Bridgeframe

Bridging Business Analysis and Public Health

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Table of contents

# Bridgeframe

Bridging Business Analysis and Public Health

# Welcome

**Bridgeframe** is a practical toolkit for professionals who work at the intersection of information technology and public health. Whether you are a business analyst stepping into your first health department project, or a public health professional learning to collaborate with software teams, this book provides the translation layer you need.

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| About This Toolkit |
| Bridgeframe is a work in progress, not an authoritative guide. The scenarios and examples throughout (including the CancerSurv case study) are illustrative and fictitious, designed to help professionals relate to common challenges in health IT projects.  The goal is educational: to spark discussion, point readers toward established frameworks (BABOK, CDC methodologies, CFIR, and others), and provide a starting point for teams navigating this intersection. Feedback and contributions are welcome as this resource continues to evolve. |

## The Challenge

Two disciplines. Two languages. One shared goal: building systems that improve health outcomes.

**Business analysts** speak of user stories, sprints, and requirements traceability. **Public health professionals** speak of logic models, PDSA cycles, and program evaluation. Both are trying to define problems, design solutions, and measure success, yet their terminology creates friction rather than collaboration.

## The Solution

Logic Model Components Mapped to Requirements Bridgeframe provides:

* **A terminology dictionary** mapping IT/Agile concepts to their public health equivalents
* **Phase-by-phase guidance** aligning the BABOK lifecycle with CDC frameworks
* **A running case study** (CancerSurv) demonstrating concepts in practice
* **Templates and tools** for hybrid teams

## Who This Book Is For

* **IT Business Analysts** entering the public health sector
* **Public Health Informaticians** collaborating with software vendors
* **Project Managers** overseeing health IT implementations
* **Data Scientists** working with epidemiological systems
* **Students** in health informatics or public health programs

## How to Use This Book

This book is organized into three parts:

1. **Foundations**: Core concepts, terminology mapping, and the CancerSurv case study
2. **The Analysis Process**: Phase-by-phase guidance from planning through evaluation
3. **Putting It Into Practice**: Tools comparison and implementation science frameworks

Each chapter includes CancerSurv examples in callout boxes, making abstract concepts concrete.

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| Getting Started |
| If you are new to this intersection, start with [Chapter 1: Introduction](chapters/01-introduction.qmd) and the [Terminology Dictionary](chapters/03-terminology.qmd). If you are already working on a project, jump to the relevant phase chapter. |

## About the Author

[**André van Zyl, MPH**](https://www.linkedin.com/in/andre-van-zyl/) is an epidemiologist and data science professional with close to two decades of experience spanning public health, health informatics, and technical system development. His career has taken him across local, state, federal, tribal, and international health systems, from helping establish global surveillance systems at the CDC to implementing health interventions in resource-constrained settings.

As a Health Scientist at CDC’s National Center for Emerging and Zoonotic Infectious Diseases, André led data acquisition and reporting systems for global antimicrobial resistance surveillance spanning multiple continents. He pioneered the integration of artificial intelligence into public health workflows and modernized data processes using R, Python, Azure Databricks, and platforms like REDCap and DHIS2. A consistent theme throughout his work has been technical translation: bridging communication gaps between laboratory scientists, clinical teams, and technical developers.

André holds a Master of Public Health from the University of Pretoria and a BA Honors in Psychology from Nelson Mandela University. This combination of behavioral science and technical expertise enables him to understand both user needs and system requirements when implementing solutions across diverse communities.

He is the founder of [**Intersect Collaborations LLC**](https://www.linkedin.com/company/intersect-collaborations-llc/), a consultancy helping public health organizations transform data systems and analytics capabilities for improved decision-making and community health outcomes.

# Preface

Throughout my career, I’ve watched brilliant teams stumble, not because they lacked expertise, but because they were speaking entirely different professional languages.

My formal training is in social sciences and public health, where business analysis concepts weren’t part of the curriculum. But my career path led me through various technical roles (working for technology companies and alongside them) where I absorbed the terminology, tools, software, and processes that business analysts and project managers use daily. This dual exposure showed me both the value and the difficulty of blending these perspectives.

## The Translation Challenge

When I joined projects bridging IT and public health, I saw the same friction points repeatedly:

* Business analysts asking for “user stories” while epidemiologists stared blankly
* Developers requesting “non-functional requirements” while program managers wondered if that related to grant compliance
* Agile sprints clashing with PDSA cycles or action research, even though both are iterative improvement frameworks
* Stakeholder maps that missed community partners because they weren’t “decision-makers” in the traditional IT sense

The IT world optimizes for efficiency and profit. Public health optimizes for equity and outcomes. Both are rigorous disciplines with systematic frameworks. Yet when they collaborate, the translation gap creates delays, misaligned expectations, and sometimes outright project failure.

## Lessons from Both Sides

I’ve experienced this challenge from multiple angles:

**Introducing IT tools to public health teams.** I’ve worked with groups who had strong public health backgrounds and wanted to streamline collaboration, tracking, and communication. I introduced project management software (including Azure DevOps, because it was the best tool available to us). But I ran into constant friction translating the software’s terminology (sprints, agile, user stories, backlogs) into concepts that made sense for public health professionals and their workflows.

**Watching tech-dominated engagements produce suboptimal products.** I’ve also seen the reverse: public health organizations relying heavily on technology vendors where the frameworks, project management styles, and terminology of business analysts dominated the engagement. The public health perspective got lost, and the resulting products didn’t fit how health departments actually operate.

## Finding Common Ground

Bridgeframe exists because I needed it. Every time I translated a clinical workflow into a requirements document, or explained why a “user story” doesn’t capture a patient journey, I wished for a reference guide that mapped these concepts clearly.

This toolkit distills what I’ve learned from CDC surveillance systems, COVID-19 contact tracing implementations, tuberculosis intervention trials, and countless cross-functional team meetings. It’s designed for the health informatician sitting between two worlds: ensuring the IT team’s technical specifications align with the health department’s programmatic goals.

## A Work in Progress

I want to be clear: I am not positioning myself as an expert on business analysis, and Bridgeframe is not intended as an authoritative guide. This is a draft that I will continue to develop and refine.

The examples throughout this book (including the CancerSurv case study) are illustrative and fictitious. They are designed to be relatable, to help professionals in both domains recognize common patterns and challenges. The intent is educational and informative.

My hope is that Bridgeframe stimulates discussion and points readers toward the established frameworks and resources that offer deeper expertise: BABOK for business analysis, CDC evaluation frameworks for public health, CFIR for implementation science, and the many other rigorous methodologies developed by true experts in these fields.

If this toolkit helps even a few teams find common ground, or sparks conversations that improve how we build health information systems, it will have served its purpose. I welcome feedback, corrections, and contributions as this resource evolves.

André van Zyl  
Intersect Collaborations

# Introduction

## Why Bridgeframe Exists

Public health and information technology are increasingly intertwined. Disease surveillance systems, immunization registries, electronic lab reporting, and health analytics platforms all require collaboration between two groups that often struggle to understand each other: **business analysts** and **public health professionals**.

This chapter explains the problem, introduces the Bridgeframe approach, and sets the stage for the detailed guidance that follows.

### The Silo Problem

Consider a typical scenario: A state health department receives funding to modernize its disease surveillance system. They contract with a software vendor whose project team includes experienced business analysts, developers, and testers. The health department brings epidemiologists, program managers, and data analysts. Both sides are competent in their respective domains. Yet within weeks, the project is mired in confusion.

The vendor’s BA asks for “user stories.” The epidemiologist provides a detailed case definition document. The BA politely explains that a case definition is not a user story. The epidemiologist wonders why the BA keeps asking about “acceptance criteria” when the CDC already publishes validation rules.

This is not a failure of intelligence or good faith. It is a failure of translation.

### Two Parallel Worlds

Business analysis, as codified in the BABOK (Business Analysis Body of Knowledge), provides a rigorous framework for understanding needs, defining requirements, and ensuring solutions deliver value1. Public health analysis, guided by CDC frameworks and epidemiological methods, provides an equally rigorous approach to assessing community needs, designing interventions, and evaluating outcomes2,3.

These frameworks are parallel, not incompatible:

| Business Analysis | Public Health |
| --- | --- |
| Stakeholder Analysis | Community Partner Mapping |
| Current State Analysis | Epidemiological Baseline |
| Requirements Specification | Program Protocol |
| Solution Design | Intervention Design |
| Implementation | Program Rollout |
| Evaluation | Program Evaluation |

The concepts align; the terminology diverges. Bridgeframe provides the translation layer.

### The Cost of Miscommunication

When BA and PH professionals cannot communicate effectively, projects suffer:

**Inability to prove impact**: Systems that cannot demonstrate public health value

More importantly, health outcomes suffer. A delayed surveillance system means delayed outbreak response. A poorly designed immunization registry means children missing vaccines. And increasingly, programs that cannot demonstrate measurable public health impact risk losing funding.

**Both technical and public health teams share responsibility for proving the value of their work.** Technology investments must translate to demonstrable improvements in population health, not just features delivered on time and on budget.

### The Bridgeframe Solution

Bridgeframe offers a structured approach to bridging these domains:

1. **Common Vocabulary**: Chapter 3 provides a comprehensive dictionary mapping BA terms to PH equivalents
2. **Phase Alignment**: Chapters 4-9 walk through each lifecycle phase, showing how BA activities map to PH frameworks
3. **Practical Examples**: The CancerSurv case study (Chapter 2) demonstrates concepts in action
4. **Implementation Science**: Chapter 11 introduces CFIR and other frameworks for addressing adoption barriers

### Start with the Client’s Framework

Before diving into requirements gathering or sprint planning, a critical first question must be answered: **What frameworks does the client already use?**

Public health organizations operate within established methodological traditions. They may follow CDC evaluation frameworks, use logic models for program planning, apply CFIR for implementation readiness, or adhere to agency-specific protocols. These are not obstacles to be worked around; they are assets to be leveraged.

When engaging with a public health client:

1. **Ask early**: In the first meetings, explicitly ask what frameworks, methodologies, or standards guide their work
2. **Prioritize existing frameworks**: If the client has established approaches, adapt your deliverables to align with them rather than imposing unfamiliar structures
3. **Translate, do not replace**: When BA frameworks offer value the client lacks, introduce them by mapping to familiar concepts. Present a “logic model with software requirements” rather than demanding they learn BABOK terminology
4. **Document the bridge**: Create explicit crosswalks showing how your deliverables map to their frameworks

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| Practical Guidance |
| If you are the business analyst or developer, your role is translation, not conversion. A requirements document that aligns with the client’s existing CDC program evaluation framework will gain faster buy-in than one that requires the client to learn Agile terminology. Meet them where they are. |

This principle works both ways. Public health professionals engaging with IT vendors should communicate their frameworks early, providing documentation and context so the technical team can adapt their approach accordingly.

### When to Introduce the Translation

A common pattern across public health IT projects: translation challenges emerge during software requirements gathering, by which point significant momentum (and sometimes conflict) has already built up. The teams discover they are speaking different languages only after the project is well underway.

**The earlier translation happens, the better the outcome.**

Ideally, translation should begin during the business case development that justifies funding. When writing grant applications or funding proposals, explicitly address:

* How IT terminology maps to programmatic outcomes
* What resources (training, facilitation, documentation) will be needed for cross-domain communication
* Who will serve as translators or bridges between teams

This early attention accomplishes two things: it surfaces potential friction points before they become costly, and it ensures that resource discovery includes the human and process elements needed for successful collaboration, not just technical requirements.

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| Practical Guidance |
| If you are writing a grant proposal or business case for a health IT project, include a line item for “cross-domain facilitation” or “terminology alignment workshops.” This signals awareness of the challenge and secures resources to address it. |

When translation training happens before or alongside business case development, teams enter requirements gathering with shared vocabulary and mutual understanding. When it happens only during software requirements definition, teams must untangle miscommunication while simultaneously trying to make progress.

### Who Should Use This Book

This book serves multiple audiences:

**For IT Business Analysts entering public health:**

* Learn the regulatory context (HIPAA, CDC reporting requirements)
* Understand grant-driven funding and its implications
* Adapt Agile practices for public health workflows

**For Public Health Professionals working with IT teams:**

* Translate your needs into requirements language
* Participate effectively in sprint planning and reviews
* Evaluate vendor proposals with confidence

**For Project Managers and Leaders:**

* Build teams with shared vocabulary
* Anticipate common friction points
* Structure projects for hybrid success

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| CancerSurv Example |
| Throughout this book, we follow the CancerSurv project: a state health department modernizing its cancer registry system. In the Introduction, the challenge is framed as both a **Business Need** (replace aging mainframe with modern cloud platform) and a **Public Health Challenge** (ensure timely, complete cancer data for prevention planning and disparity identification). |

### What Bridgeframe Is Not

This book does not replace domain-specific training. Business analysts should still study the BABOK and pursue relevant certifications. Public health professionals should still learn epidemiology, biostatistics, and program evaluation. Bridgeframe provides the bridge between these bodies of knowledge, not a substitute for them.

Similarly, this book does not cover software development practices, database design, or clinical medicine in depth. It focuses specifically on the analysis phase: understanding needs, defining requirements, and evaluating solutions.

### Moving Forward

The following chapter introduces CancerSurv in detail, providing the context you will need to engage with examples throughout the book. Chapter 3 then provides the terminology dictionary, a reference you will return to often. From there, we proceed phase by phase through the analysis lifecycle.

Welcome to Bridgeframe. Let us build this bridge together.

# Meet CancerSurv

## The CancerSurv Case Study

Throughout this book, we use a single comprehensive case study to illustrate concepts: **CancerSurv**, a cloud-based cancer surveillance and registry system. This chapter introduces the project context, stakeholders, and objectives that will appear in examples across all subsequent chapters.

