# An Open GenAI Business Case Analysis Best Practice: A Methodology for Data Program Transformation

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# 1. Executive Summary

This document presents a standardized methodology for conducting a comprehensive business case analysis for Generative AI (GenAI) initiatives. Its purpose is to provide public agencies and other organizations with an open, repeatable, and business-driven process to ensure that investments in GenAI are strategically aligned, technically sound, ethically responsible, and deliver measurable mission value. The intended audience includes program managers, IT strategists, data scientists, and agency leadership who are tasked with evaluating and proposing GenAI solutions.

The methodology outlined herein is a phased approach that guides users from initial concept to a full "Modernization Blueprint."

- **Phase 1: Initiation and Scoping**, It begins with definition of the business problem and objectives are defined.
- **Phase 2: Business Analysis** involves a detailed examination of current processes and the prioritization of high-impact GenAI use cases.
- **Phase 3: Technical and Data Analysis** assesses the feasibility of the proposed solution, focusing on data readiness and technology requirements.
- **Phase 4: Modernization Blueprint** synthesizes all findings into a formal business case, including a cost-benefit analysis and implementation roadmap.
- **Phase 5: Governance and Continuous Improvement**, finally, establishes a framework for oversight and long-term success.

Adopting this best practice offers significant benefits, including:

- Tighter alignment of GenAI investments with core mission objectives.
- Improved decision-making through a structured and evidence-based analysis.
- Enhanced stakeholder buy-in and communication.
- Proactive identification and mitigation of technical, operational, and ethical risks.
- A clear, data-informed projection of return on investment (ROI).

This standard leverages the principles of the Methodology for Business Transformation (MBT) and is informed by the practical application of these concepts in the OGC Climate and Disaster Resilience Pilot reports on GenAI in Wildland Fire Management.

## 1.1 Methodology at a Glance: The 5-Phase Approach

This best practice guides users through a structured, five-phase journey to ensure GenAI initiatives are successful and deliver mission value.

- **Phase 1: Initiation and Scoping ("Foundation Building")** The objective of this initial phase is to establish a solid foundation for the analysis. Key activities include clearly defining the business problem, identifying key stakeholders, and setting clear boundaries and scope for the work to ensure the effort is aligned with strategic priorities from the outset.
- **Phase 2: Business Analysis ("Use Case Development")** This phase focuses on conducting a thorough analysis of the current business environment to identify and prioritize specific, high-value use cases for GenAI. This involves documenting the "as-is" state, identifying

stakeholder pain points, and defining a "to-be" vision where GenAI can provide a transformative impact.

- **Phase 3: Technical and Data Analysis ("Assess Readiness")** The objective here is to rigorously evaluate the technical and data feasibility of the prioritized use case. This is a critical reality check to ensure that required data is available and of sufficient quality, the proposed technology is appropriate, and that potential risks are identified and can be mitigated.
- **Phase 4: Modernization Blueprint and Business Case ("Propose Investment Basis")** This phase synthesizes all findings into a single, comprehensive, and persuasive document known as the "Modernization Blueprint". This final business case formally presents the solution, justifies the investment with a cost-benefit analysis, and provides a clear, actionable roadmap for implementation.
- **Phase 5: Governance and Continuous Improvement ("Establish Leadership Model")** The final phase establishes a robust framework to manage the GenAI solution throughout its lifecycle. It formalizes the processes for oversight, performance measurement, and continuous improvement to ensure the solution remains effective, secure, and aligned with strategic goals as technology and business needs evolve.

| | **Phase 1: Initiation & Scoping** | **Phase 2: Business Analysis** | **Phase 3: Technical & Data Analysis** | **Phase 4: Modernization Blueprint** | **Phase 5: Governance & Improvement** |
|---|---|---|---|---|---|
| Objective | Define the problem, scope, and stakeholders. | Analyze "as-is" state and prioritize "to-be" GenAI use cases. | Assess data and technology readiness and analyze risks. | Develop the full business case and implementation plan. | Establish the long-term governance and improvement model. |
| Inputs (Source) | • Org. Strategic Plans • User Pain Points • High-Level Ideas | • Project Charter • SME Access • "As-Is" Documentation | • "To-Be" Design Doc • Data Catalogs • Security Policies | • All outputs from Phases 1, 2, and 3 | • Complete Business Case • Org. Governance Policies |
| Outputs | • Project Charter • Stakeholder Map | • "As-Is" Analysis Report • Prioritized Use Case Matrix • "To-Be" Design | • Data Readiness Report • Tech Recommendation • Risk Assessment Matrix | • Complete Modernization Blueprint / Business Case | • Operational Governance Plan • Performance Measurement Plan • Improvement Schedule |
| Who (Role) | Business Sponsor / Program Manager | Business Analyst / Product Owner | Technical Lead / Data Architect | Project Manager / Business Sponsor | Governance Lead / Program Manager |
| Complexity | ◐ (Low-to-Medium) | ◑ (Medium) | ◑ (Medium-to-High) | ● (High) | ◑ (Medium) |

**Level of Effort -** The overall complexity or effort varies based on the amount of scope chosen to analyze. Smaller efforts with experienced Senior Analysts and Subject Matter Experts available can take 1-3 months, where larger efforts with more staff involved and less availability can take 6-9 months.

## 1.2 Target Audience for Methodology - Executive and Senior Analysts

Here is a breakdown of how the document meets the needs of the executive and analyst audience.

**For the Executive Sponsor (The "Why") -** An executive sponsor requires a high-level strategic view focused on business value, return on investment, and sound governance. The method and resulting outputs provides the strategic justification, financial rationale, and governance framework necessary for an executive to confidently understand, champion, and sponsor the proposed GenAI initiative. E.g.

- **Clear, High-Level Summaries:** The document begins with a concise **Executive Summary** that provides a complete overview of the methodology and its benefits. The **"Methodology at a Glance"** summary and the **"Phased Methodology Overview"** table we added offer an even quicker, at-a-glance understanding for a busy executive.
- **Focus on Business Value and ROI:** The process is explicitly **"Mission-Driven"**. Phase 4 culminates in a **"Modernization Blueprint"** with the primary goal of justifying the investment. The **Cost-Benefit Analysis (CBA) Worksheet** is specifically designed to calculate financial metrics like ROI, directly addressing the executive's need for financial justification.
- **Robust Governance and Risk Management:** This is critical for a sponsor. **Phase 5** is entirely dedicated to **"Governance and Continuous Improvement"** , outlining the need for a formal governance body , performance measurement , and a continuous improvement loop. The document specifically notes that for major initiatives to succeed, **"Business sponsorship is paramount, not IT as lead"**, which aligns perfectly with an executive's perspective on ownership and accountability.
- **Strategic Roadmapping:** The methodology requires the creation of a clear **Implementation Roadmap** and provides a template for detailed, phased **Action Plans**. This assures an executive that there is a clear, strategic, and manageable plan for execution, not just a one-time technical analysis.

**For the Senior Analyst (The "How") -** To perform this analysis and product the outputs, a senior analyst requires a detailed, logical, and repeatable process with practical tools. The method provides a complete and actionable playbook that a senior analyst can use to execute a thorough and defensible GenAI business case from start to finish. The document provides this through:

- **A Structured, Phased Methodology:** The document is built around five distinct phases, from Initiation to Governance. Each phase includes a clear Objective, Key Activities, Inputs, and Outputs , giving the analyst a clear, step-by-step process to follow.
- **A Comprehensive Toolkit of Templates:** Appendix B is the analyst's core toolkit. It contains seven detailed templates and checklists that provide the practical structure needed for key activities , including the Stakeholder Analysis Matrix , Use Case Prioritization Matrix , Data Readiness Checklist , and Risk Assessment Matrix.
- **Clear Guidance on Technical and Data Analysis:** The document provides specific guidance on performing critical technical analysis, such as conducting a Data Readiness Assessment , evaluating specific GenAI components like RAG and GANs , and performing a comprehensive risk analysis.

- **A Real-World Case Study:** Appendix C grounds the entire methodology in a real-world example by analyzing the OGC Wildland Fire reports. This gives the analyst confidence that the process is not just theoretical but is based on successful, practical application.

## 1.3 Methodology Background

The phased approach in this document is modeled on the **Methodology for Business Transformation (MBT)**, a proven and repeatable process with its origins in the U.S. federal government's efforts to modernize technology investments. The MBT was developed and applied within the U.S. Department of the Interior (DOI) as its standard methodology for implementing the U.S. Office of Management and Budget's (OMB) **Federal Enterprise Architecture (FEA)** framework. It provides a business-driven, stakeholder-centric approach to analyzing segments of an enterprise and developing actionable "Modernization Blueprints" that ensure technology solutions are directly aligned with strategic mission goals. The Methodology for Business Transformation (MBT) is not a standalone corporate framework; it is a practical, repeatable process with its roots in the **U.S. Federal Enterprise Architecture (FEA)** program. This context is key to its credibility.

