a mixed message as, "Be innovative, but watch

the budget" (p. 15). Argyris (1992) and Hytönen et al. (2016) described the steps in this type of defensive routine: produce an inconsistent message, act as if it is not inconsistent, make the first two undiscussables, and make the undiscussability of the undiscussable also undiscussable. Lack of discussion also relates to antilearning.

Antilearning. Argyris and Schön (1996) described antilearning as behavior that does not encourage continuous or innovative learning. Antilearning leaders are overly critical and do not allow for mistakes, risk taking, or the ability to learn from experience. Additionally, they are overprotective and create an environment that is self-sealed and closed off from publicly testing ideas (Yang et al., 2018a). Argyris (1994) noted antilearning as a defensive routine helps individuals avoid reflecting on the consequences of one's mistakes. Fürstenberg and Görzig (2020) stated antilearning routines arise from organizational inertia and defensiveness related to failure.

Antilearning is central to Model I behaviors, as described in the section on single-loop learning, which protect organizations and individuals from discovering any potentially embarrassing behaviors and inhibit the production of knowledge (Argyris, 1993). When defensive routines persist over time, they become reflexive and promote an individual's self-interest, a Model I behavior (Argyris et al., 1985), with a negative impact on the organization. When self-interest is left unchecked, the organizational mission (internal) and stakeholder needs (external) are not the top priority. Instead, individuals and factions of an organization become siloed (Argyris et al., 1985; Johannessen et al., 2019) and are no longer connected with mutual communication, and the environment does not foster learning, creativity, and ultimately effectiveness. Self-interest within defensive routines shields the individual and the organization from an

undesired stimulus and produces antilearning within organizations, also decreasing organizational effectiveness (Ashforth & Lee, 1990).

Defensive routines related to antilearning cause organizations to fail to learn (J. C. Lee & Myers, 2004) when leaders operate under a need-to-know atmosphere that harbors hidden agendas and covert behaviors. Leaders are unlikely to explore root causes or underlying behaviors in an antilearning environment. Instead, norms and assumptions are accepted (J. C. Lee & Myers, 2004). Additionally, in an antilearning culture, managers operate under the assumption that employee involvement in decision-making is not needed because managers have all the information needed (Friesenborg, 2013; J. C. Lee & Myers, 2004). Managers just assign work to the employee. This creates a leader–subordinate environment focused on task completion rather than two-way communication to share knowledge. A limited exchange of ideas or information results.

Theorists such as Argyris (1990), Rahim (1997), and D. H. Kim (1993) have agreed that defensive routines perpetuate antilearning and distrust while avoiding addressing underlying concerns or problems related to organizational efficiency and performance. From an organizational standpoint, double-loop learning removes artificial barriers and antilearning (Argyris et al., 1985) through reflective and generative learning that uses a collective and teamwide approach to diagnose and solve problems.

Face Saving. As defensive routines lead to a denial of responsibility (Ashforth & Lee, 1990) and facades from leaders, these behaviors act as a face-saving tactic to avoid any embarrassment or threat to self-image. Many researchers (Argyris, 1986; Ashforth & Lee, 1990; Northouse, 2016; Oeij et al., 2016; Yang et al., 2018b; Yau & Cheng, 2011) have described face saving as a self-protective leadership tactic that protects personal

power and status and shields the leader from any potential danger or harm. Face saving in organizations obscures genuine intentions and is manipulative in general. True motives are hidden from employees, and the leader appears to be on board with the team and organizational goals. The underlying message and motive of face-saving tactics and behavior are actually a ploy for strategic domination and control.

Face saving allows the avoidance of penalty or consequence for any misstep or wrongdoing. Ultimately this is avoiding any exposure to risk (Model I behavior) in interpersonal relationships. J. C. Lee and Myers (2004) described it as unilateral self-protection, noting that face-saving behaviors include "little testing of theories publicly and much testing of theories privately" (p. 1196). Additionally, face saving is often used once a leader has built up a good reputation and does not want to risk any damage to the leader's integrity or goodwill. Edmondson and Moingeon (1999) provided the example of meeting participants avoiding addressing problems because a colleague might lose face.

Lastly, face saving is a behavior and tactic that does not support double-loop learning and is a strategy of self-protection and control (Yang et al., 2018b). Face-saving behavior minimizes embarrassment, disregards valid feedback, and limits individual and organizational effectiveness (Argyris, 1976).

Avoiding Action. Avoiding action can delay decisions or tasks, harming organizational effectiveness in a fundamental defensive behavior (Ashforth & Lee, 1990). Additionally, avoidance of action manifests in organizations as a culture of fitting in to help achieve organizational goals. This type of onboarding and socialization process introduces and creates a monoculture that is against creativity and risk taking and instead values compliance and the status quo. Ashforth and Lee studied this in the context of

organizations and stated, “At an organizational level, the institutionalization of defensive routines generates predictable long-run effects, including rigidity and stagnation, ‘red tape,’ insularity or detachment from the environment, politicization of the organization, a climate of distrust, and low morale” (p. 642). Avoidance of action is a Model I behavior (Argyris, 1982). The related mental model (Argyris, 1982) is achieving the intended purpose at all costs, suppressing negative feeling, and always acting rational.

Overcoming avoidance of action may require a crisis or disruption. Various researchers have noted the need for a crisis or dramatic interruption to create the impetus for double-loop learning (Johannessen et al., 2019; Raška & Dostál, 2017; Visser, 2017; Williams & Brown, 2018; Yu et al., 2019). Visser (2017) opined that Argyris and Schön underestimated the anxiety and emotional turmoil caused by the disruption or interruption of expected experiences; defensive routines are a protective device. Thus, a disruption in continuity may be necessary to reexamine goals and assumptions through double-loop learning (Visser, 2017).

Unilateral Control. Defensiveness in organizations is ultimately linked to efforts to maintain maximum control (Argyris, 1976) and act as a barrier to organizational learning and questioning of underlying values and root cause behaviors (Ritchie, 1999). Mohmoud et al. (2019) noted double-loop learning does not involve unilateral control but rather shared decision-making. The unilateral control stance leaves leadership behavior in a right-or-wrong stance and filled with absolute decisions (Pentland & Haerem, 2015). This one-track mind increases defensive behavior by keeping a manager or leader alert to make rapid decisions and remain on guard to prevent a perceived attack. This defensive routine is a unilateral control model (Noonan, 2007, 2018).

In organizations, single-loop learning can be expressed through one-way conversations from leader to follower (Alvesson & Spicer, 2012). Alvesson and Spicer (2012) described management of such "functional stupidity" as seeking "to restrict and distort communication action through the exercise of power" (p. 1207). A practical example was advertising copywriters being instructed not to visit factories producing the items being marketed, as knowledge about the products would make writing the desired kind of copy difficult (Alvesson & Spicer, 2012). In another example, employees were told not to discuss problems unless they also had developed proposals for solving the problems, which limited discussion on potential solutions. Corporations may promote a culture of action (Alvesson & Spicer, 2012). In sum, stupidity management blocks the collective reflexivity process, disrupts two-way communication, prevents critical scrutiny and reflection, and thus inhibits learning (Alvesson & Spicer, 2012).

Schön (1983) described how individuals within organizations enact defensive routines to protect unilateral control:

> All participants try to achieve their objectives as they see them: general managers, to keep the burden of uncertainty on the shoulders of product development; product development directors, to retain corporate commitment while maintaining their own credibility. Each participant tries to protect himself unilaterally from being tagged with failure and from the resulting loss of credibility. Each seeks to gain unilateral control over the situation, to win and avoid losing in a situation he perceives as irretrievably win/lose. And each one withholds negative information from the other, as long as he believes it is a winning strategy to do so. (pp. 263–264)

Defensive behaviors inhibit double-loop learning when leaders deal with employees though fault finding and taskmaster behavior. Regimented and micromanaging control focuses on detailing specific steps towards achievement while imposing corrective actions to deal with noncompliance or lack of productivity (Anderson et al., 2019). Too much of this behavior produces an assembly-line style of

leadership that manages by objectives and checklists. Such a hierarchical style of leadership centralizes and controls employees and margin of error through strict accountability.

Yu et al. (2019) described unilateral control as hindering double-loop learning in their university-based experiment. A dominant leader among the group typically directs activities, preventing groups from trying different social structures or strategies and promoting conformity. Unilateral behaviors inhibit double-loop learning through a one-way assessment of all problems and actions. The result is defensive listening and value of production over people. Conversely, double-loop learning is fundamentally concerned with people and production while fostering continuous learning through formal and informal two-way communication and dialog. Such a collaborative and integrated approach helps people meet and exceed production standards while promoting teamwork and rewarding experiences at work (Anderson et al., 2019).

Gaps in the Research on Double-Loop Learning

More practical, real-world examples of double-loop learning are needed in the literature. Munkvold et al. (2020) noted a lack of published resources providing exercises and supports for double-loop learning. Although double-loop learning has been described as a theory and reflective practice that helps address learning, problem-solving, and goal attainment in any organization, researchers (Clegg & Bailey, 2008; Greenwood, 1993, 1998; Newman, 1999; Reasonl, 1993; Weick & Westley, 1996) have pointed out the theory is time consuming and not easily applicable in the real world. Double-loop learning, although a sound conceptual theory, still has not created a practical roadmap or lesson plan for direct application (Clegg & Bailey, 2008). Practitioners still may confuse

their role or not be able to describe double-loop learning. More research is needed that would provide clarity to the roles and outcomes for practitioners.

Argote and Miron-Spektor (2011) concluded more research is needed on the interrelated nature of single- and double-loop learning. Yang et al. (2018b) noted researchers have not identified specific individual and organizational factors that create defensive routines. Organizational learning increases competitiveness (Yang et al., 2018a), so research on factors impacting such learning is important. Fürstenberg and Görzig (2020) stated, "To learn more about the conditions that facilitate or inhibit organizational learning, future research should therefore explore the ways in which the internal and external conditions of organizations affect the capacity for such inquiry, and how the lessons of double-loop learning are implemented" (p. 33). For double-loop learning to survive and thrive as a theory and to help organizations, it must be connected to everyday practitioners who can create meaningful case-based research.

Even though double-loop learning has been touted as creating the optimal environment for organizational success (Fürstenberg & Görzig, 2020; Winship, 1995), researchers have found the practice of double-loop learning rare, even among organizations whose survival depended on it (Wassenaar, 2019). Double-loop learning is likely particularly uncommon in hierarchical, highly structured organizations such as governmental agencies (e.g., Johannesen et al., 2019) or the military (e.g., Wassenaar, 2019). Double-loop learning as a theory embedded in organizational learning faces many challenges before it will be embraced in practice. Double-loop learning is inherently unsettling, and individuals and organizations tend to respond to challenges with single-loop learning (Putnam, 2014). "When these attempts do not succeed, the most common

responses are more single-loop learning and blaming others or the environment. Few individuals and fewer organizations are good at double-loop learning" (Putnam, 2014, p. 284). Pentland and Haerem (2015) concurred, noting that managers tend to follow routines. Alvesson and Spicer (2012) described managers as becoming "trapped into patterns" (p. 1197) of defensive routines.

Weick and Westley (1996) pointed out that learning is a disorganizing process requiring variety, meaning "organizing and learning are essentially antithetical" (p. 440). The complexity of double-loop learning places practitioners in a potential misalignment from preestablished work guidelines and procedures. In this instance, the employee is not responsible to reframe and rethink an issue to determine the root cause. This holds true even for front-line managers who are directed from senior leadership. The job of both the front-line manager and the rank-and-file employee is the same: to complete the job task as assigned. "Single-loop learning is bureaucratic learning, having to do with repetition and mundanity. Double-loop learning is 'post-bureaucratic' being less structured, less hierarchy-driven, more pro-active, more innovative" (Grey, 2001, p. 6).

Most employees in organizations do not hold a position where innovative and creativity are encouraged or rewarded. Instead, they operate in traditional top-down, vertical power structure organizations that reward compliance and risk mitigation. Argyris and Schön's (1978) definition of double-loop learning involves the term *error*, which Clegg and Bailey (2008) noted might deter management from investigating the process.

From much of the discussion in this chapter, double-loop learning presents a challenge in research and in practice. The simplicity and efficiency of single-loop

learning present a much clearer and easier path to accomplishing organizational goals compared to double-loop learning. Employees and managers "are much better at single-loop learning than at double-loop learning" (Clegg & Bailey, 2008, p. 806). Further, double-loop learning may cause confusion at an individual and organization level (Clegg & Bailey, 2008). Multiple viewpoints, voices, and directions can lead to a lack of vision, lack of direct orders, and organizational inefficacy. In bureaucratic organizations, a command and control structure is much more effective and efficient in maintaining order, balance, and task completion.

Double-loop learning appears to force the issue of reflecting, reframing, and continuous challenging of the status quo. As such, few people in practice have such time and authority to go through the process of double-loop learning. When comparing double- and single-loop learning, double-loop is described as a higher level of learning (Argyris, 1977; Fiol & Lyles, 1985; Pawlowsky, 2000). Such a label creates a hierarchy in the learning culture where double-loop learning appears superior to single-loop learning (Clegg & Bailey, 2008), even when Argyris and Schön (as cited in Clegg & Bailey, 2008) admitted that organizations are better at single-loop learning. Double-loop learning is still more of an ideological approach to organizational learning, based in academic theory and policy. Practitioners struggle to add to the content and gaps in double-loop learning because it is hard for them to understand, explain, and analyze the true day-to-day practicality of double-loop learning. In doing so, a dynamic polarization of theory and practice will continue. This conflict supports the need for continued research such as the current study. As noted in Chapter 1, researchers have yet to create a

practical roadmap or lesson plan for direct application of double-loop learning, possibly because such learning is context specific. This research was designed to help fill that gap.

Conceptual Framework

The problem addressed in this study is that organizational defensive routines inhibit double-loop learning, stifling organizational creativity, risk taking, learning, and adaptability. Yet, the research is limited on practical use of double-loop learning in organizations. Moreover, specific to the organization under study, the FAA implemented a voluntary safety reporting program in 2010, ATSAP. However, the FAA (2018) reported safety culture remained a top system problem, particularly "supervisory and organizational factors" (p. 15). The safety culture in the organization could be improved through an examination of management perceptions related to double-loop learning.

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. Resultant themes may be used to develop professional training to increase the use of double-loop learning. The research questions were the following:

1. How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)?
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?

3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?

Figure 3 in Chapter 1 illustrated the conceptual framework of the study. Though single-loop learning is suitable for routine situations, complex and new problems require double-loop learning through reflection on basic assumptions and goals. "Yet, most individuals are uncomfortable with the potential threat and embarrassment . . . from double-loop learning" (Fontaine et al., 2012, p. 1049). Defensive routines protect individuals from potential threat and embarrassment, and thus inhibit organizational learning.

As a theory of action (Argyris & Schön, 1974, 1978), double-loop learning moves from initial error detection (single-loop learning) to underlying causal analysis to learn through critical examination, reflection, and an internal commitment to learning. Double-loop learning is focused on the correction of outcomes by challenging normative behavior, beliefs, and underlying assumptions (Argyris, 1992) in organizations. Double-loop learning requires critical self-reflection, dialog, and collaboration (Argyris & Schön, 1974). Hasanudin et al. (2019) described double-loop learning as a powerful instrument that "involves reflection on values and norms and the social structure in which these values and norms are practiced" (p. 1355).

Additionally, double-loop learning involves looking at the mental models or schema (Argyris & Schön, 1974) of learning and decision-making (see Figure 5). The goal of mental models is to help individuals make better, smarter, more efficient decisions based on asking the right question instead of just getting things right. Senge (1990) defined mental models as deeply ingrained assumptions impacting how one

perceives the world and behaves. Mental models include chunking and simplifying processes so that an orderly process or system can emerge. All managers and leaders act based on a mental model developed from experience and knowledge (Cartwright, 2002).

Overall, the progression from single- to double-loop learning is the maturation of learning and leadership (Yang et al., 2018b). Adaptive leadership results from double-loop learning (Williams & Brown, 2018). Adaptive leadership is "the practice of mobilizing people to tackle challenges and thrive" (Heifetz et al., 2009, p. 14). Whereas technical problems can be solved by subject-matter experts in single-loop learning, complex adaptive problems or challenges require a team-based approach to examining the underlying issue and mobilizing all available resources to determine the best course of action. Specifically, adaptive leadership has four leadership dimensions: solving complex challenges, showing or leading with empathy, learning through critical self-reflection, and creating an optimized solutions-oriented environment (Heifetz et al., 2009). The adaptive leadership dimensions of critical self-reflection and solving complex challenges involve double-loop learning (DeRue, 2011; Hannah et al., 2011; Heifetz et al., 2009; Williams & Brown, 2018). Effective leaders use feedback to adapt in terms of identity as well as social processes (Hannah et al., 2011).

Adaptive leadership is more dynamic, decentralized, and shared (DeRue, 2011), providing a conceptual model that focuses on learning and productivity by leaders and followers based on mutual influence (Weick, 1979). The strength of adaptive leadership is the shared desire to achieve a collective goal (DeRue, 2011). The collective goal and shared purpose (Bass & Bass, 2008) align with double-loop learning through reducing defensive routines to maximize the success of the organization (Argyris, 2004).

As double-loop learning represents a higher level of learning, it also represents and reflects a higher level of leadership (Pawlowsky, 2000). Through a collaborative and self-reflective approach, double-loop learning creates a true north (George & Sims, 2007) for leaders; a sense of purpose built from mutual influence from follower and leader creates forward momentum and synergy to move the organization to the most effective, efficient, and collaborative state.

Insights

Many theorists in the past have described double-loop learning as a theoretical organizational learning theory not applicable in an agile and real-life organization (Clegg & Bailey, 2008; Greenwood, 1993; Newman, 1999; Reasonl, 1993; Weick & Westley, 1996). Perhaps because of mixed perceptions on the topic, reviewing the literature on organizational defensive routines revealed positive empirical research on the subject. As defensive routines and double-loop learning work in opposition, they are connected in most research and literature streams. Argyris remains one of the most widely cited theorists in organizational learning. Moving forward, to continue to understand and learn about what drives organizations to produce and succeed, researchers also should uncover the barriers or inhibitors that can impede organizational learning and operational progress (Fürstenberg & Görzig, 2020; Yang et al., 2018b). Defensive routines inhibit both and provide a false sense of security for leaders and organizations.

Double-loop learning is the crescendo of organizational learning. It empowers an organization to move from the unknown to the known, removes produce-or-perish behaviors, and is not supportive of a command and control environment. Double-loop learning builds trust among leaders and employees as it connects the dots of

communication, trust, respect, and collaboration (Argyris & Schön, 1996; Edmondson & Moingeon, 1999). Each of these is vitally important to ensuring organizational success. Argote and Miron-Spektor (2011) maintained that organizations with a culture of trust rather than defensive routines promote such organizational learning. As much as double-loop learning helps, organizational defensive routines inhibit double-loop learning, while overprotecting and insulating organizations from internal and external feedback. In closing, if leaders and organizations want to expand their success models and maintain concern for employees, they should identify, examine, and remove defensive routines.

Finding the root cause or underlying source of a problem is the greatest strength of organizational learning. Double-loop learning presents a model where a complex adaptive learning system can help solve some of the most complex problems within an organization. As such, double-loop learning presents a well-thought-out conceptual model that links critical self-reflection with the examination of underlying normative structures and values. Double-loop learning requires reflection, which moves the employee from experience to deep understanding (Linz & Resch, 2010).

Additionally, because of its foundational principle for a deeper understanding, double-loop learning is a challenge for practitioners. As practitioners are often on the front line of accomplishing work in an organization, they are met daily with tactical problems that need an immediate solution. The search for a deeper understanding is replaced with finding an immediate solution to so that production is continuously in motion.

Moving forward, the key for double-loop learning to reach its fullest potential is contingent upon buy-in from the practitioner community. “There is still a long way to a

fully accepted, integrated and assessable double-loop learning in work based settings" (Linz & Resch, 2010, p. 2). Case research on double-loop learning in work settings, such as the study by Houchens et al. (2012), will allow theory and practice to evolve seamlessly and continually in a multiloop process that seeks to find the right question, answer, and fit. The current study was designed to contribute to the literature. The next chapter describes the methodology of the study.

Chapter 3: Methodology

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. Results may help create professional development or a roadmap for leaders to minimize defensive routines and promote double-loop learning. In the case of the FAA, the site of the research, such professional development could improve the use of the FAA safety program, ATSAP, and other forms of double-loop learning in the organization to increase air traffic safety. The research questions were the following:

1. How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)?
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?
3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?

This chapter describes how the study was conducted. The chapter is outlined as follows: overview of the qualitative methods, research questions, research procedures, human subjects and ethics precautions, and assumptions and limitations.

Qualitative Research

A basic qualitative approach was used to examine management perceptions of behaviors, policies, and practices that affect double-loop learning in a large, federal

government organization. Pentland and Haerem (2015) noted the most effective studies of organizational routines typically were those using qualitative methods, particularly interviews. Merriam and Tisdell (2016) stated qualitative research is used to understand the meaning participants make about their experiences. Specific to a basic qualitative approach, Merriam (2009) stated, "A basic approach focuses on (a) how people interpret their experiences, (b) how they construct their worlds, and (c) what meaning they attribute to their experiences" (p. 23). A basic qualitative study is conducted in the naturalistic setting to learn participants' perceptions and interpretations of their experiences to answer the study's research questions (Caelli et al., 2003).

Maxwell (1998) described how a qualitative methodology is useful in an inductive approach with a focus on specific populations or contexts and on words rather than statistics. In an inductive approach, initial codes from the raw text are built into increasingly abstract themes (Creswell & Poth, 2018). Creswell (2014) described qualitative research as collecting data in a naturalistic setting and using thematic analysis in an inductive approach to understand the meaning individuals ascribe to a problem.

Creswell (2014) noted the importance of interviewing individuals in the field or the relevant setting; in social constructivism, individuals may share knowledge of their workplace. Creswell and Creswell (2018) noted that a constructivist epistemology looks to understand meaning through the interviewee's experiences and interactions. This study was based in a constructivist epistemology. Through in-depth interviews with open-ended questions, I elicited detailed information from participants about the range of situations they encounter when facing complex decisions.

I used interviewing as a technique in this research because it allowed the voice of the participants to be expressed in ways that quantitative analysis would not allow. Seidman (2013) described the interview process as an opportunity for participants to not only share or reconstruct their experience but also reflect on meaning through the context of their lives. This reflection is enhanced through the interaction between the participant and interviewer to support the methodological rigor (R. Cooper et al., 2012). In-depth interviews gathered rich data. Creswell (2014) described rich, thick description as a way to validate the findings through detailed descriptions and perspectives about the various themes, providing more realistic results.

Additionally, I used the critical incident technique to ask participants to reflect on a specific incident (Allen, 2017; Flanagan, 1954; Rosala, 2020). The critical incident technique is used to determine key processes or responses to critical events, as recalled by interviewees (McAllister et al., 2006). Stories of such events provide rich data to explore critical thinking and problem-solving of participants (McAllister et al., 2006). Data illuminate practices and reasoning processes and thus are a useful research tool (McAllister et al., 2006), making the critical incident technique relevant to this study.