### Project Overview

A state public health department partners with TechHealth Solutions, a health IT company, to develop CancerSurv: a modern, cloud-based platform for cancer surveillance and registry operations.

#### The Business Context

| Attribute | Detail |
| --- | --- |
| **Public Health Partner** | State Cancer Registry (Department of Health) |
| **Technology Partner** | TechHealth Solutions (cloud software vendor) |
| **Funding Source** | CDC National Program of Cancer Registries (NPCR) grant |
| **Timeline** | 18-month phased implementation |
| **Scope** | Replace legacy mainframe system with modern cloud solution |

#### The Public Health Context

Cancer registries serve a critical public health function. They collect, process, and analyze data on cancer incidence, treatment, and outcomes. This data informs:

* Prevention program targeting
* Early detection initiatives
* Health disparity identification
* Research and clinical trials
* Healthcare resource planning

The state’s current system, built on 1990s mainframe technology, cannot meet modern demands for interoperability, real-time analytics, and remote access.

### Stakeholder Landscape

Understanding who participates in this project requires seeing stakeholders through both BA and PH lenses:

| Role | BA Term | PH Term | Key Concerns |
| --- | --- | --- | --- |
| Project Sponsor | Executive Sponsor | Registry Director / State Epidemiologist | Budget, timeline, CDC compliance |
| End Users | System Users | Cancer Registrars, Epidemiologists, Data Analysts | Usability, efficiency, data quality |
| Subject Matter Experts | Business SMEs | Oncologists, Pathologists, Tumor Board Members | Clinical accuracy, coding standards |
| External Partners | Vendors / Integrators | Hospitals, Laboratories, Vital Records | Data submission, interoperability |
| Oversight Bodies | Governance Board | NPCR Program, NAACCR Standards Committee | Standards compliance, data quality metrics |

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| Terminology Note |
| While we use “stakeholder” here for its familiarity in BA contexts, public health practitioners often prefer alternatives: community partners, interest holders, rights holders, or beneficiaries. The choice of term signals values: “stakeholder” implies an interest or stake, while “rights holder” acknowledges inherent claims and dignity. See Chapter 3 for detailed discussion. |

### System Functions

CancerSurv must support five core functional areas:

#### Case Abstraction

Cancer registrars enter and code cancer cases from medical records. This involves:

* Extracting relevant data from pathology reports, discharge summaries, and treatment records
* Coding diagnoses using ICD-O-3 (International Classification of Diseases for Oncology)
* Staging tumors using TNM and SEER summary staging
* Linking cases to patients across multiple treatment facilities

#### Data Quality

Automated processes ensure data completeness and accuracy:

* Edit checks flagging inconsistent or missing data
* Duplicate detection identifying potential duplicate case records
* Linkage to vital records for death clearance
* Inter-rater reliability monitoring

#### Reporting

The registry must meet external reporting requirements:

* Annual submissions to NPCR (National Program of Cancer Registries)
* Data exchange with SEER (Surveillance, Epidemiology, and End Results Program)
* Ad-hoc queries for researchers (with appropriate IRB approval)
* Public health reports for state legislature and media

#### Analytics Dashboard

Modern surveillance requires real-time analytics:

* Cancer incidence trends by site, stage, and demographics
* Geographic mapping of cancer clusters
* Survival analysis and outcomes tracking
* Health disparity indicators

#### Interoperability

CancerSurv must integrate with external systems:

* HL7 FHIR APIs for hospital EHR integration
* Electronic pathology reporting from laboratories
* Vital records linkage for death data
* National data exchange protocols

### Project Phases

The 18-month implementation follows a phased approach, which we will revisit throughout the book:

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| Figure 4.1: CancerSurv Implementation Phases |

### How CancerSurv Appears in This Book

Each chapter includes CancerSurv examples demonstrating concepts in practice:

* **Planning (Chapter 4)**: Needs assessment comparing cancer data gaps with CDC reporting requirements
* **Elicitation (Chapter 5)**: User stories from registrars; clinical guidelines from oncologists
* **Requirements (Chapter 6)**: Functional specifications for case entry; NFRs for HIPAA compliance
* **Design (Chapter 7)**: System architecture; CFIR implementation readiness assessment
* **Implementation (Chapter 8)**: Agile sprints mapped to grant milestones; PDSA cycles for workflow adoption
* **Evaluation (Chapter 9)**: KPIs (data completeness ≥95%) mapped to health outcomes

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| Using the Case Study |
| When reading subsequent chapters, refer back to this overview to ground abstract concepts in the CancerSurv context. The case study makes the BA-PH bridge tangible. |

### The Dual Mandate

CancerSurv illustrates the fundamental tension bridged by this book. The project must simultaneously satisfy:

**Technology Requirements:**

* Modern cloud architecture
* API-first design
* Agile delivery methodology
* Vendor best practices

**Public Health Requirements:**

* CDC/NPCR compliance
* NAACCR data standards
* HIPAA security
* Health equity focus

Success requires translation between these worldviews. That is what Bridgeframe provides.

### Shared Responsibility: Proving Public Health Value

Both teams in the CancerSurv project (TechHealth Solutions’ business analysts and the State Cancer Registry’s public health professionals) share a critical responsibility: **proving the public health value and impact of the solution they develop.**

This is not merely about meeting technical specifications. Both teams must prove the public health value of their work through measurable outcomes and return on investment. In an era of constrained budgets, demonstrating tangible health impact has become essential for program survival.

Chapter 4 explores how to establish these success metrics during the Planning phase, ensuring that both technical deliverables and programmatic outcomes are measured from the start.

# Terminology Dictionary

## The BA-PH Translation Guide

This chapter provides a comprehensive mapping between Business Analysis (BA) terminology and Public Health (PH) equivalents. Use this as a reference throughout your work on hybrid projects.

### Core Process Mapping

The BA lifecycle aligns with public health program phases:

| BA / BABOK Phase | Public Health Equivalent | Key Activities |
| --- | --- | --- |
| **Strategy Analysis** | **Community Health Assessment** | Define the problem using epidemiological data vs business metrics |
| **Requirements Analysis** | **Data Analysis & Logic Models** | Model processes, define indicators |
| **Solution Evaluation** | **Program Evaluation (CDC Framework)** | Measure outcomes against targets |
| **Change Management** | **Implementation Science** | CFIR, RE-AIM for adoption barriers |

### The Complete BA-PH Process Workflow

The following diagram illustrates the six-phase analysis process covered in Part II of this book, showing how each BA phase maps to its Public Health equivalent. Note the iterative feedback loop from evaluation back to planning, reflecting the continuous improvement philosophy shared by both domains.

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| Figure 5.1: Business Analyst Process Mapped to Public Health Analyst Workflow |

Each phase produces artifacts and applies frameworks that translate across domains. The following sections detail the terminology mappings for each phase.

### Terminology Translation Table

#### Planning & Strategy Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **Business Need / Business Case** | **Public Health Challenge / Health Need** | In PH, the driver for change is health equity or social determinants, not profit |
| **Current State Analysis** | **Epidemiological Baseline** | Document existing conditions: disease incidence, service gaps, health disparities |
| **Future State / Vision** | **Program Goals & Intended Outcomes** | Define success via improved health indicators, not market share |
| **Constraints / Assumptions** | **Social Determinants / Policy Constraints** | Include funding limitations, regulatory requirements (HIPAA), cultural barriers, equity considerations |

### Stakeholder & Communication Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **Stakeholder** | **Interest Holder / Community Partner / Rights Holder** | See detailed note below on terminology considerations |
| **Stakeholder Analysis** | **Community Partner Mapping** | Identify power dynamics, health equity implications |
| **Requirements Workshop** | **Community Engagement Session** | PH emphasizes participatory approaches and cultural competency |

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| A Note on ‘Stakeholder’ Terminology |
| While “stakeholder” is standard in BA/Agile contexts (and used throughout this book for clarity), it carries colonial connotations in public health settings. The term evokes land claims and power imbalances, potentially disempowering Indigenous peoples and marginalized communities.  **Preferred alternatives in public health contexts:**   * **General Use**: Interest Holders, Parties/Affected Parties, Beneficiaries, Actants * **Action-Oriented**: Constituents, Key Informants, Knowledge Users, Rights Holders   When writing for mixed audiences, acknowledge both terms. When writing for public health audiences exclusively, favor the alternatives. |

#### Requirements & Analysis Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **User Story** | **Service-User Scenario / GPS Format** | GPS = “Given [context], the Person [role] Should [action]” for clinical settings |
| **Epic** | **Grant Objective / Program Goal** | High-level outcome (e.g., “Reduce TB incidence by 10%”) |
| **Requirements** | **Program Protocols / Clinical Guidelines** | Business rules are often legally or clinically mandated in PH |
| **NFRs (Non-Functional Requirements)** | **Implementation Characteristics (CFIR)** | Scalability = Outbreak Resilience; Security = HIPAA/Trust |
| **Process Model (BPMN)** | **Intervention Flowchart / Logic Model** | Visualize Inputs → Activities → Outputs → Outcomes |
| **Data Model / Schema** | **Case Definition / Data Dictionary** | ER diagrams vs epidemiological case criteria |
| **Use Case Diagram** | **Patient Journey Map** | UML diagrams vs mapping patient experience through care continuum |

#### Agile & Iteration Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **Sprint** | **PDSA Cycle / Adaptive Management** | Plan-Do-Study-Act: cyclic improvement framework |
| **Backlog** | **Workplan / Action Items** | Prioritized list of features vs outreach tasks |
| **Sprint Review / Demo** | **Progress Reporting** | Often aligned with grant reporting periods |
| **Retrospective** | **After-Action Review** | Systematic reflection on what worked and what needs improvement |

#### Quality & Evaluation Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **KPI (Key Performance Indicator)** | **Health Indicator** | “15% improvement in customer satisfaction” vs “10% reduction in infection rate” |
| **Acceptance Test Plan** | **Evaluation Protocol** | Test cases vs data collection and analysis plan |
| **Quality Assurance** | **Quality Improvement (QI)** | Systematic checks, continuous improvement cycles |
| **Bug / Defect** | **Adverse Event / Variance** | System error vs deviation from expected health outcome |
| **Lessons Learned** | **After-Action Review** | Retrospective analysis, sharing successes and gaps across organization |

#### Design & Implementation Terms

| BA / Agile Term | Public Health Equivalent | Context / Nuance |
| --- | --- | --- |
| **Prototype / Mockup** | **Pilot Study / Field Test** | Software wireframe vs PH intervention pilot in limited population |
| **Risk Analysis** | **Community Risk Assessment** | Standard risk assessment vs PH frameworks (CFIR, RE-AIM) |
| **Go-Live** | **Program Launch / Rollout** | System deployment vs intervention implementation |
| **Training Plan** | **Capacity Building** | End-user training vs workforce development |

### Alternative User Story Formats for Public Health

The standard “As a [user], I want [feature], so that [benefit]” format often fails in clinical contexts. Use these alternatives:

#### GPS Format (Given-Person-Should)

“Given [clinical context], the [health worker role] should [specific action] to [health outcome].”

**Example:**

“Given a positive TB test result, the contact tracer should initiate household investigation within 48 hours to prevent secondary transmission.”

#### Service-User Scenario

A narrative vignette describing a patient’s journey through the system:

“Maria, a 45-year-old farmworker, visits a mobile clinic for diabetes screening. She speaks primarily Spanish and has no regular primary care provider. The system must support her preferred language, connect her to follow-up care, and track her screening results for population health reporting.”

#### Situational Protocol

Context-specific workflow tied to clinical guidelines:

“When a laboratory reports a confirmed measles case, the system shall generate a contact list and notify the assigned epidemiologist within 4 hours.”

### The Logic Model as Requirements Framework

In public health, the **Logic Model** serves a similar purpose to a requirements specification. Understanding this mapping helps BA professionals communicate with PH colleagues:

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| Figure 5.2: Logic Model Structure |

| Logic Model Component | BA Equivalent |
| --- | --- |
| **Inputs** | Resources, Constraints, Assumptions |
| **Activities** | Functional Requirements, Use Cases |
| **Outputs** | Deliverables, System Features |
| **Outcomes** | Success Metrics, KPIs |
| **Impact** | Business Value, Strategic Objectives |

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| CancerSurv Example |
| In CancerSurv, the Logic Model framing helped translate between teams:   * **Input**: Grant funding, registrar staff, hospital data feeds * **Activity**: Case abstraction, data quality checks, interoperability * **Output**: Complete case records, quality reports, data submissions * **Outcome**: 95% data completeness, timely NPCR submissions * **Impact**: Accurate survival statistics, targeted prevention resources |

### Data Standards as Requirements

In public health IT, data standards are non-negotiable requirements, not optional “technical details”:

| Standard | Purpose | BA Implication |
| --- | --- | --- |
| **HL7** | Messaging between systems | Define trigger events (e.g., “ADT A01, Admit Patient”) |
| **FHIR** | Modern API-based exchange | Specify FHIR Resources (Patient, Observation) |
| **USCDI** | Federal data interoperability | Required for ONC certification |
| **ICD-10 / ICD-O-3** | Diagnosis coding | Validation rules in requirements |
| **SNOMED CT** | Clinical terminology | Concept mapping specifications |
| **LOINC** | Lab test coding | Interface specifications |

### Data Architecture: Medallion Architecture for Public Health

Modern data platforms often use a **medallion architecture**, a design pattern that organizes data into progressively refined layers: Bronze, Silver, and Gold. Originally popularized by Databricks around 2020 for their “Lakehouse” architecture, the term uses the metaphor of precious metal refinement to represent the purification of raw data into actionable insights.

