A DISCUSSION PAPER

Better Integrating Root Cause Analysis into Public Sector Performance Auditing

Second Edition

CANADIAN AUDIT
& ACCOUNTABILITY
FOUNDATION

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Better Integrating Root Cause Analysis into Public Sector Performance Auditing

Introduction

Purpose and Structure of this Discussion Paper

This discussion paper is based on the premise that root cause analysis may significantly increase the impact of public sector performance audits. It provides simple, tailored tools and methodology to help auditors and audit offices that wish to undertake root cause analysis. The body of this paper is organized into three main sections:

- Part 1 addresses **what** is meant by root cause analysis and why it can be useful for legislative audit offices. It explains what it means to have a "root cause mindset."
- Part 2 describes **when** root cause analysis can be carried out. It suggests a number of additional activities that can be integrated into the typical performance audit process.
- Part 3 explains **how** root cause analysis can be carried out. It suggests a useful questioning technique, categories of root causes tailored to the public service, and different means of visualizing and documenting the results of a root cause analysis. This section also explores some of the risks associated with root cause analysis and discusses the potential role that cognitive biases can play.

Selected "Key Consideration" text boxes are embedded throughout the discussion paper.

Applying root cause analysis in the public sector is not a pure science. Rather, it is an iterative process that involves exercising substantial professional judgment while considering a mixture of qualitative and quantitative factors. It is, in short, "part art, part science."

About this Paper

This paper is the second edition of our discussion paper on the topic of root cause analysis, first published in 2014. It builds on the evolution of audit research and the experience of many audit offices in Canada and in the world. It seeks to reinforce the foundational concepts of root cause analysis, while reflecting the latest good practices in its implementation in public sector auditing. Among the additions in this edition are:

- the recent developments in auditing organizational culture,
- the importance of developing a root cause mindset (including being aware of cognitive biases), and
- more root cause analysis tools that could be used when conducting performance audits.

This discussion paper is meant to stimulate discussion, experimentation, and sharing about root cause analysis within the legislative and public sector performance auditing community. The ideas presented in this paper are suggestive—not prescriptive—and should be viewed as a menu of options, not a recipe.

Part 1 – What Is Root Cause Analysis?

Root Cause Analysis in a Nutshell

Root cause analysis is an approach to understanding why something happened or how a situation developed, whether it is an industrial accident, a defective product, or a program deficiency. The American Society for Quality defines a root cause as "A factor that caused a nonconformance and should be permanently eliminated through process improvement." It defines root cause analysis as "A collective term that describes a wide range of approaches, tools, and techniques used to uncover causes of problems" (ASQ, 2020a). Root cause analysis can be used to drive efficiency, eliminate waste, or improve business processes. Root cause analysis is not a single methodology; rather, it encompasses a body of qualitative and quantitative tools and techniques. It is applied in a wide range of settings, such as accident investigation, risk analysis, business process improvement, change management, quality control, and, of course, auditing.

There are many tools and techniques commonly applied in manufacturing, extractive, commercial, and service industries (see **Appendix A**). This discussion paper explains how some of these tools and techniques—for example, the Five Whys technique, fishbone diagrams, cause mapping, and Pareto charts—can be adapted and used in legislative performance (or value-for-money) auditing. These tools and techniques could also be applied by internal auditors and other public sector performance auditors.

A Role for Root Cause Analysis in Public Sector Performance Auditing

The public sector environment is complex and dynamic. Public and private sector organizations have many things in common; for example, both can strive to eliminate waste and improve efficiencies. At the same time, the public sector can be complicated by having

- multiple and (sometimes) conflicting policy goals,
- unclear or poorly articulated goals,
- short-term planning horizons,
- administrative silos,
- partisanship, and
- scarce (and diminishing) resources.

Performance audits—whether focused on efficiency, economy, effectiveness, compliance, systems and controls, governance, and/or risk management—typically identify a number of deficiencies or weaknesses in audited organizations. A short list of common, if not recurring, audit findings includes but is not limited to:

- lack of compliance with rules or policies,
- results not being achieved as intended,
- unclear roles and responsibilities,
- risks not being evaluated and managed,
- disconnect between plans and available resources,
- strategies not being developed or followed,
- activities and actions of key players being poorly coordinated,

- missing data or information to measure program results or to support decisions, and
- inefficient or wasteful processes.

The burning question is “why”?

- Why do the deficiencies occur?
- Why are entities not in compliance?
- Why are risks not being managed or intended results not being realized?
- Why are strategies not developed?
- Why is information needed to support decisions not available?

Often these types of audit findings are symptoms or manifestations of much deeper, more systemic factors. And often these audit finding are repetitive and occur frequently. Analyzing the underlying—or root—causes of observed deficiencies helps auditors to delve below the surface, beyond the symptom, to answer these “why?” questions.

Audit offices are not obligated to perform root cause analysis—it is not required by auditing standards[1] (ICAEW, 2016). Indeed, it can be argued that the responsibility to perform root cause analysis lies with entity management. This is because management is responsible for designing and administering effective and efficient programs for public services and to correct identified program weaknesses (including in response to audit recommendations).

Benefits of Root Cause Analysis

So what is the argument in favour of auditors undertaking root cause analysis? Simply, it allows audit offices to add more value to their work by developing audit recommendations aimed at correcting the underlying causes of reported findings and deficiencies. The ultimate goal is to ensure that management can design and put in place lasting solutions so as to avoid repetition, report after report, of the same audit finding (ACCA, 2019; CIIA, 2019).

Other potential benefits of root cause analysis to audit offices and audited organizations include:

- providing insight and explanation for audit findings;
- assessing whether recommendations are necessary or relevant prior to reporting;
- adding value by making recommendations that are more meaningful to management;
- increasing the impact of recommendations;
- gaining a better understanding of the social, human, and cultural dimensions of an issue;
- providing a gateway to understanding the risk environment of an organization;
- acquiring a better understanding of the cause and effect relationships at play in problematic situations, and of their importance in conceiving potential solutions; and
- contributing to more effective use of government resources in addressing identified weaknesses. (ICAEW, 2016; Bjørklund Wangen et al., 2017; Murdock, 2018; ACCA, 2019; CIIA, 2019)

[1] Although root cause analysis is not mentioned explicitly in the ISSAI 4000 Compliance Audit Standard, it is explicitly recommended as an audit method in its companion Implementation Handbook (IDI, 2018).

Also, a sign of the audit profession's growing adoption of root cause analysis is the recommendation, made by various standard-setting bodies, to use it to enhance the quality of audits (IAASB, 2014; ICAEW, 2019). Finally, the capacity for conducting root-cause analysis is now a skill that auditors need to master, as recognized by their profession (CPA, 2018).

A Word of Caution

Uncovering and reporting root causes can be sensitive, especially if the causes relate to individual behaviours or competence, the merits or wisdom of policy, the sufficiency or allocation of resources, or plain old politics. For this reason, it may be advantageous to engage senior audit office personnel early and often to discuss how to deal with these sensitivities. As with typical quality review processes, auditors would be expected to flag such sensitivities so that they receive the appropriate level and nature of quality review.

The Root Cause Mindset

A root cause mindset is essentially a state of mind in which auditors are always thinking "Why did this happen?". While is it very important to focus audit efforts and to make recommendations for improvements, equally important is to explore why something happened in the first place: "How did this situation develop?". This type of thinking, or mindset, starts at the onset of the audit process and continues right through to the reporting phase.