Lastly, a case study design was considered, as the research was bounded by a single organization (Creswell & Poth, 2018). However, case studies require multiple sources of evidence and documentation, whereas the focus of this study was interviews to understand managers' perceptions, thereby making the design a basic qualitative study (Creswell & Poth, 2018; Merriam & Tisdell, 2016).

Procedures

Setting

The FAA is considered a large federal government organization (25,000 employees or more) as defined by the U.S. Office of Personnel Management (2019). The Air Traffic Organization of the FAA provides air navigation services and safety to commercial, private, and military aviation (FAA, 2017a). Employees number approximately 35,000, including controllers, engineers, technicians, and other personnel.

The FAA (n.d.-a) noted that air traffic in the United States is the safest it has ever been, as a result of the Air Traffic Organization's "robust safety culture" (para. 4). The FAA (2016b) uses a safety management system that integrates "modern safety risk management and safety assurance concepts into repeatable, proactive systems. . . . [safety management systems] emphasize safety management as a fundamental business process to be considered in the same manner as other aspects of business management" (para. 2). The safety management system is an evolutionary process (FAA, n.d.-d) in decision-making (FAA, 2016b).

The FAA incorporates processes that foster organizational learning, including single- and double-loop learning, and thus was an appropriate site to study the concepts. For example, air navigation service providers produce a Lessons Learned document, using a fact- and rules-based approach to find a single point of error, an example of single-loop learning. Blame-free programs like ATSAP allow reporting of issues that may require procedural changes (FAA, 2021a). Such bottom-up, nonpunitive programs allow double-loop learning. Additionally, St. George (2019) noted highly skilled

professionals like pilots may exhibit defensive routines based on their expert status and require double-loop learning processes to reexamine errors through reflection.

Participants

Study participants were senior managers (current or retired) within the FAA. A senior manager in the FAA is categorized as an employee with an MSS-4 (Air Traffic Manager) in the Air Traffic Compensation Plan or a FV-K band employee or higher in the Core Compensation Plan. I recruited nine current or retired senior managers from the FAA to participate in semistructured interviews via videoconference or face to face. Creswell and Plano Clark (2011) stated qualitative researchers often use purposive sampling to select participants who can provide detailed information to answer the research questions of a study. Purposeful sampling is used when the researcher can identify and select a set of participants for the study who can provide rich information (Creswell & Plano Clark, 2011; Patton, 2015).

An important consideration in qualitative sampling is saturation. Saturation is "the point at which the data collection process no longer offers any new or relevant data" (Dworkin, 2012, p. 319). This process is gradual and varies by study. Saturation may depend on factors such as the homogeneity of the sample and the researcher timeline (Charmaz, 2006; Dworkin, 2012). As I interviewed the participants, I noted whether interviews yielded new information or confirmed existing information from previous interviews, indicating saturation.

Inclusion criteria for selecting participants were the following: (a) willing and able to give informed consent for participation in the study, (b) aged 18 years or older, (c) FAA employee (current or retired), and (d) defined as a senior manager (MSS 4 or FV-K

pay band). My knowledge of the organization assisted me in recruiting individuals with a variety of management styles. For example, some might be more double-loop-learning oriented and open minded; others might be more procedural and prefer the status quo. I interviewed at least one manager involved with ATSAP design and implementation.

Each line of business within the FAA has its own organizational chart that depicts status, job title, and level within the FAA. As an operations manager at the FAA, I had access to that chart. I selected participants within the FAA who met the inclusion criteria and who were willing and able to give informed consent for participation in the study. I sent an email to senior managers asking if they would like to participate in the research study. I did not supervise any of the participants. Respondents could contact me through my George Washington University email. Those expressing interest received an Informed Consent Form (see Appendix A). I then contacted the senior managers and set up a time for an interview.

Informed Consent Forms were emailed to those managers who indicated interest in participation. I collected the signed Informed Consent Form via email. Given the current COVID-19 pandemic, interviews were conducted via videoconference. The George Washington University informed consent template was modified for use in this study; see Appendix A.

Data Collection

Interviews are the primary data collection source in qualitative research (Creswell & Poth, 2018; Merriam, 2009). DeMarrais (2004) described the interview as a conversation focused on the research questions. The participants were asked open-ended qualitative interview questions designed to gather data concerning the research questions.

Participants were assured of anonymity through assignment of a numeric ID to each participant. All research data are kept in a locked filing cabinet or a password-protected file accessible only by me.

Interview Protocol. A qualitative interview presented the opportunity to focus on participants' perceptions (see Creswell & Poth, 2018; Seidman, 2013). Related to my topics of study, single- and double-loop learning and organizational defensive routines, an in-depth interview approach allowed me to examine management perceptions of behaviors, policies, and practices that affect double-loop learning in a large, federal organization.

I created a semistructured interview protocol. The interview protocol creation involved four phases: (a) conducting an inquiry-based literature review, (b) ensuring interview questions aligned with the research questions, (c) receiving feedback on the interview protocol (from the dissertation committee), and (d) piloting the interview protocol with individuals not in the final research sample (Castillo-Montoya, 2016). Feedback from committee members and pilot participants was incorporated to ensure feasibility of the interview protocol. The protocol is provided as Appendix B.

Directly related to Research Question 2, Interview Question 12 asked about defensive routines. Other questions provided data to answer Research Question 3, such as Interview Questions 2–6. Questions directly related to Research Question 1 included Questions 6–11. Additionally, the critical incident technique (Allen, 2017; Flanagan, 1954; McAllister et al., 2006; Rosala, 2020) was used to explore managers' decision-making processes, related to Research Question 1. Interview Questions 9–11 involved the technique by asking respondents to recall a specific critical incident in detail.

Critical incidents are those that are clear to the observer and where the consequences are significant (Flanagan, 1954). Critical incident technique (Flanagan, 1954) is a well-established research technique for collecting data, which has been used in behavioral interviews within the management and aviation organizations as well as organizational learning (Ellinger & Bostrom, 2002; Ellinger & Watkins, 1998; Flanagan, 1954; Gremler, 2004). Critical incident technique was introduced by Flanagan (1954) concerning studies in the U.S. Army Air Forces Aviation Psychology Program to collect information on ineffective or effective behavior (Ellinger & Watkins, 1998). Flanagan noted that the technique is extremely flexible, and the underlying principles are useful to many applications. Critical incident technique is especially useful in research that is "designed to examine very specific, situationally relevant aspects of managerial behavior" (Yukl, 1981, p. 95).

Critical incident technique is useful for solving practical problems through the use of interview questions that allow for thick descriptions in the respondents' answers, thus leading to a deeper understanding of the research study (Bott & Tourish, 2016; Flanagan, 1954). Within the technique, there are four ways of collecting data: questionnaires, group interviews, record forms, and interviews (Flanagan, 1954). In qualitative research, critical incident technique is frequently used through semistructured interviews (Bott & Tourish, 2016). The technique allows respondents to provide a rich source of data because the respondents choose which incidents are most relevant to them in the context of the study (Gremler, 2004).

When applied carefully with other methodological frameworks and methods, critical incident technique is a powerful research tool because of its role in building

models or theories but also as an exploratory tool (Bott & Tourish, 2016). The technique provides an in-depth record of events, thus providing new research evidence about phenomena (Gremler, 2004). Ellinger and Watkins (1998) stated that the use of critical incident technique in research studies generates rich qualitative data. Also, the technique allows participants to reflect on critical incidents (Butterfield et al., 2005; Francis, 1995).

In addition to critical incident technique, I noted interview strategies used by Oeij et al. (2016) in their study of defensive behaviors in project teams. The researchers noted that interviewees might be defensive about discussing defensive behaviors, which Oeij et al. called "meta-defensiveness" (p. 17). Therefore, they asked participants to reflect on their experience first. Then, they showed participants a card with a list of defensive strategies and asked respondents if any of the listed behaviors had been perceived during a project. Therefore, I created a list of defensive behaviors from the research (Argyris, 1990; Argyris & Schön, 1996; Ashforth & Lee, 1990; Edmondson & Moingeon, 1999; Oeij et al., 2016; Williams & Brown, 2018; Yang et al., 2018a, 2018b). These defensive behaviors include mixed messages, lack of discussion or error, face saving, blaming others, avoidance of action, maintenance of the status quo, resistance to change, and unilateral control. These behaviors were listed and discussed as one of the interview questions, Interview Question 12.

Pilot Study. To validate the interview protocol, a pilot study was conducted with two participants who were not part of the study sample. The participants for the pilot study were selected though the researcher's professional contacts. The participants were senior managers within the Air Traffic Organization of the FAA in two states. Pilot Participants 1 and 2 are both senior managers with over 30 years of experience in the

FAA. Both are over 50 years old, male, and African American. Both participants had expressed an eagerness to help with the research study. The pilot study was collected via interviews during the spring of 2020. The pilot study revealed no problems with the interview protocol questions, wording, or length.

Interview Procedures. Each senior manager participant was interviewed once. The interviews were conducted via videoconferencing. Interviews ranged from 25 minutes for one participant to 75 and 79 minutes for two other participants. The average was 48 minutes. With the participants' consent, the interviews were recorded. The interview period was January 2022. Any participant was free to withdraw from the study at any time.

The goal was to have a social conversation (Josselson, 2013) to create a comfortable atmosphere where two-way communication and constant dialog could emerge without overt effort or strain. Seidman (2013) described in-depth interviewing as requiring a deep interest in others' stories to understand the interviewees' perceptions and the meaning they derived from those experiences.

Using the Rev software, I recorded and transcribed interviews onto a Microsoft Word document for coding. See Appendix C for the Rev security and privacy policy. After reading over it and comparing it to the audio recording, I emailed each transcript to the interviewee within 30 days from the original interview, to let the participant read the transcript. Lengthy introductory text or parts of the conversation that were off topic or regarding informed consent were not included in the transcript, for brevity. Each participant had 10 days to respond with changes to ensure accuracy. This sort of member checking of transcripts enhances study validity (Creswell, 2014). Member checking

ensures accuracy of data; the two types of member checking are (a) confirmation of transcript and (b) confirmation of a draft of the findings (Creswell & Creswell, 2018). Confirmation of the transcript involved less time for the participant and ensured their individual perspective was included in the transcript as well as accuracy of the audio-to-text process.

Trustworthiness

Trustworthy techniques in this research included member checking, peer debriefing, and an audit trail. Creswell (2014) recommended using multiple strategies for trustworthiness and accuracy. Creswell also observed that validity, a strength of qualitative research, is based on accuracy of findings. Having interviewees review their transcripts for error promoted accuracy. All participants answered the same general interview questions in the protocol in a semistructured approach. Follow-up questions or probes were used if necessary for clarification.

Data Analysis

As noted, I used Rev software to record and transcribe the interviews onto a Microsoft Word document for coding. I used Atlas.ti software to aid in analysis. Codes and emergent themes were formulated using basic thematic analysis (see Creswell & Plano Clark, 2011). Codes were organized in a spreadsheet. The theoretical lens of double-loop learning guided the initial coding process by providing sensitizing concepts, which Charmaz (2003) defined as "those background ideas that inform the overall research problem" (p. 259). Main sensitizing concepts related to double-loop learning included change in mental models, dialog or two-way communication, collaboration, critical reflection, and monitoring (Abdullah et al., 2018; Burt & Nair, 2020; Houchens et

al., 2012; Johannessen et al., 2019; Reychav et al., 2016; Vallat et al., 2017; Williams & Brown, 2018; Yu et al., 2019). Additional sensitizing concepts related to double-loop learning were critical thinking, trust, judgment-free environment, creativity, crisis, and adapting (Argyris, 1977; Argyris & Schön, 1978; Johannessen et al., 2019; Mano, 2010; Nicolaides & McCallum, 2013; Williams & Brown, 2018; Yu et al., 2019). Sensitizing concepts related to single-loop learning were standardized procedures, rule-following, as well as the concepts related to defensive routines (Argyris, 1977; Argyris & Schön, 1978; Matsuo & Nagata, 2020; Pentland & Haerem, 2015; Phelan, 2015). Sensitizing concepts related to defensive routines included control, micromanaging, checklists, risk avoidance, saving face, blame, avoiding action, top-down communication, red tape, bureaucracy, self-interest, embarrassment, and mixed messages (Argyris, 1990; Oeij et al., 2016; Wilson, 2001; Yang et al., 2018b). I used these sensitizing concepts in content analysis during preliminary coding.

The remaining phases of coding involved inductive analysis, meaning the codes and themes emerged directly from the data rather than from predecided constructs (Patton, 2015). Chunks of text or words were represented by a code word or phrase. In vivo codes were based on the actual words or language of the interviewees (Saldaña, 2015). Descriptive codes summarized the topic of the interview excerpt (Saldaña, 2015). Codes became classified into categories, and from these categories themes emerged (Saldaña, 2015). Themes developed based on the categories, which were created from collections of codes. Additionally, the critical incident technique provided in-depth narratives of interviewees' decision-making processes related to single- and double-loop learning, and these stories were used to illustrate themes. The themes answered the

research questions. For Research Question 1, themes related to management perceptions and choices of single- and double-loop learning. For Research Question 2, the theme addressed perceptions of behaviors, policies, and practices that inhibit double-loop learning (defensive routines). For Research Question 3, themes reflected perceptions of behaviors, policies, and practices that promote double-loop learning.

In addition to analyzing the transcript text, I observed interviewee behaviors or speech patterns. Oeij et al. (2016) noted the potential difficulty of interviewing participants about defensive behaviors, including participants becoming defensive. They used a second strategy to analyze interviewees' behavior during the interview. Four behaviors or speech patterns that indicated the interviewee felt defensive were (a) a long pause or asking about details, (b) deflective humor, (c) blaming others, and (d) trivializing the issues. Therefore, these behaviors were noted when they occurred during an interview. Specifically, Oeij et al. explained,

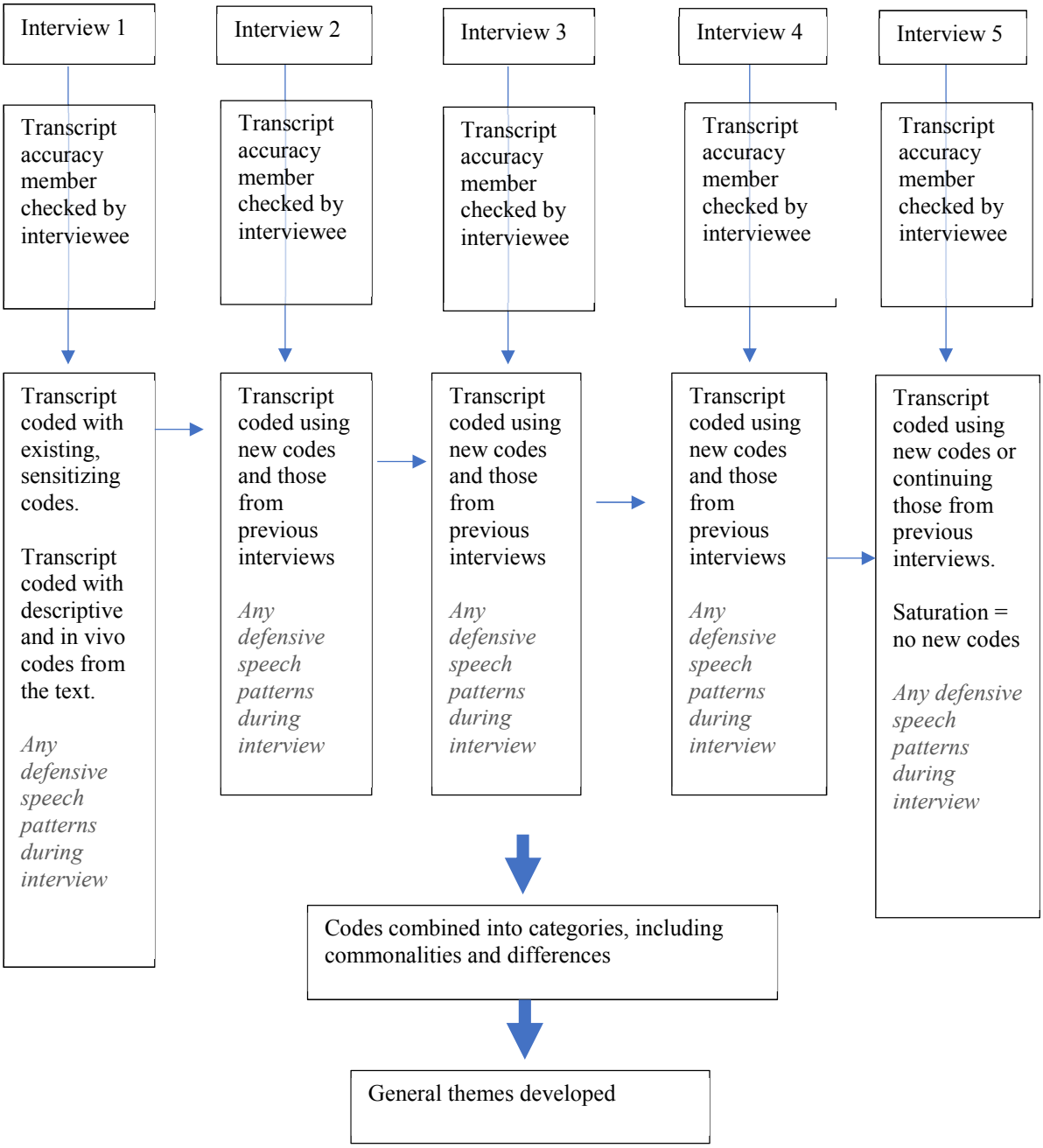
> First, in order to organise the narration when being asked a question that may trigger anxiety, people tend to take long pauses at the beginning and ask the interviewer about details. . . . Second, to neutralise the tension respondents may react with humour, jokes or laughter that helps to shift away from an arousing topic. . . . Third, persons may be inclined to not critically reflect on their own behaviour, which might be too threatening, but prefer blaming the others (psychological projection), often outside the team. . . . Fourth, and final, on certain occasions, people minimize the issue raised by denial, trivialisation or devaluation of those issues, which again reduces feelings of anxiety. (pp. 18–19)

Oeij et al.'s technique relates to Corbin and Strauss's (2008) description of the analytical tool of considering emotions expressed by participants and the context.

Figure 6 illustrates the data analysis process for five participants. The process continued for all nine interviewees.

Figure 6

Data Analysis Process



Note. Sensitizing codes are change in mental models, dialog or two-way communication, collaboration, critical reflection, monitoring, critical thinking, trust, judgment-free environment, creativity, crisis, adapting, standardized procedures, rule-following, control, micromanaging, checklists, risk avoidance, saving face, blame, avoiding action, top-down communication, red tape, bureaucracy, self-interest, embarrassment, and mixed messages.

Data Management

The interviews were recorded using an encrypted audio recorder. Using the Rev software, the interviews were recorded and transcribed onto a Microsoft Word document for coding. All documents have been placed in a locked file cabinet in my home. Electronic data are on a personal password-protected computer accessible only me. Transcriptions and analytical documents contain a numerical ID for each participant. Audio recordings of interviews were destroyed as soon as participants member checked the transcripts. The remaining data will be retained for 3 years after completion of the study, after which all data will be destroyed unless used for academic or professional publication.

Human Participants and Ethics Precautions

In terms of benefits of participation, the participants helped further the understanding of organizational defensive routines and single- and double-loop learning. The findings in the form of themes also filled a gap in the research, which is limited on practical examination of double-loop learning in real-world use. Research is also needed on aviation management. Risks to participants were minimal. The primary risk to participants was loss of anonymity, and thus procedures were followed to protect participants' identities. The participants were identified only by numerical IDs, and the participant IDs were stored separately in a secure location available only to me. Transcripts did not include participant names. All documents are stored securely and only accessible by me in password-protected files or locked filing cabinets.

All rules, regulations and guidelines were adhered to in accordance with U.S. federal code (Protection of Human Subjects, 2018). Additionally, I complied with the

Informed Consent Tips as outlined on the U.S. Department of Health and Human Services, Office for Human Research Protections (1993) webpage. Any participant was free to withdraw from the study at any time prior to completion of the dissertation study. All recordings and transcripts associated with a participant who withdrew would be destroyed upon withdrawal. No participants withdrew.

I interviewed individuals with whom I had worked; however, I did not interview anyone over whom I have supervisory duties or any conflict of interest. As shown in Appendix D, I obtained approval from two authorized representatives of the FAA.

Assumptions and Limitations

Interviewees were assumed to answer interview questions in depth. The interview questions were assumed to elicit data suitable to answer the research questions.

Another limitation of the study is researcher bias: "A qualitative interview that can be analyzed thematically and deeply requires that the language, the linkages, and the associations belong to the interviewee and not the researcher" (Josselson, 2013, p. 66). Conducting an interview within my organization was useful as I am familiar with the atmosphere and culture of the organization. In this sense I was not stepping into unfamiliar territory but an organization where I have spent over 12 years of my career. Creswell and Poth (2018) noted the importance of a qualitative researcher having experience with the issue being researched—while also being able to set aside personal bias during data collection and analysis. I did have to remember Josselson's (2013) recommendation to minimize bias and focus on the words of the interviewees rather than my preconceptions.

I provided a subjectivity statement in the Limitations and Delimitations section of Chapter 1. As described in Chapter 1, my years of managerial experience with the FAA may bias me towards a promanagement view. Because of my managerial training, I likely have a confirmation bias (see Fliek et al., 2019). Further, although I view single-loop learning as the quickest way to accomplish simple tasks, I support double-loop learning as an advanced form of organizational learning.

ATSAP was launched in 2008 but not fully implemented until 2010. I remember the procedure for operational errors during my first couple of years as an air traffic controller, prior to ATSAP. After an operational error, the facility quality control department would compile the audio and video replay using a radar replay tool to review airborne events. During the review of operational errors, the training department would request all developmental air traffic controllers and certified professional controllers to sit in a conference room to review the operational error from beginning to end. The controller who made the operational error was in the conference room as well. Even though there was no name attached to the operational error, everyone in the room was able to identify the person based on their voice. During the replay of the operational error, the controller or controllers involved in the operational error would often slide down in their seat due to shame, guilt, embarrassment, and unwanted attention while 20–30 people watched an operational error review and critique of their actions. This type of event review was typically done monthly, created a culture of fear, and contributed to air traffic controllers not wanting to voluntarily identify actual or potential safety concerns.