While the specific “medallion” terminology is relatively new, the underlying concept evolved from traditional data warehousing layers (staging → cleansed → presentation) used since the late 1990s. Although often discussed in cloud computing contexts, medallion architecture applies equally to desktop and local server environments.

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| Translation Required: Avoid ‘Medallion’ Jargon with Public Health Colleagues |
| The terms “Bronze,” “Silver,” and “Gold” layers are **IT/data engineering jargon** that will cause confusion when speaking with public health professionals. Most epidemiologists and program staff have never encountered this terminology and will not understand what you mean.  **When working with public health clients, use familiar terms instead:**   | Instead of saying… | Say this… | | --- | --- | | “Bronze layer” | “Raw data,” “source files,” “incoming data” | | “Silver layer” | “Cleaned data,” “standardized data,” “processed data” | | “Gold layer” | “Final reports,” “line lists,” “analysis-ready data,” “dashboards” | | “Land it in Bronze” | “Store the raw file first” | | “Promote to Gold” | “Move it to the final/reporting layer” |   Reserve medallion terminology for conversations with data engineers, IT architects, and other technical staff who share this vocabulary. The underlying concepts are universal; only the labels differ. |

#### Mapping Medallion Layers to Public Health

The medallion layers map directly to standard stages of public health surveillance and clinical data management:

| Medallion Layer | Cloud Concept | Desktop/Local Equivalent | Public Health Equivalent | Practical Application |
| --- | --- | --- | --- | --- |
| **Bronze (Raw)** | Data Lake, blob storage | Raw data folder, incoming file directory, source database tables | Ingestion / Source Systems | Original, unprocessed data from EHRs, medical devices, lab results, vital records, and external APIs |
| **Silver (Cleansed)** | Data warehouse staging, transformed datasets | Cleaned spreadsheets, normalized database tables, staging folders | Normalization / Harmonization | Standardizing data to common formats (FHIR, OMOP), de-identifying PHI for HIPAA compliance, harmonizing lab units and coding schemes |
| **Gold (Curated)** | Analytics layer, data marts, OLAP cubes | Final reports, pivot tables, analysis-ready datasets, exported summaries | Actionable Insights / Reporting | Line lists for contact tracing, outbreak predictive models, patient cohorts for research, operational dashboards, CDC/NPCR submissions |

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| Desktop Analogy |
| Think of medallion architecture like organizing files on your computer:   * **Bronze** = Your “Downloads” or “Inbox” folder with raw files exactly as received * **Silver** = A “Working” folder where you’ve cleaned up, renamed, and standardized files * **Gold** = Your “Final Reports” folder with polished, ready-to-share documents   Even an Excel workbook can implement this pattern: raw data on a “Source” tab (Bronze), cleaned data on a “Processed” tab (Silver), and summary tables/charts on a “Dashboard” tab (Gold). |

#### User Roles by Layer

Different team members interact with different layers based on their roles and responsibilities. In well-resourced organizations, distinct roles handle each layer; in smaller programs, a single person may be responsible for all three.

**Who Creates Each Layer?**

| Layer | BA/IT Role (Creates) | Public Health Role (Creates) |
| --- | --- | --- |
| **Bronze** | Data engineers, ETL developers, integration specialists | Data managers, IT staff, interface analysts |
| **Silver** | Data engineers, data analysts, data quality specialists | Epidemiologists, data quality analysts, cancer registrars |
| **Gold** | BI developers, analytics engineers, data scientists | Epidemiologists, biostatisticians, program analysts |

**Who Consumes Each Layer?**

| Layer | BA/IT Role (Consumes) | Public Health Role (Consumes) |
| --- | --- | --- |
| **Bronze** | Data engineers (for troubleshooting), compliance/audit teams | Data managers (validation), security officers, auditors |
| **Silver** | Data analysts, data scientists (for detailed analysis) | Epidemiologists (case-level analysis), registrars, researchers |
| **Gold** | Executives, business users, ML engineers (for models) | Contact tracers, program managers, leadership, partner agencies, the public |

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| Reality in Resource-Constrained Settings |
| The role separation above represents an ideal state. In many public health settings, particularly local health departments or small programs, a single **epidemiologist** or **data manager** may be responsible for all three layers: receiving raw data files (Bronze), cleaning and standardizing them (Silver), and producing reports and line lists (Gold).  This is common and acceptable. The medallion architecture is a logical framework, not an organizational mandate. What matters is maintaining the conceptual separation of data stages, even when one person performs all the work. This separation enables:   * Clear documentation of what transformations occurred * Ability to reprocess from raw data if errors are discovered * Easier handoff if responsibilities change |

#### What Layer Does a Line List Belong To?

A **line list**, the tabular record of cases used for outbreak investigation and contact tracing, is a **Gold layer artifact**. Here’s why:

* It serves a specific operational purpose (contact tracing, outbreak response)
* It draws from cleansed, deduplicated Silver layer data
* It is structured for end-user consumption by epidemiologists and contact tracers
* It represents a curated, analysis-ready dataset rather than raw source data

The raw lab reports and case notifications are Bronze; the standardized, deduplicated case records are Silver; the line list exported for the contact tracing team is Gold.

#### Strategic Benefits for Public Health

**Improved Data Quality and Trust**

Each layer acts as a governance checkpoint. Data in the Bronze layer may contain duplicates, inconsistencies, and errors. By the time data reaches Gold, it has been validated, deduplicated, and enriched. This is critical for clinical decision-making and regulatory reporting.

**Security and Compliance**

The layered architecture supports role-based access control. Data engineers may access Bronze (raw PHI for integration work), while analysts work primarily in Silver (de-identified or limited datasets), and program staff view only Gold (aggregated, anonymized dashboards). This minimizes unnecessary exposure of sensitive patient information.

**Scalability for Outbreak Response**

The architecture handles varying data volumes, from routine surveillance to pandemic surge. Bronze ingests high-velocity real-time streams; Silver performs complex transformations at scale; Gold delivers rapid insights to decision-makers.

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| CancerSurv Example |
| In CancerSurv, the medallion architecture maps to existing workflows:   * **Bronze**: Raw HL7 messages from hospital pathology systems, vital records death certificates, lab reports * **Silver**: Deduplicated patient records, standardized ICD-O-3 codes, NAACCR-compliant case abstracts * **Gold**: Annual incidence reports for NPCR, survival analysis dashboards, geographic cancer cluster maps for epidemiologists |

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| Translation Tip |
| When a data engineer says “we need to land this in Bronze first,” they mean the data should be ingested in its raw form before any processing. This is equivalent to a public health analyst saying “we need to see the source data before any transformations.” |

### Quick Reference Card

For easy access during meetings, here are the most commonly needed translations:

| When they say… | They might mean… |
| --- | --- |
| “What’s the user story?” | “What is the service-user scenario or clinical workflow?” |
| “Let’s do a sprint” | “Let’s run a PDSA cycle” |
| “What are the NFRs?” | “What are the implementation characteristics?” |
| “Stakeholder meeting” | “Community partner engagement session” |
| “Business case” | “Public health challenge / needs assessment” |
| “Acceptance criteria” | “Evaluation protocol measures” |
| “Technical debt” | “System sustainability issues” |
| “MVP (Minimum Viable Product)” | “Pilot intervention” |
| “Land it in Bronze” | “Ingest raw data before any processing” |
| “Promote to Gold” | “Data is ready for reporting and analytics” |

# Planning & Needs Assessment

## Planning & Strategy / Needs Assessment

Every successful project begins with understanding the problem. In business analysis, this phase is called **Strategy Analysis** or **Planning**. In public health, it is the **Needs Assessment** or **Community Health Assessment**. Both seek to answer the same fundamental question: What problem are we solving, and for whom?

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Business Need | Public Health Challenge |
| Current State Analysis | Epidemiological Baseline |
| Future State Vision | Program Goals & Intended Outcomes |
| Stakeholder Identification | Community Partner Mapping |
| Feasibility Assessment | Resource & Capacity Analysis |

### Start Translation Early

Many health IT projects encounter translation challenges only when they reach software requirements definition. By then, both teams have invested time and developed expectations using their own terminology. Untangling miscommunication while simultaneously trying to make progress creates unnecessary friction.

**The business case is the ideal moment to introduce translation.**

When building the justification for funding (whether a grant application, budget request, or vendor RFP), explicitly consider:

* What terminology gaps exist between the technical and programmatic teams?
* What training or facilitation will help teams communicate effectively?
* Who will serve as translators or bridges between domains?
* What documentation will help each team understand the other’s frameworks?

Including these considerations in the business case accomplishes two things:

1. **Resource discovery**: The funding request captures the full scope of what the project needs, including human and process elements, not just technical deliverables
2. **Early alignment**: Teams enter requirements gathering with shared vocabulary, reducing costly clarification loops later

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| CancerSurv Example |
| The CancerSurv grant application included a budget line for “cross-domain facilitation workshops” and allocated time for the project manager to develop a terminology crosswalk document before vendor selection. When TechHealth Solutions came on board, the state team provided this crosswalk in the kickoff meeting, establishing shared language from day one. |

### Defining the Problem

#### Business Analysis Approach

In traditional BA, the business need emerges from organizational pain points:

* Revenue decline
* Operational inefficiency
* Compliance gaps
* Competitive pressure
* Technology obsolescence

The BA documents this in a **Business Case** that quantifies the problem, proposes solutions, and projects return on investment.

#### Public Health Approach

In public health, the need emerges from population health data:

* Disease incidence and prevalence
* Health disparities across demographics
* Service access gaps
* Outbreak patterns
* Unmet community needs

The epidemiologist documents this in a **Needs Assessment** that quantifies health burden, identifies determinants, and prioritizes interventions.

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| CancerSurv Example |
| **Business Need (BA framing):** The legacy mainframe system is approaching end-of-life. Maintenance costs have increased 40% over three years. The system cannot support modern interoperability requirements or remote work.  **Public Health Challenge (PH framing):** Cancer data completeness has declined to 89%, below the CDC target of 95%. Late-stage diagnoses are increasing in rural counties, suggesting gaps in early detection. The current system cannot support the real-time analytics needed to identify and address disparities.  Both framings describe the same project. The BA framing emphasizes operational efficiency; the PH framing emphasizes health outcomes. Effective planning addresses both. |

### Current State Analysis

#### Documenting What Exists

Before defining requirements, understand what currently exists. The approaches differ in emphasis but serve the same purpose:

**BA Current State Analysis:**

* Process maps (BPMN diagrams)
* System inventories
* Pain point interviews
* Performance metrics
* Technical debt assessment

**PH Epidemiological Baseline:**

* Disease surveillance data
* Demographic health profiles
* Service utilization patterns
* Health equity indicators
* Environmental and social determinants

#### Data Sources for Current State

| BA Data Sources | PH Data Sources |
| --- | --- |
| System logs, usage analytics | Disease registries, vital records |
| User surveys, interviews | Community health surveys (BRFSS) |
| Process documentation | Clinical guidelines, protocols |
| Financial reports | Grant reports, program evaluations |
| Vendor assessments | CDC/state health department data |

### Future State Vision

#### Defining Success

The future state describes what success looks like. Again, the framing differs:

**BA Future State:**

* System capabilities and features
* Process improvements
* Performance targets
* Technical architecture
* Integration landscape

**PH Program Goals:**

* Health outcome improvements
* Disparity reductions
* Service access expansion
* Quality metrics
* Population health indicators

#### SMART Objectives

Both domains benefit from SMART objective setting:

| Component | BA Example | PH Example |
| --- | --- | --- |
| **Specific** | Reduce case entry time | Increase early-stage cancer detection |
| **Measurable** | From 15 to 8 minutes per case | From 45% to 55% of cases |
| **Achievable** | Based on vendor benchmarks | Based on peer state performance |
| **Relevant** | Supports registrar productivity | Supports prevention targeting |
| **Time-bound** | Within 6 months of go-live | Within 2 years of program launch |

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| CancerSurv Example |
| **SMART Objective (Dual Framing):**  *BA:* “Within 6 months of CancerSurv deployment, average case abstraction time will decrease from 15 minutes to 8 minutes, as measured by system audit logs.”  *PH:* “Within 2 years of CancerSurv deployment, data completeness will increase from 89% to 95%, enabling accurate survival analysis and disparity identification for the state cancer plan.”  Both objectives are valid; both should appear in project documentation. |

### Proving Impact: Defining Success Metrics That Matter

During the Planning phase, both teams must establish not just technical deliverables but **proof points** that demonstrate public health value and return on investment. This is not an afterthought for the Evaluation phase; impact measurement must be designed into the project from the beginning.

#### Why This Matters Now

When funding is constrained, every technology investment must justify its worth. Programs that cannot demonstrate measurable health outcomes or cost savings risk elimination. Grant proposals that lack data-driven proof of impact are increasingly non-competitive.

This creates a **shared responsibility** between technical and public health teams:

* **Technical teams** (BAs, developers, product managers) must design systems that capture and report impact metrics automatically
* **Public health teams** (epidemiologists, program managers, evaluators) must define what “success” looks like in measurable, system-capturable terms

Neither can succeed without the other. A system that tracks technical performance but not health outcomes cannot justify continued funding. A program with strong outcomes but no data to prove them cannot compete for resources.