Different audit phases will require different depths of analysis. Even during the early knowledge of business stage or the planning phase of an audit, a root cause mindset should inform all research and information-gathering activities and initial interviews. The key is to always be thinking about effecting real change by making actionable recommendations that address the root cause of the identified problems in order to create tangible impacts and benefits to society.

Part 2 – When to Incorporate Root Cause Analysis into the Performance Audit Process

How Root Cause Analysis Enhances the Entire Audit Process

Analyzing and reporting on root causes in a performance audit is a good practice, but auditors face several process-related challenges in this regard. For example, root cause analysis is not currently "hard-wired" into the performance audit process. While it may be done implicitly, or informally, it is not required by Canadian assurance (performance audit) standards and related guidance. In addition, when root cause analysis is done, it is usually toward the end of the examination phase or early in the reporting phase when recommendations are being formulated.

And yet analyzing root causes takes time and effort. It can be challenging enough for auditors to complete their planned work, let alone to undertake unplanned evidence collection to complete a root cause analysis late in the audit process. While several analytical techniques lead to hypotheses about causes, causes described in the audit report must be supported by sufficient appropriate evidence. In reality, if root cause analysis is not planned and started early in the audit process, it may not be carried out well or at all.

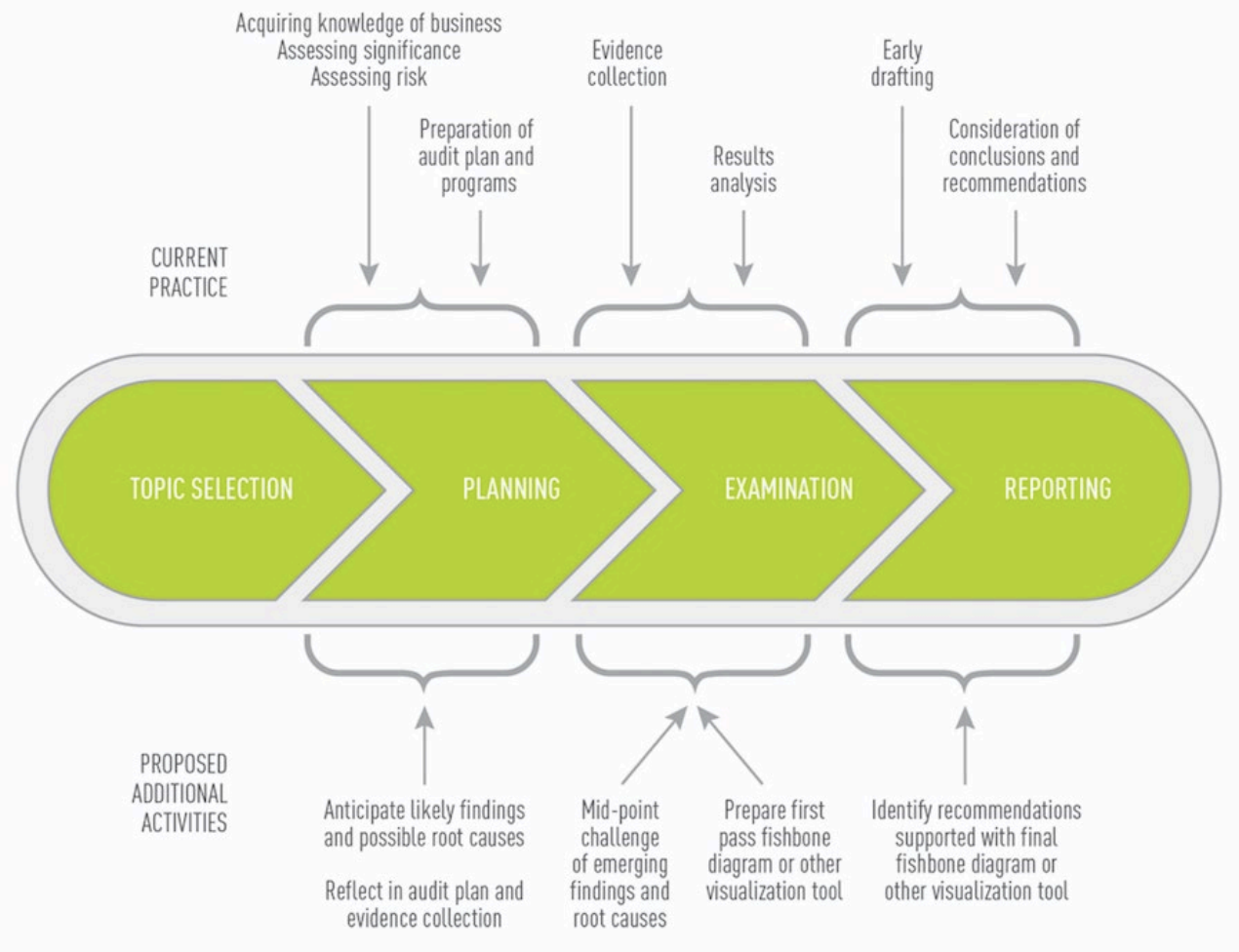
Key Consideration: Should root cause analysis be applied to all reported audit findings?

Because root cause analysis could be resource-intensive, auditors must apply professional judgment when deciding when to use it. When taking this decision, auditors should keep in mind the following:

- Although root cause analysis supports more effective recommendations, if a finding is not significant enough to result in a recommendation, then it would not be justified to spend time and effort to do the analysis.
- Also, clear instances of non-compliance, such as frauds or breaches of ethics, may require immediate remedial actions that do not warrant the level of effort and time required by a root-cause analysis.

To address these process-related challenges, this discussion paper suggests additional activities that can be integrated into the typical performance audit process, as illustrated in **Figure 1** and described below.

Figure 1 – Process Suggestions for Root Cause Analysis



Planning Phase

It is common for auditors to identify potential audit findings in the planning phase based on preliminary information they collected and analyzed. This is always subject to confirmation (or rejection) in the examination phase. In such cases, it is suggested to consider possible root causes of potential deficiencies before the audit plan and/or audit program is finalized. (This can be done in a team setting as it allows team members to contribute to the audit's potential future direction and it generates a sense of ownership and buy-in.) It may be enough at this stage to focus the audit effort on a questioning technique such as the "Five Whys" technique, described later in this paper. This, too, would be based on preliminary information collected and analyzed (such as acquiring knowledge of business and assessing significance and risk) and could also be informed by the auditors' existing knowledge of the topic or the entity, as well as by findings from past audits.

This preliminary analysis is not meant to prejudge the final audit outcome, but rather to determine what to look for in subsequent examination work. In other words, preliminary root cause analysis is an input to scoping the audit.

In addition, decisions that result from this preliminary analysis could be built into the audit plan and/or audit program (or into an Audit Logic Matrix or Evidence Collection Plan). This would help ensure the collection of sufficient appropriate evidence during the examination phase. Audit planning involves estimating the time and effort this would require.

Examination Phase

In the examination phase, we suggest that auditors undertake an internal "mid-point review." This additional activity can be used to determine progress against the audit plan as well as to discuss emerging findings and evidence collected up to that point. Although the audit team will not yet have completed its field work nor have a full picture of results, this mid-point review can nevertheless help the team to

- identify or clarify emerging findings,
- discuss and determine potential root causes, and
- make adjustments to the audit scope and/or evidence collection activities (if required) while there is still time left in the examination period.

For example, as a result of this mid-point review, an audit team may conclude that it has, or has not yet, identified potential root causes. It can use this information to decide whether it would be appropriate to invest additional examination effort and resources.

Whether undertaking the preliminary analysis in the planning phase or the mid-point analysis in the examination phase, auditors are urged to consider the Main Categories of Root Causes.