1. **U.S. Federal Government Context (OMB and FEA):**
    - The foundation for this type of methodology was established by the U.S. **Office of Management and Budget (OMB)**. The OMB mandated that all federal agencies adopt an enterprise architecture approach to manage their technology investments and ensure they align with their mission.
    - This government-wide framework is known as the **Federal Enterprise Architecture (FEA)**. The FEA provided a common set of reference models (e.g., Business Reference Model, Data Reference Model) that agencies were required to use.
    - The goal was to move from siloed project development to a more holistic, "business-driven" approach where technology solutions were directly tied to improving business functions and services across the entire government enterprise.
2. **Department of the Interior (DOI) Implementation and the Birth of MBT:**
    - To comply with the OMB mandate, large agencies like the **U.S. Department of the Interior (DOI)** needed a practical way to apply the high-level principles of the FEA to their specific needs.
    - The **Methodology for Business Transformation (MBT)** was developed and refined at the DOI as their formal, step-by-step process for doing exactly this. It was their answer to the question: "How do we actually implement the FEA framework for a specific business area?"
    - MBT became the DOI's standard for analyzing a "business segment" (e.g., water management, land records), identifying redundancies, defining future-state improvements, and creating a "Modernization Blueprint" for investment.
3. **Xentity's Role and the Public-Facing MBT:**
    - Xentity Corporation was a key partner and consultant working directly with the DOI and other federal agencies to develop, document, and execute the MBT.
    - The material on the xentity.com/MBT website is a public-facing description of this federally-applied methodology that they helped create. It makes the principles and steps of this government-proven process accessible to a wider audience.

# 2. Introduction to GenAI Business Case Analysis

## 2.1 The Need for a Structured Approach

Generative AI offers transformative potential, with the ability to scale data processing beyond human capabilities and generate novel text, images, and data-driven insights in response to complex prompts. From enhancing disaster response planning to automating complex analysis, the opportunities are vast. However, the rapid evolution of GenAI also presents significant challenges. Issues such as model inaccuracies, "hallucinations," goal drift, high costs, and the need for specialized talent require a disciplined and structured approach to adoption.

Without a rigorous business case, organizations risk investing in solutions that are poorly aligned with user needs, technically unsustainable, or ethically unsound. This best practice provides the necessary framework to navigate this complexity, ensuring that GenAI is not just a technological pursuit but a strategic enabler of the organization's mission. The process detailed here is based on the methods used to produce successful analyses, such as the OGC Engineering Reports on GenAI for Wildland Fire, which assessed user needs, data sources, technology components, and implementation challenges to provide actionable recommendations.

## 2.2 Guiding Principles

To ensure success, the GenAI business case analysis process shall be guided by the following core principles:

- **Mission-Driven:** The primary driver for any GenAI initiative must be its direct alignment with the organization's mission and strategic goals. The analysis must clearly articulate how the proposed solution will advance specific business objectives, whether it involves improving situational awareness for disaster response, optimizing resource allocation, or enhancing community resilience.
- **User-Centric and Stakeholder-Engaged:** The process must be centered on the needs and workflows of the end-users. As demonstrated in the wildland fire use cases, success depends on involving stakeholders—from national planners to field-level personnel—throughout the process to ensure the solution is practical, trustworthy, and solves real-world problems. A "human-in-the-loop" approach is often essential for validating AI-generated insights and building trust.
- **Data-Informed:** Decisions must be rooted in evidence. This requires a thorough assessment of the core data needed to train and operate GenAI models. The analysis must evaluate the availability and quality of varied data types, including unstructured documents, tabular datasets, knowledge graphs, and raster collections.
- **Responsible and Ethical AI:** A commitment to responsible AI must be integrated from the beginning. This involves proactively addressing security, privacy, and ethical considerations. The framework must include plans for ensuring data provenance, providing traceability for AI-generated content, handling sensitive data like Personally Identifiable Information (PII), and mitigating model bias.
- **Iterative and Agile:** GenAI technology and organizational needs evolve rapidly. Therefore, this methodology promotes a phased, iterative approach over a monolithic one. It encourages developing proofs-of-concept and pilots to test assumptions, gather feedback, and refine

solutions before committing to full-scale deployment. This aligns with the understanding that a continuous training and labeled data improvement lifecycle is necessary to maintain model accuracy and relevance over time.

**The approach leverages the Methodology for Business Transformation (MBT)**

First, a thorough understanding of the MBT is crucial. From the information available on the Xentity website, the MBT is a business-driven, enterprise architecture approach to transformation and integrated change. It emphasizes a structured, phased methodology to ensure that business transformation is aligned with strategic goals and delivers measurable value.

The key tenets of the MBT appear to be:

- **Business-Driven:** The process starts with understanding the business needs, drivers, and strategic context.
- **Segmented Approach:** It breaks down the transformation into manageable "segments" for analysis and implementation.
- **Stakeholder-Centric:** It heavily involves stakeholders throughout the process to ensure buy-in and that the solutions meet user needs.
- **Performance-Focused:** It aims to align products and services directly with performance drivers and improve efficiencies.
- **Iterative and Adaptive:** The methodology has evolved through lessons learned, indicating a culture of continuous improvement.

The MBT appears to have several steps, including:

- **Initiation and Scoping:** Defining the scope and objectives of the transformation effort.
- **Analysis (Business and Technical):** Analyzing the "as-is" state and defining the "to-be" state.
- **Developing Recommendations:** Authoring a "Modernization Blueprint" with actionable recommendations.
- **Implementation and Governance:** Integrating the blueprint into the enterprise plan and portfolio, with a focus on governance and change management.

### 2.3.1 Content Considerations for Each Section

To ensure the process can be followed, the level of detail should be a balance of prescriptive guidance and adaptable frameworks.

- **For each step in the phases:**
    - **Objective:** A clear statement of what the step aims to achieve.
    - **Key Activities:** A bulleted list of the actions to be taken.
    - **Inputs:** What information or resources are needed to start the step.
    - **Outputs:** What are the tangible deliverables or outcomes of the step.
    - **Best Practices and "Words of Wisdom":** Include practical advice, tips, and common pitfalls to avoid. This is where the "lessons learned" from the MBT and the Wildland Fire reports will be invaluable.
- **Templates and Checklists:** These are critical for making the process actionable. For example, the Cost-Benefit Analysis section should include a downloadable spreadsheet template with pre-defined categories for costs (e.g., software, hardware, personnel, training) and benefits (e.g., reduced man-hours, increased accuracy, new capabilities).
- **Use of Visuals:** Incorporate diagrams and flowcharts to illustrate the process, similar to the conceptual diagrams in the Wildland Fire reports.

## 2.4 Integrating the Method Facilitation with AI

Traditional business case analysis methods often involve a linear, waterfall-style process with a team of analysts, consultants, and sponsors. To augment and accelerate this practice, we recommend integrating the methodology itself into a Large Language Model (LLM) or AI Chat Assistant. Our experience in developing the NSDI Modernization Blueprint demonstrated that this approach can:

- Facilitate the rapid ingestion, digestion, and synthesis of a large-scale desk audit (in our case, nearly 150 documents).
- Speed up the identification of recurring themes, trends, and patterns across decades of policy and technical documents.
- Act as a Socratic partner, facilitating gap analysis by asking clarifying questions based on the method's required outputs.
- Rapidly draft initial versions of the blueprint and its associated work products and templates.

This AI-assisted facilitation can speed up the desk audit and synthesis process by an estimated **10-20x**, allowing human consultants and subject matter experts to focus their valuable time on high-level analysis, strategic refinement, and stakeholder engagement. To achieve this accelerated process, we encourage using an AI assistant of your choice with a structured, multi-prompt approach.

### A Proven Prompting Strategy

**Prompt 1: Initial Setup and Context Loading** First, provide the AI with the complete methodology document and a clear set of instructions for the engagement. This initial prompt is highly effective. Clearly stating the roles, the step-by-step process, and the "hold response" instruction prevented the AI

from jumping ahead and allowed for a thorough and patient desk audit. Staying within a single chat thread was also critical for maintaining the deep context established over hundreds of interactions. If possible, you can build your own LLM, RAG, MCP, and Vector Database for future use and sharing.

> *Please ingest, digest, and apply the attached methodology to generate a report on a specific topic. I will guide you through a phased process. First, I will provide the general problem objective. Next, I will provide numerous documents for a background desk audit. Please hold your response and digest all materials until I give the signal "OK, lets go." After the signal, you will act as the facilitator, asking clarifying questions based on the method and proposing options to address gaps or risks you identify. Our final goal is to generate a starter report in a collaborative canvas.*

**Prompt 2: Defining the Problem** Next, provide the initial problem statement, scope, and raw needs. Providing the documents in categorized batches (e.g., "Core Strategy," "Federal Policies," "Technical Concepts") was extremely helpful. It allowed the AI to build a more structured understanding of the problem space and formulate more precise questions later in the process.

> *The attached Purpose, Objectives, scope, raw needs, background, and ideas are the initial input for the problem statement. I will now provide documents in categorized batches for the desk audit to help you organize the research and build out the best blueprint per the method. What we need to do is run the method, use these documents, and draft an initial report focused on the needed components, architecture, services, governance, investment guidance, etc. This input above will help, based on the method, to generate a problem statement that hits the above purpose and objective points and more. Finally, as we do the desk audit, please keep in mind we'll need bibliography references - so keep that in mind when we do the report.*

**Prompt 3: The Desk Audit (Iterative)** Upload the desk audit documents in batches with clear category tags. Be aware of your chosen AI's context window and file size limits.

**Prompt 4: Initiating the Analysis** Once all documents are loaded, give the clear signal to begin.

> *That was the last set of documents. **OK, lets go.** Thank you for your patience and diligence. This should provide a rich and detailed foundation for our analysis.*

At this point, the AI will begin to facilitate the analysis, asking questions phase by phase, as we demonstrated in the NSDI Blueprint collaboration. Provide answers and include additional attachments to support responses or pointers to attachments. If you need additional documents, you can do such and treat it like Prompt 3.