At my work, I have observed the perception that there is no time to change past practices. Further, defensive routines allow for a siloed thinking approach that defends

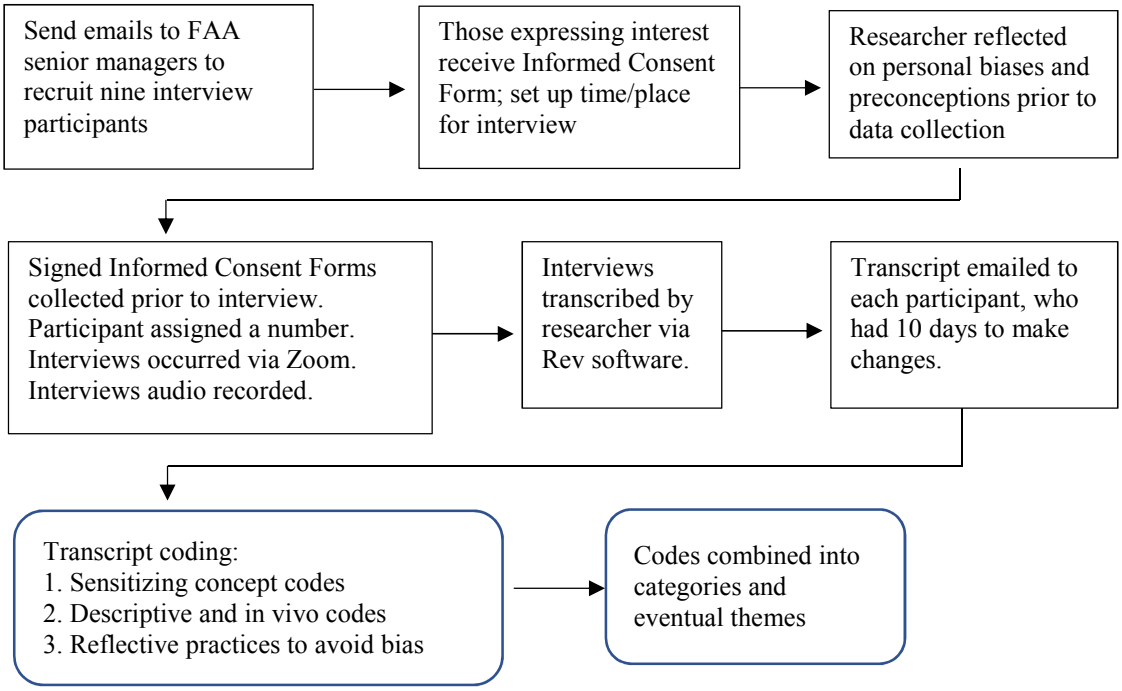
the status quo (see Bäck & Lindholm, 2014). However, I do believe that double-loop learning is superior and the most advanced form of organizational learning. Although double-loop learning does take more time and energy because of its reliance on self-reflection, it creates the environment for team-based solutions and dialog that help organizations strategically move forward. Researcher bias was mitigated through a reflexive process of recognizing my preconceptions and biases prior to collecting data and during data collection and analysis in order to be able to put aside those biases.

Summary

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. A basic qualitative design was used, involving interviews with nine senior managers at the FAA. Figure 7 provides a visual summary of the research process. Results may improve safety in air traffic. Additionally, results may help create a roadmap for leaders to minimize defensive routines and promote double-loop learning, thereby helping fill a gap in the research on the practical application of double-loop learning and leadership development.

Figure 7

Research Process Flowchart



Chapter 4: Results

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. The organization is the Air Traffic Organization of the FAA. A basic qualitative approach was used with semistructured interviews of senior managers employed or retired from the FAA. I interviewed nine current or retired senior managers from the FAA Air Traffic Organization and FAA headquarters. Interviewees had 14–40 years of experience with the FAA, and all had former military experience. Most interviewees described working in various roles and facilities with the FAA. Three of the interviewees were women.

Analysis

I coded and analyzed transcripts thematically as described in Chapter 3. Codes and categories are presented in detail in Appendix E. Appendix F shows preliminary codes and representative quotes; some codes were combined or eliminated as analysis progressed. Data were analyzed on an individual level. Defensive routines, for instance, are individual actions that then permeate throughout the organization. In the thematic analysis, patterns and commonalities were detected across the individual-level data (Braun & Clarke, 2006). These combined patterns led to themes.

For Tables 2–4, data are presented in order of number of participants noting the combined category. Table 2 shows the categories that developed related to single-loop learning, both Research Questions 1 and 3: How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines), and what

are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization? Table 2 show the number of times transcripts were coded in each category as well as the number of participants mentioning the code. More detail regarding coding is shown in Table E1 in Appendix E.

Table 2

Single-Loop Learning Categories

Category	No. times mentioned	No. participants mentioning
Rule-following	30	6
Standardized procedures	12	4

Note. $N = 9$ participants.

Table 3 shows the categories that developed related to double-loop learning (both Research Questions 1 and 3). More detail is shown in Table E2 in Appendix E. Table 4 shows the categories related to defensive routines, or Research Question 2: What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization? More detail is shown in Table E3 in Appendix E.

Table 3

Double-Loop Learning Categories

Category	No. times mentioned	No. participants mentioning
Continuous learning & data collection	50	9
Staff development & support	90	9
Collaboration	52	9
ATSAP: positive	21	9
Adapting	68	8
Change is constant	27	7
Monitoring	18	6
Dialog/two-way communication	37	8
Critical reflection	29	8
Trust	81	7
Crisis	12	6
Creativity	10	6

Note. $N = 9$ participants. ATSAP = Air Traffic Safety Action Program.

Table 4

Defensive Routines Categories

Category	No. times mentioned	No. participants mentioning
All defensive routines[a]	4	3
Individual accountability	57	9
Top-down communication	30	9
Union/labor	37	8
Saving face	30	6
Mixed messages	20	6
Unilateral control	17	6
Avoiding action	17	6
Resistance to change	14	6
Blame	12	4
Bureaucracy	9	3
Risk avoidance	6	3
Lack of trust	3	2

Note. $N = 9$.

[a] "All defensive routines" means participants confirmed saving face, mixed messages, unilateral control, avoiding action, resistance to change, blame, bureaucracy, and risk avoidance.

Table 5 shows the themes that developed from the categories. Codes from the interview data were combined into categories; then, categories were combined to develop overarching themes related to each research question. The tables in Appendix E present the details of the process of codes being combined into categories. Themes are discussed in this chapter in terms of the relevant research question. The data were rich and often intertangled between the concepts of single-loop learning, double-loop learning, and defensive routines. Numerous quotes are used to give the participants' voice.

Table 5

Research Questions and Themes

Research questions	Themes
1. How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)?	Theme 1: Managers stressed continuous learning, including staff development and support to ensure collaboration. Theme 2: Change is constant, requiring adapting, monitoring, creativity, and reflection. Theme 3: Managers build trust with staff through transparency, leading by example, and two-way communication. Theme 4: Managers stress compliance with safety procedures. Theme 5: Managers perceived ATSAP improved information gathering but reduced employee accountability.
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?	Theme 6: Defensive routines prevented or reduced double-loop learning in the organization.
3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?	Theme 7: ATSAP promotes a judgment-free environment for learning. Theme 8: The organization shows adaptability to constant change. Theme 9: Two-way communication will develop an adaptive safety culture.

Note. ATSAP = Air Traffic Safety Action Program.

Results for Research Question 1

Research Question 1 was the following: How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)? Data from Interview Questions 6–11 were analyzed for this research question,

as well as some responses to Interview Questions 13 and 14 (see Table 6). Questions 9–11 used the critical incident technique to have interviewees consider a specific instance. Interview data were analyzed to determine executives' choices related to single- and double-loop learning. I categorized five themes related to management perceptions and choices of single-and double-loop learning.

Table 6

Interview Questions to Answer Research Question 1

Research question	Interview questions
1. How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)?	6. Help me understand what makes a good safety culture. 7. What strategies do you take to meet these goals of a safety culture? 8. Describe your leadership or management style. 9. Tell me about a time when you worked on a really successful project in the organization. Who was involved? How was recognition given? 10. Can you tell me about a time when you or your operational area experienced failure or difficulty in the organization. Can you tell me about a specific incident? 11. Think about a recent important decision you made. Can you describe how you made that decision?

Theme 1: Managers Stressed Continuous Learning, Including Staff Development and Support to Ensure Collaboration

Continuous Learning and Data Collection. All nine interviewees stressed data collection as part of their strategy to ensure a safety culture. Seven specifically mentioned continuous learning. Participant B explained, "I get as much information as I can . . . to make sound decisions." When asked about strategies to meet the goal of a safety culture, Participant E said, "First strategy was to learn about it." Participant I described data collection as the first step in a tiered approach:

> The first thing I think to do is to identify. Once you identify what all of the issues are, where the weaknesses are and where the facility can be strengthened, then you need to go through the process of addressing each one of those things.

Participant A described "being aware what's going on in the facility. You know, talking to my other fellow air traffic managers, trying to identify trends. . . . This facility tried this, maybe this is something you can look into."

Staff Development and Support. The part of continuous learning stressed repeatedly by all participants was staff development, training, and support. Participant I explained,

> If I first haven't taken my time to set the example as to what my expectations are for that employee, openly communicate that, follow up with the employee, provide the tools that the employee needs in order to be successful and so forth, I cannot say that I've laid a reasonable foundation to ensure my employee's success.

Participant C stated,

> I'm willing to make sure that they are given the right tools, they're given all the things that they need to succeed whether it'd be from a training standpoint or from a working standpoint. . . . I'm caring about the person and set them up for success.

Participants A and F described themselves as proponents of employee development. Participant E described a "keen interest in training" and noted the importance of mentoring in leadership style:

> We should prepare the next generation of leaders. It's an obligation for management executives to identify potential talent and to groom talent and to help them move up, and to give them coaching and counseling. That's been my entire mantra since Day 1 as an air traffic controller. Self-development, leadership training . . . It's an empathetic, polite, and mentoring type of role.

Participant B referenced the need in the military for constant training for preparation and added,

> I think the FAA really is realizing that, that they have to prepare that next generational workforce. I think they're doing a lot of things, between the

> mentoring programs and the shadowing and all of these different types of leadership programs.

Collaboration. All participants had former military service and referenced teams. Participants described collaborating across facilities for information sharing to develop a holistic approach. Participant A stated, "You don't know everything there is to know. . . . This facility tried this, maybe this is something you can look into." Participant I described a specific example of using collaboration in decision-making:

> A very important decision I had to make was to change some past practices to improve upon safety and the workplace overall. So, that decision was a very important decision to make because some very significant changes needed to be made. The first step was collaboration. Having an understanding between management and the union and identifying common goals was important to facilitate going through the changes together. Open communication with the union, getting buy-in, . . . then making sure that we communicated overall to everyone within the facility was important as well. Then moving forward to ensure that the message was understood prior to implementation.

Five participants referenced a holistic approach for the good of the facility or system. For example, Participant B stated, "How does that work impact maybe the rest of the FAA? How does it tie into your other stakeholders, maybe those folks in the field, those maintainers, the admin people, how does all this tie together?" Participant D noted "always keeping the operation first. Every decision is based on the operation." Participant G explained, "Everybody's really a link to the network, everybody's a cog in the wheel. . . . A lot of people use different sorts of systems. And I like to look at everything as a whole."

Summary for Theme 1. Managers stressed continuous learning, including staff development and support to ensure collaboration, all elements of double-loop learning. All nine interviewees stressed data collection as part of their strategy to ensure a safety culture. Seven specifically mentioned continuous learning. Participants described

collaborating across facilities for information sharing to develop a holistic approach, elements of double-loop learning. Additional elements of double-loop learning mentioned were adapting to change and monitoring, as described in the next theme.

Theme 2: Change Is Constant, Requiring Adapting, Monitoring, Creativity, and Reflection

Change is constant. Seven participants noted change is constant within the FAA, making adapting a continual requirement. Changes include new technology, new demands, and new policies. Participant B stated, "The NAS [National Airspace System] is forever changing," particularly in technology and demand. Participant E stated change was continual due to funding and policy fluctuating with each presidential administration. Participant C described changes for the FAA related to demand in aviation. Participants noted that a fatal accident would cause overnight changes in procedure.

Adapting. As a result, participants included adapting to change as part of their decision-making. Participant B stated, "With the National Airspace System being so dynamic and ever changing and technology just being brought in, in all phases of this, we have to continually evolve." Participant C said the FAA "consistently has to adapt," due to the growth in aviation. Participant E explained, "The number one competency of an FAA employee is resiliency. You have to be resilient. You have to roll with the changes." Participant B stated, "My [management] style is very adaptive," describing different approaches to individuals who are more comfortable with change and with those who are not. Participant D noted their "willingness to step out of the comfort zone." Participant I gave a specific example of adapting training programs, which reflected double-loop learning:

> You need to do one-on-one training with them, training workshops, with the employees and with the managers. Assess the quality of the actual training

> program. What's the quality of the training they've received? Another thing I did was looked at revamping the entire training program at the facility to ensure that everyone receives quality training at the facility, not just on the floor in OJT [on-the-job training], but actually from the very beginning, when they first come into the facility.

Monitoring. Six participants mentioned monitoring to make needed changes. Participant B stated, "After we've introduced them [changes], I think we also want to make sure that we're constantly monitoring, because like I said earlier, the National Airspace is forever changing." Participant I stated,

> Once you identify what the issues are, then you put mitigations in place to improve things. Now you have to actually to measure to determine, "How well are we doing? Are there still gaps? Are there still questions? . . . Have the mitigations that I've put in place as a manager actually worked, or is there still room for improvement? What do we need to work on to help further learning within the facility to grow?" . . . Then once you assess, and if you have reached the point that things are working. we're doing good, then it's going to be continuous, positive reinforcement and ensuring that we're staying on task. It's never a thing that's over.

Participant A responded, "I see a lot of reports coming from all the facilities. . . . My job is to follow up with the facility" and watch for trends. Participant E described monitoring as follows:

> I do quality control. I edit. I look at policy. I look for opportunities for synergy to see where, where particular, let's say a change in a regulation might affect, or adversely affect, another directive or another policy. I connect the dots. I put people in touch with each other that know things on certain topics.

Participant I used monitoring as a step after identifying the problem, collecting data, and offering data.

Creativity. Six participants described creativity in their decision-making. Participant B said, "The demand for more and more access [to aviation], I think it is forcing us to be a bit more creative in how we look at things, and how do we do it and do it safely?" Participant F described using creativity to address a disciplinary issue that was

systemic in the facility. The participant did not want to discipline everyone the same way and had to take into consideration all the information, context, employee awareness of expectations, and managers' behavior, "considering the totality of the situation." Participant G provided a specific example involved examining the funding structure to find a way to replace outdated equipment in spite of "zero budget allotted for me to be able to make a change," resulting in "the magic of addressing a situation that was going to be really bad."

Participant D gave a specific example of using creativity rather than rule-following; instead of diverting two aircraft late at night, due to a bureaucratic issue, the participant took the risk. Participant D explained, "Operations first. . . . The decisions aren't always clear cut. Sometimes there's a little bit of gray area there. And that's part about being in leadership. You have to make the right decisions for the right reasons." Similarly, Participant I overcame a bureaucratic overload by creatively changing the approval process to dramatically reduce the overload of authorization requests. The new process involved some automation as well as streamlining the process to provide blanket authorizations where appropriate.

Critical Reflection. Eight of the nine participants expressed using critical reflection with themselves as well as staff to inform their decision-making, an important aspect of double-loop learning. Had I only used in vivo coding, rather than descriptive coding as well (see Saldaña, 2015), this would not have been a code, as participants did not use the term "critical reflection," and only one (Participant F) used the term "reflect." Moreover, the quotes related to critical reflection were mostly in response to an interview

question about feedback and criticism, so it is not known if participants would have described critical reflection without the prompt of that question.

Participant F also described feedback "as a means of being able to self-reflect, hopefully improve my actions, my activities, and personal growth." Participant F also described critical reflection when recounting an instance of making a mistake, saying, "I should have reported it. So I was a failure, and a good lesson learned." Without critical reflection, micromanagers exerting unilateral control (defensive routines) might labor under the misconception that they are closely guiding subordinates, without realizing the negative impact on employee autonomy and self-motivation.

Notably, participants viewed the word "feedback" positively and the word "criticism" negatively. Participant B stated, "Negative feedback, . . . if it's delivered the right way, it's not a criticism at all. It's just simply an awareness tool." Participant C described the importance of feedback to "see if there's anything you need to address or if you've got any blind spots." Participant G, when asked about responding to feedback and criticism, stated,

> I welcome it, listen to it, address it, catalog it, and even if it's considered ridiculous or petty, I think it deserves a review and coming up with a solution to, to address it or to examine it . . . feedback or criticism, which are actually two different types of expressions. I believe that it's a gift, an opportunity for improvement. . . . Can you mitigate criticism and get positive feedback, for example? Because feedback's not always also negative, unlike criticism, but can you turn criticism into something positive?

Participant B incorporated critical reflection into their management approach:

> If you do make a mistake, then let's sit down and figure out why and say, okay, well, wait a minute, you made that decision because . . . and if it sounds rational and reasonable, then it's like, okay, I can understand why you made that call. So now, let's go back and learn from it.

Participant B continued, “We need to continue to ask ourselves, okay, how do we get better? How do we do this thing or this procedure or this process?” Participant I welcomed employee feedback but also espoused crucial self-reflection: “I would say that my very hardest and worst critic is myself. I look at myself every day and assess what I can improve upon or how can I do a better job.”

Summary for Theme 2. Participants acknowledged change is constant at the FAA. As a result, the only approach is to adapt and then monitor adaptations through creativity and critical reflection to ensure processes remain relevant. Adapting, monitoring, creativity, and critical reflection are all elements of double-loop learning. Interestingly, some interviewees described a process of critical reflection but did not term it as such, suggesting they are engaging in the practice instinctively but without formal training on its importance. This is discussed further in Chapter 5.

Theme 3: Managers Build Trust With Staff Through Transparency, Leading by Example, and Two-Way Communication

All participants had a military background, and many had worked their way up through the ranks of the FAA to their current executive position, holding many diverse roles at varying sites. They sought to lead by example to promote trust and two-way communication. Participants frequently cited aspects of transformational leadership such as transparency, integrity, trust, setting an example, achieving buy-in from employees, and seeking input from all ranks of the organization. Having a “just culture,” as Participant G put it, encouraged input and a safety culture. Participant G stated, “I try to embody the just culture system. . . . Silence is really killer. But you preclude that by ensuring you have a just culture.”

Leading by Example. Six participants stressed that as leaders they set an example and "walk the walk." Participant A stated,

> I try to be a good example. And then . . . people will look to you, if they feel like you know what you're talking about and you have confidence and they know that you are dedicated to your job and that you are always trying to . . . gain information and share information, that people will naturally just support you as a leader.

Leaders stressed not asking employees to do any task they would not do themselves. Participant G said, "I believe a good leader is the type that won't ask of employees something more than that individual can't provide or do. . . . Leadership by example is the bedrock." Participant I also "leads by example," explaining, "You cannot hold an employee to a standard that you yourself do not uphold."

Participant F described trust in terms of not micromanaging. Participant B stated, "Constant transparent communication . . . I'm going to be one of the first to admit that I don't know it all. . . . You've got to totally communicate. You've got to ask questions. You've got to trust." The result of trust and setting an example, participants explained, was dialog and two-way communication, described next.

Two-Way Communication. Participant G said, "Silence is scary because no system is perfect. . . . Can you utilize the negative feedback and positive feedback to make improvements? Most definitely. But you can't do anything with silence. Silence is a killer." Participant A described personally "being receptive to the workforce . . . allowing them to offer solutions. . . . These are the people that are working at the front lines, so maybe they have the best idea of what the solutions should be." Participant A encourages supervisors to "solicit ideas from the workforce." Participant B holds "a monthly all hands with my group. and I ask, 'Please let me know if I'm doing something that may or may not be helping you.'" Participant F said, "I rely largely on integrity and

honesty. We can talk about anything. I need that open and honest dialog, I need transparency." Participant I stated, "I want my employees to know that they can have complete trust and understanding between us that they can share whatever with me."

Summary for Theme 3. Managers described using transparency, leading by example, and two-way communication, all elements of double-loop learning. These elements supported trust in the workplace. Additionally, managers described practices that align with single-loop learning, as described in the next theme.

Theme 4: Managers Stress Compliance With Safety Procedures

Participant H described a safety culture as "adequate, standard operating procedures." Participant E observed, "Our rules and regulations need to be complied with. They mean something. They're put there for a reason." Participant G, when asked about leadership style, said, "Honest, upfront, and regulatory compliant."

One way participants ensured rule-following was constant reinforcement of procedures with staff. Participant D explained,

> Constant reminders. Whether it be through mandatory brief items or discussions, like the quality control process does for us, keeping it at the forefront of the controller's minds. If you keep hammering that home and to be able to constantly have reminders, it keeps in the forefront of their minds so when they're faced with that situation, hopefully it'll be the first thing that pops into their head to give a safety alert versus just traffic. So I think it's the constant reinforcement of safety processes.

Participant F used similar language, referring to "consistent reinforcement" and "frequent and constant reminders . . . to choose safety over . . . expediency or complacency . . . just daily and constant reinforcement." Similarly, Participant E described implementing a new safety procedure:

> Anytime I would see a trainee in the hallway, the elevator, in the tower cab, the very first thing I would say to the person after saying hello is "What's the number

> one safety issue?" And the correct answer was "runway safety." I drilled that into every trainee's head.

Participant E described training and enforcing standardized procedures related to the safety culture.

> When the actual tenets of the safety culture came in, I embraced it. This was the executive policy. I trained it. I provided training to my employees. I provided refresher training. I met with my employees individually. I met with my supervisors individually to explain to them what the expectations were. And basically when the new concepts came out and were rolled out officially, I embraced it. And as any good manager would do, I said, "Okay. You asked me to do this and implement it. That's exactly what I did faithfully."

Participant F noted a difficulty with adapting to new COVID-19 pandemic policy was the need for standardized procedures. Staff received the same policy, but implementation varied by facility and state, resulting in "a huge quagmire" and grievances from staff. Participant F stated,

> We're here to change. I don't get a choice as to whether or not I accept it or reject it. So, you know, it's implemented to the best of our ability, until new guides are given. My function right now is to basically make sure that those things are carried out.

When asked for a specific example of an important decision they had made, four respondents described checks in terms of procedure compliance. One was related to suspending a person who did not meet training requirements. Participant A described top-down communication of COVID rules: "We have to communicate what the policies are going to be to the workforce. The course of action we took was just basically understanding what the agency stance was and try and communicate that back to the workforce."

Summary for Theme 4. In addition to the examples of double-loop learning given above, participants described single-loop learning in the organization and in their own decision-making, although they did not use the terms *single-* or *double-loop*

learning. Following rules is vital in an environment where the safety of the public is at stake, and all participants had military backgrounds, which might have favored following rules and standardized procedures. When asked for a specific example of an important decision they had made, four respondents described an incident reflecting single-loop learning.

Theme 5: Managers Perceived ATSAP Improved Information Gathering but Reduced Employee Accountability

Although participants viewed ATSAP as a positive part of a safety culture and information gathering, they also felt the program was misused to avoid individual accountability. Five interviewees used the term "get-out-of-jail-free card."

One participant in particular reported the program negatively impacted managers' roles. Participant F stated,

> Lack of cooperation, or there's slothfulness, to lack of attention to detail. They [air traffic controllers] just decided to disregard known rules, things that they've been thoroughly trained on, know how to do, and they've done in the past. . . . It requires a conduct response. ATSAP has had some [negative] impact on how we are able to effectively effect discipline. . . . I think it's also fostered an environment of complacency to a degree. You have situations where controllers routinely or readily will say, . . . "Maybe I'll flout the rules a little bit and I'll just ATSAP it, no big deal." So it's had some unintended impacts.