At the mid-point stage, the analysis could be limited to team-based brainstorming using the Five Whys questioning technique or it could be supplemented by preparing a visual aid such as a draft "fishbone" diagram or cause map.

Key Consideration: Is "sufficient appropriate evidence" required for root causes?

Auditing standards require that auditors have sufficient appropriate evidence on file for all findings presented in the audit report. This includes those related to root causes. Yet determining causality and attribution in a complex human, political, social, economic, or public policy environment may be challenging. There may be multiple (often competing) theories as to cause and there may be no documentary evidence.

Ultimately, the extent and nature of evidence required to support findings related to root causes is a matter of professional judgment.

Key Consideration: Validating root causes

It is important to base root causes on evidence, not speculation or conjecture. Auditors can ask the following questions to validate suspected root causes.

- Is there any proof (something you can measure or observe) to support the root cause determination?
- Is there any evidence that shows that the possible root cause has produced the problem in the past?
- Is there anything underneath the possible root cause that could be a more probable root cause?
- Is there anything that this possible root cause requires in order to produce the problem?
- Are there any other causes that could produce the same problem?
- Does the organization's management agree with the root causes identified by the auditors?

Reporting Phase

Finally, in the reporting phase (or the transition between the examination and reporting phases), the suggested additional activity is to use root cause analysis to

- assess and document the significance of audit findings,
- draw valid conclusions, and
- develop recommendations that are rigorous and meaningful to management.

Performance auditors are encouraged, at all times, to consider the "characteristics of good recommendations" identified in the text box below. Root cause analysis helps to formulate audit recommendations aimed at correcting the underlying causes of a reported finding or deficiency. The ultimate goal is to ensure that management can design and put in place lasting solutions so as to avoid repetition, report after report, of the same audit finding. The use of visual tools (such as a fishbone diagram) or a document template can improve the rigour of the analysis and provide required documentation of the underlying causes.

It is further suggested that auditors present to and discuss the root cause analysis and its results with senior managers in the audit office during the reporting phase.

In all phases of the audit process, auditors and audit offices need to be mindful of the cost-benefit ratio of carrying out a root cause analysis. In this regard, there is no simple answer to the question "What level of effort is required?" This is a question that can only be addressed in the context of a specific audit, based on the auditors' professional judgment. This is, in part, why this discussion paper proposes early and ongoing discussion among team members. The earlier that root cause analysis is considered, the less likely that there will be additional work required toward the end of the audit.

Key Consideration: Characteristics of good recommendations

Audit offices have differing practices for formulating recommendations. Existing guidance suggests that recommendations should do the following.

- Logically flow from significant findings or observations.
- Be entity-specific.
- Be succinct but detailed enough to stand alone from the observations.
- Focus on the intended result or outcome to be achieved, not the means.
- Be specific enough to allow for future monitoring and assessing progress made in implementing them.
- Take into account practicality (such as legal and cost constraints) such that the audited organization can implement them in a reasonable time frame.

In this paper, we also suggest that audit recommendations should be aimed at the root causes of problems, not at their symptoms.

Part 3 – How to Incorporate Root Cause Analysis into Public Sector Performance Auditing

Main Categories of Root Causes

Cause and effect analytical techniques used in the private sector commonly group potential root causes into predefined categories, such as People, Methods, Machines, Materials, Measurements, and Environment. However, these categories are generally tailored to a manufacturing or service environment.

This discussion paper proposes a set of main categories and associated potential root causes that are more aligned with the public service, as set out in **Figure 2** and **Table 1**. These categories and potential roots causes include a mix of governance-related and operations-related matters.

- Governance-related matters are an organization's structures, systems, and practices to determine its strategic direction (based on its mandate), oversee the implementation of its work, and measure and report on performance.
- Operations-related matters are the day-to-day delivery of line functions and activities.

Overarching all of these matters are an organization's culture.

These categories are suggestive, not exhaustive. Auditors can add, subtract, or adjust categories as needed.

Figure 2 – Main Categories of Possible Root Causes

Table 1 – Main Categories of Possible Root Causes, Possible Causes,[2] and Sources of Evidence

Main Category	Possible Causes	Sources of Evidence
Culture[3] (overarching category)	▪ Inconsistent or inappropriate tone at the top ▪ No policies that define expected behaviours ▪ Biases in recruitment practices ▪ Lack of training to help staff adopt expected behaviours ▪ Lack of or inadequate incentives (to promote expected behaviours) or disincentives (to discourage violations of policies) ▪ Lack of monitoring and enforcement of policies; wrong behaviours tolerated by managers ▪ Existence of sub-cultures misaligned with expected corporate culture	▪ Corporate messages ▪ Other communications ▪ Polices and directives ▪ Human resources and labour practices ▪ Training ▪ Incentives and sanctions ▪ Monitoring practices ▪ Employee surveys ▪ Ethics ▪ Traditions ▪ Attitudes ▪ Morale
Authority (governance-related category)	▪ Authority for the program, activity, or function absent ▪ Multiple entities have competing authorities ▪ Clear direction for planning, delivery, or reporting not provided ▪ Mandate not understood ▪ Governance structures weak, inappropriate, or non-existent	▪ Legislation ▪ Regulations and rules ▪ Policies and directives ▪ Management of contracts and agreements ▪ Design and composition of boards, committees, central functions
Processes and planning (governance-related category)	▪ Rules and processes, including for decision-making, not established or unclear ▪ Strategic and operational plans not developed, not approved, or not SMART (Specific, Measurable, Attainable, Realistic, Time-bound)	▪ Strategic and operational plans ▪ Operating procedures and guidance ▪ Risks and controls

[2] The main categories and possible causes were defined by CAAF through research and consultation with audit practitioners and experts.

[3] The category of "culture" is based on research conducted by the Office of the Auditor General of Alberta in 2017. The possible root causes for culture are based on research conducted by CAAF for our Research Highlights article *Auditing Organizational Culture in the Public Sector*.

Main Category	Possible Causes	Sources of Evidence
Oversight and performance reporting (governance-related category)	▪ Oversight bodies not carrying out assigned functions ▪ Performance measures and intended outcomes not established ▪ Performance not measured or reported ▪ Preventable risks not proactively managed ▪ No risk management strategy for addressing strategic risks ▪ Required information not defined or not provided	▪ Performance indicators ▪ Financial and performance reporting ▪ Risk management strategy ▪ Availability of performance information
Delivery (operations-related category)	▪ Assets, people, and planning not brought together to deliver and implement an activity ▪ Delivery and implementation of goods and services poorly coordinated or not achieved ▪ Absence of monitoring and control of inputs, activities, outputs, and outcomes ▪ Absence of continuous improvement or corrective measures ▪ Strategic and operational plans not implemented	▪ Technology and tools ▪ Project management ▪ Resource scheduling (people and assets) ▪ Corrective measures ▪ Day-to-day monitoring
Assets (operations-related category)	▪ The right type and right amount of assets not available ▪ The financial and operational skills needed to properly use and apply the assets not available	▪ Funding ▪ Equipment ▪ Land and buildings ▪ Information technology infrastructure
People (operations-related category)	▪ Not having the right people, at the right time and place, doing what they are supposed to do ▪ People did something they should not do ▪ Weak hiring, retention, and/or compensation practices ▪ Roles and responsibilities unclear ▪ People with the necessary skills and competencies not in place ▪ Adequate supervision and performance appraisal process not in place	▪ Number of people ▪ Qualifications and competence ▪ Training ▪ Supervision and performance reviews

Applying these categories is part art, part science, and requires exercising judgment and flexibility. Consider the following, for example:

- Not all main categories or possible causes will apply to each audit.
- Findings and causes can be "exchangeable": what is considered a root cause in one audit could be considered a significant finding in another audit, depending on the specific objective and criteria. For example, in one audit, "weak governance processes" could be the cause of a significant finding related to a "lack of planning." In another audit, a "lack of planning" could be the cause for a significant finding related to "late and over-budget project delivery."
- The categories are interrelated. While the categories have been separated into discreet "boxes" for purposes of analysis, in the real world they are not mutually exclusive. Indeed, it is possible that multiple causes contribute to a given deficiency. There are many ways in which main categories could have been grouped.
- Some categories are crosscutting. For example, people-related issues (such as not having the right skills and competencies) could be manifest in other categories, such as governance and delivery.
- For any given significant finding, there could be multiple and interrelated causes, particularly in audits addressing complex topics involving several organizations or sectors. This could complicate the task of determining attribution to specific causes.