**Prompt 5: The Refinement Phase** After the AI generates the initial blueprint, download the document and create a checklist of desired refinements. You will likely need to modify the template (e.g. headers, table of contents, other moves) and then get familiar with the outputs. Review it and make a task list by phase for the changes you may want to make such as the following examples:

- Phase 1 - Stakeholders missing, changes; Mapping of Stakeholders to Use Cases
- Phase 2 - Validate data source lists, add tables
- Phase 3 - Further background context on as-is state, history of changes, etc.

- Phase 4 - Additional target components, mapping Use Cases to Components, specific component expansion or technology references
- Phase 5 - Add implementation plan, add TCO/ROI Business case section, improved next steps and recommendations
- General - Ask the AI to review or emphasize specific document more; clean up citations; create bibliography/references summary; expand or shorten sections; revisit executive summary with target emphasis; improved risk section by the template

Then, re-engage the AI for iterative improvements. This iterative refinement process is far more effective than trying to perfect the document in a single pass. It allows the human expert to guide the strategic direction, correct nuances, and add subject matter expertise, while the AI handles the rapid redrafting and integration of information from the extensive source materials. This collaborative loop proved to be the most valuable aspect of the entire process.

> *We will now begin the document refinement phase. I will provide a series of targeted prompts for specific sections. I will take your output and integrate the changes into a local copy of the document. Please leverage your current work and all the desk audit inputs to assist with these refinements.*

Track your checklist, iterate and integrate improvements while editing the document offline (editing in canvas tends to be slower).

# 3. Phase 1: Initiation and Scoping ("Foundation Building")

**Objective**

The objective of Phase 1 is to establish a solid foundation for the business case analysis. This phase focuses on clearly defining the business problem or opportunity, identifying the key stakeholders and project team, and setting clear boundaries for the work. A well-executed initiation phase ensures the analysis is focused on a genuine business need and is aligned with strategic priorities from the outset. This corresponds to the "Foundation Building" phase of a successful GenAI implementation roadmap.

**Key Activities**

## 3.1 Identify the Business Need/Opportunity:

- **Clearly articulate the problem** to be solved or the capability gap to be filled. The problem should be framed in the context of the organization's mission. For example, the problem may be a need to improve the speed and accuracy of situational awareness during disaster response or to optimize the allocation of critical resources.
- **Conduct preliminary research and interviews** with key personnel to validate the problem and gather initial context. Identify a mix of executive, mission, data, and technology candidates for the first round, while knowing there will be follow-up for deep dive later in Phase 2.

## 3.2 Define High-Level Business Outcomes:

- **Translate the business need into a set of desired, measurable outcomes.** These outcomes should be specific, achievable, and relevant.
    - Examples include: "Reduce the time to generate initial incident action plans," "Improve the accuracy of wildfire risk forecasts," or "Increase the efficiency of insurance claims processing."

## 3.3 Form the Core Team & Map Stakeholders:

- **Identify and form a cross-functional core team to lead the analysis.** This team should include representation from business operations, IT, data science, and project management.
- **Map all relevant stakeholders** across the enterprise. In a public sector context, this could include national and regional planners, incident command staff, field-level operators, and partner agencies or industries.
- **Develop a stakeholder engagement plan** that defines how and when each group will be involved to ensure their needs and expertise inform the process.

## 3.4 Define Scope and Boundaries:

- **Explicitly define what is "in scope" for the business case analysis**. This includes the specific processes, organizational units, and technologies to be examined.
- **Equally important is to define what is "out of scope"** to manage expectations and prevent the analysis from becoming too broad. For instance, an analysis might focus on GenAI for wildfire *response* while explicitly excluding the *recovery* phase for a later effort.

## 3.5 Document Initial Assumptions and Constraints:

- List all assumptions being made at the start of the project (e.g., "access to necessary data will be granted," "key personnel will be available for interviews").
- Identify all known constraints, which may include budget limitations, technology standards, regulatory requirements, or project deadlines.

**Inputs for this Phase**

- Organizational strategic plans and mission statements.
- Existing documentation on challenges, user pain points, or identified capability gaps.
- High-level ideas or proposals for leveraging GenAI.
- Input from subject matter experts and potential end-users.

**Outputs of this Phase**

- **Project Charter:** A formal document that includes the problem statement, business outcomes, scope, assumptions, constraints, and a list of the core project team members.
- **Stakeholder Map and Engagement Plan:** A visual map of all stakeholders and a corresponding plan detailing their roles, interests, and the plan for communication and engagement throughout the analysis.

# 4. Phase 2: Business Analysis ("Use Case Development")

**Objective**

The objective of Phase 2 is to conduct a thorough analysis of the current business environment to identify and prioritize specific, high-value use cases for GenAI. This phase bridges the gap between the high-level business problem defined in Phase 1 and a concrete, conceptual solution. The process involves documenting the "as-is" state, identifying stakeholder needs and pain points, and then defining a "to-be" vision where GenAI can provide a transformative impact.

**Key Activities**

## 4.1 Analyze the "As-Is" State:

- **Document the current business** processes, workflows, and performance metrics associated with the problem area. This includes mapping the sequence of activities, the systems used, and the roles involved.
- **Conduct structured interviews** and workshops with stakeholders to understand their day-to-day operations, challenges, and unmet needs. The goal is to identify specific pain points and inefficiencies that GenAI could potentially alleviate.
- **Analyze existing data and reports** to establish a baseline for current performance. This baseline will be critical for measuring the impact of the GenAI solution later.
    - For example, in the wildland fire context, this would involve documenting how situational reports are currently generated or how resource allocation decisions are made during an incident.

## 4.2 Identify and Prioritize GenAI, AI, Analytics and Data Workflow Use Cases:

- **Brainstorm a list of potential GenAI use cases** based on the "as-is" analysis. These use cases should be directly linked to the identified pain points and desired business outcomes.
- **Categorize the use cases into logical MISSION groups**. The GenAI Wildland Fire reports categorize use cases by disaster management phase (e.g., Mitigation, Preparedness, Response, Recovery) or by stakeholder group (e.g., Helping People, Insurance Business Management).
- **Categorize the use cases of the capabilities** and consider using a framework to guide stakeholders of what areas to consider the use cases capabilities touch:

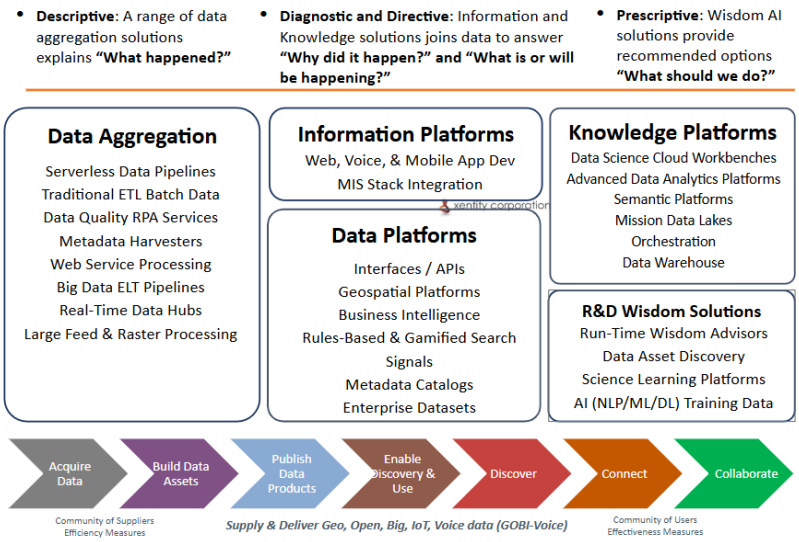
| Data & Foundation | Services & Reasoning | Applications & Interaction |
|---|---|---|
| **[Pipelines]** ingest and agent models for big, fast, geo data to feed advanced analytics and AI models.<br>**[Foundation]** models integration with Pre-trained GeoAI Models, LLM/SLM, and Domain-Specific Models (Prithvi, SAM, ClimaX)<br>**[Review & Extraction]** LLM, SLM, classification, Geospatial tagging, and extraction, real-time workflows, and from large unstructured lakes for documents, | **[Reasoning]** lab development of Task-Specific, Fine-Tuned, and integrated Generalized models for Skills, Agents, and Utilities<br>**[Adapt and Analyze]** with ML analytics, LORA, regression, transform, forecast and Foundation Model training<br>**[Components]** and Patterns for GeoAI Models, AI Skills (e.g., Code Generators), AI Agents (e.g., Data Explorer), and Utility Services (e.g., Text/Vision) including RAG | **[Integrate]** (The How) analytics, skills, agents, lakes in advanced visualizations in common tools (GIS, BI, ERP, etc.)<br>**[Visualize]** (The What) with Tracking, Classification, Detection in maps, apps, BI, Digital Twins, 3D, AR, XR<br>**[Interact]** (Actions for the Who) Engage via AI Assistants for app creation, coding, and data discovery. Use Voice, Chat, Q&A Prompts, and other agent-driven exploration tools. |

| | | |
|---|---|---|
| various imagery, LiDAR, feeds | and ReAct | |

- **Evaluate and prioritize these use cases using a formal matrix.** This matrix should score each use case against a set of defined criteria. As demonstrated in the OGC CDRP reports, valuable criteria include:
    - **Stakeholder Need / Mission Impact:** How critical is this for the end-user and the organization's mission?
    - **GenAI Value:** How significant is the potential improvement that GenAI can provide compared to existing solutions?
    - **Categorization:** Have capability to breakdown by the mission or AI Capability category tagged to assist in trends or to uncover findings.
    - **Technical Feasibility:** How practical is it to develop and implement this use case with current technology and data?
    - **Data Readiness:** Is the necessary data available and of sufficient quality?
- The output should be a ranked list of use cases, allowing the team to focus on the one(s) with the highest potential for success and impact, such as "Community Risk & Resilience Assessment" or "Loss Analysis for Portfolio Management".