Participant F also disliked that the ATSAP procedure took assessment of response through a bureaucratic external procedure rather than allowing the site manager to "have a more effective response," or direct control. Participant I concurred:

> Those who do not have intentions to use the program how it was intended can abuse the program. People can use it as a get-out-of-jail-free card, which is essentially making improper operational decisions or making false reports and not being held accountable. If an incident occurs, a controller isn't required to report the incident to management if they file an ATSAP. So, if I'm a controller and I have an incident, or I'm involved in something that's unsafe, as opposed to telling management about the incident and giving him/her the opportunity to be aware of what happened, report upward as appropriate and take whatever corrective actions needed, I could just simply file an ATSAP and not say anything. That type of

> scenario can really put management at a disadvantage in many ways. If someone has the intention of avoiding accountability instead of helping to improve safety within the system, it can hinder them from developing further operationally. Ultimately, this increases risk in the system and impacts safety.

Participant E noted ATSAP was a huge improvement over the previous, punitive system, but also noted the negative effect on managers. "There's nobody holding anybody to account for negligence." Participant E elaborated,

> Supervisors now are dispirited. They feel they have no management support. They've pretty much given up on performance management. . . . I think there needs to be some redress of that. There needs to be a balance between ATSAP, which is essentially considered a get-out-of-jail-free card, and performance management. . . . Performance management is not just going after the things that a person does badly. . . . You may prescribe skill enhancement training, you can offer refresher training. . . . There's a lot of human factors, ways that can be employed by the smart supervisor to mold performance and get the achievement that you're looking for. However, in the current environment I think supervisors don't feel that they have any support. That the union basically runs the show in the FAA and that they have no real say in how performance is managed. . . . So, in that respect I'd say that ATSAP has had a very negative impact on the overall safety of the agency.

ATSAP regulations state that employees may not be disciplined or de-certified; however, employees may be required to serve in administrative duties or receive further. Skill enhancement or corrective action is taken confidentially by either the facility or the employee. Several participants felt without assigning blame and individual accountability, employee performance could not be improved. Some participant responses reflected defensive behaviors related to blame and control. This topic is related to defensive behaviors, the next section.

Summary for Research Question 1

How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines)? Managers stressed aspects of double-loop learning, including continuous learning, including staff development and support to

ensure collaboration. All nine interviewees stressed data collection as part of their strategy to ensure a safety culture. Change is constant, requiring adapting and then monitoring procedures, representing double-loop learning. Managers build trust with staff through transparency, leading by example, and two-way communication.

Managers also described the use of single-loop learning when appropriate. Participants described learning (single-loop learning) in the organization and in their own decision-making. Following rules is vital in an environment where the safety of the public is at stake, and all participants had military backgrounds, which might have favored following rules and standardized procedures. An unexpected finding was that although participants viewed ATSAP as a positive part of a safety culture and information gathering, they also felt the program was misused to avoid individual accountability. Five interviewees used the term "get-out-of-jail-free card."

Results for Research Question 2

What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization? Results from Interview Question 12 were used to answer Research Question (see Table 7). Three participants stated that all defensive behaviors mentioned by the interviewer were prevalent in the FAA: top-down communication, resistance to change, saving face, mixed messages, unilateral control, avoiding action, blame, bureaucracy, risk avoidance, and lack of trust. The defensive behaviors are described in order of number of participants citing them. Combining categories led to a single theme: Defensive routines prevented or reduced double-loop learning in the organization.

Table 7

Interview Questions to Answer Research Question 2

Research question	Interview question
2. What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?	12. I'm going to describe some behaviors. Do you recognize any of these behaviors as occurring in your organization, with you or others? a. Mixed messages. For example, "Be innovative, but watch the budget." Or agreeing to follow policy whether or not you actually plan to do so. b. Lack of discussion of possible pitfalls or mistakes. No risk taking. c. Face saving. Not discussing errors to save your own reputation or a coworker's. Denial of problems. d. Blaming others, particularly external sources e. Avoidance of action, maintenance of the status quo, and resistance to change. Red tape. f. Unilateral control. Lack of group decision-making, a right-or-wrong leadership style, short-term perspectives.

Theme 6: Defensive Routines Prevented or Reduced Double-Loop Learning in the Organization

Unilateral Control and Top-Down Communication. All nine participants observed unilateral control routines through top-down communication in the FAA. Participant F said unilateral control was "still very prevalent." When asked if the interviewee wanted to elaborate, the response was, "No, sir." Participant C said simply, "We don't have any input." Participant B described directors making decisions and policies without consulting those on the front lines.

> How could you make that decision without talking to us? We do the work every day. And we could have actually given you some really good information. But I think the person who made the call had come up through the ranks. So I've thinking they probably felt like they knew the right thing, not realizing, once again though, the dynamic is changing, it's ever evolving.

Participant E described suffering from unilateral control, possibly before changes in FAA culture:

> Throughout my FAA career, I have been the victim. And I mean victim of many situations where I have suffered abuse at the hands of management or executives. . . . toxic environment . . . Some people have no integrity. They take personal pleasure in harming other people. They use the Conduct and Discipline Program as a whip for some of their managers and supervisors. I am not the only senior manager in the FAA who has suffered as such. I have several people in my office who have also suffered under the hands of tyrants. . . . I worked for an absolute tyrant. . . . That place was corrupt as all hell. That manager treated me and others with contempt, disrespect. He was just a downright evil person. . . . So, resiliency is key. You cannot let the agency get you down. You've got to keep go, go, go. You've got to look for opportunities. You've got to develop yourself.

Conversely, two participants said they did not currently experience unilateral control. Participant A stated, "You don't have opportunities to make unilateral decisions. Everything is collaboration, collaboration, which, in theory is good, but I think that that causes a lot of hold up."

Participant I advocated a need for less top-down communication:

> Getting input is extremely important. If the agency seeks to get the answers from the lowest level on upward, I think they could definitely receive valuable information they need to improve safety. I think having more participation from the facility level would be helpful with that. Having those open lines of communication is so valuable because if there's an approach where rules are coming down, instead of open communication going upward those decisions are being made together, it can lead to a situation where all bases may not be covered.

Participant F noted the need for input from those in the field to make informed decisions and policies, observing that managers put policies into place when they have "no idea of the impact in the field operationally. So the operation is subject to having to suffer through compliance when there's a better way or a better policy could have been formulated."

Participant E noted that the interview for this research was the exit interview he never received, which could have provided valuable input to the agency:

> For someone like me to leave the agency with my level of experience working in all the different organizations, wonderful organizations, and my experiences, and nobody in management leadership ever came to me, and said, "Hey, I know you're leaving the agency pretty soon, let's talk about your career. What worked for you? What didn't work? What are your observations? What, what are your recommendations? What do you think that we could have done better? What, what could we have done to keep you in the system?" And that never happened. This is the closest I've ever gotten to an exit interview.

Participant C described the implementation of the ATSAP policy as top-down communication: "The up above saying this is what the change is to the new policy. Boom! . . . You're just rolling it out at that point, so it's reaction." Participant A explained people "did not trust" ATSAP when first implemented. Participant A said, "I think that managers do not understand its purpose and how it can be useful to improve the safety culture."

Some participants, in spite of likely espousing two-way communication, also revealed they relied on top-down communication. The same participants described trying to avoid "pushback" from staff. Participant C noted the importance of separation between leaders and followers when imparting information, to avoid "pushback." Participant B described a failure as presenting a briefing about a new tool without anticipating questions from the staff. "Initially, it was just a whole lot of pushback, which I was not expecting." Rather than gathering input, Participant B went back to "folks that were good with messaging and making sure we deliver the content" differently. The solution was to deliver top-down communication more clearly and effectively to explain how the new tool would benefit the employees and the organization. Participant A described getting "pushback" when communicating policies top-down to the workforce and holding staff to the standards. Participant H directly espoused top-down communication:

> What promotes a good safety culture is understanding what safety means for whatever you're doing at that moment. Making sure that you're reading, doing

> your research, and that information is available from the top-down, never starting at the bottom. That information needs to start from the top, flow down. And flow down, having adequate, standard operating procedures.

However, such top-down communication is not conducive to information gathering or sharing.

Resistance to Change. Eight participants mentioned issues with the air traffic controllers' union as preventing constructive change. Participants noted a history of poor labor relations in the FAA, including punitive behaviors by managers, which have improved in the last decade. However, Participant E noted the agency is "still in a period of labor strife." Participant A explained,

> As far as I've been working for the FAA, safety has always been one of the pillars of their culture. But I think when it comes to also having to incorporate working with unions and, you know, what their needs and wants are, then it makes it very difficult to balance the two. So, I think a lot of things are held up by unions.

Participant F described union reps as defending negligent employees and misusing ATSAP for political reasons. Comments by participants suggested a need for more cooperation between managers and workforce. The current situation may include self-interest and resistance to change on the part of the workforce and a lack of two-way communication and collaboration on the part of management. Participant E mentioned a specific success as crafting policies that were at first resisted by the union; eventually, the union rep acknowledged the good work done. That acknowledgement, combined with the knowledge that lives were saved, made it one of the high points of his career.

Participant D noted,

> It's human nature to avoid change. . . . There's always resistance to change. That's where the leadership piece is so important. Guiding that change and explaining and showing the people why we're making the change and why it's beneficial, getting the buy-in.

Participant B also noted people tend to be "challenged by change," requiring adjustments to leadership style. Participant E described a controller who not only resisted change but also chose to grandstand his refusal to obey a simple policy. Overall, however, Participant E said, "I think that where we are as an agency now, though, I think that we're getting a bit better with the resistance to change."

Saving Face. Participants not only described face-saving behaviors in the organization, but some also demonstrated face-saving during the interview. When asked to describe a time when they experienced or observed failure in the organization, four participants were surprisingly resistant to describe or even remember a failure. Participant C denied experiencing specific failure within the organization and laughed, "I never make mistakes." Participant D said, "Let me circle back to that one," but later in the interview still could not remember a failure. Participant B almost mentioned something and then said, "Let me back away from that one. I don't know if I want to talk about that processes." After a pause of several minutes, Participant B stammered,

> I'm finding this to be a lot tougher than I thought it would be. And this is a hard one for me because I know I've had a number of failures, but you know, I pretty much, I don't know if you've heard about the goldfish memory. Goldfish don't have a very long memory, so that's kind of how I look at life. It's like, okay, you can't remember the bad stuff, you just gotta keep moving.

Participant G offered a vague response about the military but did not provide an FAA example.

Conversely, Participant F, one of the few to provide detailed discussion, offered a personal failure, concluding, "I should have reported it. So I was a failure and a good lesson learned." Participant A described having to overcome face-saving tendencies as well as avoidance of action in order to promote a safety culture. A facility had a backlog of safety reports. Participant A said,

> I understand, being at the facility, that perspective also. And so I let it linger for a long time without elevating the issue that they're not responding. . . . If I believe in what we're doing here, then yes I have to override my need to protect that facility.

Participant I described a situation in which an employee reported a systemic issue with people using cell phones in the operation area; the employee used ATSAP rather than reporting the problem to management likely because they "did not want to feel like they were telling on their peers."

Interestingly, two participants described using face saving or threat of embarrassment as ways to change behavior. Participant E used threat of embarrassment to prevent a top-down communication that was flawed. Participant E described preventing a poor policy by saying in a meeting,

> If our director signs this, the [group affected] is going to have our heads on this one. They're going to go public with this. It's going to embarrass the Air Traffic Organization. It's going to embarrass the FAA, and the administration, and somebody in the Department of Transportation is going to say, "Who the hell signed off on that?"

Participant B framed leading by example as motivating employees in terms of avoiding embarrassment: "I can't have my boss, you know, doing more or working harder than I am because this is my primary job."

Mixed Messages. The defensive routine of mixed messages was referenced by six interviewees, particularly in terms of support for managers. Participant F described the need for the FAA to relax standards for employees to compete with other employers like Google, yet not relaxing responsibility for managers. Participant F also described policies "swinging left and right, left and right." Participant E stated the agency gives "lip service to management leadership training" yet provides inadequate funding for it. Participant E

also stated, “There’s theory and there’s practice.” Participant E elaborated on the continual funding challenges of the agency, stating,

> Congress is notorious for turning the spigot on, and, and letting the dollars flow in response to a fatal aircraft accident or some major media event. And then the money starts flowing. However, when the FAA seems to be doing a pretty good job of keeping the planes running and there are no accidents, well, the funding goes to where the problems are, and the FAA sometimes suffers from that.

Participant I described difficulty conveying top-down policies that change continually or lack specifics on implementation.

> It makes it difficult for you as a manager with your employees, for them to be able to trust what you’re saying or to be able to have complete confidence in you as the manager because you’re receiving mixed messages from above. . . . And in the end, it makes good managers feel defeated. So I think what would be most helpful for managers is for the agency to listen to the managers, give the support that’s needed, give them the resources needed, educate them, and give them the tools needed to be successful.

Avoiding Action. Participant E described avoiding action as follows:

> We’re going to do something about it, but when the agency says, “We’re going to do something about it” for 30 years and does nothing about it for 30 years, you know, that tells me that maybe we’re not all that serious about a safety culture. We say all the right things, but do we do all the right things? And the answer quite frankly is no. We don’t do all the right things.

As noted earlier, Participant A admitted avoiding action reporting a facility with “a backlog of unanswered reports.” Participant A stated,

> If we believe in this program, we believe that these are safety issues that need to be addressed in a timely manner. You just can’t just keep getting ignored, ignored, ignored. And so I had to make the decision to elevate the issue to my boss because I’m like, okay, even though I can understand what’s going on over there, I still have to hold them accountable.

Blame. Participants described the FAA prior to the safety culture and ATSAP as a punitive culture of blame. Participant E explained,

> It was not an agency that was very friendly to aviation safety. We talked a good game, but at the end of the day, it was nothing more than management and

> executives yelling louder and louder and louder, and then that kind of bitterness in the workforce.

Additionally, performance metrics prevented errors being reported.

> There were many, many creative ways to get out of having something be an operational error. Many times the error was blamed on the pilot, when in fact everybody knew it was not the pilot's issue, it was the controller's issue. . . . The controllers union would argue very strongly that this was a pilot deviation, not an operational error. That skewed the system, and it wasn't fair to anybody. It wasn't fair to our managers either because they were given an impossible metric to meet their impossible standard to meet. So, even the most highly ethical managers . . . found themselves opting in some cases to not report or to categorize something in a different level because of the consequences of failing to meet your performance metric.

Participant E was happy when the performance metrics changed.

However, blame still was reported as a defensive behavior in the organization.

Participant I said,

> Blaming others, I've seen as well. People may not want to take accountability for something they've done and would rather place blame elsewhere. It doesn't help anything, because without accountability, the issues don't get fixed because the focus is blaming instead of finding solutions.

Participant B described "how much better things would be" if groups prepared to blame each other instead "got together and said, 'Well, how do we fix this?'"

Bureaucracy. Some participants described overcoming obstacles of red tape and bureaucracy. Participant E described de-certifying a belligerent controller who refused to follow a simple new procedure. However, this act promoting safety was not supported due to red tape. A guidance document had been produced but not widely disseminated, which prevented him from having the power to de-certify.

> I violated a rule that was not even sent to me, not even trained to me. I took immediate action to preserve safety on my runway. I de-certified an employee who was patently unsafe and insubordinate to management and you're putting me through the ringer? They said, "Well, it's not our problem. . . . you violated the policy." . . . I think the organization failed me terribly.

Participant I described having "a 90-day window to get all of our authorizations reviewed and completed," which was overwhelming. A team of 11 was expected to handle 16,000 authorization requests. Participant I, as described earlier in the discussion for Research Question 1, overcame this defensive obstacle by using creativity—an aspect of double-loop learning—to implement new systems.

Summary for Research Question 2

All the defensive behaviors discussed in the literature review and interview questions were cited by at least three participants. The dominant problem appeared to be top-down communication, cited by nine participants. Resistance to change was another major defensive routine. Saving face, mixed messages, unilateral control, avoiding action, and blame (including need for individual accountability) were major issues as well. Bureaucracy, risk avoidance, and a lack of trust were cited as well.

Results for Research Question 3

What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization? Results from Interview Questions 2–6 were used to answer Research Question 3 (see Table 8). Managers reported personal practices discussed in Research Question 1. In addition, senior managers reported that ATSAP has positively impacted the FAA by promoting a judgment-free environment for information sharing. The organization show adaptability to constant change. Finally, senior managers emphasized continuous learning and two-way communication will continue the process of developing a learning safety culture.

Table 8

Interview Questions to Answer Research Question 3

Research question	Interview questions
3. What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?	2. Based on your experience, help me understand what makes a good safety culture. 3. Describe how the organization has had to adapt to meet safety or general success goals. 4. How has the Air Traffic Safety Action Program (ATSAP) impacted the Federal Aviation Administration? 5. In what ways have you made changes based on ATSAP? Think on those incidents and describe them. What were they, and why? 6. Help me understand what makes a good safety culture.

Theme 7: ATSAP Promotes a Judgment-Free Environment for Learning

Participant I defined a safety culture as "a no-judgment type of environment that allows learning to take place." A just culture is a prerequisite for a safety culture (Houston, 2015; International Air Transport Association, 2019, 2021). Participant G explained,

> It changed the mindset of blaming an individual to then looking at the one individual as a part of a system. And I thought that was pretty great because, like many other people, I don't think one individual is the problem. I think it's more of a program-based and systemic type of issue. Being able to address it that way was a big plus for the FAA.

Participant F said, "Kudos to the agency for adopting a safety culture mindset. . . . I think that was a huge adjustment." Participant F noted the program helped create a

> just culture in which people were not threatened with having to go back to remedial training or lose all their certifications because of one oversight, one error, one time in which maybe they were overloaded with traffic and couldn't keep up.

ATSAP allows information gathering and comparison across facilities to determine root causes and whether issues are systemic, according to Participants B, F, and I. Participant A explained, "The reason that we have ATSAP is to not look at the individual person but to look at the system and how we can make corrections within the system." Participants C, F, and J described ATSAP as "proactive," allowing change whether a simple mechanism such as a window shade to changing how a system does billing. Participant D said,

> I think it encourages recording of things that ordinarily would've been swept under the rug. And then we can adjust and make changes to mitigate those safety issues that are brought to light through ATSAP. I think it's a great program.

Participant C agreed that ATSAP encouraged information sharing. Participant B noted the nonpunitive program provided an "opportunity to learn." Participant H credited the program with bringing different aviation organizations together "to develop a complete safety culture."

In summary, ATSAP has changed the mindset of the organization, promoting double-loop learning and a just culture, which is a prerequisite for a safety culture. The voluntary safety reporting program allows data gathering and analysis to make systemic improvements to organizational safety. ATSAP encourages organizational learning.

Theme 8: The Organization Shows Adaptability to Constant Change

In response to Research Question 1 regarding how managers perceive organizational learning in general (including single- and double-loop learning), Theme 2 developed: Change is constant, requiring adapting, monitoring, creativity, and reflection. Theme 2 reflected practices managers use. Similarly, for Research Question 3 regarding manager perceptions of how to promote double-loop learning, Theme 8 developed: The

organization shows adaptability to constant change. Theme 8 represents practices managers espouse for an improved organization.

The senior managers noted change is constant with the FAA. Change and adaptations result from new technologies, increased demand, civilian space travel, crises like the COVID-19 pandemic, and swings in policy based on governmental administrations. Participant E observed that the military also would frequently change policies and expect members to accept and adapt to the new policies.

Participant D described double-loop learning in adaptability and change in procedures to continue training and operations in spite of the COVID-19 pandemic.

> Learning a new way to do business with COVID . . . We immediately went through a process of identifying those facilities that were able to operate on less staffing. . . . They could clean the facility, bring in a fresh crew to continue the facilities' operation. Which is a phenomenal idea, something that took a lot of work and thought process.

Participant F observed, "We just had six updates on one day yesterday. . . . Responses to this whole COVID pandemic have been policy change and adjustments, amendments daily." Participant H said the organization had to "redevelop, redefine" work and training processes, including teleworking.

Participant D described the success of the in-depth, continual quality control review:

> What makes this a good safety culture? Our checks and balances, having the different organizations that are constantly analyzing our processes. . . . It's the safest [airspace] in the world. And I think that's because we spend so much time looking at safety.

As noted in Chapter 2, double-loop learning frequently occurs in times of crisis. The FAA changes continually based on crises such as COVID or aircraft accidents. Constant change requires continual monitoring of existing processes to determine needed

changes. Thus, the FAA is promoting double-loop learning through adaptability to constant change.

Theme 9: Two-Way Communication Will Develop an Adaptive Safety Culture

Change requires continuous learning. Participant B stated, "Once you stop learning, then I think failure is right around the corner." Although participants noted some collaboration and two-way communication, gathering input from all levels of the organization represented an area for improvement. Participant I noted a need for more training and open communication in an environment where questions are encouraged:

> A good safety culture, again, is open communication. . . . The management team also can't create an environment where a controller may feel embarrassed to come to them to ask questions. Controllers shouldn't be made to feel that they should already know the answer to something and feel shamed for asking. Managers cannot have an attitude that they're unwilling to give the help that's needed if it's needed by an employee. If it's something they feel that the employee should already know, they shouldn't make them feel that they're wrong to ask. If anything, that they should commend them for asking.

Participant G stated the FAA could improve by "providing opportunities for mentoring, education." Participant F stated,

> I think one of the ways that they can improve related to safety is empowering the people who are actually in the field, who actually have to carry out those safety-related functions, that make decisions. . . . If you want buy-in, you should also allow input.

Participant I agreed with a need for less top-down communication and more collaborative information gathering:

> I think getting input is extremely important. If the agency, seeks to get the answers from the lowest level on upward, I think they could definitely receive valuable information they need to improve safety. I think having more participation from the facility level would be helpful with that. Having those open lines of communication is so valuable, because if there's an approach where rules are coming down, instead of open communication going upward, those decisions are being made together, it can lead to a situation where all bases may not be covered.

Participant I described avoidance of discussion as related to face saving:

> Discussions aren't happening the way that they need to and in all transparency. I think when that happens, all it does is just leave people in the dark only to make the same mistakes, rather than learning from others' experiences. If we come together and learn together overall, we will be able to move greater as an organization.

As Participant E put it, "Speaking truth to power is a very key component of a safety culture and a just culture, and yet in this agency, we're not there yet." Participant G described silence as "the killer." With more input from those on the front lines, the impact of policies will be more clearly understood, preventing inadequate policies and frequent changes. As Participant F put it, policies are often introduced top-down "without any roadmap to how it gets done." With more two-way communication, the organization can become more adaptive.

Summary for Research Question 3

What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization? Managers indicated ATSAP promotes a judgment-free environment for learning. ATSAP has changed the mindset of the organization, promoting double-loop learning and a just culture. Additionally, the organization shows adaptability to constant change. However, more two-way communication will help develop a more adaptive safety culture. Gathering input from all levels of the organization, increasing dialog and two-way communication, could help the organization become more adaptive and increase organizational learning.