In a public sector environment, the causes of significant audit findings may be traced back to

- the merits of policy,
- the absence or adequacy of legislation,
- a lack of political prioritization, or
- the adequacy of resources.

It is up to each audit office to determine whether, and how, to report on such root causes.

Culture: An Overarching Category

"Culture" is a main category that can impact all of the others. The culture of any organization influences how it operates in reality. The published statements and documents of an organization, such as the stated vision, the mission statement, the organizational goals, and so on, are what we see—just as we can only see the part of an iceberg that is above the water's surface. But it is what lies beneath the surface that often explains how an organization actually functions. These invisible elements include such things as an organization's shared values, perceptions, and assumptions. (For more information on this topic, see our Research Highlights article *Auditing Organizational Culture in the Public Sector*.)

In the last few years, the internal audit community has placed much emphasis on auditing culture. The profession is evolving and developing ways to "take a hard look at the soft stuff." This trend is primarily a reaction to a succession of high-profile frauds and financial scandals in well-known private sector corporations (for example, the Volkswagen

emission scandal (Mansouri, 2016) or the Wells Fargo phony accounts scandal (Tayan, 2019)). More recently, the Boeing 737 Max crisis has been largely attributed to a flawed corporate culture (Reiners et al., 2019).

Also, it is interesting to note that issues of culture have been at the root cause of many high-profile disasters, such as in 2003 when the space shuttle Columbia disintegrated during atmospheric entry, killing its seven crew members. In its final report, the Columbia Accident Investigation Board (CAIB) said: "The organizational causes of this accident are rooted in the space shuttle program's history and culture" (CAIB, 2003). The report goes on to say: "the NASA organizational culture had as much to do with this accident as the foam" (CAIB, 2003). Culture was also cited as the root cause of the 2010 explosion of the Deepwater Horizon offshore oil rig in which 11 workers were killed and an estimated 775 million litres of oil were leaked into the Gulf of Mexico (National Commission, 2011; Deep Water Horizon Study Group, 2011). There is an emerging awareness that culture is a gateway to understanding how risk is managed within an entity. As a result, there is a growing interest in performing audits of organizational culture (ACCA, 2019; CIIA, 2019).

In the performance audit community, culture is also beginning to be recognized as a category of possible root causes to explain why significant audit observations and findings have occurred. In fact, in his message that accompanied the Auditor General of Canada's second performance audit on the federal government's Phoenix pay system, Michael Ferguson specifically cited culture as the root cause:

> "The culture has created an obedient public service that fears mistakes and risk. Its ability to convey hard truths has eroded, as has the willingness of senior levels—including ministers—to hear hard truths. This culture causes the incomprehensible failures it is trying to avoid." (OAG Canada, 2018)

Because of the pervasive nature of culture, the growing literature on auditing culture indicates that it is a key factor of organizational performance, successful change management, and the extent of fraudulent and unethical behaviours (CAAF, 2020). Therefore, it is a fundamental potential root cause that has to be considered in a rigorous root cause analysis.

Techniques for Probing and Questioning

At the heart of public sector performance auditing is the inquisitive mind and the desire to get to the bottom of things. And so it is with root cause analysis: It is an iterative process of enquiry, questioning, and exploration. This discussion paper suggests using the Five Whys questioning technique to brainstorm and generate ideas about potential root causes. Other questioning techniques could also be used but are not described in this paper.

Invented in the 1930s and made popular in the 1970s by the Toyota Production System, the Five Whys is a technique often used in cause analysis (Serrat, 2009). As the name implies, this technique involves asking the question "Why?" five times about a given event, problem, or significant performance audit finding. The theory suggests that the answer to the fifth "Why?" is usually pretty close to the root cause. (It could take fewer than or more than five). The Five Whys technique helps to separate the symptoms from the causes of a problem. One of the effects of this kind of iterative questioning is that it helps to avoid the hasty attribution of responsibility to "human error." It makes it more likely that possible situational, environmental, and other systemic factors will be brought to attention. The Five Whys

technique can also help to reduce the effect of confirmation bias by forcing an investigation into areas that may not initially be at the forefront of anyone's thinking about the problem at hand.

The Five Whys technique is simple and easy to use, is adaptable to many different situations, and can be used in a team setting. It can also be combined with other methods (such as fishbone diagrams) as described in a subsequent section of this paper.

An example of the Five Whys technique

Significant finding: The fleet of vehicles did not meet the availability target.
Why? The vehicles were often not available due to mechanical problems.
Why? Not enough technicians are on site to do all the necessary maintenance and repairs.
Why? Too few technicians have completed the training program in recent years.
Why? Not enough instructors to provide the required training.
Why? Many instructors retired the same year and there was no succession plan or recruitment strategy.
Recommendation *(aimed at symptom):* The organization should ensure that the fleet of vehicles meets availability targets.
Recommendation *(aimed at cause):* The organization should establish a succession plan and recruitment strategy for instructors and technicians to support maintenance activities.

The Five Whys method does have limitations, however. For example, since it relies on the professional judgment of the participants involved, the answers may not be repeatable; different auditors assessing the same situation could arrive at different conclusions. It is also reportedly easy to fall back on guesswork, to stop at symptoms, or to identify a single root cause when there may be many (Galley, 2018). Lastly, the Five Whys technique does not provide a structure or categorization for organizing the possible root causes. This limitation is addressed in the next section.

For auditors or audit offices that require a traditional approach to documenting the analysis of root causes, a suggested document template is set out in **Table 2**. This could be treated as a stand-alone template or could be integrated into existing templates used in the office.

Table 2 – Suggested Template for Documenting Root Cause Analysis

Significant Audit Finding	Answers to the Five Whys	Main Root Cause	Secondary Root Cause	Conclusion	Recommendation
	1. 2. 3. 4. 5.				