#### Focus on Outcomes, Not Just Outputs

During planning, resist the temptation to define success solely through system features or process metrics. Instead, establish clear lines of sight from technical deliverables to health outcomes:

| Don’t Just Measure… | Instead, Translate To… |
| --- | --- |
| System processes 12,000 records annually | Faster outbreak detection through real-time analytics |
| Achieved 95% data quality scores | Enabled accurate survival statistics that guide treatment protocols |
| Implemented HL7 FHIR integration | Reduced registrar burden by 40%, allowing focus on complex cases |
| Built analytics dashboard | Identified cancer disparities 6 months faster, enabling targeted screening |

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| CancerSurv Example |
| During the Planning phase, the CancerSurv project team established **paired metrics** that satisfy both technical and programmatic accountability:  **Baseline Metrics:** - Legacy system processes 12,000 cases annually with 87% data completeness - 6-month lag between data collection and annual reporting - Manual processes consume 15 minutes per case for abstraction - Limited ability to identify geographic or demographic disparities  **Target Metrics (Technical + Health Outcomes):**   1. **Data Completeness**: Increase from 87% to 95% within 18 months    * *Technical benefit*: Meets CDC/NPCR reporting standards    * *Health outcome*: Approximately 960 additional cases fully documented, strengthening survival analyses and disparity assessments 2. **Reporting Timeliness**: Reduce lag from 6 months to 3 months    * *Technical benefit*: Automated data pipelines and validation    * *Health outcome*: Policy decisions about screening programs informed by more current data 3. **Workflow Efficiency**: Reduce abstraction time from 15 to 8 minutes per case    * *Technical benefit*: Improved UI/UX and automated coding suggestions    * *Health outcome*: Registrars can process more cases or dedicate time to complex case resolution 4. **Disparity Identification**: Enable real-time geographic and demographic analysis    * *Technical benefit*: Analytics dashboard with interactive mapping    * *Health outcome*: Target screening and prevention resources to underserved populations faster   These metrics were not arbitrary technical goals. They directly map to CDC reporting requirements, state strategic health objectives, and competitive grant criteria. By establishing them during Planning, the team ensured that both the business case and the system requirements aligned around demonstrable impact. |

#### Making the Case to Multiple Audiences

Success metrics serve different stakeholders with different priorities. Plan for multiple reporting formats:

**For CDC/NPCR Program:** - Annual performance reports demonstrating compliance with NPCR standards - Data quality metrics (completeness, timeliness, validity) - Comparison to national benchmarks

**For State Legislature and Budget Offices:** - Budget justifications showing public health value per dollar invested - Efficiency gains (e.g., “Automation saves 140 hours/month, equivalent to $X salary”) - Health outcomes (e.g., “Earlier detection in rural counties reduced late-stage diagnoses by 12%”)

**For Hospital Partners and Data Submitters:** - Evidence that data submission yields insights valuable to their quality improvement efforts - Feedback reports showing how their data contributes to statewide cancer prevention - Reduced burden through automated electronic reporting

**For Registry Staff:** - Tangible improvements in workflow efficiency and job satisfaction - Recognition of their work’s impact on community health - Career development opportunities through new technical skills

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| Design for Impact from Day One |
| Proving impact is not solely the responsibility of the public health team’s evaluation unit. Business analysts, developers, and product managers must design impact measurement into the system architecture from requirements gathering forward. This means:   * Including “evaluation metrics capture” as functional requirements, not optional features * Designing data models that support both operational reporting and outcome analysis * Building dashboards and export functions that generate grant-ready reports automatically * Architecting audit logs that track not just system usage but workflow improvements   Likewise, epidemiologists and registry staff must collaborate with technical partners early to define what “success” looks like in measurable, system-capturable terms. Vague goals like “improve cancer outcomes” must translate to specific, quantifiable indicators the system can track. |

#### Building Impact into the Business Case

The business case or grant application developed during this Planning phase should explicitly address impact demonstration:

**Resource Allocation:** - Budget line items for evaluation tools, data visualization platforms, or analytics staff - Time allocated for defining metrics and establishing baselines - Training for staff on using system-generated reports for grant writing

**Long-term Sustainability:** - How will the system prove its value over time to justify continued funding? - What ongoing performance indicators will be tracked and reported? - Who is responsible for translating technical metrics into health outcome narratives?

**Competitive Positioning:** - How does this project’s approach to impact measurement differentiate the proposal? - What evidence-based outcomes make the case more compelling than competing priorities?

When both technical and public health teams embrace this shared responsibility for proving impact, technology investments do more than deliver features on time and on budget. They deliver **demonstrable improvements in population health**, which justifies existing funding and unlocks new opportunities. Public health leaders and elected officials are far more likely to protect and expand programs that show tangible results: reduced cancer mortality, eliminated disparities, dollars saved through prevention.

### Stakeholder / Community Partner Identification

#### Mapping the Landscape

Identifying who participates in the project requires understanding both organizational and community perspectives:

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| Figure 6.1: Stakeholder/Community Partner Landscape |

#### Power-Interest Analysis

The classic BA power-interest grid maps to PH community engagement levels:

| Quadrant | BA Approach | PH Approach |
| --- | --- | --- |
| High Power, High Interest | Manage closely | Active partnership |
| High Power, Low Interest | Keep satisfied | Inform and consult |
| Low Power, High Interest | Keep informed | Empower and involve |
| Low Power, Low Interest | Monitor | Ensure representation |

### Feasibility Assessment

#### Can We Do This?

Both domains assess feasibility before committing resources:

**BA Feasibility Dimensions:**

* Technical feasibility (Can we build it?)
* Economic feasibility (Can we afford it?)
* Operational feasibility (Can we run it?)
* Schedule feasibility (Can we deliver on time?)

**PH Feasibility Dimensions:**

* Evidence base (Does the intervention work?)
* Resource availability (Do we have funding, staff?)
* Political will (Is there leadership support?)
* Community readiness (Will the population engage?)
* Ethical considerations (Is it equitable?)

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| Bridging Tip |
| When presenting feasibility to mixed audiences, address both technical and programmatic dimensions. A system that is technically feasible but lacks community buy-in will fail. An intervention with strong evidence but no technical infrastructure cannot scale. |

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Business Case | Needs Assessment Report | Justify the project |
| Stakeholder Register | Community Partner Map | Identify participants |
| Current State Analysis | Epidemiological Baseline | Document starting point |
| Future State Vision | Program Goals | Define success |
| Feasibility Study | Readiness Assessment | Confirm viability |

### Common Pitfalls

**For BA professionals entering PH:**

* Underestimating regulatory constraints (HIPAA, IRB)
* Ignoring health equity implications
* Treating clinical workflows like business processes
* Missing grant-cycle dependencies

**For PH professionals working with BA:**

* Providing needs assessments instead of requirements
* Assuming IT teams understand clinical context
* Underspecifying data quality needs
* Ignoring change management complexity

### Moving Forward

With the problem defined and feasibility confirmed, the next phase focuses on **Elicitation**: gathering detailed information from stakeholders and community partners about their specific needs and constraints.

# Elicitation & Engagement

## Elicitation & Stakeholder Engagement

Once the problem is defined, we must gather detailed information about needs, constraints, and context. In business analysis, this is **Elicitation**. In public health, it is **Stakeholder Engagement** or **Community-Based Participatory Research**. Both involve systematic approaches to learning from people who will use, be affected by, or govern the solution.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Elicitation Techniques | Community Engagement Methods |
| Requirements Workshops | Focus Groups, Town Halls |
| User Interviews | Key Informant Interviews |
| Document Analysis | Literature Review, Policy Analysis |
| Observation | Ethnography, Site Visits |
| Prototyping | Pilot Testing, Formative Research |

### Elicitation Techniques Mapped

#### Interviews

Both domains rely heavily on one-on-one conversations with knowledgeable individuals:

**BA User Interviews:**

* Focus on workflow, pain points, desired features
* Structured around use cases or process steps
* Document functional and non-functional requirements

**PH Key Informant Interviews:**

* Focus on community needs, barriers, facilitators
* May explore cultural context, health beliefs
* Inform intervention design and implementation strategy

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| CancerSurv Example |
| **BA Interview with Registrar:**  “Walk me through your typical day. What tasks take the most time? Where do you encounter errors? What features would make your work easier?”  **PH Interview with Oncologist:**  “How do you currently receive staging information? What data quality issues affect your treatment decisions? How could better surveillance data support tumor board discussions?”  Both interviews inform CancerSurv requirements, but from different perspectives. |

### Workshops and Focus Groups

Group sessions enable collaborative discovery:

**BA Requirements Workshop:**

* Facilitated session with defined agenda
* Uses techniques like brainstorming, affinity mapping
* Produces prioritized requirement lists
* Resolves conflicts through negotiation

**PH Focus Group:**

* Semi-structured group discussion
* Explores shared experiences and diverse perspectives
* May surface unanticipated needs or concerns
* Emphasizes inclusive participation

#### Document Analysis

Existing documentation provides essential context:

| BA Documents | PH Documents |
| --- | --- |
| System specifications | Clinical protocols |
| Process manuals | CDC guidelines |
| Vendor contracts | Grant requirements |
| Training materials | Health education materials |
| Audit reports | Program evaluations |

#### Observation

Watching work happen reveals what interviews miss:

**BA Observation (Job Shadowing):**

* Watch users perform tasks
* Note workarounds and inefficiencies
* Identify undocumented processes
* Time critical workflows

**PH Observation (Site Visits, Ethnography):**

* Visit clinics, community settings
* Understand context and constraints
* Observe patient-provider interactions
* Identify environmental factors

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| Gemba Walks |
| The Lean concept of “Gemba” (going to the actual place where work happens) applies to both domains. For CancerSurv, this means spending time in the registry office watching abstractors work, not just interviewing them in a conference room.  However, Gemba walks often fall short when designers and programmers only observe a single point in the workflow. A critical gap in many software projects is the failure to understand the **complete data and document flow** across all users and use cases. |

#### Understanding the Full Workflow

A frequent and costly mistake is that software designers speak primarily with **decision-makers and budget holders**—often located far from the actual work. These gatekeepers may not themselves use the system daily, and they may not see the entire operational flow. The result: software that fails to support the messy, multi-stage reality of work.

**The Complete Workflow Includes:**

1. **Data Generation & Collection** (field operations)
   * How data originates: inspections, tests, patient encounters
   * Who collects it and what constraints they face
2. **Data Intake & System Processing** (data entry, administration)
   * How raw data enters the system
   * What validation, coding, and quality checks occur
   * Who performs these tasks and their priorities
3. **Data Preparation for External Use** (records, reporting)
   * How data is processed for public requests, legal discovery, or external reporting
   * Admin support and customer service functions
   * Regulatory and compliance requirements
4. **Data Use by Multiple Stakeholders** (analysis, management, operations)
   * How frontline workers (field inspectors, registrars) use data for daily decisions
   * How managers use the same data for productivity metrics, resource allocation, and accountability
   * These uses often conflict—what serves operational efficiency may not serve field worker needs

**Why This Matters:**

Each stage has **different outcomes, different focuses, and different definitions of success**. Data collected by one stakeholder is processed by another and used by a third—each with distinct priorities. A system designed to satisfy the decision-maker but not these three operational groups will fail in practice.

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| CancerSurv Example |
| **The Problem:**  A software vendor designs CancerSurv by consulting the State Cancer Registry **Director** (the budget holder). The director prioritizes:   * NPCR reporting compliance * Cost efficiency * Centralized system control   But the director rarely enters data or manages daily workflows. The actual system involves:   1. **Data Generation:** Hospital pathologists and surgical oncologists generate reports (often outside the system, in hospital EHRs) 2. **Data Intake:** Registrars abstract cases from hospital records into CancerSurv—manually reviewing pathology, staging, treatment 3. **Data Processing:** Admin staff validate data, perform quality checks, request missing information, deduplicate records, and prepare annual reports for CDC 4. **Data Use (Inspection/Operations):** Registrars use the system to identify missing follow-up information and flag data quality issues 5. **Data Use (Management):** The director uses dashboards to track incidence trends and ensure grant milestones are met; registry managers use the same data to evaluate registrar productivity and workload   **The Disconnect:**  If programmers and designers only shadow the director or attend leadership meetings, they miss critical needs:   * Registrars need efficient batch workflows for large case imports (not addressed in director-focused design) * Admin staff need audit trails and error logs (not a director priority) * Registrars’ productivity data goes to managers for performance reviews—creating tension between doing quality work and doing work fast * Hospital pathologists need interoperability to send structured reports directly into CancerSurv (if this step is never observed, a manual workaround becomes permanent)   **The Solution:**  Before programming begins, the development team—including programmers and architects—must shadow all four phases:   * Spend time in the hospital observing how pathology reports are generated and accessed by registrars * Sit with registrars as they abstract cases and manage quality issues * Work with admin staff processing data for CDC submission and responding to records requests * Interview both field registrars and managers to understand how the same data supports different decisions   Only then can the team design a system that truly serves the work, not just the budget narrative. |

**A Critical Principle for Both Domains:**

Whether in public health or IT, the programmer or analyst who designs the system must see the complete workflow before design begins. This is not optional; it is the foundation of requirements elicitation. Skipping this step guarantees expensive redesigns, user dissatisfaction, and workarounds that undermine system integrity.

### Engaging Diverse Voices

#### The Equity Imperative

Public health emphasizes inclusive engagement, ensuring marginalized voices are heard. This principle benefits IT projects as well:

**Questions to Ask:**

* Who is missing from our stakeholder list?
* Whose needs might be overlooked by “typical” users?
* What barriers prevent participation (language, location, schedule)?
* How do we ensure power imbalances do not silence important perspectives?