Summary

Detailed interviews with nine senior managers employed or retired from the FAA yielded rich data. I developed nine themes from the data:

1. Managers stressed continuous learning, including staff development and support to ensure collaboration.
2. Change is constant, requiring adapting, monitoring, creativity, and reflection.
3. Managers build trust with staff through transparency, leading by example, and two-way communication.
4. Managers stress compliance with safety procedures.
5. Managers perceived ATSAP improved information gathering but reduced employee accountability.
6. Defensive routines prevented or reduced double-loop learning in the organization.
7. ATSAP promotes a judgment-free environment for learning.
8. The organization shows adaptability to constant change.
9. Two-way communication will develop an adaptive safety culture.

Interviewees explained when they used learning and provided specific examples that described both single- and double-loop learning. Themes 1–3 and Themes 7–9 relate to double-loop learning, reflecting existing or needed elements of continuous learning, staff development, collaboration, adapting to change, monitoring, creativity, reflection, trust, transparency, leading by example, two-way communication, and a judgment-free safety reporting program (ATSAP). Theme 4 related to how and when managers use single-loop learning. As shown in Theme 6, managers also revealed a prevalence of defensive routines at the organization, particularly saving face and top-down communication.

An unexpected finding was Theme 5. Although participants viewed ATSAP as a positive part of a safety culture and information gathering, they also felt the program was misused to avoid individual accountability. Five interviewees used the term "get-out-of-jail-free card." A need for blame (a defensive routine) impacted the perception of the safety program, a strategy for double-loop learning. Managers, although espousing change and a judgment-free environment for learning, still felt the need to ascribe blame. Although the program does not eliminate accountability of staff for all errors (FAA, n.d.-c), managers did not understand that and continued to feel they had lost control over staff performance. This finding is elaborated on in Chapter 5. Chapter 5 presents an interpretation of the findings as well as resultant conclusions and recommendations.

Chapter 5: Interpretations, Conclusions, and Recommendations

The purpose of this research study was to examine management perceptions of behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large, federal government organization. The problem is that organizations struggle to improve creativity, risk taking, learning, and adaptability, which are essential for survival in continuously changing and competitive environments. Contributing to this struggle are defensive routines, which block organizational learning, creativity, risk, and adaptability (Alvesson & Spicer, 2012; Ashforth & Lee, 1990). To survive in a knowledge economy, according to Jaaron and Backhouse (2017), organizations and leaders need to build highly effective learning systems, which is accomplished by rethinking goals and underlying foundations, part of the double-loop learning process (Nicolaides & McCallum, 2013). Organizations face complex challenges that require adaptive leadership, which requires critical reflection as in double-loop learning (Nicolaides & McCallum, 2013). Defensive routines and a lack of double-loop learning affect the entire organization (Argyris, 1994; Argyris & Schön, 1978). Yet, the research is limited on the practical use of double-loop learning in organizations. As a result, leaders may not understand how to transition critical reflection in organizational learning from theory to practice in the workplace, where real-world dynamics and obstacles exist (Rigg & Trehan, 2008). This study was designed to help fill that gap.

Specific to the FAA, the site of the study and the researcher's employer, improved organizational learning can lead to better air traffic safety. The U.S. Department of Transportation (2021) called on the FAA to strengthen safety management systems, use

data and analytics to proactively address safety risks, promote examples of robust safety culture practices, and expand the use of nonpunitive reporting programs to enhance and ensure a just culture. Daily, the FAA's Air Traffic Organization provides critical safety services to more than 2.9 million airline passengers on 45,000 flights. With 16.4 million annual flights in 24.1 million square miles of oceanic airspace and 5.3 million square miles of domestic airspace handled by only approximately 14,000 air traffic controllers (FAA, 2020a), the FAA is known as a high-reliability agency.

As a high-reliability agency, increased reporting events draw scrutiny from the highest levels of government and public (Mills, 2010). The FAA is constantly concerned with the highly sensitive nature of voluntary safety reported data, agency performance, and the concerns of internal and external stakeholders (Mills, 2013). The voluntary safety data reported provides frontline feedback to why incidents occurred or did not occur (C. W. Johnson, 2003). Voluntary safety data such as the Air Traffic Safety Action Program (ATSAP) can serve as a warning sign or opportunity to learn due to the commonality of multiple smaller incidents that can serve as precursor to a mishap or accident (Cooke & Rohleder, 2006; Oster, 2013). Voluntary safety reporting is supported by airlines and other modes of transportation around the world (Gao et al., 2021). The success of aviation safety reporting systems has encouraged countries such as Japan, China, United Kingdom, Canada to implement their own voluntary safety reporting program (NASA, 2021). Additionally, domestic transit agencies such as the Washington Metropolitan Area Transit Authority have recently announced they will deploy a voluntary safety reporting program to strengthen their safety management system and lower barriers to hazard reporting (Business Wire, 2022).

It is paramount to the flying public that organizations involved in aviation establish and continuously improve their safety culture (Holguin et al., 2007). A strong safety culture is important not only to the FAA (2021a) but also to the International Civil Aviation Organization (Huerta, 2015) and the NTSB (2020). All three organizations work to achieve a global safety culture that improves flight safety and mitigates tragic events and the loss of human life (FAA, 2021a; Huerta, 2015). A safety culture is a high-level initiative that impacts the future of aviation (Huerta, 2015).

Examples of FAA single- and double-loop learning systems have been described (e.g., Lessons Learned documents and ATSAP) to improve safety. However, the FAA (2021h) reported safety culture as the top systemic safety problem. Therefore, this study was designed to help determine ways to improve the use of ATSAP and other forms of double-loop and organizational learning in the organization to increase safety and promote safety culture.

Findings help fill the gap in the literature related to practical application of double-loop learning. Findings reveal ways managers use single- and double-loop learning. How defensive routines prevent acceptance of a double-loop learning safety initiation is described as well. The themes described below present areas of success and provide a basis for practical changes to training and communication within the organization. Ultimately, results may help improve the safety culture at the organization.

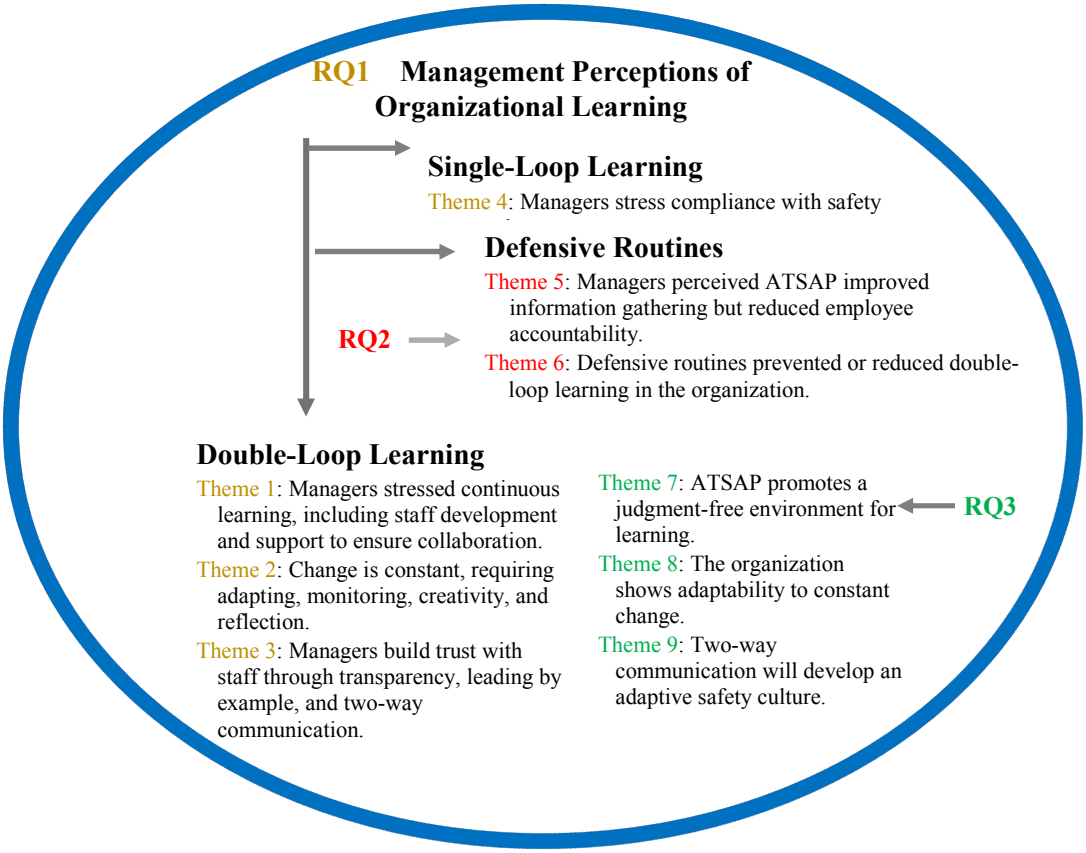
Brief Review of Findings

Table 5 in Chapter 4 presented the research questions and related themes. The revised conceptual framework of the study is presented in Figure 8. Research Question 1 was the following: How do managers perceive organizational learning (including single-

and double-loop learning, and defensive routines)? I developed five themes based on interviews with managers related to their perceptions and experience of learning in the organization.

Figure 8

Final Conceptual Framework



Note. ATSAP = Air Traffic Safety Action Program. Research Question (RQ) 1 was "How do managers perceive organizational learning (including single- and double-loop learning, and defensive routines?" RQ2 was "What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization?" RQ3 was "What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal government organization?"

Theme 1 was that managers stressed continuous learning, including staff development and support to ensure collaboration. The elements of Theme 1 included

aspects of double-loop learning. All managers interviewed emphasized gathering data to create a safety culture. Theme 2 was that managers perceived change is constant, requiring adapting, monitoring, creativity, and reflection. Again, those aspects represent double-loop learning. Theme 3 was managers chose to build trust with staff through transparency, leading by example, and two-way communication. Theme 4 was managers stressed compliance with safety procedures; this theme illustrated the use of single-loop learning. Theme 5 was managers perceived ATSAP improved information gathering but reduced employee accountability. Theme 5 was an unexpected finding; although participants viewed ATSAP as a positive part of organizational learning and a safety culture, they also felt the program was perceived as or even misused as a "get-out-of-jail-free card" to avoid individual accountability.

Research Question 2 was the following: What are management perceptions of behaviors, policies, and practices that inhibit double-loop learning (e.g., defensive routines) in a large federal government organization? Theme 6 was that managers perceived that defensive routines prevented or reduced double-loop learning in the organization. All the defensive behaviors discussed in the literature review and interview questions were cited by at least three participants: unilateral control through top-down communication, resistance to change, saving face, mixed messages, avoiding action, blame, bureaucracy, risk avoidance, and lack of trust. The major problem appeared to be unilateral control through top-down communication. Resistance to change and saving face were other major defensive routines.

Research Question 3 was the following: What are management perceptions of behaviors, policies, and practices that promote double-loop learning in a large federal

government organization? Three themes were developed. Theme 7 was managers perceived that ATSAP promotes a judgment-free environment for learning. Theme 8 was that the organization shows adaptability to constant change. Theme 9 was that two-way communication will develop an adaptive safety culture.

Management perceptions of behaviors, policies, and practices that promote double-loop learning in the FAA included that ATSAP promotes a judgment-free environment for discussion of mistakes. ATSAP has changed the mindset of the organization, promoting more double-loop learning and a more just culture. As described earlier, before ATSAP, the organizational procedures for learning from mistakes were to blame and shame the individual who made the mistake in a group meeting. This negative approach to learning from mistakes actually led to employees not reporting mistakes for fear of embarrassment and shame, which had a negative effect on improving the safety culture of the organization. ATSAP has changed the culture of the organization, promoting more double-loop learning and a more just culture, which is noticeably improving opportunities for learning and the safety culture. Additionally, the organization shows adaptability to constant change. However, more two-way communication will develop a more adaptive safety culture. Gathering input from all levels of the organization, increasing dialog and two-way communication and decreasing defensive behaviors such as a need for unilateral control, could help the organization become more adaptive and increase organizational learning.

Interpretation of Results

The themes and findings are discussed in four areas: single-loop learning, double-loop learning, defensive routines, and ATSAP. The section on double-loop learning

includes both practices managers use, as found in Research Question 1, and those they espouse for an improved organization, as found in Research Question 3. The section on the complex findings related to ATSAP describes how participants appreciated the program as contributing to organizational learning and a safety culture (i.e., double-loop learning) yet still observed or even offered resistance through defensive routines. Managers interviewed did not use terms such as *single-loop learning* or *double-loop learning*, but rather referred to behaviors and practices that are described in the research literature as characteristic of each type of organizational learning.

Single-Loop Learning

Single-loop learning is simply learning from mistakes to improve practices through basic detection and error correction (Argyris & Schön, 1978). Managers described the use of single-loop learning when appropriate, involving compliance with safety procedures (Theme 4). Participants described the importance of standardized procedures and rules in the organization and in their own decision-making. Following rules is vital in an environment where the safety of the public is at stake. All participants had military backgrounds, which might have favored following rules and standardized procedures. The tendency to follow rules (be in compliance) without question is a form of single-loop learning.

As all the managers had former military service, their decision-making favored a top-down leadership approach that Participant G referenced as "honest, upfront, and regulatory compliant." In addition, managers described a good safety culture as one that was "consistent[ly] reinforced" (Participant D) and "to make sure [policy] was carried

out" (Participant F). The use of single-loop learning within organizations such as the FAA is vital due to the need to follow standardized safety procedures (FAA, 2022b).

Single-loop learning answers the question, "Will my action lead to the desired result?" (Bremmer et al., 2020 p. 2). In an example specific to the FAA (2020d), air navigation service providers produce a Lessons Learned document for detection and correction of error. The Lessons Learned document emphasizes a single point of error to determine where to assign blame, in a single-loop approach. After pinpointing the failure, a new rule or procedure is created to mitigate the causation of the failure. To enhance safety and production, strict compliance to all applicable rules, orders, regulations, and policies is evaluated and ordered by management to ensure a mistake is not repeated. Argyris (1977) described single-loop learning as a process that allows an organization to continue with current policies and meet current goals. In organizations, single-loop learning can be expressed through top-down, one-way conversations from leader to follower (Alvesson & Spicer, 2012). Air traffic control requires standardized safety operations. One-way, top-down communication yields less organizational friction and efficient task completion (Alvesson & Spicer, 2012).

However, Yang (2017) noted criticism of Argyris's presentation of single- and double-loop learning as a dichotomy, with one inherently better for organizations with difficult problems. Gupta et al. (2006) stated organizations should balance both types of learning. As the FAA has conceptualized air traffic control as a "complex life-and-death system" (Air Traffic Control Association, 2020, p. 27), it is easy to see how managers view air traffic operations as a zero-fail mission that is built upon rule-based compliance, as supported by Participant E's statement, "Our rules and regulations need to be complied

with. They mean something. They're put there for a reason." This type of unilateral control model (Argyris, 2001) is sometimes necessary when an objective is framed as win-loss or in a produce-or-perish environment (Argyris & Schön, 1996).

Yet researchers have asserted that in complex life-or-death systems such as aviation safety, continuous organizational learning is vital (Ek et al., 2003; Jarrar & Balouki, 2018). Air traffic management involves continual change (Whitley & Leone, 2020). Participants described using single-loop learning to maintain standardized safety procedures. However, when asked to describe a failure or difficulty in the organization, Participant H described a facility where "standardized operating procedures were extremely outdated, which was causing errors throughout the operation." Teams were brought in to update procedures. Participant G described progression from "outdated modus operandi" through a new generation of managers who could generate trust. Therefore, a combination of single- and double-loop learning is necessary. As Nicolaides and McCallum (2013) stated, "Adaptive leaders are challenged to regularly engage in single- and double-loop learning" (p. 257).

Double-Loop Learning

Unlike single-loop learning, double-loop learning involves critical reflection and rethinking of organizational assumptions and goals (Argyris & Schön, 1978). Ultimately, double-loop learning helps improve a safety culture by allowing managers to move from doing what is right to asking whether they are doing the right things (Argyris, 1990; Eilertsen & London, 2005). Managers used various elements of double-loop learning to make better decisions and develop employees, such as continuous learning, data

collection, collaboration, adapting, monitoring, and two-way communication, as detailed in the next sections.

Continuous Learning, Data Collection, and Collaboration. Managers stressed continuous learning, including staff development and support to ensure collaboration (Theme 1). These elements in isolation do not guarantee a system of double-loop learning but contribute to a higher level of organizational learning. Collaboration and continuous learning are vital aspects of double-loop learning (George & Sims, 2007; Reynolds, 2014; Vallat et al., 2017). All nine interviewees stressed data collection as part of their strategy to ensure a safety culture. Participant B explained, "I get as much information as I can . . . to make sound decisions." Seven managers noted that continuous learning and collaboration were important to their decision-making. Participant A described "being aware what's going on in the facility. You know, talking to my other fellow air traffic managers, trying to identify trends. . . . This facility tried this, maybe this is something you can look into." Participant G explained, "Everybody's really a link to the network, everybody's a cog in the wheel. . . . A lot of people use different sorts of systems. And I like to look at everything as a whole." Rather than simple error detection, managers were trying to incorporate learning into rethinking current systems and mindsets. Within leadership models, "double-loop learning goes further and involves modification of the management team's mental model or the theory that underlies the action" (H. Kim et al., 2013, p. 291). Through double-loop learning, managers could adapt to the continuous changes within air traffic control.

Adapting to Change and Monitoring. Participants perceived that change is constant, requiring adapting, monitoring, creativity, and reflection (Theme 2),

representing double-loop learning (Williams & Brown, 2018). Participant E explained, "The number one competency of an FAA employee is resiliency. You have to be resilient. You have to roll with the changes." Double-loop learning allows managers to engage in monitoring and critical self-reflection to respond to constant change and complex problems.

Interestingly, only one participant used the term *reflect*; managers typically described asking questions or encouraging feedback. Participant F (the only participant to use the term *reflect* or *self-reflect*) described using feedback "as a means of being able to self-reflect, hopefully improve my actions, my activities, and personal growth." Participant I also espoused crucial self-reflection: "I look at myself every day and assess what I can improve upon or how can I do a better job." Participant B incorporated critical reflection into a management approach:

> If you do make a mistake, then let's sit down and figure out why and say, okay, well, wait a minute, you made that decision because . . . and if it sounds rational and reasonable, then it's like, okay, I can understand why you made that call. So now, let's go back and learn from it.

Managers may need training to incorporate self-reflection more deeply into their practice. Such self-reflection is more likely to help remove residual defensive routines or need for unilateral control. Double-loop learning requires organizations to reflect on beliefs and assumptions (Abdullah et al., 2018). Whereas the FAA has used double-loop learning to implement ATSAP, the practice of self-reflection is not common in management. Organizations that do not promote self-reflection are less adaptive. For example, without self-reflection, employees who view themselves as experts are less likely to notice or admit to errors (St. George, 2019), and staff may face negative consequences for discussing problems without having a solution ready (Alvesson &

Spicer, 2012). Adaptive learning based on changing contexts, as in double-loop learning, contributes to long-term organizational success (Argote & Miron-Spektor, 2011) through competitive adaptability (Argyris & Schön, 1996; V. Johnson, 2019; Sisaye & Birnberg, 2010). An important part of adapting to the context of the problem includes reflection (Makuwira, 2013; Schön, 1983). Two aspects of adaptation are changing mental models and monitoring practices and beliefs, both described in more detail in the following subsections.

Changing Mental Models. Mental models may be changed through double-loop learning (Burt & Nair, 2020; Houchens et al., 2012; Johannessen et al., 2019). Change in mental models may require deliberate changes in perspective. Nicolaides and McCallum (2013) described meetings in a governmental organization where staff at all levels considered their individual perspective, that of other individuals, and that of the organization as a whole. Staff considered double-loop questions about individual blind spots or biases, reconsideration of norms, and dynamics at play. Participants self-reflected, considered others' perspectives, and considered the perspective of the organization. Questions included whether individuals were "working on the basis of tacit norms that need reconsideration" or whether "political tensions" or defensive routines exerted influence (Nicolaides & McCallum, 2013, p. 253). Results showed an improvement in double-loop learning through "an unprecedented, agency-wide forum" (Nicolaides & McCallum, 2013, p. 249).

Abouraia (2018) advocated airlines use double-loop learning in instrumental and policy issues to improve crisis management. Compared to single-loop learning, double-loop learning allows airlines to more quickly recover from uncertainties or crises.

Ultimately, double-loop learning can enhance safe practices by allowing managers to move from doing what is right to asking whether they are doing the right things (Argyris, 1990; Eilertsen & London, 2005).

The FAA (2003) stated, "A team approach in reviewing input data, assumptions and judgment is most effective" (p. 16). Within aviation safety, the desire to encourage and build a stronger safety culture is predicated on organizational learning to enable an environment where the question is whether collective efforts are happening for the right reasons (double loop; Yeo, 2007) instead of a "right first time" mental model (single loop; Thomas, 2014). Changing mental models to allow for nonpunitive feedback is a critical part of ATSAP. A strong safety culture reflects a safety-oriented mindset that everyone at every level must have (Kurt & Gerede, 2018).

Monitoring Practices and Beliefs. Monitoring is another vital aspect of double-loop learning and adapting to change (Williams & Brown, 2018). Both single- and double-loop learning involve monitoring consequences; the difference is in the depth of response to the consequences. A strong safety culture using double-loop learning requires a deep analysis for continuous improvement at all times to enhance decision-making (Argyris & Schon, 1974; Kelly & Lauderdale, 1999). In the aviation safety community, at a practical level, effective double-loop learning practices include continual monitoring to ensure practices and organizational vision remain relevant to safety. Participant B stated, "We're constantly monitoring, because . . . the National Airspace is forever changing." Participant I described a process of monitoring mitigations to determine whether gaps remained or the approach was effective.

Two-Way Communication. Another practice related to double-loop learning is that managers build trust with staff through transparency, leading by example, and two-way communication (Theme 3). They advocated for increased two-way communication to develop an adaptive safety culture (Theme 9). Learning that is bottom-up is based primarily on experience, whereas top-down learning is based on goals and task demands (Argote & Miron-Spektor, 2011). Both dimensions complement one another in two-way communication (Argote & Miron-Spektor, 2011; Pickett, 2019).

Managers in this study described some personal practices using two-way communication. Participant A encourages supervisors to "solicit ideas from the workforce." However, as an organization, the FAA can improve on this practice, according to managers. Participant I advocated a need for less top-down communication: "Getting input is extremely important. If the agency seeks to get the answers from the lowest level on upward, I think they could definitely receive valuable information they need to improve safety." Participant F noted the need for input from those in the field to make informed decisions and policies, observing that managers put policies into place when they have "no idea of the impact in the field operationally." Participant F also recommended "empowering the people who are actually in the field, who actually have to carry out those safety-related functions, that make decisions. . . . If you want buy-in, you should also allow input."

Whereas ATSAP allows input related to error reporting, other experiential-based input from frontline staff—as well as reflection—would increase organizational learning (van Aken & Romme, 2012). This is discussed in more detail in the Recommendations

for Practice section. Purely top-down communication tends to become a defensive routine, as discussed in the next section.