Root Cause Analysis Tools for Performance Auditing

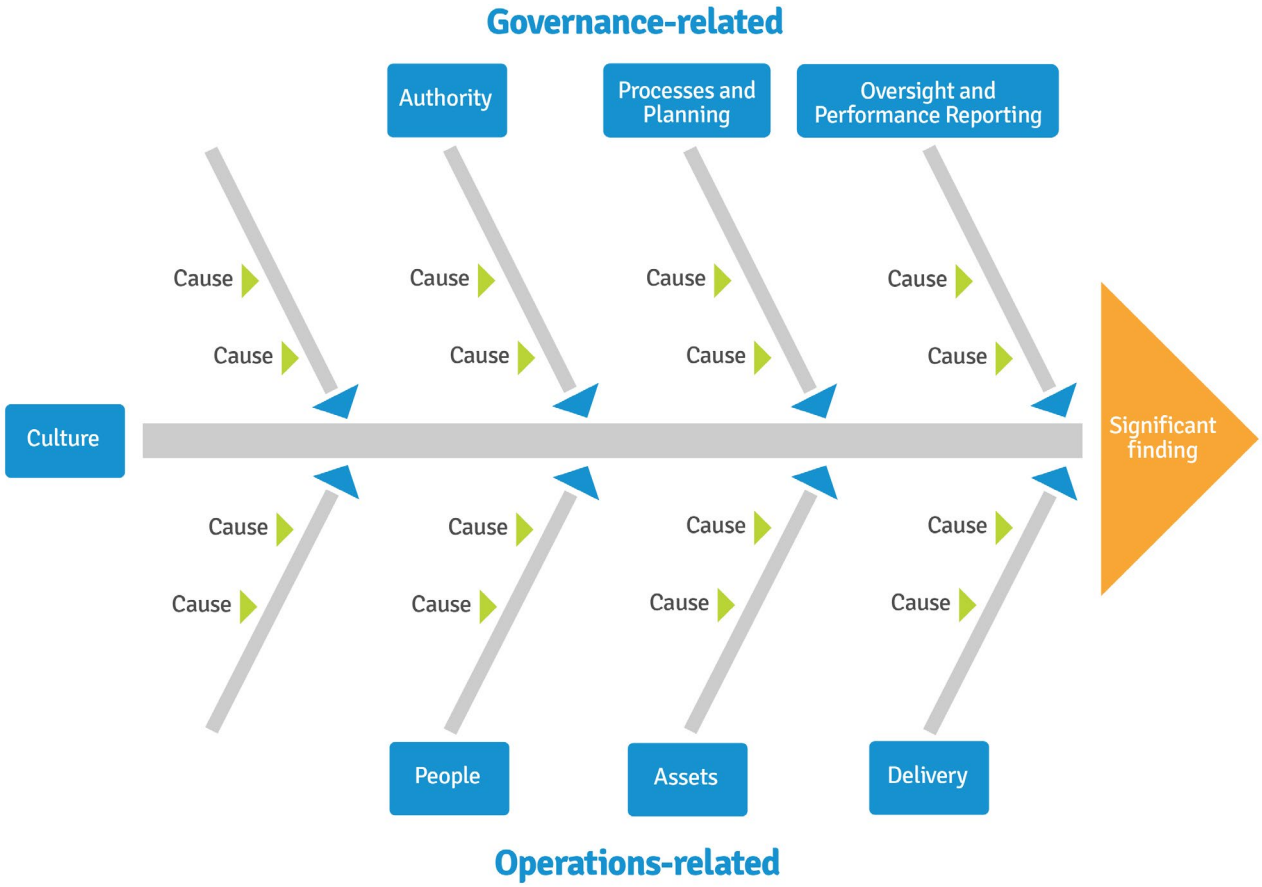
Various tools can be used to illustrate or visualize the relationships between root causes and significant audit findings. This discussion paper provides an overview of three of them: the fishbone diagram, cause mapping, and Pareto charts. (There are other visual aids available; see ASQ, 2020b).

Fishbone Diagrams

Fishbone diagrams, created by Kaoru Ishikawa (and therefore sometimes called "Ishikawa" diagrams), show the causes of a specific event. Common uses of the Ishikawa diagram are for product design, defect prevention, problem solving, and identification of potential factors causing an overall effect. Fishbone diagrams typically place the problem at the "head" of the fish and the main categories of root causes at the end of the "bones." Secondary or minor causes are then placed under the main categories (Tague, 2004).

This discussion paper presents a conceptual fishbone diagram (**Figure 3**) that has been tailored for use in public sector performance auditing by using the main categories of root causes previously described in Part 2. In this case, the significant audit finding appears at the head of the fish and the main categories of root causes (Culture, Authority, Processes and Planning, Oversight and Performance Reporting, People, Assets, and Delivery) appear at the ends of the primary bones. Possible causes typically appear under the main category.

Figure 3 – General Fishbone Diagram for Main Categories of Root Causes

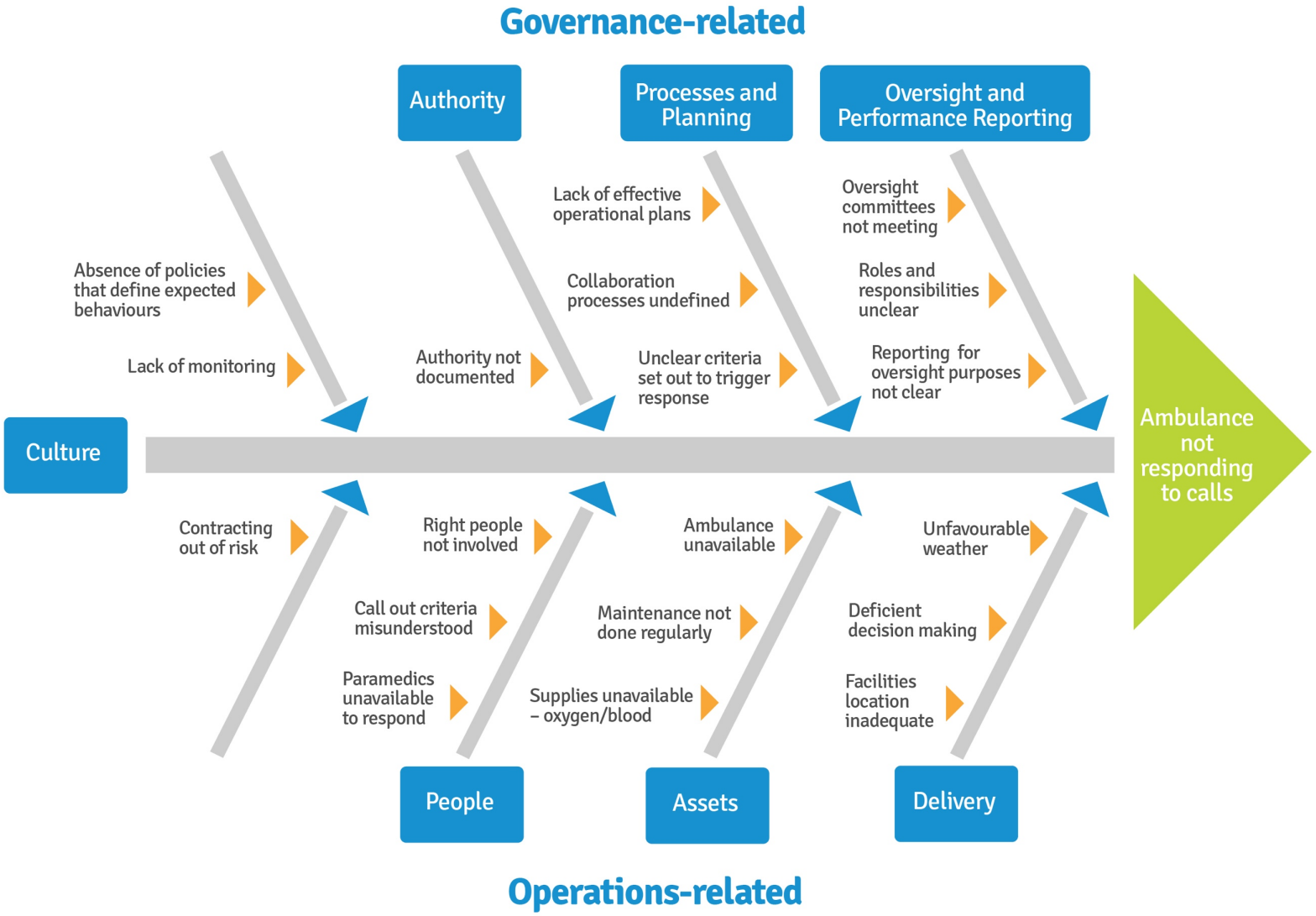


A fishbone diagram is meant to be a flexible tool that auditors can modify to suit their specific audit circumstances. It is also a useful tool to remove or reduce biases. Fishbone diagrams provide auditors with a set of predetermined potential causal categories at the start of an audit. This helps to broaden the scope of the analysis by looking at causal factors that may not immediately come to mind otherwise. The fishbone diagram technique can be especially effective when combined with a questioning technique such as the Five Whys.