#### Community-Based Participatory Research (CBPR)

CBPR principles can strengthen BA elicitation:

| CBPR Principle | BA Application |
| --- | --- |
| Community as equal partner | Users co-design, not just provide input |
| Build on community strengths | Leverage existing workflows that work |
| Balance research and action | Deliver incremental value during elicitation |
| Long-term commitment | Maintain relationships beyond project end |

### Translating What You Hear

#### From Needs to Requirements

Elicitation produces raw material that must be translated into actionable requirements:

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| Figure 7.1: From Elicitation to Requirements |

#### Common Translation Challenges

| What Stakeholders Say | What They Might Mean | Requirement Implication |
| --- | --- | --- |
| “It should be easy to use” | Current system requires too many clicks | Reduce clicks per task by 50% |
| “We need real-time data” | Current reports are weeks old | Dashboard updates within 24 hours |
| “Make it like Excel” | Users are comfortable with Excel | Familiar grid-based interface |
| “We need better reports” | Current reports lack specific metrics | Add [specific metric] to [report] |

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| CancerSurv Example |
| **Stakeholder statement:** “We need the system to be faster.”  **Probing questions:**   * Which specific tasks feel slow? * How long do those tasks take now? * What would be an acceptable time? * What happens when the system is slow?   **Refined requirement:** “The case search function shall return results within 3 seconds for queries returning up to 1,000 records, to support efficient case lookup during abstraction.” |

### Documentation Approaches

#### BA Requirements Documentation

* User Stories (Agile)
* Use Cases (UML)
* Requirements Specifications (Waterfall)
* Acceptance Criteria

#### PH Program Documentation

* Logic Models
* Intervention Protocols
* Evaluation Plans
* Implementation Guides

#### Bridging the Formats

For hybrid projects, consider dual documentation:

| Audience | Format | Content |
| --- | --- | --- |
| Development team | User Stories | Functional requirements in Agile format |
| Clinical stakeholders | Service-User Scenarios | Narrative descriptions of clinical workflows |
| Funders (CDC, grants) | Logic Model | Inputs, activities, outputs, outcomes |
| Governance | Requirements Traceability Matrix | Links requirements to objectives |

#### When Standard User Stories Fall Short

The standard Agile user story format (“As a [user], I want [feature], so that [benefit]”) works well for many software contexts. However, it often fails to capture the nuances of clinical workflows, regulatory requirements, and public health scenarios.

**Why standard user stories may not fit clinical contexts:**

* Clinical workflows involve conditional logic (“if this lab result, then that action”)
* Regulatory requirements mandate specific timeframes and actions
* Patient safety considerations require explicit protocols, not just user preferences
* Public health surveillance involves system-initiated actions, not just user-initiated features

**Alternative formats worth considering:**

**Given-Person-Should (GPS) Format:**

This format emphasizes context and obligation rather than desire:

“Given [clinical/situational context], the [health worker role] should [specific action] to [health outcome].”

*Example:*

“Given a positive TB test result, the contact tracer should initiate household investigation within 48 hours to prevent secondary transmission.”

**Situational Protocol Format:**

This format ties system behavior to clinical guidelines or regulatory requirements:

“When [triggering event], the system shall [required action] within [timeframe].”

*Example:*

“When a laboratory reports a confirmed measles case, the system shall generate a contact list and notify the assigned epidemiologist within 4 hours.”

**Service-User Scenario Format:**

This narrative format describes a patient or client journey through the system:

“Maria, a 45-year-old farmworker, visits a mobile clinic for diabetes screening. She speaks primarily Spanish and has no regular primary care provider. The system must support her preferred language, connect her to follow-up care, and track her screening results for population health reporting.”

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| CancerSurv Example |
| **Standard user story:**  “As a registrar, I want to search for existing cases, so that I can avoid creating duplicates.”  **GPS format (adding clinical context):**  “Given a new pathology report for a patient who may already be in the registry, the registrar should be able to search by name, SSN, and diagnosis within 3 seconds to prevent duplicate case creation and ensure accurate incidence counts.”  **Situational protocol (system-initiated):**  “When a new case is entered, the system shall automatically search for potential duplicates using probabilistic matching and present candidates to the registrar for review before saving.” |

Choose the format that best communicates intent to your audience. Development teams may still translate these into standard user stories for sprint planning, but starting with clinical context ensures nothing gets lost in translation.

### Validation and Confirmation

#### Ensuring Accuracy

Elicitation is iterative. Validate what you heard:

**BA Validation Techniques:**

* Requirements reviews
* Prototype walkthroughs
* Structured walkthroughs
* Sign-off meetings

**PH Validation Techniques:**

* Member checking (returning findings to participants)
* Community review sessions
* Pilot testing
* Expert review panels

### Managing Conflicting Needs

#### When Stakeholders Disagree

Conflicts are inevitable. Resolution approaches include:

| Approach | When to Use |
| --- | --- |
| **Prioritization** | When resources are limited; use MoSCoW or weighted scoring |
| **Negotiation** | When compromise is possible without losing value |
| **Escalation** | When authority must resolve; use governance structure |
| **Phasing** | When both needs are valid; address in different releases |
| **Alternatives Analysis** | When creative solutions can satisfy both parties |

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| CancerSurv Example |
| **Conflict:** Registrars want a simple, streamlined interface. Epidemiologists want comprehensive data fields for analysis.  **Resolution:** Implement a tiered interface:   * Core fields (required): Streamlined view for registrars * Extended fields (optional): Available when needed * Analytics fields: Populated from other sources, not requiring registrar entry |

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Elicitation Results | Engagement Summary | Raw findings documentation |
| Requirements Document | Program Protocol | Detailed specifications |
| User Stories / Use Cases | Service-User Scenarios | Actionable descriptions |
| Stakeholder Feedback Log | Community Input Register | Track all input received |

### Moving Forward

With needs elicited and documented, the next phase focuses on **Requirements Analysis**: organizing, prioritizing, and specifying the detailed requirements that will guide solution design.

# Requirements & Data Analysis

## Requirements Analysis & Data Analysis

Raw elicitation findings must be organized, analyzed, and specified in detail. In business analysis, this is **Requirements Analysis and Design Definition**. In public health, it maps to **Data Analysis** and **Logic Model Development**. Both processes transform unstructured input into structured, actionable specifications.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Requirements Analysis | Data Analysis |
| Requirements Specification | Logic Model / Theory of Change |
| Functional Requirements | Program Activities |
| Non-Functional Requirements | Implementation Characteristics |
| Data Requirements | Case Definitions, Data Dictionaries |
| Business Rules | Clinical Guidelines, Protocols |

### Types of Requirements

#### Functional Requirements

**BA Definition:** What the system must do. Capabilities, features, functions.

**PH Equivalent:** Program activities, intervention components, service delivery specifications.

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| CancerSurv Example |
| **Functional Requirement (BA format):**  FR-101: The system shall allow users to search for cases by patient name, medical record number, or social security number.  **Program Activity (PH format):**  Cancer registrars will abstract and code incident cases from hospital pathology reports within 6 months of diagnosis date.  Both describe “what happens” but at different levels of specificity. |

#### Non-Functional Requirements (NFRs)

**BA Definition:** Quality attributes, constraints, performance characteristics.

**PH Equivalent:** Implementation characteristics (per CFIR framework).

| NFR Category | BA Focus | PH Focus (CFIR Domain) |
| --- | --- | --- |
| **Performance** | Response time, throughput | Efficiency of intervention delivery |
| **Security** | Access control, encryption | HIPAA compliance, trust |
| **Scalability** | Growth capacity | Outbreak surge response |
| **Usability** | User interface design | Complexity, ease of adoption |
| **Reliability** | Uptime, fault tolerance | Service continuity |
| **Interoperability** | API standards, data exchange | Health information exchange |

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| CancerSurv Example |
| **NFR (BA format):**  NFR-201: The system shall maintain 99.9% uptime during business hours (8 AM to 6 PM Eastern).  **Implementation Characteristic (PH format):**  The CancerSurv platform must demonstrate high reliability to maintain registrar confidence and ensure continuous data collection, critical during cancer awareness campaigns when reporting volumes increase. |

#### Data Requirements

Data specifications are central to both domains:

**BA Data Model:**

* Entity-Relationship diagrams
* Database schemas
* Data dictionaries
* Validation rules

**PH Case Definitions:**

* Diagnostic criteria
* Inclusion/exclusion criteria
* Coding standards (ICD-O-3, TNM)
* Data quality metrics

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| Figure 8.1: CancerSurv Simplified Data Model |

#### Data Architecture Requirements

Modern public health data systems require architecture that handles data from ingestion through analytics. The **medallion architecture** provides a framework for specifying data flow requirements across three progressive layers.

**Specifying Requirements by Layer**

When documenting data requirements, specify which layer each requirement applies to:

| Requirement Type | Bronze Layer | Silver Layer | Gold Layer |
| --- | --- | --- | --- |
| **Primary Focus** | Completeness, lineage | Accuracy, consistency | Timeliness, usability |
| **Data State** | Raw, as-received | Cleansed, standardized | Aggregated, analytics-ready |
| **Schema** | Schema-on-read (flexible) | Enforced schema | Dimensional models |
| **Retention** | Long-term archive | Medium-term | Purpose-specific |

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| CancerSurv Example |
| **Bronze Layer Requirements:**   * REQ-DATA-001: The system shall ingest HL7 v2.x ADT messages from hospital interfaces within 15 minutes of receipt * REQ-DATA-002: The system shall preserve original message content with timestamp and source metadata for audit purposes * REQ-DATA-003: The system shall support ingestion of CSV files from facilities without HL7 capability   **Silver Layer Requirements:**   * REQ-DATA-010: The system shall deduplicate patient records using probabilistic matching (≥95% precision) * REQ-DATA-011: The system shall map incoming diagnosis codes to ICD-O-3 standard within 24 hours * REQ-DATA-012: The system shall apply NAACCR edit checks and flag records failing validation   **Gold Layer Requirements:**   * REQ-DATA-020: The system shall generate NPCR-compliant annual submission files by January 31 * REQ-DATA-021: The system shall calculate age-adjusted incidence rates by county, updated monthly * REQ-DATA-022: The system shall provide self-service query access for approved epidemiologists |

**Data Lineage and Traceability**

Public health reporting requires demonstrable data provenance. Requirements should specify:

* How data flows from source to final output
* Which transformations are applied at each layer
* How to trace any Gold-layer value back to its Bronze-layer source

This is equivalent to the “chain of custody” concept in laboratory settings.

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| Figure 8.2: Data Flow Through Medallion Layers |

#### Business Rules / Clinical Guidelines

Rules governing system behavior and data processing:

| BA Business Rule | PH Clinical Guideline |
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| “Order cannot be placed if credit limit exceeded” | “Case is reportable if primary site is within state jurisdiction” |
| “Discount applies if quantity > 100” | “Stage is unknown if pathology report unavailable within 4 months” |
| “Manager approval required for refunds > $500” | “Multiple primary rules apply per SEER guidelines” |

### Data Standards as Primary Requirements

In commercial software projects, data standards (file formats, API specifications, integration protocols) are often treated as technical details to be resolved by developers during implementation. In public health IT, this approach fails.

**Data standards are primary business requirements, not optional technical details.**

Health information systems operate within a regulatory and interoperability landscape where specific standards are mandated, not merely preferred. These standards should be identified and documented early, during requirements analysis, not deferred to design or implementation.

| Standard | Purpose | Requirement Implication |
| --- | --- | --- |
| **HIPAA** | Privacy and security | Security architecture, access controls, audit logging |
| **HL7 v2** | Message-based data exchange | Interface specifications for lab results, ADT events |
| **HL7 FHIR** | Modern API-based exchange | RESTful API design for EHR integration |
| **USCDI** | Federal data interoperability | Required data classes for ONC certification |
| **ICD-10 / ICD-O-3** | Diagnosis and oncology coding | Validation rules, lookup tables, code mapping |
| **SNOMED CT** | Clinical terminology | Concept mapping specifications |
| **LOINC** | Laboratory test coding | Interface specifications for electronic lab reporting |
| **NAACCR** | Cancer registry standards | Data dictionary, edit checks, submission formats |

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| Common Pitfall |
| When data standards are not identified as requirements, projects encounter costly surprises during integration testing. A system that functions correctly in isolation may fail when connected to external systems that expect specific data formats, codes, or protocols.  For business analysts entering public health IT: treat data standards as "Must Have" requirements from day one. Interview stakeholders about external data exchanges early, and document the specific standards each interface requires. |

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| CancerSurv Example |
| **Standards-Based Requirements for CancerSurv:**   | Standard | CancerSurv Requirement | | --- | --- | | HIPAA | All PHI encrypted at rest and in transit; role-based access; 6-year audit log retention | | HL7 FHIR | Patient, Condition, and Observation resources for hospital EHR integration | | NAACCR v24 | All required data items; automated EDITS validation; annual submission file generation | | ICD-O-3 | Validated primary site and histology codes with cross-validation rules | | LOINC | Mapping table for incoming electronic pathology reports |   These standards-based requirements appeared in the CancerSurv requirements specification alongside functional requirements, with the same priority and traceability as any other "Must Have" item. |

### The Logic Model as Requirements Framework

Public health uses the **Logic Model** to specify program components. This structure maps directly to requirements categories:

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| Figure 8.3: Logic Model Components Mapped to Requirements |

| Logic Model Component | Requirements Category |
| --- | --- |
| Inputs | Constraints, Assumptions, Dependencies |
| Activities | Functional Requirements |
| Outputs | System Deliverables, Features |
| Outcomes | Success Metrics, Acceptance Criteria |
| Impact | Strategic Objectives, Business Value |

### Prioritization

#### Methods for Ranking Requirements

Not all requirements are equal. Prioritization ensures critical needs are addressed first:

**MoSCoW Method:**

* **Must have**: Essential for go-live
* **Should have**: Important but not critical
* **Could have**: Desirable if time permits
* **Won’t have**: Out of scope for this release

**Weighted Scoring:**

Assign weights to criteria (business value, regulatory requirement, user impact) and score each requirement.