Defensive Behaviors and Routines

All the participants cited defensive routines and behaviors in the FAA. Defensive routines over time disrupt a positive working relationship with employees and interfere with two-way and honest communication (Hislop et al., 2014). Within a safety culture, defensive routines affect managers' ability to be effective (Reese, 2017), hinder people from sharing knowledge, facilitate evasive answers, and support conservative environments where change is seen as a threat (Cegarra-Navarro et al., 2021; Noonan, 2007). Defensive routines mentioned in the interview question and described by participants were unilateral control, resistance to change, saving face, mixed messages, avoiding action, bureaucracy, and risk avoidance. Mixed messages included policies "swinging left and right, left and right," based on federal U.S. leadership. Avoiding action included allowing a backlog of reports to gather, in part to protect a facility (related to saving face). Blame as a defensive routine appeared to be decreasing compared to previous decades in the FAA, in part due to the focus on nonpunitive safety reporting. The most salient findings were for unilateral control, resistance to change, and saving face. For example, all nine managers referenced a problem with unilateral control through top-down communication rather than two-way communication. These three types of predominant defensive routines are discussed in more detail in the following sections.

Unilateral Control and Top-Down Communication. Organizational defensive routines have a negative effect on organizational learning and performance (Cegarra-Navarro et al., 2021). All nine managers observed unilateral control through top-down

communication as a top problem in the agency and thus supporting traditional methods, thoughts, and procedures that are resistant to change. Participant C described top-down communication as reactive and lacking employee input: "The up above saying this is what the change is to the new policy. Boom! . . . You're just rolling it out at that point, so it's reaction." The process lacks reflection, collaboration, and two-way communication.

As Pentland and Haerem (2015) observed, top-down organizations are more likely to develop defensive routines. Li et al. (2021) described top-down implementations as a way to coerce frontline employees to have a single-loop learning mental model due to the goals and targets being set by senior management, which ultimately strengthen what was previously learned (Crossan et al., 1999).

Moreover, some participants, in spite of espousing two-way communication, also revealed they relied on the practice of top-down communication as a form of control. Espoused theory had not yet become theory-in-use. Participants described trying to avoid "pushback" from staff when sharing new policies. Rather than thinking in terms of pushback, leaders could be gathering input from the field. However, the organization appears to be based on unilateral control, which Participant F described as "still very prevalent." Participant C said simply, "We don't have any input." Participant B described directors making decisions and policies without consulting those on the front lines.

Double-loop learning is uncommon in hierarchical governmental agencies (Johannesen et al., 2019). Nicolaides and McCallum (2013) stated many leaders still operate from assumptions based on a "traditional command and control notion of authority" (p. 251). In a unilateral control environment, a top-down, linear way of learning can quickly increase organization-specific competencies and knowledge but

produces less innovative knowledge. Unilateral control may contribute to single-loop learning but prevents double-loop learning. Pentland and Haerem (2015) noted the tendency of single-loop learning, rule-based, top-down organizations to resist change.

Resistance to Change. Eight managers cited issues with perceived resistance to organizational change. Double-loop learning is difficult to implement because it requires organizational members to want to change or critically reflect on deeply held beliefs (Argote & Miron-Spektor, 2011; Fürstenberg & Görzig, 2020). Members of the organization must be open to challenging deeply help beliefs and assumptions. Nicolaides and McCallum (2013) described double-loop learning and adaptive leadership as "obviously" requiring "leaders to bear intense resistance to change" (p. 249). Double-loop learning is likely particularly uncommon in hierarchical, highly structured organizations such as governmental agencies (Johannesen et al., 2019) or the military (Wassenaar, 2019). Resistance to learning from every level of the organization is prevalent when defensive routines are present (Alvesson & Spicer, 2012). Participant A described the agency as "still in a period of labor strife," and Participant B said that people are "challenged by change."

An important implication for the FAA is that, even though the FAA (n.d.-c) literature for managers explains that ATSAP should not impede performance management, managers do not have the same perception. More internal FAA research is needed to determine why. Participant E stated,

> Supervisors now are dispirited. They feel they have no management support. They've pretty much given up on performance management. They feel that they have nothing that they can use in a meaningful way with air traffic controllers to affect meaningful change in their behaviors. And I think there needs to be some redress of that. There needs to be a balance between ATSAP, which is essentially considered a get-out-of-jail-free card, and performance management.

The FAA needs to investigate a forum with managers to gather perceptions of managers and communicate how managers can still manage performance. Another implication is the need for more research on this topic among air traffic controllers rather than managers, as described in a later section.

Saving Face. Schein (1993) noted the tendency to self-protect and save face as an obstacle to organizational learning. Saving face is a leadership tactic that protects power (Ashforth & Lee, 1990; Northouse, 2016; Oeij et al., 2016; Yang et al., 2018b; Yau & Cheng, 2011). Argyris (1995) stated that of the organizational defensive routines, "saving face" was a global mainstay. Managers pointed out that saving face was an issue in the agency, yet also demonstrated the defensive routine themselves. When asked to describe any failure during their tenure with the agency, many managers could not give an answer. Most notably, Participant C laughed and said, "I never make mistakes." Participant B answered, "Let me back away from that one. I don't know if I want to talk about that process." Later Participant B described moving forward by selective forgetting of errors, rather than the more productive process of self-reflection. As Participant D said, "Let me circle back to that one," but later in the interview still could not remember a failure. Participant A admitted to letting a problem remain too long because of feeling the need to protect staff at a facility, a form of saving face.

Reluctance to describe failure of any kind demonstrated an ingrained face-saving culture. As organizational defensive routines such as saving face are present, they hamper the ability for the FAA to enhance safety. ATSAP may be a welcome first step toward more of a reflective culture in the FAA. Self-reflection should be encouraged among all staff to move the organization to a double-loop learning culture free of defensive routines

such as saving face. The FAA provides leadership training and may need to emphasize self-reflection among leaders, as well as encouraging input from staff and a reduction in unilateral control, as described in the next section.

ATSAP: A Double-Loop Learning Project Implemented in a Single-Loop Culture

Resistance Through Defensive Routines. An unexpected finding was that although participants viewed ATSAP as a positive part of a safety culture and information gathering, they also felt the program was misused to avoid individual accountability. Five interviewees used the term "get-out-of-jail-free card." This finding showed a mix of appreciation for double-loop learning combined with latent defensive routines requiring some sort of punishment for the employee. Previous researchers have found implementing double-loop learning to be a challenge in hierarchical organizations (Johannesen et al., 2019; Li et al., 2021; Nicolaides & McCallum, 2013; Wassenaar, 2019). Typically goals or performance indicators are controlled by managers, with little input from frontline employees (Li et al., 2021). Occupational culture is an obstacle. Li et al. (2021) stated, "A blaming culture arises from inherent power differences between employees and supervisors" (p. 8). In the Li et al. study, although leaders espoused double-loop learning, they preferred a top-down, linear method of organizational learning. Organizations often operate in ways that are inherently contradictory (Carmine & Smith, 2021). Understanding the differences and interactions of single- and double-loop learning could explain such paradoxes. In some instances at the FAA—such as the implementation of COVID protocols—a more detailed top-down standardized procedure would have reduced staff friction based on different implementation of the policy;

however, obtaining input from the frontline staff prior to creating the protocol could have informed the procedure and reduced resistance to change.

As an organization based on standardized procedures, and employing many former military, ATSAP is a double-loop learning project implemented in a single-loop learning culture. In the FAA, the Lessons Learned document emphasizes a single point of error to determine where to assign blame, in a single-loop approach. ATSAP uses a double-loop approach to address the problem rather than assign blame. Double-loop learning relies upon the strategic importance of collaboration and critical reflection on espoused and in-use theories (Argyris, 1976; Tsang, 2002). The process requires a change in mental models, from a punitive culture to one based on information. According to Argyris and Schön (1978), organizational behavior is constructed from theory in use rather than espoused theory. Organizational learning based on critical reflection, as in double-loop learning, involves disrupting or at least questioning the status quo (Rigg & Trehan, 2008). Double-loop learning "involves reflection on values and norms and the social structure in which these values and norms are practiced" (Hasanudin et al., 2019, p. 1355).

ATSAP and other voluntary safety reporting programs support safety. The NTSB (2020, 2021) advised all aircraft operators to participate in the FAA's voluntary safety management system. According to researchers (Air Safety Support International, n.d.; Önen, 2016; Piers et al., 2009), the most important element in a safety management system is the safety culture in an organization. The FAA safety management system is part of the organization's learning culture (FAA, 2017a). The International Civil Aviation Organization (2018) guidelines stated,

> Organizations should effectively promote safety through communication and training. . . . When the organization has a positive safety culture, and this is visibly supported by upper- and middle- management, front-line personnel tend to feel a sense of shared responsibilities towards achieving the organization's safety objectives. (p. 3-2)

The FAA (2021a) has referred to the need for a just safety culture allowing for "self-disclosure of errors" and "due consideration of honest mistakes, especially in a complex environment like the National Airspace System" (para. 2). According to the FAA (2021d), voluntary safety reporting programs such as ATSAP have improved safety, training, and maintenance procedures.

Effectiveness in Improving Aviation Safety. The more ATSAP reports that are received, the greater the likelihood that critical safety issues are identified and corrected. Additionally, so that the error is not just detected and corrected (single-loop learning), it is important to review the data through reflection and monitoring (double-loop learning) so that local, regional, or national trends and issues are identified and communicated with both internal and external stakeholders. Such practices will support hazard identification, risk assessment, and safety assurances into a process that is both repeatable and proactive (International Civil Aviation Organization, 2018). Lastly, Title 14 Code of Federal Regulations Part 193 from the Freedom of Information Act protects sensitive and personally identifiable information in voluntary safety reporting systems (FAA, 2017b).

Specifically, when an air traffic controller files an ATSAP report, the report is reviewed by an ATSAP analyst who removes any identifiable information that could link the employee to the ATSAP report. The event is reviewed by the Event Review Committee, consisting of a member of FAA management from the Air Traffic Organization, a member from the National Air Traffic Controller Association, and a representative from the Air Traffic Safety Oversight Service. The committee may

recommend training, which is conducted at the facility of the air traffic controller who filed the report. If multiple reports suggest a systemic issue at a facility, the committee may require the facility to conduct a Corrective Action Plan, which could include changes in directives, creation of a workgroup, or changes to training, among others (FAA, 2021g). The committee then reviews whether the safety issue has been addressed. Quarterly ATSAP reports are shared—with sensitive personal information protected—to show examples of issues and help employees and managers learn from mistakes. Air traffic controllers can have honest conversations about mistakes, accidents, and incidents and can proactively report any potential unsafe behavior, practices, or procedures.

Managers are responsible for creating an environment where reporting is valued. A private, internal brochure and FAA ATSAP information page for front line managers specifically states,

> As managers, you must properly apply the processes within ATSAP, but perhaps your most crucial role is leadership in creating a climate where reporting is not only safe but valued, and employees have confidence that they will not be punished if they tell the truth. Accountability is not based on outcome. The protective provisions in ATSAP focus on safety improvement rather than reactionary responses, but are not intended to constrain proactive performance management. You CAN talk to your employee after an event, and you CAN recommend corrective action, including Skill Enhancement Training. (FAA, n.d.-c, p. 2)

The section on performance management specifically states that ATSAP does not limit a manager's performance management tools (FAA, n.d.-c). Multiple instances of noncompliance from an individual, or errors resulting from substance abuse, will result in an ATSAP report not being accepted from the individual, allowing corrective action (FAA, 2021g). The system has been designed to allow performance management, but managers do not seem to understand that aspect. Managers are still struggling with the notion of air traffic controllers being able to admit mistakes via ATSAP and not be

disciplined as they once were during earlier parts of their career. As the FAA moves from a blame culture to a just culture, many managers (as noted in the interviews) still referenced ATSAP as a "get-out-of-jail-free" card. The term *jail* relates to punishment for a crime in a unilateral control model. Managers still are concerned with discipline instead of the enormous benefits of ATSAP. The military background of most managers may contribute to this mindset.

According to the FAA Voluntary Safety Reporting Programs Executive Committee (2021) Fiscal Year 2021 annual report on voluntary safety reporting programs, the ATSAP Event Review Committee reviewed 9,868 reports, of which 72% were safety events and 28% were safety problems related to policies or procedures. Based on these reports, the committee was able to collect air traffic control input from frontline employees to mitigate safety hazards and identify unknown risk to the National Airspace System (FAA Voluntary Safety Reporting Programs Executive Committee, 2021). This process used bottom-up communication to improve safety. Additionally, the committee issued 14 Corrective Action Requests and published 166 ATSAP positives that

> identified previously unknown safety issues and emergent risk, analyzed data to make proactive changes to improve NAS [National Airspace System] safety, validated existing safety strategies and risk mitigations, allowed for continuous analysis to discover vulnerabilities in the NAS and provided information in response to corrective actions. (FAA Voluntary Safety Reporting Programs Executive Committee, 2021, p. 5)

Researchers have argued that confidential reporting systems have a positive effect on learning from incidents and should be an essential part of any organization (Bo, 2020; Sieberichs & Kluge, 2021b, 2021c). In a blame culture of unilateral control, the mindset is that "if people do the right thing, bad things should not happen. Consequently,

whenever something goes wrong, someone must have done something wrong" (Kofman, 2010, p. 1).

Unilateral control also supports and incorporates face-saving defensive routines that make air traffic controllers as well as managers fearful of being vulnerable to admit mistakes and errors, and hinders the exploration of new mindsets or practices. ATSAP provides the Air Traffic Organization with a viable model to detect and correct error, providing vigilant monitoring of the National Airspace System through accounts of safety events from frontline employees (air traffic controllers). Yet managers still have trouble fully believing in ATSAP and its benefits. Argyris (1993) stated, "Top managerial level is typically at the forefront of espousing change but not producing it" (p. 245).

Just Culture. In a just culture, the mental model of blame is replaced with an opportunity to learn. MacLellan (2017) stated, "Just culture doesn't let willful, deliberate (sometimes criminal) actions off the hook" (para. 7). However, "if the controller makes an honest mistake and owns up to it, then that's absolutely fine. They will get training, they will get help to overcome the psychological aspects of having an incident" (MacLellan, 2017, para. 7).

A just culture is conducive to psychological safety and double-loop learning (Argyris & Schon, 1978; Edmondson, 1999; Fürstenberg & Görzig, 2020). Participant B described directors making decisions and policies without consulting those on the front lines:

> How could you make that decision without talking to us? We do the work every day. And we could have actually given you some really good information. But I think the person who made the call had come up through the ranks. So I've thinking they probably felt like they knew the right thing, not realizing, once again though, the dynamic is changing, it's ever evolving.

An ideal organizational environment for air traffic controllers is one where two-way communication, shared goals, shared values, and mutual respect are important, as they are associated with a safety culture and profitability (FAA, n.d.-b).

Moreover, a just culture of interpersonal safety is required to implement a safety culture (Houston, 2015; International Air Transport Association, 2019, 2021). Tarnavska et al. (2021) stated, "With the growth of aircraft passenger-carrying capacity, the human cost of disasters is increasing" (p. 1). As FAA managers provide oversight, which is the commitment of leadership (M. D. Cooper & Finley, 2013), the continuous improvement of a safety and just culture creates a higher level of safety that in turn protects human life. Other professions refer to this as psychological safety (Edmondson, 1999, 2012). Li et al. (2021) noted that double-loop learning requires an organizational culture and climate promoting psychological safety and teamwork. Similar to just culture, both are concerned with the literal safety of internal and external stakeholders (controllers and customers). Houston (2015) stated a just culture is necessary to create a safety culture. A strong safety culture normalizes admitting mistakes and calling for help when it is needed. Strong connections must be acknowledged between feedback and learning to create proactive risk management for safety (Arvidsson, 2006). Building a stronger safety culture is an organization-wide approach (Wiegmann et al., 2004), which, to succeed, relies on employees knowing that reporting defects and errors is important to avoid accidents (Naor et al., 2020).

The benefit of ATSAP is that it promotes not only air safety but also psychological safety internally by allowing air traffic controllers to report risks and errors to the National Airspace System without fear. From there, the data and individual

performance are analyzed by the Event Review Committee to determine the root cause of the problem. This approach has a widespread effect on the total workforce because of its critical but collaborative approach to problem-solving through qualitative and quantitative data. More safety internally creates more safety externally.

Using ATSAP creates organizational and cultural development that is a blueprint for the next generation of safety. ATSAP enables the Air Traffic Organization to continuously self-evaluate (Langer, 2000) air traffic operations and to potentially prevent a crisis through warning signals (Veil, 2011) based on ATSAP reports. ATSAP provides a real-time bird's-eye view of air traffic operations and acts as a canary in the coal mine as an indicator of systemic safety issues. As Participant B noted,

> Being able to take and gather and compile all that data and look at things more holistically versus just as a single event happening in one place, I think that's one of the great things about ATSAP. It's giving you real-time data . . . and take a high-level look at these things [safety events] and realize, okay, this a challenge that's happening throughout the National Airspace System.

As proactive, voluntary reporting programs such as ATSAP become adopted by other agencies, perhaps mindsets will change more readily. ATSAP is still a relatively new program in a large governmental agency. Participant E observed that "prior to the formal adoption of a safety culture," the FAA was a punitive organization, and safety suffered. Mindsets have begun to change and improve the organization, although there is much room for improvement. Changing mindsets organization wide is a challenge. Kofman (2010) recommended an emphasis on mistakes as "puzzles to be explored" and "opportunities to examine the process that generated them and learn to work together more effectively" (p. 3). Sharing data and encouraging buy-in and a vision—rather than a unilateral control model—are strategic methods to change the organization to a double-

loop learning organization (Kofman, 2010). Rather than top-down communication, the organization relies on mutual learning (Kofman, 2010), leading to a just safety culture.

Conclusions

Within a vibrant aviation industry, managers play a critical part in developing a strong safety culture (Arvidsson et al., 2006; Flin, 2006; C. W. Johnson et al., 2009). Even though aviation is the safest mode of transportation, air safety remains an ideal learning model due to its highly complex system, safety-critical work, and grave potential during failure (Ballesteros, 2007; Owen, 2018). Within aviation safety, the FAA's air traffic control system is an essential part of the national infrastructure (Trump White House, 2017).

The U.S. Department of Transportation (2018, 2021) has adopted and supports a systemic safety approach to address safety risk and promote a safety culture by using data-driven information, actions, and behaviors that demonstrate a commitment to safety. A systemic approach reflects impacts of an individual action on the whole and vice versa. Within a safety system, the highest level of safety includes a safety management system that fosters information and data sharing among the aviation community to promote a safety culture (FAA, 2021e). Identifying risk and hazards through confidential incident reporting systems such as ATSAP is supported by the International Civil Aviation Organization (2018). Using information collected from these programs promotes organizational learning and organizational improvements that connect corrective action and prevent event reoccurrence (Clare & Kourousis, 2021) and harmful outcomes (Tamuz & Thomas, 2006).

FAA Air Traffic Organization Safety and Technical Training (AJI-1) has declared that evolving the voluntary safety reporting program through promotion and education while enhancing data collection, evaluation, and sharing capabilities is a top priority for Fiscal Year 2022 (FAA, 2022a). The goal of the evolution is to increase information on system performance to employees at every level (FAA, 2022a). Continuous assurance, integrated oversight, and the promotion of a nonpunitive environment enhance a safety culture through critical thinking, exchange of information, and trust (FAA, 2017b).

However, despite the intention of creation of trust and psychological safety within the organization, these elements remain underdeveloped in the agency. In a hierarchical organization, the organizational culture will need to shift to create a true safety culture. Participant A stated ATSAP is viewed as "a get-out-of-jail-free card. I think that managers do not understand its purpose and how it can be useful to improve the safety culture." Participant B described a lack of trust between managers and employees. Even managers who espoused two-way communication and trust still demonstrated a tendency toward unilateral control in terms of trying to avoid "pushback" from staff and in needing to feel power over performance management. Edmondson and Moingeon (2001) stated that in organizational learning, "trust can be defined as the belief that relinquishing some degree of control over a situation to one or more others will not lead to personal loss or harm" (p. 158). Managers must feel able to relinquish some unilateral control to promote trust in the organization.

The International Air Transport Association (2021) argued that improving a safety culture also means improving safety leadership by strengthening the mindset of aviation executives to influence organizational behaviors that are embedded among traditional

ways of doing things. The promotion of safety leadership behaviors would include the promotion of values, behaviors, and practices that utilize data-driven decisions and standardized methodology and performance indicators to improve safety and system efficiency (Searle, 2021). Additionally, a nonpunitive culture must be implemented. Participants in this study noted a great improvement from a punitive culture to one more conducive to safety reporting. To that end, FAA Administrator Stephen M. Dickson (2021b) submitted a written testimony to the U.S. Senate Committee on Commerce, Science and Transportation stating that the FAA is working to improve safety through the use of safety management systems, global collaboration, and strengthening aviation research through a contractual agreement with the Transportation Research Board that will conduct analysis on current and emerging trends. In his additional oral testimony, Dickson (2021a) added,

> We are promoting the use of safety management systems, or SMS, internally and externally. With SMS, an organization actively searches for and identifies safety issues, and then addresses the root cause. From my own experience, I know that SMS works, but only if there is buy-in from everyone in the organization, from the C-Suite down to the person pushing the broom on the shop floor. At the FAA, that means when anyone—at any level—flags an issue, I've got their back. No questions asked. (para. 8)

Having a robust safety culture is the pillar of aviation safety (FAA, 2021a). Supporting a safety culture also means having a just culture. A just culture is a critical enabler of a safety culture (EUROCONTROL, 2015). A just culture produces safe behaviors with both pilots and air traffic controllers and promotes voluntary safety reporting (International Air Transport Association, 2019; Siebericchs & Kluge, 2021a). Free of reprisal or other repercussions, a just safety culture encourages and supports the identification of actual or potential safety concerns as well as risk hazards (NTSB & FAA, 2021). In doing so, a just culture enables a robust voluntary safety reporting

program so that operational concerns can be reviewed, analyzed, and fixed by corrective action rather through discipline or punishment (NTSB & FAA, 2021).

> Proactive safety is highly dependent on the individuals within an organization. To elicit a collaborative approach to safety, there must be a strong culture of self-reporting and an intrinsically just culture throughout the organization. (Perkins, 2021, para. 20)

The ultimate goal is that safety issues are identified by root causes, and a proactive approach to safety remains paramount (NTSB & FAA, 2021). Identifying hazards and detecting error help produce practicable levels of safety and are supported by International Civil Aviation Organization recommended practices and standards (Clare & Kourousis, 2021; International Civil Aviation Organization, 2018). Whereas ATSAP and other FAA documents refer to "root causes," a culture supportive of reflection and input from all levels will be more likely to determine complex factors contributing to errors. Understanding the importance of complex relationships (Dekker et al., 2011) among employees and managers, including through studies such as this one, can contribute to a broader, more effective interpretation of errors and how to solve them.