## 4.3 Develop the "To-Be" Vision:

- **For the highest-priority use case(s), develop a clear and detailed "to-be" vision**. This is a narrative and visual description of the desired future state with the GenAI solution implemented.
- **Create a conceptual workflow diagram** that illustrates how users will interact with the new GenAI-powered process.
- **Develop a high-level conceptual architecture diagram.** This diagram should show the key components of the solution—such as Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), and potential AI Agents—and how they connect with data sources and end-users. It should also illustrate the flow of data from input to a potential GenAI-generated solution. Use the reference below to help in laying out and organizing the groups of components.




**Inputs for this Phase**

- Project Charter and Stakeholder Map (from Phase 1).

- Access to subject matter experts and end-users for interviews and workshops.
- Documentation of existing processes and systems.

**Outputs of this Phase**

- **"As-Is" Process Analysis Report:** A document detailing the current workflows, pain points, and performance baselines.
- **Prioritized Use Case Matrix:** A ranked list of potential GenAI use cases with their evaluation scores, justifications, and a recommendation of which use case(s) to pursue.
- **"To-Be" Conceptual Design Document:** A document containing the narrative vision, conceptual workflow diagrams, and high-level architecture for the selected use case.

# 5. Phase 3: Technical and Data Analysis (“Assess Readiness”)

**Objective**

The objective of Phase 3 is to rigorously evaluate the technical and data feasibility of the prioritized GenAI use case. This phase is critical for grounding the "to-be" vision in reality by ensuring that the required data is available and of sufficient quality, the proposed technology is appropriate, and potential risks are identified and mitigated. The outcome of this phase determines whether a viable solution can be built.

**Key Activities**

## 5.1 Conduct a Data Readiness Assessment:

- **Inventory and Categorize Data Sources:** Identify and inventory all potential data sources required to train and operate the GenAI model. This includes a wide range of types, such as unstructured documents, tabular datasets, knowledge graphs, and raster collections. A Data Reference Model (DRM) should be used to categorize these sources into logical information classes, such as STRATEGIC GUIDANCE, TOPOGRAPHIC, WEATHER, and FIRE ANALYTIC PRODUCTS, as was done in the wildland fire reports.
- **Assess Data Quality and Gaps:** Evaluate each data source for its quality, availability, accessibility, and potential for bias. This assessment is crucial because the performance of any GenAI model is fundamentally dependent on its training data. This activity must also identify critical data gaps. For example, the analysis for the wildland fire use case identified a gap in national structures data, which is a key input for risk assessment.
- **Define Data Governance and Security:** Establish clear requirements for data governance, security, and the handling of any personally identifiable information (PII). This includes defining protocols for data provenance and traceability, which are essential for building trust and ensuring the ethical application of AI.

## 5.2 Conduct a Technology Assessment:

- **Evaluate GenAI Components:** A complete GenAI solution often requires augmenting a foundational Large Language Model (LLM) with other technologies to provide domain-specific context and accuracy. The assessment must evaluate a suite of components:
    - **Retrieval-Augmented Generation (RAG):** To enhance contextual understanding by retrieving relevant information from a specified knowledge base, which is critical for "knowledge-intensive" scenarios.
    - **Generative Adversarial Networks (GANs):** To generate or enhance synthetic imagery, which is valuable for tasks like damage assessment or predictive modeling from satellite and aerial imagery.
    - **AI Agents:** To orchestrate real-time API requests and call other specialized models, enabling the integration of live data feeds.

- **Natural Language Processing (NLP):** To complement LLMs by performing nuanced analysis and extracting specific information, such as named entities, from unstructured text.

- **Determine Architecture and Integration Needs:** Assess how the proposed technology stack will integrate with existing enterprise systems addressing Data, Information, Knowledge, and Wisdom Integration.

| Maturity | Asks | Complexity | Function | Data Needs |
|---|---|---|---|---|
| **Data** | "What happened?" | Simple Predictable | Reporting | raw feeds, simple datafiles, logs, content, simple queries in DB or warehouse |
| **Information** | "Why did it happen?" | Complicate Enterprise | Analytics | relational databases, warehouse, math, MIS, GIS, Temporal/Time-Series Data, data services, and early standards |
| **Knowledge** | "What is happening?" | Complex Fluid | Monitoring | engineering data, semantic data, time-series and GIS integration, detailed attributes and at times higher performance capacity, quality data, relationship understanding, RDF |
| **Wisdom** | "What should we do?" | Chaotic Uncertain | Predictive | AI-based and more prediction/solution relies on natural language processing, higher order linked data, fuzzy logic, interpretive signals, sentiment analysis, and low-level atomic big data analytics). |

- Consider the full data, information, knowledge integration with AI Wisdom capabilities noted in Phase 4.

| Data Aggregation | Information Platforms | Data Platforms | Knowledge Platforms |
|---|---|---|---|
| Serverless Data Pipelines<br>Traditional ETL Batch Data<br>Data Quality RPA Services<br>Metadata Harvesters<br>Web Service Processing<br>Big Data ELT Pipelines<br>Real-Time Data Hubs<br>Large Feed & Raster Processing | Web, Voice, & Mobile App Dev<br>MIS Stack Integration (e.g. MIS, ERP, CRM, etc.) | Interfaces / APIs<br>Geospatial Platforms<br>Business Intelligence<br>Rules-Based & Gamified<br>Search Signals<br>Metadata Catalogs<br>Enterprise Datasets | Data Science Cloud Workbenches<br>Advanced Data Analytics Platforms<br>Semantic Platforms<br>Mission Data Lakes<br>Orchestration<br>Data Warehouse |

- **Confirm Human-in-the-Loop Requirement:** For high-stakes applications like disaster management, it is imperative to design the solution as a "human-in-the-loop" system. This ensures that AI-generated recommendations are reviewed and validated by human experts before action is taken, improving reliability and trust.

## 5.3 Perform a Comprehensive Risk Analysis:

- **Identify and Categorize Risks:** Proactively identify potential risks across multiple domains:

  - **Technical Risks:** These include model inaccuracies, "hallucinations," lazy responses, goal drift, and the challenge of keeping models updated with real-time data.

  - **Operational Risks:** These include a lack of user trust, the need for new workforce skills, and cultural resistance to adopting new tools.

    - **Ethical Risks:** These include potential model bias derived from training data and a lack of transparency or traceability in AI-generated outputs.
    - **Security Risks:** These include protecting sensitive data and ensuring the system is resilient against adversarial attacks.

- **Develop a Risk Mitigation Plan:** For each identified risk, assess its likelihood and potential impact. Develop a clear mitigation strategy for high-priority risks. This plan is an essential component of the final business case.

**Inputs for this Phase**

- "To-Be" Conceptual Design Document (from Phase 2).
- Organizational data catalogs and system architecture diagrams.
- Enterprise security and data governance policies.

**Outputs of this Phase**

- **Data Readiness Report:** A comprehensive report detailing the available data sources, their quality assessment, and a clear analysis of any data gaps that must be addressed.
- **Technology Recommendation Document:** A document outlining the recommended GenAI technology stack, conceptual architecture, and integration plan.
- **Risk Assessment Matrix:** A formal register of identified risks, their potential impact, and the corresponding mitigation strategies.

# 6. Phase 4: Modernization Blueprint and Business Case (“Propose Investment Basis”)

**Objective**

The objective of Phase 4 is to synthesize all the findings from the preceding phases into a single, comprehensive, and persuasive document: the "Modernization Blueprint" or final business case. This document formally presents the recommended GenAI solution, justifies the investment through a detailed cost-benefit analysis, and provides a clear and actionable roadmap for implementation. It is the primary decision-making tool for leadership to approve and fund the initiative.

**Key Activities**

## 6.1 Formalize the Solution Recommendation:

- Provide a detailed description of the recommended GenAI solution, including its proposed architecture, core capabilities, and how it will function within the "to-be" workflow.
- Clearly articulate how the solution addresses the business need identified in Phase 1.
- The recommendation should incorporate findings from the technical analysis, such as the plan to augment foundational LLMs with other techniques like RAG, GANs, or AI Agents to ensure domain-specific accuracy and functionality.
- Specify how the solution will be designed as a human-in-the-loop system, ensuring that human experts review and validate outputs for critical decisions.
- **Develop a Communication or Outreach version of the Conceptual Architecture** that lays out the potential integrations.