**Kano Model:**

* Basic needs (expected, cause dissatisfaction if missing)
* Performance needs (more is better)
* Delighters (unexpected features that excite)

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| CancerSurv Example |
| **Must Have:**   * Case entry and coding functionality * HIPAA-compliant security * NPCR data submission capability   **Should Have:**   * Real-time analytics dashboard * Mobile-friendly interface * Automated duplicate detection   **Could Have:**   * Machine learning for coding assistance * Patient portal for self-reported outcomes * Integration with research databases |

### Requirements Traceability

#### Linking Requirements to Objectives

Traceability ensures every requirement connects to a business need or program goal:

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| Figure 8.4: Requirements Traceability Structure |

**Traceability Matrix Example:**

| Requirement ID | Description | Source | Priority | Test Case |
| --- | --- | --- | --- | --- |
| FR-101 | Case search functionality | Registrar interviews | Must | TC-101, TC-102 |
| FR-102 | ICD-O-3 coding validation | NAACCR standards | Must | TC-103 |
| NFR-201 | 99.9% uptime | SLA requirements | Must | TC-201 |

### Specification Formats

#### Writing Good Requirements

Regardless of format, good requirements share characteristics:

| Characteristic | Description | Example |
| --- | --- | --- |
| **Complete** | Contains all necessary information | Includes error handling, edge cases |
| **Consistent** | Does not contradict other requirements | Uses standard terminology |
| **Unambiguous** | Only one interpretation possible | “Within 3 seconds” not “quickly” |
| **Verifiable** | Can be tested | Measurable acceptance criteria |
| **Traceable** | Links to source and test | Includes requirement ID |

#### User Story Format

For Agile projects:

As a [role], I want [feature], so that [benefit].

**Acceptance Criteria:**

* Given [context], when [action], then [result]

#### GPS Format for Clinical Contexts

Given [clinical context], the [health worker role] should [specific action] to [health outcome].

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| CancerSurv Example |
| **User Story:**  As a cancer registrar, I want to search for existing cases before creating a new record, so that I avoid creating duplicate entries.  **GPS Format:**  Given a new pathology report, the registrar should search existing cases by patient identifiers before abstracting, to maintain data integrity and accurate incidence counts.  **Acceptance Criteria:**   * Given a patient name, when the registrar searches, then matching cases display within 3 seconds * Given a patient with no existing cases, when the registrar searches, then a “No matches found” message displays with option to create new case |

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Requirements Specification | Logic Model | Document what must be built |
| Data Dictionary | Case Definition / Data Standards | Specify data structures |
| Business Rules Catalog | Clinical Protocol | Define processing rules |
| Traceability Matrix | Evaluation Framework | Link requirements to objectives |
| Prioritized Backlog | Workplan | Order implementation work |

### Moving Forward

With requirements analyzed, prioritized, and specified, the next phase focuses on **Design**: defining how the solution will be built to meet these requirements.

# Design & Solution Definition

## Design & Solution Definition / Intervention Design

With requirements defined, we move to designing the solution. In business analysis, this is **Solution Design** or **Design Definition**. In public health, it parallels **Intervention Design** and **Implementation Planning**. Both involve translating requirements into a blueprint for action.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Solution Architecture | Intervention Framework |
| System Design | Program Design |
| Interface Design | Service Delivery Model |
| Integration Design | Health Information Exchange |
| Change Management Plan | Implementation Strategy (CFIR) |

### Architecture and Framework

#### Solution Architecture

BA solution architecture defines:

* System components and their relationships
* Technology stack selection
* Integration points with existing systems
* Data flow between components
* Security architecture

#### Intervention Framework

PH intervention design defines:

* Core intervention components
* Delivery mechanisms
* Target populations
* Adaptable vs. core elements
* Contextual considerations

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| CancerSurv Example |
| **Solution Architecture (BA):**  ┌─────────────────────────────────────────────────────────┐ │ CancerSurv Platform │ ├──────────────┬──────────────┬──────────────┬────────────┤ │ Web UI │ API Layer │ Analytics │ Reporting │ │ (React) │ (REST/FHIR) │ (R/Python) │ Engine │ ├──────────────┴──────────────┴──────────────┴────────────┤ │ Core Services │ │ Case Management │ Data Quality │ User Management │ ├─────────────────────────────────────────────────────────┤ │ Data Layer │ │ PostgreSQL │ Document Store │ Data Warehouse │ └─────────────────────────────────────────────────────────┘  **Intervention Framework (PH):**  CancerSurv delivers the surveillance intervention through:   * **Core components**: Case abstraction, data quality, NPCR reporting (non-negotiable) * **Adaptable elements**: Dashboard customization, local report templates * **Delivery mechanism**: Cloud-based SaaS with local training support * **Target population**: State cancer registries, hospital tumor registrars |

### Design Patterns

#### User Interface Design

Both domains emphasize user-centered design:

**BA UI/UX Approach:**

* Wireframes and mockups
* User journey mapping
* Usability testing
* Accessibility compliance (WCAG)

**PH Service Design Approach:**

* Patient journey mapping
* Cultural competency review
* Health literacy assessment
* Equity impact analysis

#### Key Design Principles

| Principle | BA Application | PH Application |
| --- | --- | --- |
| **Simplicity** | Minimize clicks, clear navigation | Reduce complexity for adoption |
| **Consistency** | Standard UI patterns | Consistent with clinical workflows |
| **Feedback** | Visual confirmation of actions | Clear outcome indicators |
| **Error Prevention** | Validation before submission | Built-in clinical decision support |
| **Flexibility** | Customizable views, workflows | Adaptable to local context |

### Integration Design

#### Connecting Systems

Health IT projects require extensive integration:

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| Figure 9.1: CancerSurv Integration Landscape |

#### Integration Standards

| Standard | Use Case | Design Consideration |
| --- | --- | --- |
| **HL7 FHIR** | Real-time EHR integration | REST APIs, JSON payloads |
| **HL7 v2.x** | Legacy lab interfaces | Message parsing, acknowledgments |
| **NAACCR XML** | Cancer registry exchange | Schema validation, field mapping |
| **Direct Protocol** | Secure health messaging | Certificate management |

### Implementation Readiness Assessment

#### CFIR for Design Validation

The Consolidated Framework for Implementation Research (CFIR) provides a lens for evaluating design decisions:

| CFIR Domain | Design Questions |
| --- | --- |
| **Intervention Characteristics** | Is the design evidence-based? Is it adaptable? |
| **Outer Setting** | Does it meet regulatory requirements? Does it connect to external systems? |
| **Inner Setting** | Does it fit organizational workflows? Is infrastructure adequate? |
| **Individuals** | Will users accept it? What training is needed? |
| **Process** | How will it be implemented? Who champions it? |

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| CancerSurv Example |
| **CFIR-Informed Design Review:**   | CFIR Construct | CancerSurv Design Decision | Rationale | | --- | --- | --- | | Relative Advantage | Modern UI, mobile access | Clear improvement over mainframe | | Complexity | Phased rollout, role-based views | Reduce cognitive load | | Adaptability | Configurable data fields | Support local registry needs | | Available Resources | Cloud-hosted, vendor support | Minimize IT infrastructure burden | | Self-Efficacy | Embedded training, help system | Build user confidence | |

### Prototyping and Validation

#### Iterative Design

Design should be validated before full development:

**BA Prototyping:**

* Low-fidelity wireframes for concept validation
* High-fidelity mockups for detailed feedback
* Interactive prototypes for workflow testing
* MVP (Minimum Viable Product) for market validation

**PH Piloting:**

* Formative research with target population
* Pilot testing in representative sites
* Rapid cycle evaluation (PDSA)
* Fidelity assessment

#### Prototype Fidelity Levels

| Level | BA Artifact | PH Artifact | Purpose |
| --- | --- | --- | --- |
| **Low** | Paper sketches, Balsamiq | Concept paper, draft protocol | Concept validation |
| **Medium** | Clickable mockups | Pilot at 1-2 sites | Workflow validation |
| **High** | Working prototype | Multi-site pilot | Full process validation |

### Change Management Planning

#### Preparing for Transition

Design must include plans for organizational change:

**BA Change Management:**

* Stakeholder impact analysis
* Communication plan
* Training plan
* Resistance management
* Transition strategy

**PH Implementation Planning:**

* Capacity building
* Technical assistance model
* Sustainability planning
* Scale-up strategy

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| CancerSurv Example |
| **Change Management Elements:**   | Element | Plan | | --- | --- | | **Training** | 3-tier approach: super-users (in-person), all users (webinar), ongoing (self-paced modules) | | **Communication** | Monthly newsletters, demo sessions at registrar conferences | | **Support** | Help desk during business hours; online knowledge base; user community forum | | **Rollout** | Phase 1: High-volume hospitals; Phase 2: Remaining facilities; Phase 3: Full operation | |

### Design Documentation

#### What to Document

Design documentation bridges requirements and implementation:

| Document | BA Content | PH Content |
| --- | --- | --- |
| **Architecture Document** | System components, technology stack | Intervention components, delivery model |
| **Interface Specifications** | Screen layouts, navigation flows | Service user touchpoints |
| **Integration Specifications** | APIs, message formats | Data exchange protocols |
| **Data Design** | Database schema, data flows | Data collection instruments |
| **Security Design** | Access controls, encryption | Privacy protections, consent |
| **Transition Plan** | Deployment, training, support | Implementation, capacity building |

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Solution Architecture | Intervention Framework | Define solution structure |
| UI/UX Design | Service Delivery Model | Specify user experience |
| Integration Design | HIE Specifications | Define system connections |
| Prototype | Pilot Protocol | Validate design |
| Change Management Plan | Implementation Strategy | Prepare organization |

### Moving Forward

With design complete, the next phase focuses on **Implementation**: building, deploying, and rolling out the solution while managing the organizational change required for adoption.

# Implementation & Execution

## Implementation & Program Execution

Design becomes reality through implementation. In business analysis, this phase involves **Solution Delivery** and **Change Management**. In public health, it is **Program Implementation** guided by frameworks like **PDSA** (Plan-Do-Study-Act). Both require managing complexity while maintaining focus on outcomes.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Sprint/Iteration | PDSA Cycle |
| Release Management | Phased Rollout |
| User Acceptance Testing | Pilot Evaluation |
| Go-Live | Program Launch |
| Defect Management | Variance/Adverse Event Tracking |

### The Double Loop of Agile in Public Health

Standard Agile focuses on product improvement: Build → Measure → Learn. Public health adds a second loop: Surveillance → Intervention → Evaluation.

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| Figure 10.1: The Double Loop: Agile + Public Health |

The BA must ensure both loops are synchronized: software releases should align with epidemiological reporting cycles.

### Agile Practices Adapted

#### Sprint Planning

**Traditional Agile:**

* Product owner prioritizes backlog
* Team selects stories for sprint
* Stories estimated in points
* Sprint goal defined

**Public Health Adaptation:**

* Program manager prioritizes based on grant milestones
* Team considers reporting deadlines
* Stories linked to program objectives
* Sprint goal aligned with public health impact

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| CancerSurv Example |
| **Sprint Goal (BA):** Complete case search functionality and duplicate detection module.  **Program Alignment (PH):** This sprint supports NPCR Milestone 2: “Data quality infrastructure operational.” Completion enables Q2 data submission with duplicate resolution.  **Sprint Backlog:**   | Story | Points | Grant Milestone | | --- | --- | --- | | Case search by patient ID | 5 | M2 | | Case search by name/DOB | 3 | M2 | | Duplicate candidate display | 5 | M2 | | Merge duplicate records | 8 | M2 | | Audit log for merges | 3 | Compliance | |

#### PDSA Cycles

PDSA provides a structured approach to continuous improvement:

| Phase | Activities | CancerSurv Example |
| --- | --- | --- |
| **Plan** | Define change, predict outcomes | “Adding auto-population of demographics will reduce entry time by 2 minutes” |
| **Do** | Implement on small scale | Enable feature for 3 pilot registrars |
| **Study** | Analyze results | Compare entry times before/after; gather feedback |
| **Act** | Adopt, adapt, or abandon | Feature reduced time by 1.5 minutes; adopt with UI adjustments |

#### Mapping Sprints to PDSA

| Sprint Element | PDSA Element |
| --- | --- |
| Sprint Planning | Plan |
| Development | Do |
| Sprint Review | Study |
| Retrospective | Act |
| Backlog Refinement | Next Plan cycle |

### Testing in Health IT

#### Testing Levels

| Level | BA Focus | PH Focus |
| --- | --- | --- |
| **Unit Testing** | Code functions correctly | N/A (technical) |
| **Integration Testing** | Systems connect properly | Data flows between systems |
| **System Testing** | Full system works | End-to-end workflows function |
| **User Acceptance Testing** | Users approve functionality | Clinical workflows validated |
| **Operational Testing** | System performs under load | Handles reporting surge periods |

#### UAT for Clinical Systems

User Acceptance Testing in public health requires clinical validation:

**Standard UAT:**

* Does the system do what was specified?
* Do users accept the interface?
* Are performance requirements met?

**Clinical UAT Additions:**

* Do clinical workflows function correctly?
* Does data quality meet standards?
* Do edits align with NAACCR rules?
* Is patient safety protected?