Highlighting the importance of organizational learning (Argyris & Schön, 1996), diligent reporting and event review analysis (FAA, 2021f) are positive traits to improve safety, avoid adverse events, and improve the operational environment (Clare & Kourousis, 2021). According to the literature, managers are important and impactful on creating a just culture (Fruhen et al., 2014a, 2014b). Through leadership behaviors such as a commitment to safety, safety knowledge, two-way communication, and situational awareness, managers can decrease unsafe behavior from employees (Ek & Arvidsson, 2012; Fruhen et al., 2014a, 2014b; Reason, 2000). Lastly, it is important to remember that the nonpunitive function within a voluntary safety reporting program does not mean no

accountability within a just culture. The filing is "indicative of a constructive attitude" (FAA, 2011, p. 4) and ensures that employees will be not be penalized as long as the violation was inadvertent.

Air safety is fertile ground for double-loop learning due to double-loop learning's capacity to mitigate or prevent future disasters (Choularton, 2001; Malakis & Kontogiannis, 2010). Due to the dynamic nature of the National Airspace System, aviation professionals need to continuously learn, as learning increases the effectiveness of action to produce intended results (Argyris, 1976, 1982; Clark, 2021; FAA, 2020e). Argyris (1976, 1982, 1993) argued that a cycle of learning consists of four stages: discovery, invention, production, and evaluation. When organizations learn to reframe an error as a learning opportunity instead of viewing errors as a crime, errors can inform aviation professionals and organizations about their current performance and level (Clark, 2021). This is a major change in deeply help assumptions and mental models, however. As Participant E noted, the FAA was a punitive organization for decades based on performance metrics and propensity for blame, which has been changing to a nonpunitive organization with two-way communication and frank discussion of errors.

According to Houston (2015), assistant director of safety and operations for the International Air Transport Association–Asia Pacific, an effective safety reporting culture leads to learning culture, which in turn leads to an informed culture, finally producing a safety culture. Houston described six drivers of a safety culture: commitment, behavior, awareness, adaptability, information, and a just culture. A safety culture cannot be mandated, however, and must evolve through the six drivers. For the FAA (n.d.-d), commitment is the understanding of everyone in the organization that safety is the

primary mission. Behavior is everyone being accountable, in that consequences of actions depend on the behavior and intent. Related to the participants in this study, not all behaviors are excused by ATSAP. Deliberate or repeated reckless errors incur consequences. Behavior also includes job satisfaction and the provision of support, equipment, and training. Awareness is the understanding of the risks to self and others in the organization. Adaptability is learning from experience and error to increase safety; this driver is proactive and requires employee input (Houston, 2015), as with ATSAP. Information as a driver means employees are encouraged to report safety concerns; additionally, information is communicated effectively, avoiding mixed messages (Houston, 2015). The information driver includes training and safety reporting systems.

Houston's (2015) description of a just culture is particularly relevant to the findings of this study. *Just* does not mean blame free or the lack of personal responsibility (Houston, 2015). Staff are evaluated, and reckless or deliberate violation of rules is unacceptable. Honest errors are addressed with training rather than punishment, however. In a just culture, unacceptable behavior is clearly explained. Safety reporting is encouraged (Houston, 2015). As the International Air Transport Association (2019) stated, a safety culture requires psychological safety in the organization and willingness to point out dangerous situations in a nonpunitive structure.

Additionally, the International Air Transport Association (2021) stated that accident investigation analyses have proven that a safety culture enhances performance and reduces the likelihood of accidents. Strong organizational safety leadership is a precondition of a positive safety culture (International Air Transport Association, 2021). Lastly, the International Air Transport Association (2021) recommended strengthening a

safety leadership mindset with aviation managers to implement a positive culture of safety within the workforce; managers must turn their efforts into practical actions.

Leaders should develop trust at all levels. Leaders can maximize their teams' contributions by applying leadership principles of respect, vulnerability, compassion, collaboration, and shared participation. Additionally, leaders should at all times use a team-wide approach to solving potential or actual problems while self-reflecting on their performance and critically reflecting on their ability to lead using alternate possibilities to improve performance and efficiency through double-loop learning. The only way to accomplish leadership excellence is through trust that fosters creativity and innovation, enhancing organizational learning and safety. Organizational culture is the framework that ties employees and management together and sets the behavioral standard and vision of the organization. Members at all levels of the organization should learn from each other to accomplish the mission of the organization. To establish a safety culture, the FAA needs to also promote a culture of trust and collaboration.

Recommendations for Practice

Based on the results of this study, I make several recommendations for practice specific to strengthening the safety management system of the FAA. According to Jaaron and Backhouse (2017), organizations and leaders need to build effective learning systems by rethinking goals and underlying foundations, part of the double-loop learning process (Nicolaides & McCallum, 2013). Continuous learning is particularly vital in a complex, continually changing system such as air traffic and the National Airspace System (Air Traffic Control Association, 2020; Ek et al., 2003; Jarrar & Balouki, 2018). In a quote promoting double-loop learning, FAA administrator Nolen (2022) stated, "Our mission to

provide the safest aerospace system in the world requires us to adapt, learn, and innovate. . . . All of us need to think differently—to question the way we have traditionally done things."

Specific to the FAA, mindsets must be changed to improve the safety management system, safety culture, and attitudes toward ATSAP. In a 2021 report, the FAA (2021h) identified supervisory and organizational factors as contributing to the "lack of safety culture" (p. 8). According to researchers (Air Safety Support International, n.d.; Önen, 2016; Piers et al., 2009), the most important element in a safety management system is the safety culture in an organization. A safety culture is nonpunitive (Houston, 2015) and particularly effective in complex systems (Sorensen, 2002). The organization is still operating with top-down hierarchy and needs to expand two-way communication between managers and air traffic controllers. Critical self-reflection should be stressed in managerial training. The ATSAP system should be expanded to include Unmanned Aircraft Systems, commercial space operations, and transportation. Further, the program should be regularly evaluated. These recommendations are described in more detail in the following sections.

Changing Mindsets for Better Safety Reporting

Participants noted that despite the perceived success of ATSAP, they still felt somehow unable to blame or hold employees accountable. Managers stated the program hindered their ability to manage performance, in spite of FAA (n.d.-c) literature indicating ATSAP does not prevent performance management. In a hierarchical system like the FAA, managers may feel a loss of control and thus a loss of some psychological safety and confidence. The individual results of voluntary reporting need to be shared

with managers, so they understand that in many cases, air traffic controllers receive training in response to an ATSAP filing. The FAA needs to communicate the benefits of the system to overcome residual defensive behaviors among managers. The FAA Air Traffic Organization Safety and Technical Training is responsible for materials and training related to ATSAP, led by the Vice President of Safety and Technical Training. Additionally, the FAA safety management system has a point of contact specific to air traffic, the Air Traffic Organization Safety Management Group manager.

Based on my experience, managers did not like that they were not kept in the loop by controllers. When the ATSAP mobile app was created, air traffic controllers could file ATSAP reports at home or while they were away from the facility when no one was around. Managers viewed this as a loss of managerial power. Most managers did not perceive that the air traffic controller who filed the ATSAP report could be saving future lives by proactively reporting a safety concern. Managers want control and the process of discipline (accountability) to come through them. Thus, an ingrained system of unilateral control must be overcome for ATSAP to be accepted completely into the organizational culture.

The International Air Transport Association (2019) recommended surveys to gather insight on safety culture. Studies such as this one are important to promote a more effective safety culture. Participant E noted that when leaving the FAA after decades of service, no one conducted an exit interview; this study was effectively the first time anyone had gathered the participant's perceptions of issues at the organization. Participants emphasized training and information as part of a safety culture but could use some training themselves on the importance of self-reflection, reflection of all staff, and

the role of trust in a safety culture. Additionally, managers could use some reminders that ATSAP does not eliminate employee accountability. Participant F remembered an emphasis on just culture 5 years prior but had not heard the term since, describing it as a loss of momentum. Clearly the FAA can improve on communicating and promoting the value and tenets of a just culture among staff continuously, rather than during initial training.

In this study, many leaders were resistant to reflecting on instances of failure, whether their own or in the FAA. Grounded in a constructionist perspective, reflection is critical to adult learning (Faller et al., 2020; Kolb, 2015). Schön (1983) described reflection as a necessary component to organizational performance and effective learning. Schön (1983) stated reflection is central for innovation, deep learning, and problem-solving. Argyris (1991) argued, "Solving problems is important. But if learning is to persist, managers and employees must also look inward" (p. 4). Reflection changes the frame of reference or mental model to change an individual's worldview (Faller et al., 2020). Reflection is useful during complex or volatile situations or when a solution is not obvious (Faller et al., 2020). Moving forward, the discussion surrounding double-loop learning in organizations should include how organizations can incorporate a culture of a reflective mentality (Hilden & Tikkamäki, 2013). "In a context where organizations operate with limited time and resources, reflection is an intervention that can be implemented without dramatic structural changes and can produce strategic and long-lasting impact" (Faller et al., 2020, p. 11). The FAA should encourage reflective practices among all staff.

Reflection and the use of personal experiential learning of frontline staff can help organization members to cross the "swamp of organizational change" (van Aken & Romme, 2012, p. 156). A deliberate, organized approach is likely needed to promote such reflection (van Aken & Romme, 2012). Pentland and Haerem (2015) described the importance of regularly reviewing "established patterns. . . . Organizations need active metaroutines, routines for changing routines" (p. 481). Nicolaides and McCallum (2013) described specific meetings in a governmental organization where staff at all levels considered their individual perspective, that of other individuals, and that of the organization as a whole. Staff considered a list of double-loop-related questions about individual blind spots or biases, reconsideration of norms, and dynamics at play. This process might be adapted for use in the FAA, also incorporating the six drivers of a safety culture described by Houston (2015): commitment, behavior, awareness, adaptability, information, and a just culture. Houston included sample "Safety Culture Discussion Cards" for use in staff meetings. Ironically, Houston advised, however, "Safety culture cannot be 'mandated' or designed,' it evolves. It is generated from the 'top-down'" (p. 33). Training initiatives in this instance would be generated from the top down to strengthen the FAA (n.d.-d) safety management system. Educating managers and supervisors on the importance of double-loop learning and critical reflection will require training interventions. FAA leadership training must emphasize these aspects.

Increase Two-Way Communication to Promote Double-Loop Learning

A common theme throughout the interviews was the need to increase two-way communication. Input from those who work on the front lines is vital. Whereas ATSAP allows input related to error reporting, other experiential-based input from frontline staff—as well as reflection—would increase organizational learning (van Aken &

Romme, 2012). The idea of collecting data and communicating results throughout all levels of the organization is supported by participants in this study. Such information sharing would support both single- and double-loop learning.

Additionally, two-way communication can be displayed with joint messages and verbal briefings from senior FAA management and senior union leadership from the National Air Traffic Controllers Association. As the union represents vital hands-on experiences from frontline bargaining-unit employees, participation from senior union leadership in collaboration with senior FAA management would create a top-down and bottom-up approach that promotes double-loop learning. Participation of all staff is important, but with a strong union, air traffic controllers likely will need the encouragement of union leadership. Within organizational learning, learning is at its best when communication is both upward and downward (Pickett, 2019); this type of learning climate stimulates both the manager and the subordinate so interaction is open and continuous. Argote and Miron-Spektor (2011) noted bottom-up, experience-based learning should be combined with top-down, goal- and task-based perspectives.

Currently, joint written messages are disseminated to the FAA workforce but joint verbal or face-to-face messaging by both parties is rare. Notably, when air traffic controllers are promoted to supervisor status, they are no longer part of the union. Their social identity (Korte, 2011) changes, another issue beyond the scope of this dissertation but a potential topic for more research. As Participant E noted, the agency is "still in a period of labor strife." This labor strife acts as a defensive routine and resistance to change; as Argyris and Schön (1974) stated, the role of defensive routines is to stifle change, collaboration, and communication.

Continue to Revise and Expand ATSAP

Managers commented on the continuing change in air traffic. The ATSAP system thus should be expanded to include Unmanned Aircraft Systems. Additionally, ATSAP should incorporate commercial space operations and transportation, as space travel expands to civilians. Further, the most recent analysis of ATSAP was an audit report card and congressional testimony from the early 2010s. The program should be regularly evaluated.

In my 14 years as an air traffic controller, I have never witnessed an air traffic controller withholding reporting a safety issue due to embarrassment or threat. It has actually been quite the opposite. When ATSAP was launched in 2008, air traffic controllers were relieved, as they could openly admit embarrassing or dangerous mistakes without fear of punishment by management or de-certification for an operational error. Additionally from my experience, ATSAP increased dialog with air traffic controllers as they began to look at everything critically and would submit ATSAP reports on not only themselves but also peers who had actual or potential operational errors. The system reduced the defensive behavior of saving face for others as well as one's self. Air traffic controllers could openly discuss issues with equipment or outdated procedures because filing the ATSAP report led to the issue being reviewed by a neutral party other than local facility management.

More Organizations Should Adopt Voluntary Safety Reporting Systems

Voluntary safety reporting programs have been integral to a 94% decrease in the risk of fatal accidents because they identify and resolve issues before an accident occurs (Namowitz, 2021). National Air Traffic Controllers Association President Paul Rinaldi stated, "The more we can continue to encourage people to report, the more we can

influence the safety in the system" (as quoted in Namowitz, 2021, para. 6). Within aviation, safety voluntary reporting programs such as ATSAP significantly contribute to the U.S. commercial aviation safety record (FAA, 2021h; Westerman, 2021).

Additionally, the U.S. Congress has mandated that the FAA establish a voluntary safety reporting program for non-air-traffic employees such as engineers, safety inspectors, system safety specialists, and other employees in the Aviation Safety organization of the FAA (Lynch, 2021; Westerman, 2021). The mandate was in response to external reviews of the Boeing Max crashes; after two crashes in 5 months, killing 346, the 737 MAX aircraft was grounded for 20 months (Shepardson, 2021). Voluntarily reporting safety hazards "often leads to corrective actions that make a difference in day-to-day operations" (National Business Aviation Association, 2019, para. 1). The NASA Aviation Safety Reporting System, which is FAA funded, receives over 100,000 safety reports a year from all users, such as aviation mechanics, air traffic controllers, cabin crew, Unmanned Aircraft Systems operators, general aviation pilots, and commercial pilots, and is critical to aviation research at the U.S. Department of Transportation John A. Volpe National Transportation Systems Center (Caron, 2019). Similar to ATSAP data, the Aviation Safety Reporting System data are critical to research; understanding how and why a problem happened is necessary to fix or prevent the issue (Caron, 2019).

Recommendations for Future Research

Replicate This Study With More Participants at All Levels of the Organization

A limitation of this study was a small number of participants. Many had worked with the FAA in various areas of the United States; however, a broader sample might produce additional information. Additionally, a similar study with interviewees (or

survey participants) from the frontline levels of the organization—air traffic controllers rather than managers—would supplement the findings of this study. Additionally, the "us versus them" attitude with managers and the union is an area of further research. Given that managers typically have been promoted from the ranks of air traffic controllers, the strife between the two groups is surprising and may be related to how managers' social identity changes after promotion (Korte, 2011).

More Practical Research on Defensive Routines

This study was designed to help fill a large gap in the existing research. Existing research is limited in real-world practical examination of double-loop learning in organizations. Double-loop learning, although a sound conceptual theory, still has not created a practical roadmap or lesson plan for direct application. This research helps fill a gap in safety and aviation research. The International Civil Aviation Organization (n.d.-b) noted research gaps in civil aviation, aviation management, and case studies related to standards and recommended practices.

Perhaps because of mixed perceptions on the topic, or different nomenclature of the concept, reviewing the literature on organizational defensive routines revealed a lack of a dense collection of research on the subject. As defensive routines and double-loop learning work in opposition, they are connected in most research and literature streams. Michelsen and Thorsteinsdottir (2010) noted,

> A literature study has found few references about defensive routines. This can be due to the fact that little is understood about the subject since it's a combination of many disciplines such as psychology, leadership, management and others. Even less has been written about the motives or tensions causing rise to the various mechanisms and actions used such as resistance or compliance. (p. 6)

Moving forward, to continue to understand and learn about what drives organizations to produce and succeed, researchers also should uncover the barriers or inhibitors that can

impede organizational learning and operational progress. Defensive routines inhibit both and provide a false sense of security for leaders and organizations.

More Research on Double-Loop Learning and Adaptive Leadership

The body of research on organizational learning seemed to lack practical research on double-loop learning; more recent research may be using different terminologies to describe similar concepts. For instance, researchers have referred to the concepts of double-loop learning using other terms, such as *reflective* or *adaptive management*. Double-loop learning has been explored through the lens and terminology of causal analysis (Carroll et al., 2002), unlearning (Burt & Nair, 2020), collective intuition (Akinci & Sadler-Smith, 2019), adaptive management (Williams & Brown, 2018), reflection (Schön & DeSanctis, 1986), collective learning (Rydstedt Nyman, 2019), and mindful processing (Argote & Miron-Spektor, 2011; Pentland & Haerem, 2015). Perhaps the term *double-loop learning* fell out of vogue for a time. However, recent researchers (S. Lee et al., 2020; Wolff et al., 2016) have used the term, including in research related to safety response (Munkvold et al., 2020). Researchers can combine relevant findings so concepts are not presented as separate techniques but rather as similar aspects of effective organizational learning.

Double-loop learning is the crescendo of organizational learning. Double-loop learning builds trust among leaders and employees as it connects the dots of communication, trust, respect, and collaboration (Argyris & Schön, 1996; Edmondson & Moingeon, 1999). Also, double-loop learning encourages and emphasizes an additional layer of learning to acquire knowledge and find a better way to solve problems (Hwang & Wang, 2016). Each of these is vitally important to ensuring organizational success.

Hilden and Tikkamäki (2013) recommended more research on how organizations can incorporate a culture of reflection to instill double-loop learning. This is an area needing more research.

As much as double-loop learning helps, organizational defensive routines inhibit double-loop learning, while overprotecting and insulating organizations from internal and external feedback. According to researchers (Alvesson & Spicer, 2012; Argyris, 1994; Fürstenberg & Görzig, 2020; Hytönen et al., 2016; Noonan, 2018; Yu et al., 2019), the biggest problem practitioners face is their defensive routines. To promote double-loop learning and a safety culture, the FAA and other organizations must commit to an organizational culture of reflection, regular review of routines, and two-way communication. Adding these elements to the FAA (n.d.-d) safety management system would lead to improved safety and workplace culture.

In closing, if leaders and organizations want to expand their success models and maintain concern for employees, they should identify, examine, and remove defensive routines. Additionally, supporting recent aviation safety literature (Houston, 2015; International Air Transport Association, 2019, 2021), a just culture of interpersonal safety seems to be necessary before an organization can move to a true safety culture. This study contributes to organizational learning practice and theory and adds to understanding of the inverse relationship between double-loop learning and defensive routines within organizations.

More importantly, findings have revealed areas where managers' perceptions of behaviors, policies, and practices may prevent some safety systems, such as ATSAP, from being accepted and understood as a way to improve the safety culture. Findings

suggest a need for training initiatives to ensure FAA managers and supervisors (and all staff) understand the importance of critical reflection and how a just culture leads to a safety culture. To ensure the effectiveness of ATSAP and other safety initiatives, the FAA must achieve buy-in. ATSAP is currently a double-loop learning system implemented in a mostly single-loop system. Staff need training to encourage more two-way communication. Bottom-up learning is based primarily on experience, whereas top-down learning is based on goals and task demands (Argote & Miron-Spektor, 2011). Training managers on how single- and double-loop learning intersect and contribute to organizational learning is important to encourage institutionalizing practices leading to critical reflection, self-reflection, two-way communication, double-loop learning, and a just safety culture. The result would be a more collaborative workforce, stronger safety management system, and safer airspace.

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Appendix A: Informed Consent Form

Title of Study: Adapt and Thrive: Management Perceptions and Behaviors That Affect Double-Loop Learning in a Federal Organization

IRB #:

Principal Investigator Name: Russell Korte, Ph.D.

Doctoral student: Samuel E. Odom Jr.

Version Date: June 13, 2021

You are invited to participate in a research study by doctoral student Samuel E. Odom Jr. under the direction of Dr. Russell Korte of the Graduate School of Education and Human Development, George Washington University (GWU). Taking part in this research is entirely voluntary. The status of your employment will not, in any way, be affected should you choose not to participate or if you decide to withdraw from the study at any time. Up to 15 managers at the FAA will be interviewed and results analyzed together.

Purpose

The purpose of this study is to learn about leadership perceptions, behaviors, policies, and practices that affect double-loop learning in the organization. Also, how do managers choose single- or double-loop learning?

What are the reasons you might choose to volunteer for this study?

You have been selected as a possible participant in this study because you are a senior manager at the FAA. The goal of this research is to interview senior managers from the Air Traffic Organization within the FAA regarding organizational learning. Have your voice heard. You may add to the growing body of knowledge of organizational learning by sharing your valuable experience helping the Air Traffic Organization implement nationwide contingency plans for administrative staff and air traffic controllers. Your input will help create the management literature of the future and provide answers and strategies that can help leaders at all levels learn and make better decisions.

Researchers have associated double-loop learning with improved organizational performance. Whereas single-loop learning is learning from mistakes to reformat processes and strategies, in double-loop learning, reflection also considers the values and mission of the organization, which may change. Organizationally, double-loop learning enhances learning and reasoning through continuous feedback and assessments of organizational performance that lead to the modification of objectives and norms. Many organizations have defensive routines that inhibit double-loop learning. Your perceptions could help further the understanding of double-loop learning and organizational defensive routines.

What are the reasons you might not choose to volunteer for this study?
You might have concerns about anonymity, although your identity will be protected. Your privacy is of paramount concern. You might be reluctant to share failures or criticism of leadership or the organization.

Procedures

If you choose to take part in this study, you will be interviewed once, for about an hour. You may be interviewed in person or via Skype or Zoom; your interview will be recorded for transcription. The transcribed file will be emailed to you afterwards so you can review it for accuracy and make any necessary changes. The total amount of time you will spend in connection with this study is about 90 minutes. You may refuse to answer any of the questions, and you may stop your participation in this study at any time.

Risks & Confidentiality

Risks in this study are minimal. Possible risks or discomforts you could experience during this study include having to admit mistakes or errors by yourself or management and the small possibility of loss of confidentiality, although efforts to protect your identity will be made.

Every effort will be made to keep your information confidential; however, this cannot be completely guaranteed. There is a small chance that someone not on our research team could find out that you took part in the study or somehow connect your name with the information we collect about you,, however the following steps are being taken to reduce this risk. The records of this study will be kept private. Your records for the study may be reviewed by departments of the University responsible for overseeing research safety and compliance. Your transcription and audio file will be coded with a number rather than your name; only the principal investigator will know the identity matched to each number. The audio file will be erased as soon as you confirm the written transcript. The doctoral dissertation report will not include your name or any personally identifying details. The dissertation report will not reference your specific job title, location, prior duty stations, or specific demographic information such as ethnicity, tenure, or age. As with the dissertation, if results of this research study are reported in journals or at scientific meetings, the people who participated in this study will not be named or identified. All results will be reported using a number (e.g., Participant 1).

Benefits

You will not benefit directly from your participation in the study, other than perhaps learning about double-loop learning and benefiting from reflection during the interviews. You may feel a sense of pride and accomplishment in helping management research move forward, help the researcher complete his doctorate, and help the FAA create a better tactical and strategic vision.