## 6.2 Develop the Cost-Benefit Analysis (CBA):

- **Estimate the Total Cost of Ownership (TCO)** for the solution. This must include one-time costs (e.g., initial software/hardware procurement, model development, initial training) and recurring operational costs (e.g., cloud computing/API fees, personnel, data maintenance, model retraining).
- **Quantify the expected benefits.** These include tangible "hard benefits" like reduced man-hours, lower operational costs, and increased processing speed. They also include "soft benefits" that are critical to mission success but harder to monetize, such as improved decision quality, enhanced community safety, or more effective disaster preparedness.
- **Calculate key financial metrics** to support the investment decision, such as Return on Investment (ROI), payback period, and Net Present Value (NPV).

## 6.3 Create an Implementation Roadmap:

- Outline a detailed, phased implementation plan. This roadmap should be modeled on a structure that includes key activities and deliverables for each phase, ensuring a managed rollout. A best practice is to follow a multi-phase approach:

    - **Pilot Implementation:** Develop functional prototypes for prioritized use cases and conduct pilot tests with stakeholder feedback to refine the solution. This phase focuses on integrating datasets and proving the model's value in a real-world scenario.
    - **Scaling & Optimization:** Deploy the validated solution across broader organizational processes. This includes developing training modules for end-users and implementing monitoring systems to track performance and ensure compliance.
    - **Ecosystem Expansion:** Establish partnerships with additional stakeholders to enhance data sources and expand the solution's reach and impact.
- For each phase, define clear milestones, timelines, resource requirements, and specific success metrics (Key Performance Indicators - KPIs) that will be used to measure progress and impact.

## 6.4 Develop a Change Management & Communication Plan:

- **Identify the organizational changes** that will result from implementing the new GenAI solution. This includes changes to roles, responsibilities, and standard operating procedures.
- **Develop a comprehensive plan** for training and upskilling affected staff to ensure they have the necessary competencies to use the new tools effectively.
- **Outline a strategic communication plan** to keep all stakeholders informed about the project's progress, benefits, and impacts, thereby managing expectations and fostering buy-in for a smooth transition.

**Inputs for this Phase**

- All outputs from Phases 1, 2, and 3, including:
    - Project Charter
    - "As-Is" Analysis and "To-Be" Conceptual Design
    - Data Readiness Report and Technology Recommendation
    - Risk Assessment Matrix

**Outputs of this Phase**

- **The Complete GenAI Business Case / Modernization Blueprint:** A single, consolidated document containing the full analysis, the recommended solution, the cost-benefit analysis, the implementation roadmap, and the change management plan.

# 7. Phase 5: Governance and Continuous Improvement (“Establish Leadership Model”)

**Objective**

The objective of Phase 5 is to establish a robust framework for governance and continuous improvement that will manage the GenAI solution throughout its lifecycle. Deployment is not the end of the project; it is the beginning of the operational phase. This phase ensures that the solution remains effective, secure, and aligned with strategic goals as technology, data, and business needs evolve. It formalizes the processes for oversight, performance measurement, and iterative enhancement.

**Key Activities**

## 7.1 Implement the Governance Model:

After categorizing the use cases, capabilities, datasets, and technology integrations, it is important to understand the governance and championing of the future efforts. This analysis is an on-going portfolio management effort that will continue the dialog and investment decisions that will need to consider the gap between capability, dataset readiness, and balancing what is WANTed to be done and begin to uncover which data CAN support answering those questions.

To achieve implementation, recognize it is less of a technical challenge (as many other industries are achieving this level now), but tighter data acquisition control with defined needs and application design will be the key to achieve this level. Many initiatives stall not due to technical hurdles, but a lack of business sponsorship to lead enterprise operations, monitoring, and data integration. ROI is often delayed until the "chasm" is crossed, and while IT labs generate initial energy, full-scale implementation demands significant investment and programmatic management, including Data Governance and Lifecycle Management, for sustained success. As an enterprise capability, this should be a future investment, augmented by agile development for pilots. Achieving the highest level is less a technical challenge and more about controlled data acquisition and application design.

- **Establish a Governance Body:** Formally establish a governance body with defined roles and responsibilities for overseeing the GenAI solution. This group will be responsible for monitoring performance, managing risks, and approving significant changes.
- **Adopt Data and Model Standards:** Implement clear standards for data quality, training, and deployment to ensure the integrity of the AI pipeline. This includes leveraging standards like the OGC Training Data Markup Language for AI (TrainingDML-AI) to ensure traceability, provide context for training data, and track provenance.
- **Enforce Security and Privacy Controls:** Operationalize the security framework defined during the analysis phase. This should include Zero Trust Architecture concepts to filter unwanted data and processes to de-identify sensitive values or PII in solutions.
- **Manage and Inventory AI/ML Assets:** Establish and maintain a clear enterprise inventory of GenAI sources, transformation tools, and services to ensure that data is being used from authoritative sources and that workflows are transparent.

## 7.2 Establish a Performance Measurement Plan:

- **Implement Monitoring Systems:** Deploy tools and dashboards to continuously track the Key Performance Indicators (KPIs) that were defined in the implementation roadmap.
- **Conduct Regular Performance Reviews:** Schedule and conduct regular reviews of the GenAI solution's performance against its baseline and stated business outcomes. These reviews should assess accuracy, user satisfaction, and overall mission impact.
- **Report to Stakeholders:** Establish a regular reporting cadence to keep leadership and other stakeholders informed of the solution's performance and return on investment.

## 7.3 Create a Continuous Improvement and Maintenance Loop:

- **Establish a Continuous Training Lifecycle:** Pre-trained models are often "closed loop" systems that do not automatically adapt to new information. It is critical to establish a continuous training and labeled data improvement lifecycle to tune the GenAI models over time, ensuring the reliability and accuracy of their outputs. This addresses challenges like "goal drift" and performance degradation.
- **Incorporate Feedback Mechanisms:** Create formal channels for end-users to provide feedback, report issues, and suggest enhancements. This user feedback is a vital source of information for prioritizing updates and improvements.
- **Plan for Model Retraining and Evolution:** The governance plan must include a strategy for periodically retraining the model with new data and adapting to new neural network architectures or improved techniques as they become available. This ensures the solution does not become technologically obsolete and continues to provide maximum value.

**Inputs for this Phase**

- The Complete GenAI Business Case / Modernization Blueprint (from Phase 4).
- Organizational governance, risk, and compliance policies.
- Deployed GenAI solution and performance monitoring tools.

**Outputs of this Phase**

- **An Operational Governance Plan:** A formal document detailing the governance structure, policies, standards, and processes for managing the GenAI solution.
- **A Performance Measurement and Reporting Plan:** A plan outlining the KPIs, monitoring tools, review schedules, and reporting procedures.
- **A Continuous Improvement and Maintenance Schedule:** A schedule for planned activities such as model retraining, user feedback reviews, and technology updates.

# Appendix A: Glossary of Terms

This glossary defines key terms and acronyms used throughout this best practice document. The definitions are contextualized for the purpose of a GenAI business case analysis.

- **AI Agent:** An advanced AI system that can perform complex tasks by breaking them down into smaller steps, gathering information, reasoning, and taking actions. AI agents can orchestrate real-time API requests and call other modeling services to perform flexible and complex tasks.
- **Data Provenance:** The documentation of where a piece of data originates and the processes and methodology by which it was produced. In a GenAI context, this is critical for ensuring traceability and trust in both the training data and the model's outputs.
- **GAN (Generative Adversarial Network):** A class of machine learning frameworks where two neural networks (a "generator" and a "discriminator") contest with each other. GANs can generate new, synthetic instances of data that can mimic real data, such as generating synthetic imagery for training models or improving the quality of existing images for tasks like fire detection and damage assessment.
- **GenAI (Generative Artificial Intelligence):** Artificial intelligence capable of generating new text, images, or other data using generative models, often in response to prompts. GenAI models learn the patterns and structure of their input training data and then generate new, original content.
- **Goal Drift:** A phenomenon where an AI model's outputs begin to deviate from the intended goals or objectives, often due to issues in the training data or a lack of specific context.
- **Human-in-the-Loop:** A system design that requires human interaction and validation. In a GenAI context, this means an expert reviews and approves AI-generated content or recommendations before they are acted upon, which is crucial for improving reliability and trust in high-stakes environments.
- **LLM (Large Language Model):** A large-scale machine learning model trained on a vast and diverse dataset, making it capable of understanding and generating human-like text for a variety of applications. LLMs often serve as the foundational model that can be augmented with other technologies.
- **Modernization Blueprint:** A comprehensive document that serves as the final business case. It details the "as-is" analysis, the "to-be" vision, the recommended solution, a cost-benefit analysis, and an implementation roadmap. It is the primary decision-making tool for leadership.
- **RAG (Retrieval-Augmented Generation):** A technique that enhances the accuracy and contextual understanding of LLMs by connecting them to an authoritative, external knowledge base. The LLM can then retrieve relevant information from this base to generate more informed and domain-specific responses, which is particularly effective in "knowledge-intensive" scenarios.
- **Zero Trust Architecture:** A security model based on the principle of maintaining strict access controls and not trusting any entity by default, even those already inside the network perimeter. In a GenAI context, this involves concepts like filtering unwanted data and cleaning prompts of sensitive information.

# Appendix B: Templates and Checklists

This appendix contains templates and checklists to support the key activities outlined in the GenAI Business Case Analysis methodology. These tools are intended to provide structure and consistency to the analysis process.

## Template B.1: Stakeholder Analysis Matrix

**Purpose:** This matrix is a foundational tool to be used during **Phase 1: Initiation and Scoping**. Its purpose is to systematically identify all individuals, groups, or organizations that have an interest in or will be affected by the GenAI project. By analyzing their interests, influence, and needs, the project team can develop a targeted engagement strategy to foster buy-in, manage expectations, and ensure the final solution is user-centric and meets genuine business needs.