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| CancerSurv Example |
| **UAT Test Case:**   | ID | Scenario | Steps | Expected Result | PH Validation | | --- | --- | --- | --- | --- | | UAT-101 | Duplicate detection | Enter case matching existing patient | System flags potential duplicate | Matches NAACCR duplicate resolution rules | | UAT-102 | Stage validation | Enter invalid stage combination | System prevents save with error message | Error references SEER staging manual | | UAT-103 | NPCR export | Generate submission file | Valid NAACCR XML produced | Passes CDC validator tool | |

### Managing Change

#### Organizational Readiness

Implementation fails without organizational change management:

**Readiness Assessment:**

* Leadership commitment
* Staff capacity
* Infrastructure availability
* Workflow adaptability
* Cultural alignment

**Common Barriers:**

| Barrier | BA Perspective | PH Perspective |
| --- | --- | --- |
| Resistance | Users prefer old system | “Not how we’ve always done it” |
| Capacity | Training time unavailable | Staff already overburdened |
| Infrastructure | Hardware/network issues | Rural sites lack bandwidth |
| Workflow | Process changes required | Clinical protocols affected |

#### Training Approaches

| Approach | When to Use | CancerSurv Example |
| --- | --- | --- |
| **Train-the-Trainer** | Large, distributed user base | Registry supervisors trained first |
| **Just-in-Time** | Complex, infrequent tasks | Context-sensitive help for staging |
| **Simulation** | High-stakes processes | Practice mode for case abstraction |
| **Peer Support** | Ongoing questions | Super-user network |

### Deployment Strategies

#### Phased vs. Big Bang

| Strategy | Pros | Cons | When to Use |
| --- | --- | --- | --- |
| **Big Bang** | Single cutover, consistent | High risk, no rollback | Simple systems, urgent deadlines |
| **Phased** | Lower risk, lessons learned | Longer timeline, parallel systems | Complex systems, distributed users |
| **Pilot** | Real-world validation | Limited initial impact | New interventions, uncertain adoption |
| **Parallel** | Safety net available | Resource intensive | Critical systems, high risk tolerance |

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| CancerSurv Example |
| **Deployment Strategy: Phased with Pilot**   | Phase | Scope | Duration | Success Criteria | | --- | --- | --- | --- | | Pilot | 3 high-volume hospitals | 8 weeks | >90% user satisfaction; <5% error rate | | Phase 1 | Remaining hospitals (20) | 12 weeks | All hospitals submitting data | | Phase 2 | Physician offices, labs | 8 weeks | ELR feeds operational | | Phase 3 | Full operation, legacy decommission | 4 weeks | Legacy system retired | |

### Monitoring During Implementation

#### What to Track

| Category | BA Metrics | PH Metrics |
| --- | --- | --- |
| **Adoption** | Login counts, feature usage | Sites trained, go-live completion |
| **Performance** | Response times, error rates | Data submission timeliness |
| **Quality** | Defect counts, resolution time | Data completeness, accuracy |
| **Satisfaction** | User surveys, support tickets | Registrar feedback, NPS scores |
| **Outcomes** | Feature delivery, velocity | Grant milestone achievement |

#### Issue Escalation

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| Figure 10.2: Issue Escalation Path |

### Communication During Implementation

#### Stakeholder Updates

| Audience | Frequency | Content | Channel |
| --- | --- | --- | --- |
| Executive Sponsors | Bi-weekly | Milestone status, risks, decisions needed | Meeting, dashboard |
| Project Team | Daily | Progress, blockers, coordination | Standup, chat |
| End Users | Weekly during rollout | Training, go-live dates, support | Email, newsletter |
| External Partners | As needed | Integration status, requirements | Meeting, documentation |

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Working Software | Operational Program | Deliver the solution |
| Test Results | Pilot Evaluation | Validate quality |
| Training Materials | Capacity Building Resources | Enable users |
| Release Notes | Implementation Updates | Communicate changes |
| Support Documentation | Operational Guides | Enable ongoing use |

### Moving Forward

With the solution implemented, the next phase focuses on **Evaluation**: measuring outcomes, assessing value delivered, and identifying opportunities for continuous improvement.

# Evaluation & Improvement

## Evaluation & Continuous Improvement

Did we solve the problem? Are outcomes improving? What should we do differently? In business analysis, this phase encompasses **Solution Evaluation** and **Continuous Improvement**. In public health, it maps to **Program Evaluation** using frameworks like the CDC Evaluation Framework. Both seek to measure value delivered and inform future action.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Solution Evaluation | Program Evaluation |
| KPI Tracking | Health Indicator Monitoring |
| ROI Analysis | Cost-Effectiveness Analysis |
| Lessons Learned | After-Action Review |
| Continuous Improvement | Quality Improvement (QI) |

### The CDC Evaluation Framework

Public health evaluation follows a well-established framework that parallels BA evaluation practices:

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| Figure 11.1: CDC Evaluation Framework Steps |

| CDC Step | BA Equivalent |
| --- | --- |
| Engage Stakeholders | Identify evaluation stakeholders |
| Describe the Program | Document solution scope and objectives |
| Focus the Evaluation | Define evaluation questions and scope |
| Gather Credible Evidence | Collect metrics and feedback |
| Justify Conclusions | Analyze data, determine value delivered |
| Ensure Use and Share Lessons | Communicate results, inform decisions |

### Types of Evaluation

#### Formative vs. Summative

| Type | When | Purpose | BA Example | PH Example |
| --- | --- | --- | --- | --- |
| **Formative** | During implementation | Improve the intervention | Sprint reviews, usability testing | PDSA cycles, pilot feedback |
| **Summative** | After implementation | Judge overall value | Post-implementation review | Annual program evaluation |

#### Process vs. Outcome

| Type | Focus | Questions | Metrics |
| --- | --- | --- | --- |
| **Process** | How well did we implement? | Was the solution delivered as designed? | Adoption rates, fidelity measures |
| **Outcome** | What difference did it make? | Did we achieve intended results? | Health indicators, KPIs |
| **Impact** | Long-term effects | What is the lasting change? | Population health trends |

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| CancerSurv Example |
| **Process Evaluation:**   * Were all registrars trained? (Target: 100%) * Are hospitals submitting data electronically? (Target: 90%) * Is the system meeting uptime requirements? (Target: 99.9%)   **Outcome Evaluation:**   * Has data completeness improved? (Target: 89% → 95%) * Has case abstraction time decreased? (Target: 15 min → 8 min) * Are NPCR submissions timely? (Target: 100% on-time)   **Impact Evaluation:**   * Are survival statistics more accurate? * Can disparities be identified at the county level? * Has the data informed state cancer plan priorities? |

### Defining Metrics

#### KPIs and Health Indicators

Metrics should be SMART (Specific, Measurable, Achievable, Relevant, Time-bound):

| BA KPI | PH Health Indicator | Measurement |
| --- | --- | --- |
| System uptime | Service availability | % time operational |
| User adoption | Program reach | % target users active |
| Task completion time | Efficiency | Minutes per case abstraction |
| Error rate | Data quality | % records with errors |
| User satisfaction | Acceptability | Survey scores |

#### Building a Balanced Scorecard

Consider multiple dimensions of value:

| Dimension | BA Metrics | PH Metrics |
| --- | --- | --- |
| **Financial** | Cost savings, ROI | Cost per case, grant compliance |
| **Customer** | User satisfaction, NPS | Registrar satisfaction, partner feedback |
| **Internal Process** | Efficiency gains, quality | Data completeness, timeliness |
| **Learning & Growth** | Skill development, innovation | Workforce capacity, continuous improvement |

### Data Collection for Evaluation

#### Sources of Evidence

| Source | BA Application | PH Application |
| --- | --- | --- |
| **System Logs** | Usage analytics, performance data | Data submission tracking |
| **Surveys** | User satisfaction, feature requests | Registrar feedback, partner surveys |
| **Interviews** | Detailed user feedback | Key informant perspectives |
| **Document Review** | Project artifacts, change logs | Reports, protocols |
| **Observation** | Usability testing | Workflow observation |
| **Administrative Data** | Support tickets, defects | Program records, health data |

#### Evaluation Plan Components

| Component | Description | CancerSurv Example |
| --- | --- | --- |
| **Questions** | What do we want to know? | Has data quality improved? |
| **Indicators** | How will we measure? | % records passing NAACCR edits |
| **Data Sources** | Where will we get data? | CancerSurv quality reports |
| **Methods** | How will we collect? | Automated monthly extraction |
| **Timeline** | When will we measure? | Baseline, 6 months, 12 months |
| **Responsibilities** | Who will do it? | Registry data quality manager |

### Analysis and Interpretation

#### Comparing to Baseline

Effective evaluation requires baseline data:

|  |
| --- |
| Figure 11.2: Data Completeness Trend |

#### Interpreting Results

| Result | Interpretation | Action |
| --- | --- | --- |
| Exceeds target | Success; potential to raise bar | Document best practices; set stretch goals |
| Meets target | Success; sustain performance | Continue current approach; monitor |
| Below target, improving | Progress; maintain effort | Identify accelerators; address barriers |
| Below target, flat/declining | Concern; intervention needed | Root cause analysis; corrective action |

### Communicating Results

#### Tailoring Messages

| Audience | Interest | Format | Content Emphasis |
| --- | --- | --- | --- |
| Executive sponsors | Bottom line, strategic alignment | Executive summary, dashboard | ROI, milestone achievement |
| Funders (CDC, grants) | Compliance, outcomes | Formal reports | Grant objective progress |
| Project team | Detailed performance | Working reports, retrospectives | Specific metrics, lessons learned |
| End users | How it helps them | Newsletters, town halls | Efficiency gains, new features |

#### Visualization Best Practices

* Use clear, simple charts
* Show trends, not just snapshots
* Compare to targets/benchmarks
* Highlight key takeaways
* Make data accessible

### Continuous Improvement

#### The QI Cycle

Evaluation feeds continuous improvement:

|  |
| --- |
| Figure 11.3: Continuous Improvement Cycle |

#### Retrospectives and After-Action Reviews

| Element | Agile Retrospective | PH After-Action Review |
| --- | --- | --- |
| What went well? | Sprint successes | Program strengths |
| What could improve? | Sprint challenges | Program gaps |
| What will we do differently? | Action items for next sprint | Recommendations |
| Who is responsible? | Team member assignments | Action owners |

|  |
| --- |
| CancerSurv Example |
| **12-Month Evaluation Summary:**   | Metric | Baseline | Target | Actual | Status | | --- | --- | --- | --- | --- | | Data completeness | 89% | 95% | 96% | ✅ Exceeded | | Abstraction time | 15 min | 8 min | 9 min | ⚠️ Close | | User satisfaction | N/A | 80% | 85% | ✅ Exceeded | | NPCR submission | 85% on-time | 100% | 100% | ✅ Met | | System uptime | N/A | 99.9% | 99.7% | ⚠️ Close |   **Key Findings:**   1. Data quality improvements exceeded expectations 2. Abstraction time reduced but not to target; workflow analysis needed 3. Two outages impacted uptime; infrastructure improvements planned   **Recommendations:**   1. Continue current data quality processes 2. Conduct workflow study to identify remaining abstraction bottlenecks 3. Implement redundant infrastructure for high availability |

### Sustaining Value

#### From Project to Operations

Evaluation supports the transition from project mode to operations:

| Project Phase | Operational Phase |
| --- | --- |
| Project team manages | Operations team manages |
| Change requests | Enhancement requests |
| Implementation metrics | Operational metrics |
| Go-live success | Ongoing performance |
| Project budget | Operating budget |

#### Governance for Continuous Improvement

Establish ongoing governance:

* Regular metric reviews (monthly/quarterly)
* User feedback channels
* Enhancement prioritization process
* Performance monitoring
* Periodic comprehensive evaluations

### Deliverables from This Phase

| BA Deliverable | PH Deliverable | Purpose |
| --- | --- | --- |
| Solution Evaluation Report | Program Evaluation Report | Document outcomes |
| Lessons Learned | After-Action Review | Capture knowledge |
| Performance Dashboard | Health Indicator Dashboard | Monitor ongoing performance |
| Improvement Recommendations | QI Action Plan | Drive continuous improvement |
| Transition Documentation | Sustainability Plan | Enable long-term success |

### Moving Forward

With the core analysis process complete, the following chapters provide additional resources: tools comparison (Chapter 10), implementation science frameworks (Chapter 11), templates (Appendix A), and a comprehensive glossary (Appendix C).

# Tools Comparison

## Commercial vs. Open Source/Public Health Tools

Public health agencies often operate with constrained budgets while managing sensitive health data. This chapter compares commercial enterprise tools with open source and public health-specific alternatives, helping you select the right tools for your context.