Figure 4 presents a more detailed fishbone diagram based on a generic ambulance program.[4] It includes the possible causes under each main category.

[4] The examples in **Figure 4**, **Figure 7**, and **Figure 9** are fictitious and do not represent actual audit findings. The examples of possible causes are based on Nicholl et al. (2003), Wankhade and Brinkman (2014), Wankhade and Mackway-Jones (2015), and El Itani et al. (2019).

Figure 4 – Example of a Detailed Fishbone Diagram for an Ambulance Program (Using the Structure Provided by the Main Categories of Root Causes)



Tips for using the fishbone diagram

The fishbone technique uses a diagram-based approach for thinking through all of the possible causes of a problem. Here are suggested steps for using the fishbone technique.

1. Start with a blank paper or whiteboard and draw a fishbone diagram.
2. Describe the significant audit finding.
3. Determine the possible main category (or categories) involved.
4. Identify possible root causes under each main category. (Consider the "possible causes" listed in **Table 1**).
5. Analyze your diagram and exercise professional judgment to determine the most likely root causes.
6. Investigate these further, if needed, to confirm the actual root causes and obtain sufficient appropriate evidence (if these causes are to be included in the audit report).

Conduct the above steps with the audit team. This will strengthen the diagram by ensuring that all main categories and possible causes are considered and the right ones are retained.

Cause Mapping

A cause map is similar to a fishbone diagram, with some subtle but important distinctions. The cause mapping method actually uses Ishikawa's (fishbone diagram) convention by asking "Why?" questions in the direction we read. A cause map can start with just one "Why?" question and then expand to accommodate as many "Why?" questions as necessary.

Cause mapping is a root cause analysis method that improves the way people analyze, document, communicate, and solve problems. In many companies, problem solving is a confusing maze of different tools, baffling terms, and puzzling categories. An investigation should make a problem clearer, not more complicated. Cause mapping demystifies root cause analysis. It is an uncomplicated approach, grounded in the basics, that people find easy to learn and straightforward to apply (York et al., 2014).

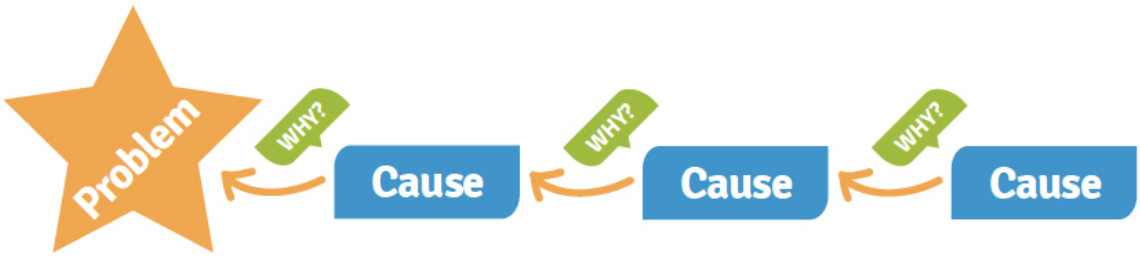
A clearly defined problem is an important step of the cause mapping and problem-solving process. Without a clear problem statement, people can drift off course, waste valuable time, and miss opportunities to solve the problem. The "problem" with defining problems is that everyone has a different perspective on what the "real" problem is. A well-defined problem at the onset will help auditors to avoid the common pitfalls that can derail an investigation.

A cause map provides a visual explanation of why an incident occurred. It connects individual cause-and-effect relationships to reveal the system of causes related to an issue. A cause map can be very basic (**Figure 5**) or it can be very detailed, depending on the issue.

Figure 5 – A Simple Cause and Effect Diagram

In the cause mapping method, a problem within an organization is defined as a deviation from the ideal state. A cause map always begins with this deviation and then backs into the causes by asking "Why?" questions. The questions begin with "Why did this deviation happen?". The response to this question provides a cause (or causes), which is written down to the right (**Figure 6**).

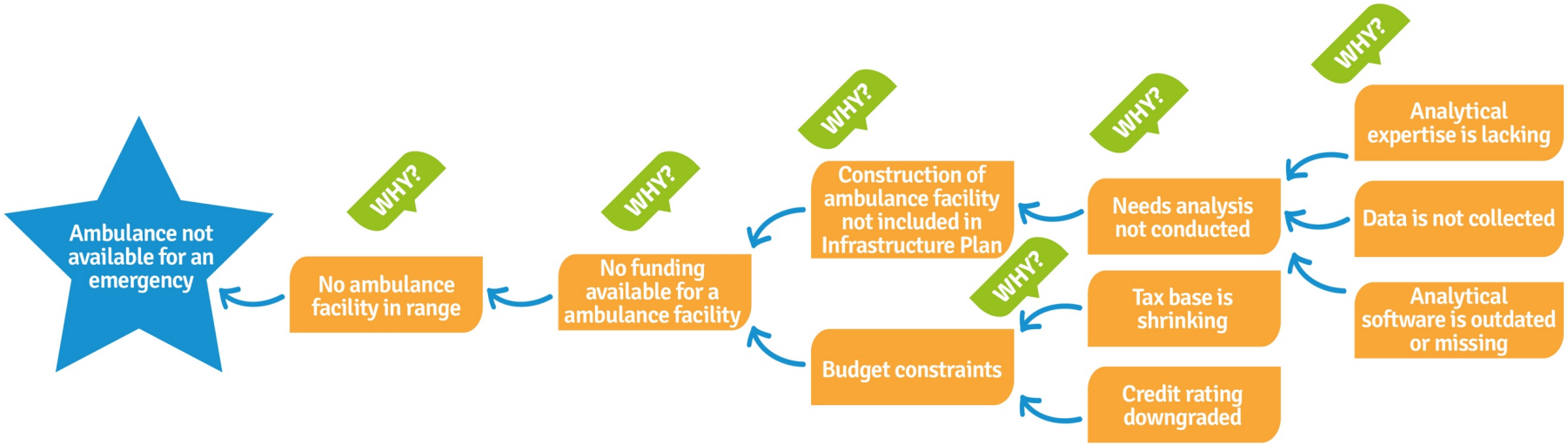
Figure 6 – Starting with a Problem and Identifying More Causes



The next question is again, "Why did this effect happen?". The cause that was written down last becomes the effect for the next "Why?" question.

Figure 7 builds on the example of the ambulance program used previously in **Figure 4**. It shows how the causal mapping method would be used to examine an actual program.