**Instructions:**

1. **Identify Stakeholders:** Brainstorm and list all potential stakeholders in the first column. Consider internal groups (e.g., different departments, leadership) and external groups (e.g., partner agencies, public users). The wildland fire reports identify stakeholders such as National/Regional Planners, Incident Command, and Incident Operations.
2. **Analyze Interest and Influence:** For each stakeholder, assess their level of interest in the project and their degree of influence over its outcome, using the 1-5 scoring key. This helps prioritize engagement efforts.
3. **Define Key Interests/Needs:** Document what each stakeholder cares about most in relation to the project. What are their primary needs, goals, or potential concerns?
4. **Develop Engagement Strategy:** Based on the analysis, determine the most appropriate strategy for engaging each stakeholder. This is not a one-size-fits-all approach; different groups require different levels and methods of communication.
5. **Define Key Messages:** Outline the core messages that need to be communicated to each stakeholder group to ensure alignment and manage expectations.

**Interest Scoring Key:**

- **1:** Very Low (Minimal interest in the project's outcome)
- **3:** Medium (Aware of the project and its potential impact)
- **5:** Very High (The project's success is critical to their own success)

**Influence Scoring Key:**

- **1:** Very Low (No ability to affect project decisions or outcomes)
- **3:** Medium (Can influence opinions and some decisions)
- **5:** Very High (Has direct authority or significant power to halt or advance the project)

Having established a strong set of templates in Appendix B, we will now proceed to Appendix C. This section will formally tie the methodology back to the provided OGC reports, demonstrating how they serve as a successful, real-world application of these principles. This directly addresses your original

request to consider the steps taken in the creation of those reports. This checklist is a crucial tool for operationalizing the data analysis phase. Here is a draft of that template.

| Stakeholder / Group | Interest (1-5) | Influence (1-5) | Key Interests / Needs | Engagement Strategy | Key Messages |
|---|---|---|---|---|---|
| Example: Incident Command (IMT) | 5 | 5 | Wants "Command Decision Informatics" , including insights on fuel behavior, changing conditions, and resource tracking. Needs trustworthy, real-time data to support high-stakes decisions. | Involve directly in use case definition and prototype testing. Conduct regular (daily/weekly) briefings during pilot phases. Ensure their feedback directly influences feature prioritization. | The GenAI tool is designed to augment, not replace, command experience by providing faster data synthesis and predictive insights to enhance situational awareness. |
| National / Regional Planners | 4 | 4 | Want "National Readiness & Overall Incidents Metrics" , risk awareness, and asset tracking. Interested in strategic-level dashboards and long-term planning tools. | Provide quarterly progress briefings. Consult on the design of strategic dashboards. Involve in the review of the final Modernization Blueprint. | This project will provide new data streams and analytical capabilities to support national readiness planning and resource allocation strategies. |
| Field Operators / Single Resources | 5 | 3 | Primary interest is safety and tactical efficiency. Need tools for egress modeling, identifying safety zones, and understanding immediate risks related to topography and weather. | Conduct user workshops and "day-in-the-life" interviews. Use their feedback to design a simple, intuitive, and highly reliable user interface. Involve them in field testing of any mobile components. | The goal is to provide a tool that enhances your safety and tactical effectiveness by giving you critical information (e.g., on safe egress routes) quickly and reliably. |
| GIS Specialists (GISS) | 4 | 4 | Interested in data integration, data standards, and automating the generation of geospatial products. Need to ensure the GenAI solution integrates with existing GIS workflows (e.g., PMS-936) and authoritative data sources. | Consult on all aspects of data readiness, data modeling, and system integration. Involve as key members of the technical development and testing team. | This solution will automate many manual data integration and map generation tasks, freeing up your time for higher-level spatial analysis and decision support. |

## Template B.2: GenAI Use Case Prioritization Matrix

**Purpose:** This matrix is a tool to be used during **Phase 2: Business Analysis** to objectively evaluate and rank potential GenAI use cases. It helps the analysis team focus on initiatives that offer the highest potential mission impact and the greatest likelihood of success.

**Instructions:**

1. List all brainstormed use cases in the first column.
2. For each use case, provide a brief, one-sentence description.
3. Score each use case from 1 to 5 for each of the evaluation criteria, using the scoring key below.
4. Sum the scores for each use case to get a Total Score.
5. Rank the use cases based on their Total Score to determine their priority.
6. Provide a brief justification for the scoring and any relevant notes.

**Scoring Key:**

- **1:** Very Low / Negligible
- **2:** Low
- **3:** Medium
- **4:** High
- **5:** Very High / Critical

| Use Case Name & Description | Alignment with Strategic Goals (1-5) | Stakeholder Need / Impact (1-5) | GenAI Value / Potential for Improvement (1-5) | Technical Feasibility (1-5) | Data Readiness (1-5) | Total Score | Priority Rank | Justification / Notes |
|---|---|---|---|---|---|---|---|---|
| Example: Community Risk & Resilience Assessment | Assess community wildfire risk based on local data to highlight high-risk neighborhoods for mitigation efforts. | 5 | 5 | 5 | 4 | 4 | 23 | Addresses the critical mission of community safety. Rated as High Need and High GenAI Value in source report. Data is largely available but may have gaps in structure/fuels data. |

# Template B.3: Data Readiness Checklist

**Purpose:** This checklist is a detailed tool to be used during **Phase 3: Technical and Data Analysis**. It provides a systematic framework for evaluating the suitability of individual data sources for the GenAI project. By completing this checklist for each potential dataset, the project team can ensure a consistent and thorough assessment, identify data-related risks early, and accurately scope the effort required for data engineering and integration.

**Instructions:**

1. Use a separate copy of this checklist for each individual data source being evaluated.
2. Thoroughly investigate each question, consulting data owners, documentation, and performing technical tests where possible.
3. Document all findings, especially any identified issues, gaps, or required actions in the "Findings and Required Actions" section.
4. Assign an overall readiness score to summarize the dataset's suitability for immediate use.
5. The findings from these checklists should be used as direct inputs into the project's overall Risk Assessment Matrix (Template B.2) and implementation plan.

**Data Source Identification**

- **Data Source Name:**
- **Data Owner / Steward:**
- **URL / Endpoint:**
- **Brief Description:**

**Summary Assessment**

- **Overall Readiness Score (1-5):** *(1=High Risk/Not Ready, 5=Low Risk/Ready to Use)*
- **Summary Findings:** *(Briefly summarize the key strengths and weaknesses of this data source.)*
- **Required Actions:** *(List the critical next steps, e.g., "Develop ETL script for cleaning," "Finalize data use agreement," "Add 'PII de-identification' to risk matrix.")*

| Category | Question | Score | Findings and Required Actions |
|---|---|---|---|
| **1. Accessibility** | Is the data source publicly accessible without authentication? | | |
| | Is an Application Programming Interface (API) available for data access? | | |
| | Are there any costs associated with accessing or using the data (e.g., API fees, subscription costs)? | | |
| | Is the data format structured and machine-readable (e.g., JSON, CSV, Shapefile, GeoTIFF)? | | |
| **2. Quality & Integrity** | Is the data current and actively maintained? | | |
| | Is the dataset complete, or are there significant gaps/missing values? | | |
| | Is there known or potential bias in the data that could impact the model? | | |
| | Is the data considered accurate and reliable by subject matter experts? | | |

| | | | |
|---|---|---|---|
| | Does the temporal and geographic coverage of the data meet the project's requirements? | | |
| **3. Usability & Documentation** | Is a data dictionary, schema, or comprehensive metadata available? | | |
| | Is the data's lineage and provenance documented, allowing for clear traceability? | | |
| | Is the data structure straightforward, or will it require a complex ETL (Extract, Transform, Load) process? | | |
| **4. Governance, Rights, & Ethics** | Does the data have clear licensing terms that permit its use for this project? | | |
| | Does the dataset contain Personally Identifiable Information (PII) or other sensitive data? | | |
| | If PII is present, is there a plan and technical capability to de-identify or secure it? | | |
| | Are there any other ethical considerations for using this data (e.g., related to community privacy or protected species)? | | |

## Template B.4: Risk Assessment and Mitigation Matrix

**Purpose:** This matrix is a critical tool for **Phase 3: Technical and Data Analysis**. It provides a structured framework to systematically identify, analyze, prioritize, and plan for the mitigation of risks associated with a GenAI project. Proactively managing risks is essential for ensuring project success and building stakeholder trust.

**Instructions:**

1. **Identify Risks:** Brainstorm potential risks and list them in the Risk Description column. Consider all categories: Technical, Operational, Ethical, and Security. The "Challenges" and "Key Considerations" sections of the source reports provide excellent starting points for common GenAI risks.
2. **Categorize:** Assign each risk to a Risk Category.
3. **Analyze and Score:**
    - Assess the Likelihood of each risk occurring, using the 1-5 scoring key.
    - Assess the potential Impact on the project or mission if the risk occurs, using the 1-5 scoring key.
    - Calculate the Risk Score by multiplying Likelihood x Impact. This score helps to prioritize which risks require the most attention.
4. **Plan Mitigation:**
    - For each high-priority risk, define a specific Mitigation Strategy. This strategy should be an actionable plan to either reduce the likelihood of the risk or lessen its impact.
    - Assign an Owner responsible for implementing the mitigation strategy.
    - Track the Status of the mitigation action (e.g., Not Started, In Progress, Complete).
5. **Review Regularly:** This matrix should be a living document, reviewed and updated regularly by the project team and stakeholders.