The benefits to science and humankind that might result from this study are increased air safety, organizational learning, adaptability, and double-loop learning due to measures to counteract organizational defensive routines, and much-needed practical research on double-loop learning. Additionally, this research will help fill a need for additional research on aviation management.

Questions

Further information regarding this study may be obtained by contacting Samuel E. Odom Jr., doctoral candidate and principal investigator, samuelodomjr@gwu.edu, at telephone number (xxx) xxx-xxxx; or Dr. Russell Korte, Associate Professor, GWU, rkorte@gwu.edu, (xxx) xxx-xxxx.

The Office of Human Research of George Washington University, at telephone number (202) 994-2715, can provide further information about your rights as a research participant.

Voluntary Participation - You are not required to participate in this study. In the event you do participate, you may leave this research study at any time. If you leave this research study before it is completed, there will be no penalty to you, and you will not lose any benefits to which you are entitled. You must be at least 18 years old to participate. After you sign this Consent form, the research team will provide you with a copy. Please keep it in case you want to read it again or call someone about the study.

Documentation of Consent

If you agree to take part in this study, please sign below:

_____ _____

Signature Date

If you agree to the audio recording of this interview, please sign below:

_____ _____

Signature Date

Appendix B: Interview Protocol

Thank you for agreeing to participate in this study. The purpose of this study is to examine management perceptions of behaviors, policies, and practices that affect double-loop learning in the FAA. Studying organizational learning in the FAA may improve air traffic safety. I have completed a pilot study with Air Traffic Organization (ATO) employees who have had a favorable response to the interview. Let's review the Informed Consent Form again. I would like to make sure you have a clear understanding before we begin. Do you consent to this recorded interview? You may discontinue this interview at any time. Please do not hesitate to ask any questions about the research or interview questions.

Additionally, I just want to point out a few things; this is completely voluntary, and you are able to stop this process at any time. I want to ensure you that your information is completely anonymous and, to the best extent possible, no data will be traced back to you. Also any future publications of this material will not include your name or any other identifying data. All documents will be password protected.

As described in the Informed Consent Form, you have been selected because you are a senior manager at the FAA. The goal of this research is to interview senior managers from the Air Traffic Organization within the FAA regarding organizational learning. You may add to the growing body of knowledge of organizational learning by sharing your valuable experience helping the Air Traffic Organization implement nationwide contingency plans for administrative staff and air traffic controllers. Your input will help create the management literature of the future and provide answers and strategies that can help leaders at all levels learn and make better decisions.

1. Tell me about your work history with the FAA and prior to the FAA? Do you have military experience?
    - Probe and clarify if needed
    - (If applicable, What did the military experience teach you that you are using with the FAA?)
2. Based on your experience, help me understand what makes a good safety culture.
3. Describe how the organization has had to adapt to meet safety or general success goals.
4. How has the Air Traffic Safety Action Program (ATSAP) impacted the FAA?
5. In what ways have you made changes based on ATSAP? Think on those incidents and describe them. What were they, and why?
6. Help me understand what makes a good safety culture.
7. What strategies do you take to meet these goals of a safety culture?
8. Describe your leadership or management style.

9. Tell me about a time when you worked on a really successful project in the organization. Who was involved? How was recognition given?
10. Can you tell me about a time when you or your operational area experienced failure or difficulty in the organization. Can you tell me about a specific incident?
    - (participants, behaviors, trigger, cause, critical thinking used, resolution; critical incident technique)
11. Think about a recent important decision you made. Can you describe how you made that decision?
12. I'm going to describe some behaviors. Do you recognize any of these behaviors as occurring in your organization, with you or others?
    a. Mixed messages. For example, "Be innovative, but watch the budget." Or agreeing to follow policy whether or not you actually plan to do so.
    b. Lack of discussion of possible pitfalls or mistakes. No risk taking.
    c. Face saving. Not discussing errors to save your own reputation or a coworker's. Denial of problems.
    d. Blaming others, particularly external sources
    e. Avoidance of action, maintenance of the status quo, and resistance to change. Red tape.
    f. Unilateral control. Lack of group decision-making, a right-or-wrong leadership style, short-term perspectives.
13. Can you tell me about a time where there was a change in policies or procedures. Describe how you handled the change?
    - Who was involved in the change?
    - What was your role in the change?
    - Did you anticipate any resistance to the change? If so, what steps did you take to deal with it?
    - Was anyone else involved in the change?
14. Can you tell me how you handle feedback and criticism?
15. How have you been able to progress throughout your career?
16. How can the FAA improve decision-making related to safety?
17. How can the FAA help you improve as a leader?

Do you have any additional comments?

Thank you for your time. I will email you a copy of your transcribed interview within 30 days. Please read through it and make any changes for accuracy within 10 days and email it back to me, if you have any changes.

Appendix C: Rev Software Security and Privacy Policy

Rev Information Security & Privacy Program Overview

The following document provides an overview of Rev's Information Security & Privacy program. We advise reviewing this document in its entirety.

Rev.com's advanced platform is a multi-tenant, multi-user, on-demand service providing unbeatable quality, speed, and value to clients and freelancers alike.

Rev.com may be securely accessed 24x7 through any Internet-connected computer with a standard browser, an application program interface (API), or mobile applications.

Objectives

Security is a critical part of our business. With our security & privacy program, we strive to achieve the following goals:

1. Ensure that customer data is encrypted and inaccessible to other customers and the public.
2. Ensure that customer data is accessible to staff only to the extent necessary to perform the required work.
3. Prevent loss or corruption of customer data.
4. Maintain a redundant infrastructure with 99.9% uptime.
5. Provide timely notification in the unlikely event of downtime, data corruption or loss.
6. Provide continuous training for our staff on proper operation of our systems and best practices for security and privacy.

Our security policies and procedures are reviewed on an ongoing basis by the Rev security team, which is also responsible for their enforcement. All our staff have signed confidentiality agreements.

Rev

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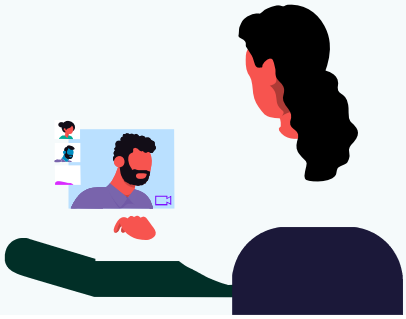
Information Security

Rev.com uses appropriate technical, organizational and administrative security measures to protect any information in its records from loss, misuse, unauthorized access, disclosure, alteration and destruction. Rev.com uses National Institute of Standards and Technology (NIST) guidelines as a foundation for its security program including information security policies and incident response.



Privacy

Please see the Rev Privacy Policy (https://www.rev.com/about/privacy) for details on how Rev.com treats personal information and complies with privacy regulations.

Personally Identifiable Information

Rev follows best practices handling Personally Identifiable Information (PII) with guidance from the published General Data Protection Regulation (GDPR).

Rev never stores credit card information. Rev maintains a PCI certification for payment processing. Rev works with PayPal to ensure that all payments are secure and encrypted.

Employees

Employees are restricted to handle data required to perform their job. Our staff is trained on proper use of our systems and best practices for security & privacy. All employees have completed background checks and have signed confidentiality agreements.

Transcriptionists & Captioners

Revvers (our transcriptionists, captioners, etc.) are vetted through a rigorous screening process and receive training. All Revvers have signed NDAs and strict confidentiality agreements.

While actively working on a file, Revvers are required to use our secure and proprietary tools, only accessible through a web-based portal.

Revvers cannot download audio, video or transcript files as a general rule (configuration can be modified regarding audio/video download if the customer requests it). They are required to have a valid username and password.

Technical controls exist to block Revvers from accessing Rev.com while using VPN technology. If their account is deactivated, they are locked out of all platform customer resources including forums. All Revver account modifications and customer data access are logged.

Third Party Marketers

We do not share or sell information we collect to third party marketers.

Secure Infrastructure

All Rev.com services are hosted by Amazon Web Services (AWS). AWS maintains strict physical access policies that utilize sophisticated access control mechanisms.

Environmental controls such as uninterruptible power and non-destructive fire suppression are integrated elements of all data centers.

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Secure Infrastructure (cont.)

Rev.com's infrastructure spans multiple AWS availability zones for high availability and utilizes amazon S3 for storage of data (https://docs.aws.amazon.com/AmazonS3/latest/dev/DataDurability.html). AWS provides Distributed Denial of Service (DDoS) services.

Storage & Transmission

All customer files are encrypted both at rest and in transit. Communications between you and Rev servers are encrypted via industry best-practice protocols TLS 1.2 and AES-256. TLS is also supported for encryption of emails.

Backup & Recovery

Rev backs up data constantly to prevent any loss or corruption. All Rev & customer data is hosted at Tier IV or III+, SSAE-16, PCI DSS, or ISO 27001 compliant facilities in the United States.

Data Control & Deletion

Customers can purge video, audio, and/or document data from Rev systems at any point via the User Interface (UI) and can set up automated deletion policies via a support ticket.

Software Development Lifecycle

As a cloud service company, Rev.com releases software frequently so that clients may benefit from on-going development of new service and security capabilities. Rev.com follows a defined Software Development Lifecycle (SDLC) that includes the application of security-by-design principles. Rev operates using an agile development methodology under which software development teams and management are tasked with ensuring that the SDLC process and design principles are followed.

Secure Service Operations

Access to production infrastructure is managed in keeping with Role Based Access Controls (RBAC) and "Least Privilege". Access is limited to the Rev.com operations team. Sensitive product service data stored in service databases never leaves the production system.

Firewall rules are maintained so that production systems can only be accessed for maintenance from defined Rev.com locations using secured access mechanisms. Systems are maintained in a hardened state with defined baselines for all host and network equipment. All changes to systems are tracked and managed according to well-established change management policies and procedures. The patch level of third-party software on systems is regularly updated to eliminate potential vulnerabilities.

Availability & Access

We maintain a redundant infrastructure with 99.9% uptime. All customer data is accessible to staff only to the extent necessary to perform the required work. And just like our customer support, our Security Team is on call 24/7 to respond to security alerts and events.

Breach Detection and Response

Rev.com utilizes network Intrusion Detection Systems (IDS) and network integrity management tools to continuously monitor the state of the system. Availability is continuously monitored using external monitoring tools. Application and infrastructure logs are aggregated and archived centrally, facilitating both analysis for suspicious access patterns and future forensic analysis. Regular external vulnerability scanning is also performed.

In the event of a breach, Rev.com has the ability to isolate components of the system for containment and maintain ongoing operations. Rev.com's incident response team is at the ready to notify customers of security impacting events according to contractual agreements.

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Appendix D: Authorization From FAA Representatives

Federal Aviation Administration

Memorandum

Date: July 13, 2021

Name: Samuel E. Odom Jr., M.A., Air Traffic Control Specialist, Air Traffic Training and Requirements (AJI-2410)

Subject: Statement of Support – George Washington University
Russell Korte, Ph.D. – Associate Professor of Human and Organizational Learning

From: Jennifer Allen-Tallman, Manager, Air Traffic Training and Requirements (AJI-2420)
FAA National Headquarters
950 L'Enfant Plaza N SW
(202) 267-9284

Jennifer S. Allen-Tallman

Digitally signed by Jennifer S. Allen-Tallman
Date: 2021.07.13 16:41:48 -04'00'

This letter confirms that that I, as an authorized representative of Federal Aviation Administration, allow the Dr. Russell Korte and Samuel E. Odom Jr., a doctoral candidate at George Washington University access to conduct study related activities at the listed site(s), as discussed with the Principal Investigator and briefly outlined below, and which may commence when the Principal Investigator provides documentation of IRB approval for the proposed project.

- **Study Title:** Adapt and Thrive: Management Perceptions and Behaviors That Affect Double-Loop Learning in a Federal Organization

- **Objective & Justification:** This study helps to better understand the nature of organizational learning in the context of a large federal government organization. In the current world context, organizations face complex challenges that require continuous learning, as well as adaptive leadership (Nicolaides & McCallum, 2013). Due to the difficulty and complexity of organizational challenges, it is necessary to develop a more robust understanding of organizational learning.

- **Purpose:** This research study will examine management perceptions, behaviors, policies, and practices that affect organizational learning—specifically single-loop and double-loop learning, as well as the defensive routines that inhibit learning—in a large federal government organization. Findings may help fill a gap in the literature, which has limited research on the real-world practical examination of double-loop learning in organizations. Additionally, improved organizational learning at the FAA may lead to better air traffic safety.

- **Benefits:** This study may determine ways to improve the use of ATSAP and other forms of organizational learning in the FAA to increase air traffic safety and develop a more robust safety culture.

Study Activities Occurring at this Site:

1. I will send an email to senior managers asking if they would like to participate in the research study.
2. Those expressing interest will receive an Informed Consent Form. I then will contact the senior managers and set up a time for an interview.
3. Other aviation professionals in [redacted]vill be recruited based on their expertise in the field of aviation.
4. Each interview should last no longer than 90 minutes.
5. Interviewee identities will be protected through numerical ID, reporting results through thematic (aggregate) analysis, and by not giving specific details that could divulge an interviewee's identity. The participants will be identified only by numerical ID (e.g., Participant 1, Participant 2), and the participant IDs will be stored separately in a secure location available only to the investigator. All documents will be stored securely and only accessible by the researcher. All rules, regulations and guidelines will be adhered to in accordance with U.S. federal code (Protection of Human Subjects, 2018). Additionally, I will comply with the Informed Consent Tips as outlined on the U.S. Department of Health and Human Services, Office for Human Research Protections (1993) webpage.
6. Voluntary Participation - You are not required to participate in this study. In the event you do participate, you may leave this research study at any time.

   Site(s) Support: The study site agrees to support the research study.

   Other: N/A

   Anticipated End Date: 12/31/2021

I understand that all activities involve compliance with Health Insurance Portability and Accountability Act (HIPAA), Family Educational Rights and Privacy Act (FERPA), and other applicable regulations at this site. I am authorized to make this determination on my organization's behalf.

We understand that FAA's participation will only take place during the study's active IRB approval period. All study related activities must cease if IRB approval expires or is suspended. If we have any concerns related to this project, we will contact the Principal Investigator who can provide the information about the IRB approval. For concerns regarding IRB policy or human subject welfare, we may also contact George Washington University IRB at ohrirb@gwu.edu (https://humanresearch.gwu.edu).

Appendix E: Detailed Codes and Categories

Table E1

Single-Loop Learning Categories and Codes

Category	Code	*n*	Participant *n*
Rule-following		30	6
	Rule-following	15	6
	Emphasis/constant reminders of safety	15	5
Standardized procedures		12	4
	standardized procedures	11	4
	checklists	1	1

Table E2

Double Loop Learning Categories and Codes

Category	Code	*n*	Participant *n*
Continuous learning & data collection		50	9
	Continuous learning	21	7
	Collect data/information/data-based decisions	27	6
	Stay educated/up to date	2	2
Staff development & support		90	9
	Training	32	9
	Develop staff/self	24	9
	Support, encouragement	24	7
	Mentor	10	6
Collaboration		52	9
	Collaboration	18	5
	Good of the facility/system/holistic	19	5
	Team	10	4
	Share information	5	3
ATSAP: positive	ATSAP: positive	21	9
	Change in mental models, culture	16	6
	Judgment-free environment	16	6
Adapting		68	8
	Adapting	35	7
	Constant change	18	5
	New technology	9	4
	Proactive	6	2
Change is constant		27	7
	Constant change	18	5
	New technology	9	4
Monitoring	Monitoring/checks & balances	18	6
Dialog/two-way communication	Dialog/2-way communication	37	8
Critical reflection	Critical reflection	29	8
Trust		81	7
	Trust	21	7
	Transparency/integrity	15	6
	Just culture	14	2
	Walk the walk/set example	17	6
	Buy-in	14	7
Crisis	Crisis/COVID	12	6
Creativity	Creativity	10	6

Note. ATSAP = Air Traffic Safety Action Program.

Table E3

Defensive Routines Categories and Codes

Category	Code	*n*	Participant *n*
All defensive routines	All defensive routines	4	3
Individual accountability		57	9
	Individual accountability	21	6
	Performance	6	6
	Get-out-of-jail-free card	6	5
	Difficulty enforcing staff performance requirements	17	3
	ATSAP: negative	7	3
Top-down communication	Top-down communication	30	9
Resistance to change		37	8
	Union/labor resistance	35	8
	Resistance to change	10	6
	Pushback	4	3
	Self-interest	2	2
Saving face		30	6
	Saving face	15	6
	Resistance to describe or even remember failure	12	4
	Embarrassment	2	2
Mixed messages		20	6
	Mixed messages	18	6
	Funding challenges	2	2
Unilateral control	Unilateral control	17	6
Avoiding action		17	6
	Avoiding action	11	6
	Ignored	6	2
Blame	Blame	12	4
Bureaucracy	Red tape/bureaucracy	9	3
Risk avoidance	Risk avoidance	6	3
Lack of trust	Lack of trust	3	2

Note. ATSAP = Air Traffic Safety Action Program.

Appendix F: Initial Code Spreadsheet and Sample Quotes

Code	Frequency	Sample quote snippet
Defensive routines	143	
○ all defensive routines	4	All of those apply in my current organization to varying degrees. All of those are absolutely present in all of my dealings.
○ avoiding action	11	When the agency says we're going to do something about it for 30 years and does nothing about it for 30 years, you know, that tells me that maybe we're not all that serious about a safety culture.
○ blame	12	People may not want to take accountability for something they've done and would rather place blame elsewhere.
○ checklists	1	Oversight is what helps us to reinforce
○ embarrassment	2	It's going to embarrass the ATO. It's going to embarrass the FAA
○ ignored	6	A backlog of unanswered reports
○ lack of trust	3	Managers do not understand its purpose and how it can be useful to improve the safety culture
○ micromanaging	3	I'm not a micromanager
○ mixed messages	18	You'll get a message and that's what you convey to your people but then the guidance may change or be interpreted differently and that can make your messaging to your people confusing
○ red tape/ bureaucracy	10	A 90-day window to get all of our authorizations reviewed and completed. It got to the point where it was just extremely overwhelming for all for everyone
○ resistance to change	10	I think it's more attitudes. I think a lot of people are a little challenged by change
○ resistance to describe or even remember failure	12	Let me back away from that one. I don't know if I want to talk about that process.
○ risk avoidance	6	Lack of discussion, of pitfalls or mistakes. Overall, I've seen that within the agency.
○ saving face	15	Face saving, not discussing errors
○ self-interest	2	I'm going to get in trouble, then I better make sure I got everything all set, so everybody knows it wasn't me.
○ top-down communication	30	That information needs to start from the top, flow down.
○ unilateral control	17	I work for an absolute tyrant. We don't have any input.
Double-loop learning	186	

Code	Frequency	Sample quote snippet
○ adapting	34	Safety looks different in different environments. Dealing with the pandemic was an environment that we've not had to deal with before. The standard operating procedures were extremely outdated, which was causing errors throughout the operation.
○ change in mental models	16	Changed the mindset of blaming an individual to then looking at the one individual as a part of a system
○ collaboration	17	I first collaborated with the union to make sure that the union was fully involved in this
○ creativity	7	So how could I come up with a way to make that happen? And that was the magic of addressing a situation that was going to be really bad.
○ crisis	12	Learning a new way to do business with COVID A fatal aircraft accident, sometimes a policy or procedure can change overnight
○ critical reflection	29	Continue to ask ourselves, okay, how do we get better? How do, you know, how do we do this thing or this procedure or this process?
○ critical thinking	12	A lot of people use different sorts of systems. And I like to look at everything as a whole
○ dialog/2-way communication	37	Having those open lines of communication is so valuable because if there's an approach where rules are coming down, instead of open communication going upward those decisions are being made together, it can lead to a situation where all bases may not be covered
○ judgment-free environment	16	A good safety culture, again, is open communication. If an incident occurs, you can't be afraid to communicate about it and ask the questions.
○ monitoring	18	Preventing deviations, have oversight and ensuring that the leaders have a clear understanding of the intended goals.
○ share information	5	Information sharing, whether it's in the form of training, or whether it's in the form of a memo, briefing, as much information that can be shared, distributed, so that controllers and the rest of the workforce can retain it.
○ trust	20	Ensuring that my fellow peers had faith in me, and earning the trust of everybody to include the union
Single-loop learning	27	
○ rule-following	15	Our rules and regulations need to be complied with. They mean something. They're put there for a reason.
○ standardized procedures	13	District does it this way, or one service area does it this way, another one does it another way
ATSAP: negative	7	Can be used by the union to get what it wants when it didn't get something let's say at the negotiating table or through other means.

Code	Frequency	Sample quote snippet
ATSAP: positive	11	FAA is doing a great job right now as far as just the voluntary safety reporting culture
buy-in	14	If you want buy-in, you should also allow input.
challenging conversation	5	Challenging conversations and having hard conversations
collect data/ information	28	Getting input is extremely important. If the agency, seeks to get the answers from the lowest level on upward, I think they could definitely receive valuable information they need to improve safety.
		The decisions you're making are really based on sound data information.
constant change	18	National Airspace System being so dynamic and ever changing
continuous learning	21	Once you stop learning, then I think failure is right around the corner.
develop staff/self	24	Caring about the person and set them up for success
different perspectives	18	Four air traffic controller facilities, ranging from Level 11 to Level 4.
difficulty enforcing staff performance requirements	17	There's nobody holding anybody to account for negligence.
emphasis/constant reminders of safety	15	A lot of briefings from controllers. Constant reminders.
funding challenges	2	The funding goes to where the problems are, and the FAA sometimes suffers from that.
get-out-of-jail-free card	6	People can use it as a “get out of jail free” card which is essentially, making improper operational decisions or making false reports and not being held accountable.
good of the facility/system/holistic	19	Everybody's a really a link to the network, everybody's a cognitive wheel.
individual accountability	21	I still have to hold them accountable
just culture	14	Because overturning a regular culture into a just culture is really hard to do.
mentor	10	I like to mentor people
new technology	9	The rapid increase in technology has forced us to adapt
performance	6	There's a lot of blame to go around, because the agency's performance management rules and conduct and discipline rules were not properly explained or trained to the supervisors and managers prior to the event of ATSAP.
pillar	4	Big pillars, which is promotion, you have to get endorsement from the executive level
proactive	6	In a safety environment, you always want to be on the proactive side

Code	Frequency	Sample quote snippet
pushback	4	Initially, it was just a whole lot of pushback, which I was not expecting
recognition	4	
○ cash	1	Cash award...
○ letter	1	...and a letter of recognition.
○ none	2	Quite frankly nobody seemed to care.
○ rating	1	An outstanding rating.
stay educated/up to date	2	Trying to keep yourself educated,
support	23	I give them every means to perform their function. I provide the support that's necessary.
team	10	It's really a team effort
thick skin	4	Thick skin
training	32	What needs to be learned, what needs to be relearned
transparency	15	A just culture is a key part, and probably the most important part of safety culture, because when you say the word just. It means essentially that there's a sense of fairness, integrity, honesty, trust.
union/labor	36	Management and labor have not always agreed
vision	10	Vision for safety
walk the walk/set example	17	You can't just talk. You've got to be able to walk the walk