Figure 7 – Using a Causal Mapping Approach to Analyze the Performance of an Ambulance Program



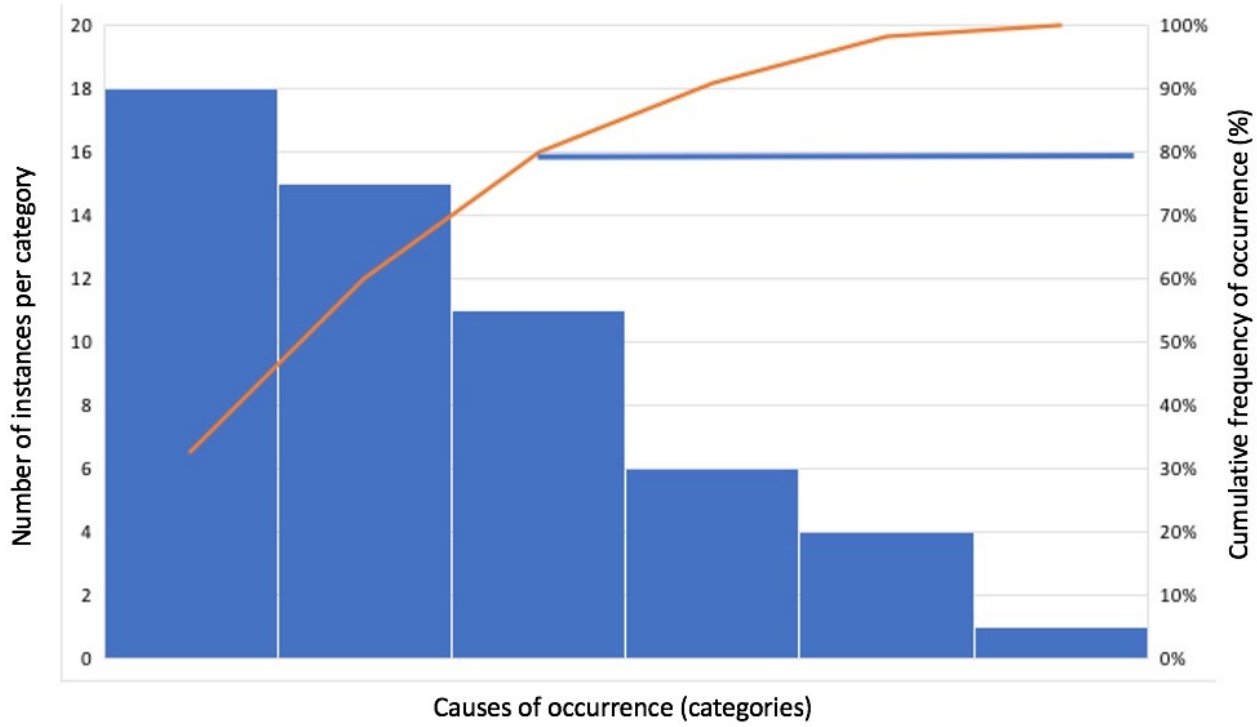
Pareto Charts

Vilfredo Pareto was an Italian engineer, sociologist, economist, political scientist, and philosopher. He introduced the concept of Pareto efficiency and helped develop the field of microeconomics. He was also the first to discover that income follows a Pareto distribution, which is a power law probability distribution. The Pareto principle was named after him, and it was built on observations of his such as that 80% of the land in Italy was owned by about 20% of the population: the famous 80/20 rule! (For further reading, consult Koch, 2001).

A Pareto chart, also called a Pareto distribution diagram, is a vertical bar graph in which values are plotted in decreasing order of relative frequency from left to right. Pareto charts are extremely useful for determining what problems need attention first because simply looking at the bars on the chart, which represent the frequency of occurrence of each variable, shows which variables have the greatest cumulative effect on a given system.

The Pareto chart in **Figure 8** provides a graphic depiction of the Pareto principle. A horizontal line (blue), drawn at the 80% cumulative frequency, intersects the cumulative frequency curve (orange). Drawing a vertical line down from this intersection point identifies which of the variables are significant. In this case the first three categories from the vertical axis represent 80% of all the reported cases.

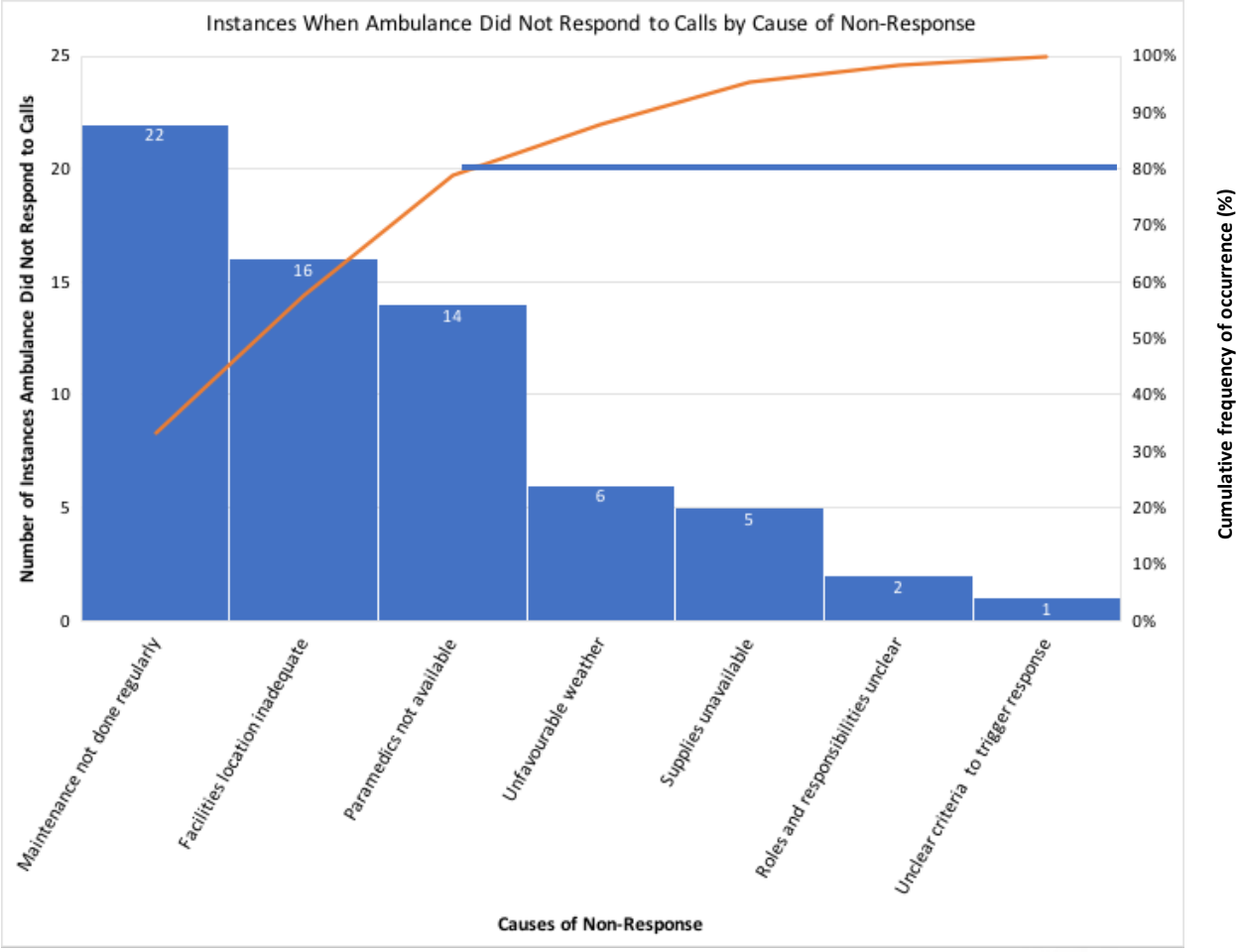
Figure 8 – Example of a Pareto Chart



In a performance audit context, Pareto charts are extremely useful when analyzing large amounts of data. The tool can quickly identify the most significant variables in terms of their frequency.