**Likelihood Scoring Key:**

- **1:** Rare (Unlikely to occur)
- **2:** Unlikely
- **3:** Possible (May occur)
- **4:** Likely
- **5:** Almost Certain (Expected to occur)

**Impact Scoring Key:**

- **1:** Insignificant (No notable impact on cost, schedule, or mission)
- **2:** Minor
- **3:** Moderate (Noticeable impact on cost, schedule, or mission)
- **4.**: Major
- **5:** Critical/Catastrophic (Threatens project success or mission objectives)

| Risk ID | Risk Category | Risk Description | Likelihood (%) | Impact (1-5) | Risk Score (L x I) | Mitigation Strategy | Owner | Status |
|---|---|---|---|---|---|---|---|---|
| 1 | Technical | The GenAI model produces undesirable outputs such as inaccuracies, "hallucinations," or goal drift. | 80 | 5 | 4 | Augment the foundational LLM with Retrieval-Augmented Generation (RAG) using curated, domain-specific knowledge bases. Implement a human-in-the-loop review | Tech Lead | In Progress |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | process for all critical outputs before they are finalized or acted upon. | | |
| 2 | Ethical / Governance | The GenAI solution has poor traceability and does not provide clear data provenance for its outputs, eroding user trust and making validation difficult. | 80 | 4 | 3.2 | Adopt the OGC TrainingDML-AI standard to ensure high-quality content in the data pipeline, with micro-citations and data headers to ensure traceability and provenance. | Data Gov. Lead | Not Started |
| 3 | Operational | End-users are slow to adopt the new tool due to a lack of trust, a preference for existing models, and insufficient literacy on the GenAI solution's capabilities and limitations. | 60 | 5 | 5 | Develop and execute a comprehensive change management plan. This includes targeted training, clear communication on the solution's benefits and limitations, and establishing a continuous feedback loop with users. | Project Manager | Not Started |
| 4 | Security | The GenAI solution processes sensitive or Personally Identifiable Information (PII) without proper controls, creating a privacy or security breach. | 40 | 5 | 4 | Establish Zero Trust Architecture concepts to filter data. Implement a solution to de-identify sensitive values before they are processed by the GenAI model (e.g., Skyflow GPT Privacy). | Security Officer | In Progress |

# Template B.5: Capability-to-Use-Case Mapping Matrix

**Purpose:** This matrix is a strategic tool for **Phase 4: Modernization Blueprint and Business Case**. Its purpose is to create a clear, traceable link between the prioritized business use cases (the "why") and the specific technical capabilities that need to be built to address them (the "what"). This ensures that all development effort is justified by a business need, aids in creating a logical implementation roadmap, and helps communicate the solution structure to both business and technical stakeholders.

**Instructions:**

1. In the first column, list the highest-priority use cases identified in the Use Case Prioritization Matrix (Template B.1).
2. For each use case, identify one or more specific Required Capabilities needed to make it successful. The capabilities listed in the OGC reports (such as "Risk Assessment Modeling" or "Automated Claims Processing") serve as excellent examples.
3. Briefly describe what the capability does in the context of the use case.
4. Identify the core Enabling Technology (e.g., LLM, RAG, GAN) required to build the capability.
5. Assign a Development Priority (High, Medium, Low) to each capability to help sequence the work in the implementation roadmap.

| Use Case (The "Why") | Required Capability (The "What") | Capability Description (How it helps) | Enabling Technology (The "How") | Priority |
|---|---|---|---|---|
| Community Risk & Resilience Assessment | Risk Assessment Modeling | Process weather, climate, and fuel load data to create dynamic wildfire risk assessments for municipalities. | LLM, RAG, NLP | High |
| Community Risk & Resilience Assessment | Geospatial Data Analysis | Analyze spatial datasets (e.g., topography, vegetation, fire history) to model risk and generate neighborhood-level insights. | GAN, RAG | High |
| Claim Efficiency & Automation | Automated Claims Processing | Use natural language processing (NLP) and computer vision to extract and analyze claims data from images, reports, and videos. | NLP, GAN, LLM | Medium |
| Predictive Risk & Pricing Models | Predictive Pricing Models | Leverage historical claims and geospatial data to create dynamic, location-based pricing models. | LLM, RAG | Medium |
| Grant & Funding Strategy Development | Natural Language Generation (NLG) | Create tailored reports, educational content, and grant applications based on data inputs. | LLM | Low |

# Template B.6: Cost-Benefit Analysis (CBA) Worksheet

**Purpose:** This worksheet is a key component of **Phase 4: Modernization Blueprint and Business Case**. It provides a structured format to estimate the costs and benefits associated with the proposed GenAI initiative over a defined period (typically 3-5 years). A thorough CBA is essential for justifying the investment and enabling leadership to make a sound financial decision.

**Instructions:**

1. Work with representatives from finance, IT, and the business unit to identify and estimate all potential costs and benefits.
2. **Estimate Costs:** Document all one-time (Capital Expenditures/CapEx) and recurring (Operational Expenditures/OpEx) costs. Be as comprehensive as possible.
3. **Estimate Benefits:** Document both tangible (quantifiable in monetary terms) and intangible (qualitative but mission-critical) benefits.
    - For tangible benefits, clearly state the assumptions used to calculate the monetary value (e.g., "Saves 200 person-hours per year at a blended rate of $75/hour").
    - For intangible benefits, describe the positive impact on the organization's mission or strategic goals.
4. **Calculate Financial Metrics:** Use the total costs and tangible benefits to calculate summary financial metrics such as ROI and Payback Period.
5. **Review and Refine:** The CBA should be reviewed for completeness and reasonableness by all relevant stakeholders.

### Part 1 - Costs

| Cost Category | Description & Assumptions | Year 1 ($) | Year 2 ($) | Year 3 ($) | Total ($) |
|---|---|---|---|---|---|
| A. One-Time Costs (CapEx) | | | | | |
| Initial Development | Cost for internal staff and contractors for model development, tuning, and integration. | | | | |
| Software & Licenses | Initial purchase of any required software platforms or licenses. | | | | |
| Hardware/Infrastructure | Initial cost for any required on-premise servers, GPU hardware, or cloud setup. | | | | |
| Initial User Training | Cost to develop and deliver initial training to end-users and support staff. | | | | |
| Subtotal One-Time Costs | | | | | |
| B. Recurring Costs (OpEx) | | | | | |
| Cloud / API Fees | Ongoing fees for cloud services (compute, storage) or third-party GenAI model APIs. | | | | |
| Software Maintenance | Annual fees for software maintenance, subscriptions, and support. | | | | |
| Data Acquisition/Storage | Costs associated with acquiring or maintaining datasets needed for the model. | | | | |
| Personnel | Salaries/FTE portion for staff dedicated to maintaining and governing the solution. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| (Maintenance) | | | | | |
| Ongoing Training | Costs for refresher training for existing users and training for new staff. | | | | |
| Model Retraining | Estimated cost for periodic model retraining to incorporate new data and prevent drift. | | | | |
| Subtotal Recurring Costs | | | | | |
| TOTAL ESTIMATED COSTS | | | | | |

## Part 2 - Benefits

| Benefit Category | Description & Assumptions | Year 1 ($) | Year 2 ($) | Year 3 ($) | Total ($) |
|---|---|---|---|---|---|
| **C. Tangible (Quantifiable) Benefits** | | | | | |
| Productivity Gains | Value of person-hours saved on specific tasks (e.g., report generation, data analysis). | | | | |
| Operational Cost Savings | Reduction in costs for materials, travel, or other operational line items. | | | | |
| Risk Mitigation | Avoidance of costs associated with fines, penalties, or damages from mitigated risks. | | | | |
| TOTAL TANGIBLE BENEFITS | | | | | |
| | | | | | |
| **D. Intangible (Qualitative) Benefits - Description of Mission Impact** | | | | | |
| Improved Decision-Making | Enhances situational awareness and provides more accurate, timely insights for command decisions. | | | | |
| Enhanced Mission Outcomes | Directly contributes to improved community resilience, safety, or more effective environmental remediation. | | | | |
| Increased Capacity | Enables scalability in data processing beyond human capabilities, allowing for more comprehensive analysis. | | | | |
| Improved Staff Morale | Reduces tedious, manual work, allowing staff to focus on higher-value, mission-critical activities. | | | | |

## Part 3 - Summary

| Metric | Calculation | Result |
|---|---|---|
| Total Project Cost | Total One-Time Costs + Total Recurring Costs | |
| Total Tangible Benefit | Total from Section C | |
| Net Benefit / (Loss) | Total Tangible Benefit - Total Project Cost | |
| Return on Investment (ROI) | (Net Benefit / Total Project Cost) x 100 | |
| Payback Period | The point in time at which cumulative benefits equal cumulative costs. | |

# Template B.7: Example Plan Activities

**Purpose:** This template is designed to translate the high-level implementation roadmap from **Phase 4** into a detailed, short-term (e.g., 3-6 month) action plan. It helps teams organize their work into thematic streams, define concrete activities, and align them with measurable outcomes for a specific phase of the project.