Figure 9 demonstrates how it could be used.[5] It is a Pareto chart based on simulated data that also uses the possible causes in the fishbone diagram in **Figure 4** for an ambulance program. It shows a range of causes that could be attributed for each instance where an ambulance was not able to respond to a call. It also shows the observed frequency of each cause. Note that the three most frequent causes (maintenance, facilities, and lack of paramedics) represent almost 80% of the failures, thus narrowing the number of issues that need to be addressed to increase the likelihood that ambulances are able to respond to a call. **Appendix B** provides the underlying data that was used to create this chart.

Figure 9 – Example of a Pareto Chart for an Ambulance Program



[5] A Pareto chart can be created in Excel 2016 and 2019. Learn how here.

The Potential Role of Cognitive Bias

One risk that auditors doing root cause analysis need to be aware of is the undue influence of "cognitive biases" (Okes, 2019). Cognitive biases make humans prone to systematic errors in judgment and decision making. Auditors are vulnerable to a host of such biases because performance auditing involves exercising judgment and making decisions throughout the audit process (in planning, evidence collection, data analysis, managing relationships, reporting, and more). Cognitive biases are of particular relevance to root cause analysis because humans have a predilection for causal thinking and are hard-wired to look for patterns in experience and data.

Cognitive biases describe how the human mind actually operates, not how it ought to operate. In that sense, the term is part of our empirical, scientific understanding of human nature. Research over the past 50 years has revealed more than 100 distinct cognitive biases and inspired new theories about how human beings make judgments and decisions.

A cognitive bias is a systematic pattern of deviation in judgment whereby we may draw inferences about other people and situations in an illogical fashion. Cognitive biases compel us to form beliefs and make decisions in systematic ways that are often erroneous. For example, we are prone to "confirmation bias." Confirmation bias is the tendency to focus on information in a way that confirms one's preconceptions and expectations, while giving less consideration to alternative possibilities.

The notion of cognitive biases was introduced by Amos Tversky and Daniel Kahneman in 1972 and grew out of their experience of people's innumeracy, or inability to reason intuitively with the greater orders of magnitude. Tversky, Kahneman, and colleagues demonstrated several replicable ways in which human judgments and decisions differ from rational choice theory.

Tversky and Kahneman explained human differences in judgment and decision making in terms of heuristics. Heuristics are the strategies derived from previous experiences with similar problems. Heuristics involve mental shortcuts that provide swift estimates about the possibility of uncertain occurrences (Baumeister & Bushman, 2010). Heuristics are simple for the brain to compute but sometimes introduce "severe and systematic errors" (Tversky & Kahneman, 1974).

Human thought has limitations, including these four:

- When there is too much information, we can miss things.
- When there are information gaps, we can fill in the wrong missing pieces.
- We can act too fast and reach the wrong decisions.
- When there are too many things to remember, we can pick the wrong ones.

One category of cognitive biases might be called cognitive laziness or "satisficing," which means that, rather than seeking an optimum result, we do just enough to get to a result that is sufficient. This is most applicable to root cause analysis (i.e. we did not dig deep enough!). Some examples of cognitive "laziness" in root cause analysis identified in the literature in the context of audits (CAQ, 2014; ACCA, 2017) include the following:

- Availability bias: A mental shortcut that relies on immediate examples that come to a person's mind when evaluating a specific topic, concept, method, or decision
- Anchoring bias: Latching on to the first piece of data and focusing on what it indicates while ignoring other evidence that might conflict
- Recency bias: Giving undue weight to the latest evidence reviewed; similar to the anchoring bias, which gives weight to the first evidence reviewed
- Confirmation bias: Looking only for evidence that supports our theory of what the cause is, rather than also searching for an alternative that might disprove our theory

These biases are especially relevant to root cause analysis because the human mind is hard-wired for causal thinking and pattern-seeking. One manifestation of this is the tendency to create "causal narratives" to make sense of our experiences. We construct a story of how a sequence of events—linked by cause and effect—result in or explain the outcome we hope to understand. A problem with this, according to Daniel Kahneman (2011), is that the human mind is a "machine for jumping to conclusions," exposing us to serious mistakes in evaluating the randomness of truly random events.

In relation to confirmation bias, for example, there may be many competing causal narratives that could explain a given outcome or observation. But once an auditor finds one that makes sense, it is difficult to see or consider alternatives. The bias is toward interpreting the available data in a way that confirms the causal narrative being actively considered. Compounding this, availability bias makes auditors prone to overestimating the likelihood of any given causal narrative being true. Events and examples that come readily to mind (and are thus easier to imagine) are judged to be more probable than events that do not come readily to mind.

Being aware of the influence of cognitive biases on performance auditing and root cause analysis can help avoid undesirable outcomes. The root cause mindset is a way of looking at things from a unique perspective, and it should inform decision making and not cause "groupthink" or strengthen biases, especially at the planning phase of an audit. (Groupthink is the tendency of members of cohesive groups to conform and not question decisions, which was a factor cited in the Columbia disaster.) The risk at the planning phase is that of prejudging the findings.

Auditors should take the time necessary to do a good investigation of an audit problem, especially if it is a recurrent problem (e.g. "We found the same thing last time!"). In order to mitigate against any of the cognitive biases, the key is for audit teams to continually ask themselves "What would prove us wrong?".

Conclusion

Root cause analysis in legislative and public sector auditing provides an opportunity to add more value to audit reports and increase their impact by

- providing insight and explanation for audit findings, and
- crafting recommendations that address the cause, rather than the symptoms, of deficiencies, thereby leading to lasting solutions.

This discussion paper suggests when and how root cause analysis can be integrated into the existing process for those who wish to do so. This includes using questioning techniques such as the Five Whys as well as visual aids such as fishbone diagrams. This paper also provides a set of main categories of possible root causes that is suited to the public sector and presents more information on two additional tools, the Pareto chart and cause mapping, to provide more examples of how root cause analysis can be implemented in public sector audits.

Since we published the first edition of this discussion paper, many Canadian audit offices, and more around the world, have begun to appreciate the value of root cause analysis and its application to public sector auditing. They embrace it as an important analytical tool to derive more meaningful and impactful audit recommendations. This new edition of this discussion paper acknowledges the growing awareness of culture as an important category of potential root causes. It also acknowledges the necessity to develop a “root cause mindset” accompanied by a keen awareness of cognitive bias when identifying root causes.

We hope that this discussion paper will stimulate awareness about root cause analysis and encourage auditors to explore the analytical possibilities it opens, while strengthening the relevance of their audit findings, conclusions, and recommendations.

Appendix A – Examples of Root Cause Analysis Tools

- The “Five Whys” questioning technique
- Pareto charts
- Fishbone (“Ishikawa”) diagrams
- Cause mapping
- Flowcharting
- SIPOC mapping (Suppliers, Inputs, Processes, Outputs, Customers)
- FMEA (Failure Mode and Effects Analysis)
- Kipling’s questioning technique (What, Why, When, Where, How, Who)

Appendix B – Spreadsheet Supporting Figure 9 – Example of Pareto Chart for an Ambulance Program

Causes	# of failures to respond	Cumulative # of failures	Cumulative percentage
Maintenance not done regularly	22	22	33%
Facilities location inadequate	16	38	58%
Paramedics not available	14	52	79%
Unfavourable weather	6	58	88%
Supplies unavailable	5	63	95%
Roles and responsibilities unclear	2	65	98%
Unclear criteria to trigger response	1	66	100%
Total	**66**		

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