**Instructions:**

1. **Define the Phase:** Give the current implementation phase a clear, descriptive name (e.g., "Phase I - Foundational Investigation," "Phase II - Prototype Development").
2. **Set the Timeframe:** Define the duration for this action plan (e.g., "Next 3-6 months").
3. **Structure Activities by Theme:** For each of the core themes (Business Value, Data, Technology, Management), list the specific, actionable tasks to be completed within the timeframe. Use action verbs (e.g., "Hold workshop," "Inventory data," "Pilot tools").
4. **Define Maturity Goal and Outcomes:**
    - For the Maturity Space, describe the overall goal for this phase in terms of capability growth (e.g., "Discover Chasm Depths," "Build the Bridge," "Scale the Solution").
    - For the Outcomes, clearly state what will be achieved and understood by the end of the phase for each theme. This ensures the work is tied to tangible results.

**Example Plan Activities**

**Next 3-6 months**

| Themes | Phase I - Investigating the Chasm<br>Inventory and Pilot AND investigate business case parameters |
|---|---|
| Business Value | • Hold pilot definition workshop to Define and decompose MISSION QUESTIONS backlog<br>• Work with the ongoing results from Phase I PILOT to:<br>- identify requirement GAPS<br>- additional mission questions and maintain log<br>- apply to operational or planning scenarios<br>- evaluate benefits with initial stakeholders, |
| Data | • Research, INVENTORY and evaluate and test the Data quality for initial set of associated priority business objectives;<br>• Identify GAPS and integrity issues in data sources,<br>• Develop mitigation approaches for issues and test. |
| Technology | • INVENTORY existing / owned systems and technologies that are required to would support automation/ analysis of data to business objectives<br>• INVENTORY the As-Is suite of AI/analytical tools and use constraints within enterprise<br>• PILOT data usability (visualization, reasoning, interoperability, automation) |
| Management | • Identify initial key stakeholder community for PILOT involvement<br>• Initiate ownership and advocacy for Activity<br>• Create PROJECT STRUCTURE with objectives<br>• Develop basic communication plan for stakeholders |
| Maturity Space | Discover Chasm Depths |
| Outcomes | Business: Getting a sense of what BI means to the business<br>Data: Assessing Data Quality and readiness<br>Tech: Assessing flexibility of existing tech. |

**Next 6-18 months**

| Themes | Phase II - Planning and Designing the Bridge |
|---|---|

| | **Iterative Demonstration to establish full business case for working operating model** |
|---|---|
| **Business Value** | • Continue to feed 'questions backlog' for ongoing PILOTS, efforts<br>• Define on-going operating Model<br>- Assess and understand implications and benefits on future operating model and business practices<br>- Initiate development of business value proposition<br>- Identify and document key Use Stories and Epics from Backlogs |
| **Data** | • Explore **DATA LIFECYCLE and STANDARDS** needs for Phase 1 with IT<br>• Develop alternative strategies to determine reproducibility of processes and data integrity for reuse<br>• Iterate **GAP** analysis next set of business objective<br>• Develop **CORE DATA MODEL** and supporting metadata |
| **Technology** | • Continue expanding architecture qualities by executing **PILOTs**<br>• Investigate **GAPS** in As-Is technology for full usability of analysis results.<br>• Conduct Technology and Cost Assessment for new Operating Model<br>• Develop alternative architecture solutions and do cost benefit.<br>• Establish Service Level needs to cost out Labor Operations |
| **Management** | • Develop **NEGOTIATE** and CONSOLIDATION alternatives and strategies<br>• Enhance communication plan to address new stakeholders<br>• Propose PROGRAM/DEPARTMENT funding strategy |
| **Maturity Space** | **Plan for Chasm** |
| **Outcomes** | **Business:** Evaluating business benefits on current operations.<br>**Data:** Position data management for predicable and accurate support of business needs<br>**Tech:** Evaluating and designing the Target Architecture Solution |

**12-24 months and Beyond**

| **Themes** | **Phase III - Building the Bridge**<br>**Plan, Fund, and Execute fully sponsored program** |
|---|---|
| **Business Value** | • SIGN OFF on target operating model and business practice benefits, value message<br>• SIGN OFF on target technology architecture and costs<br>• SIGN OFF on data lifecycle management plan and costs<br>• Develop full investment BUSINESS CASE capital and operations |
| **Data** | • **STANDARDIZE** data and automation processes to provide information qualities<br>• Extend CORE DATA model to full scope of data associated to business objectives<br>• Continue to Integrate data assets with program's **DATA LIFECYLE** approach |
| **Technology** | • Incorporate Technology requirements and cost estimates into **BUSINESS CASE**<br>• Acquire and implement target architecture solutions.<br>• Establish Formal Agile PM for executing to Questions Backlog<br>• Conduct IT Maturity Model Assessment to establish O&M Service Level Needs & plan |
| **Management** | • Extend the stakeholder community to include all who have ownership in the systems and data that that will be exploited<br>• Develop GOVERNANCE solution with IT<br>• **Negotiate and Consolidate** with key business and IT stakeholders and develop change management strategies and communication approach |
| **Maturity Space** | **Cross Chasm** |
| **Outcomes** | **Business:** Investing and leading the data and business changes<br>**Data:** Managed lifecycle approach to "valued" data<br>**Tech:** Implement Architecture Solution |

# Appendix C: Case Study Example - GenAI for Wildland Fire Management

**Introduction**

The principles and phases outlined in this Best Practice document are modeled on successful, business-driven transformation methods. The OGC Engineering Reports D-030: Generative AI for Wildfire State-of-the-Art Report and D-123: Generative AI in Wildland Fire Management serve as a practical case study of these principles in action.

While these reports were not created by explicitly following this document, their structure, content, and recommendations retroactively demonstrate the core activities of each phase of the methodology. They provide a robust example of how to conduct a thorough analysis that results in a credible and actionable plan for a complex GenAI initiative.

**Application of the 5 Phases in the Case Study**

**Phase 1: Initiation and Scoping ("Foundation Building")** The reports clearly establish a foundation by defining the problem space and scope.

- **Business Need:** The reports identify the need to enhance planning and operational decision-making in the Wildland Fire community, which currently relies heavily on experiential knowledge, by leveraging GenAI's ability to scale data processing.
- **Scope and Objectives:** The scope is clearly defined as assessing the "domain adaptation needed for Generative AI to support advancements in the wildland fire community". The objectives include exploring the necessary inputs, tools, challenges, and recommendations for implementation.
- **Stakeholder Identification:** The reports identify and incorporate input from a wide range of stakeholders, including the US Forest Service , Bureau of Land Management practitioners , and Natural Resources Canada (NRCan) , as well as key roles like National Planners and Incident Command.

**Phase 2: Business Analysis ("Use Case Development")** This phase is extensively covered in both reports, demonstrating a deep analysis of stakeholder needs and potential GenAI applications.

- **"As-Is" Analysis:** The reports implicitly analyze the current state by discussing the challenges of situational awareness and the limitations of existing tools and workflows.
- **Use Case Identification and Prioritization:** A core activity in the reports is the detailed identification and prioritization of use cases. The analysis for the Canadian insurance sector, for example, explicitly rates use cases for "Helping People" and "Business Management" on their "GenAI Value" and stakeholder "Need".

**Phase 3: Technical and Data Analysis** The reports contain a rigorous assessment of the technical and data feasibility required for the identified use cases.

- **Data Readiness Assessment:** The reports perform extensive "Data Mapping" , inventorying over 200 Canadian data sources and providing a conceptual Data Reference Model (DRM) to categorize them. They also identify critical data gaps, such as the need for national structures data.

- **Technology Assessment:** A dedicated section evaluates the "Technology Components Need to Support Gen AI," detailing the roles of LLMs, RAG, GANs, and AI Agents. This assessment concludes that augmenting foundational LLMs is necessary to handle the specific, real-time demands of wildland fire management.
- **Risk Analysis:** The reports explicitly detail risks in sections on "Challenges in Leveraging Gen AI" and "Key Considerations for Gen AI Model Development". These sections discuss risks such as model "hallucinations" , poor data traceability , and the challenges of user adoption.

**Phase 4: Modernization Blueprint and Business Case** The reports themselves serve as the Modernization Blueprint, synthesizing the analysis into a set of clear, actionable recommendations and plans.

- **Solution Recommendation:** The reports recommend specific "Potential Prototypes," such as a "Predictive Risk Dashboard" and a "Claims Automation System," which function as concrete solution proposals.
- **Implementation Roadmap:** A detailed, four-phase "GenAl Roadmap" is provided, outlining key activities and deliverables for Foundation Building, Use Case Development, Pilot Implementation, and Scaling & Optimization.

**Phase 5: Governance and Continuous Improvement** A strong emphasis on governance and long-term evolution is woven throughout the reports' recommendations.

- **Governance Model:** The reports recommend establishing a "Governance Framework" and adopting standards like the OGC TrainingDML-AI to ensure data provenance and ethical AI deployment.
- **Continuous Improvement:** The analysis highlights that LLMs can be "closed loop" systems and therefore recommends establishing a "continuous training and labeled data Improvement lifecycle" to ensure models remain accurate and reliable over time.

**Conclusion**

The GenAI for Wildland Fire reports provide a compelling, real-world example of how this best practice methodology can be applied to produce a high-quality analysis. They demonstrate a logical progression from understanding the business problem to defining a feasible, well-justified, and actionable path forward for a complex and mission-critical GenAI initiative.