### Selection Criteria

When evaluating tools, consider:

| Criterion | Commercial Advantage | OSS/PH Advantage |
| --- | --- | --- |
| **Cost** | Predictable licensing | No license fees |
| **Support** | Vendor SLAs | Community + self-reliance |
| **Features** | Polished, integrated | Customizable, extensible |
| **Compliance** | Often pre-certified | Full control over data |
| **Data Sovereignty** | Vendor-managed | Organization-controlled |
| **Sustainability** | Vendor roadmap | Community-driven |

### Tool Categories

#### Project Management

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Full PM Suite** | Jira, Azure DevOps, MS Project | OpenProject, Redmine, Taiga |
| **Kanban Boards** | Trello (paid), Monday.com | Trello (free tier), Wekan, Kanboard |
| **Agile Planning** | Jira, Rally, VersionOne | Taiga, OpenProject |
| **Grant Management** | Smartsheet, Asana | OpenProject with custom fields |

**Recommendation for Public Health:**

* **Small teams (<10):** Trello free tier or Taiga for simple Kanban/Scrum
* **Larger programs:** OpenProject for full PM capabilities with data sovereignty
* **CDC/Federal projects:** Often require Azure DevOps or Jira per contract

|  |
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| When to Choose OSS |
| Choose open source when:   * Budget is constrained * Data sovereignty is critical (cannot store project data externally) * Technical staff can support installation and maintenance * Customization is needed beyond commercial options |

#### Requirements and Documentation

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Wiki/Docs** | Confluence, SharePoint | BookStack, MediaWiki, GitHub Wiki |
| **Requirements Management** | Jama, Helix RM, DOORS | GitHub Issues, GitLab, Notion (free) |
| **Collaborative Editing** | MS 365, Google Workspace | Nextcloud, CryptPad, HedgeDoc |

**Recommendation for Public Health:**

* **Documentation:** BookStack provides Confluence-like experience without licensing
* **Requirements:** GitHub Issues sufficient for most projects; integrates with development
* **Collaboration:** Consider data sensitivity; Nextcloud for on-premise control

#### Diagramming

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **General Diagramming** | Visio, Lucidchart | diagrams.net (draw.io), Mermaid |
| **Process Modeling (BPMN)** | Visio, Bizagi | diagrams.net, Camunda Modeler |
| **Architecture** | Lucidchart, Visio | diagrams.net, PlantUML |

**Recommendation for Public Health:**

* **diagrams.net** is the de facto standard in public sector: free, web-based, exports to multiple formats, works offline
* **Mermaid** for diagrams in documentation (renders from text, version-controllable)

#### Data Collection

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Surveys** | Qualtrics, SurveyMonkey | LimeSurvey, KoBoToolbox |
| **Clinical/Research Data** | REDCap (free for research) | REDCap, ODK, DHIS2 |
| **Forms** | Microsoft Forms, Google Forms | KoBoToolbox, ODK Collect |
| **Case Management** | Salesforce | DHIS2, CommCare |

**REDCap: The Public Health Standard**

REDCap (Research Electronic Data Capture) deserves special mention:

* Free for non-profit research institutions
* HIPAA-compliant, 21 CFR Part 11 capable
* Supports complex branching logic, validation
* Built-in audit trails
* Consortium of 6,000+ institutions
* CDC and NIH approved

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| CancerSurv Example |
| For the CancerSurv project, data collection tools include:   * **REDCap**: Pilot site feedback surveys, user satisfaction assessments * **KoBoToolbox**: Field data collection for mobile cancer screening events * **Native CancerSurv**: Case abstraction (built into the platform) |

#### Data Analysis

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Statistical Analysis** | SAS, SPSS, Stata | R, Python (pandas, scipy) |
| **Epidemiological Analysis** | SAS, Stata | R (epitools), Epi Info |
| **Data Wrangling** | Alteryx, Trifacta | R (tidyverse), Python (pandas) |
| **Notebooks** | Databricks, SAS Studio | Jupyter, RStudio, Quarto |

**Epi Info: CDC’s Free Epidemiology Tool**

Epi Info is developed by CDC specifically for outbreak investigation:

* Free download, no installation fees
* Built-in epidemiological statistics (odds ratios, relative risks)
* Epidemic curve generation
* Geographic mapping
* Survey development and analysis
* 7-day moving averages, case fatality rates

**R for Public Health**

R has become the standard for public health analytics:

# Example: Calculate age-adjusted incidence rate  
library(epitools)  
library(tidyverse)  
  
cancer\_data %>%  
 group\_by(county, year) %>%  
 summarize(  
 cases = n(),  
 population = first(population),  
 crude\_rate = cases / population \* 100000  
 ) %>%  
 # Age adjustment using standard population  
 ageadjust.direct(count = cases, pop = population, stdpop = us\_std\_pop)

#### Data Platform Architecture

Modern public health data systems benefit from structured data architectures that organize information from raw ingestion through analytics-ready outputs. The **medallion architecture** (Bronze → Silver → Gold) provides a framework for designing scalable, maintainable data platforms.

While often discussed in cloud contexts, medallion architecture works equally well on desktop computers and local servers. The key is the logical separation of data by refinement stage, not the specific technology.

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| Communication Tip |
| “Medallion architecture” and “Bronze/Silver/Gold” are IT jargon unfamiliar to most public health professionals. When discussing data workflows with epidemiologists or program staff, use terms like “raw data,” “cleaned data,” and “final reports” instead. See the [Terminology Dictionary](#X310d771ff6f33464510d3b2d7630a20afff91ad) for a complete translation guide. |

**Commercial vs. Open Source Data Platforms**

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Data Lake / Lakehouse** | Databricks, Snowflake, Azure Synapse | Apache Spark + Delta Lake, Apache Iceberg, DuckDB |
| **ETL/Orchestration** | Azure Data Factory, Informatica, Talend | Apache Airflow, Dagster, Prefect, dbt |
| **Data Catalog** | Alation, Collibra | Apache Atlas, DataHub, Amundsen |
| **Data Quality** | Informatica DQ, Talend | Great Expectations, dbt tests, Soda |

**Implementing Medallion Architecture**

The medallion architecture can be implemented with various tool combinations, from enterprise cloud platforms to desktop applications:

| Layer | Purpose | Cloud/Server Options | Desktop/Local Options |
| --- | --- | --- | --- |
| **Bronze** | Raw data landing, preserve source fidelity | Object storage (S3, Azure Blob), PostgreSQL staging tables | File folders, SQLite database, Excel “Raw Data” sheets |
| **Silver** | Cleansing, standardization, deduplication | dbt transformations, Apache Spark, Python/pandas | Excel Power Query, Python scripts, Access queries |
| **Gold** | Analytics-ready datasets, aggregations | Dimensional models, materialized views, OLAP cubes | Pivot tables, final Excel reports, exported CSVs for tools |

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| Starting Small |
| You don’t need Databricks or Snowflake to implement medallion architecture. Even a well-organized folder structure with clear naming conventions implements the same principle:  project/ ├── 01\_bronze/ # Raw files as received │ ├── lab\_results\_2024-01-15.csv │ └── ehr\_export\_raw.xlsx ├── 02\_silver/ # Cleaned and standardized │ ├── cases\_cleaned.csv │ └── patients\_deduplicated.xlsx └── 03\_gold/ # Ready for analysis/reporting  ├── outbreak\_line\_list.xlsx  └── monthly\_summary\_report.xlsx  Many state health departments successfully run medallion architectures on modest infrastructure, including single PostgreSQL databases with three schemas or even organized Excel workbooks. |

**Open Source Lakehouse Stack for Public Health**

For organizations seeking data sovereignty and cost control:

| Component | Tool | Notes |
| --- | --- | --- |
| Storage | MinIO or local filesystem | S3-compatible object storage |
| Table format | Delta Lake or Apache Iceberg | ACID transactions, time travel |
| Compute | Apache Spark or DuckDB | DuckDB for smaller workloads |
| Orchestration | Apache Airflow | Workflow scheduling |
| Transformation | dbt | SQL-based transformations |
| Quality | Great Expectations | Data validation |
| Catalog | DataHub | Metadata management |

**Data Architecture for Different Scales**

| Organization Size | Recommended Approach | Key Tools | Typical Staffing |
| --- | --- | --- | --- |
| **Individual analyst** | Organized folders with naming conventions | Excel, Python/R scripts, SQLite | Single epidemiologist or data manager handles all layers |
| **Small program** | Single PostgreSQL database with layered schemas | PostgreSQL, dbt, Python | 1-2 staff share responsibilities across layers |
| **Medium health department** | Data warehouse with ETL pipeline | PostgreSQL/Snowflake, Airflow, dbt | Dedicated data team with some role specialization |
| **Large state/federal** | Full lakehouse architecture | Spark/Databricks, Delta Lake, Airflow, dbt | Specialized roles: data engineers (Bronze/Silver), analysts (Silver/Gold), BI developers (Gold) |

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| CancerSurv Example |
| CancerSurv implements a medallion architecture using open source tools:   | Layer | Implementation | Gold Layer Outputs | | --- | --- | --- | | **Bronze** | PostgreSQL raw schema; HL7 messages stored as JSON; CSV uploads preserved verbatim | — | | **Silver** | PostgreSQL staging schema; dbt models for deduplication and ICD-O-3 standardization | — | | **Gold** | PostgreSQL analytics schema; pre-computed incidence rates, survival metrics, NPCR submission tables | Line lists for case follow-up, incidence reports, survival dashboards | | **Orchestration** | Apache Airflow schedules daily Bronze→Silver→Gold pipeline | — | | **Quality** | Great Expectations validates data at Silver layer before promotion to Gold | — | |

#### Visualization

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Dashboards** | Tableau, Power BI | R Shiny, Dash (Python), Apache Superset |
| **Static Visualization** | Tableau, Excel | R (ggplot2), Python (matplotlib, plotly) |
| **Interactive Charts** | Tableau, Power BI | Plotly, Highcharts (free for non-commercial) |

**R Shiny for Public Health Dashboards**

R Shiny enables interactive dashboards without JavaScript expertise:

* Free and open source
* Integrates with R analysis pipelines
* Can be deployed on-premise or Shinyapps.io
* Many public health templates available

#### GIS and Mapping

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Desktop GIS** | ArcGIS Pro | QGIS |
| **Web Mapping** | ArcGIS Online, Mapbox | Leaflet, OpenLayers |
| **Spatial Analysis** | ArcGIS, ESRI | QGIS, R (sf package), PostGIS |
| **Geocoding** | Google, ESRI | Nominatim, US Census Geocoder |

**QGIS for Disease Mapping**

QGIS is essential for spatial epidemiology:

* Free, cross-platform
* Full-featured GIS capabilities
* Disease mapping and cluster detection
* Integrates with R for spatial statistics
* Active public health user community

|  |
| --- |
| CancerSurv Example |
| CancerSurv analytics stack:   | Function | Tool | Rationale | | --- | --- | --- | | Case data storage | PostgreSQL | Open source, HIPAA-capable | | ETL/Data pipeline | Apache Airflow | Orchestration of data flows | | Statistical analysis | R (tidyverse, survival) | Standard for cancer epidemiology | | Dashboards | R Shiny | Interactive, deployable on-premise | | Geographic mapping | QGIS + Leaflet | Cancer cluster visualization | | Ad-hoc queries | Apache Superset | Self-service for epidemiologists | |

#### Data Standards and Interoperability

| Standard | Commercial Tools | OSS Tools |
| --- | --- | --- |
| **HL7 FHIR** | Rhapsody, Corepoint | HAPI FHIR, LinuxForHealth |
| **HL7 v2.x** | Rhapsody, Mirth | Mirth Connect (open source), HAPI |
| **CDA/C-CDA** | Various EHR vendors | MDHT, Reference CDA |

**Mirth Connect**

Mirth Connect is widely used in public health for health information exchange:

* Open source (NextGen Healthcare)
* HL7 v2, FHIR, CDA support
* Visual interface builder
* Used by many state health departments

### Building Your Stack

#### Small Public Health Program

| Function | Recommended Tool | Notes |
| --- | --- | --- |
| Project Management | Trello or Taiga | Free tier sufficient |
| Documentation | GitHub Wiki or BookStack | Version-controlled |
| Diagramming | diagrams.net | Free, export to any format |
| Data Collection | REDCap | Standard for research |
| Analysis | R + RStudio | Free, extensive packages |
| Visualization | R Shiny or Excel | Depends on technical capacity |

#### Large State Health Department

| Function | Recommended Tool | Notes |
| --- | --- | --- |
| Project Management | Azure DevOps or OpenProject | Enterprise scale |
| Documentation | Confluence or BookStack | Team collaboration |
| Requirements | Jira or GitHub | Integrated with development |
| Data Collection | REDCap + DHIS2 | Research + program monitoring |
| Data Platform | PostgreSQL + Airflow | Scalable, HIPAA-capable |
| Analysis | R + Python | Comprehensive capabilities |
| Visualization | R Shiny + Superset | Dashboards + self-service |
| GIS | QGIS + PostGIS | Full spatial capabilities |
| Integration | Mirth Connect | HL7/FHIR integration |

### Considerations for Tool Selection

#### Total Cost of Ownership

Free software is not always cheaper:

| Cost Factor | Commercial | Open Source |
| --- | --- | --- |
| License fees | Yes | No |
| Implementation | Vendor/partner | Internal/consultant |
| Training | Often included | Self-directed or purchased |
| Support | Included in license | Community or purchased |
| Customization | Limited | Unlimited but costly |
| Infrastructure | Cloud included or on-prem | You manage |

#### Compliance and Security

| Consideration | Commercial | Open Source |
| --- | --- | --- |
| HIPAA compliance | Often certified | Your responsibility to configure |
| SOC 2 certification | Common | Rare; your responsibility |
| Security updates | Vendor manages | You monitor and apply |
| Audit trails | Built-in | May require configuration |

#### Sustainability

Consider long-term viability:

* Commercial: Vendor may be acquired, change pricing, sunset product
* Open Source: Community may lose momentum; check activity levels
* Hybrid: Consider tools with both commercial and open source options

### Summary

The choice between commercial and open source tools depends on your context: budget, technical capacity, data sensitivity, and compliance requirements. Public health has excellent open source options, particularly for data collection (REDCap), analysis (R), mapping (QGIS), and integration (Mirth Connect). Evaluate total cost of ownership, not just license fees.

# Implementation Science

## CFIR and Implementation Frameworks

Why do evidence-based interventions fail to achieve expected outcomes when deployed in the real world? Implementation science provides the answer: the gap between efficacy (works under ideal conditions) and effectiveness (works in practice) is bridged by understanding implementation context. This chapter introduces key frameworks that help business analysts anticipate and address adoption barriers.

### Why Implementation Science Matters for BA

Traditional requirements focus on what a system must do. Implementation science asks: **Will people actually use it?** This question is critical because:

* 70% of change initiatives fail to achieve their objectives
* Clinical guidelines take an average of 17 years to become standard practice
* Technology adoption depends on factors beyond functionality

For the business analyst, implementation science provides:

* A structured way to assess organizational readiness
* Language for discussing non-technical barriers with stakeholders
* Frameworks for designing implementation strategies
* Metrics for measuring adoption, not just deployment

### The Consolidated Framework for Implementation Research (CFIR)

CFIR is the most widely used implementation science framework. It organizes factors influencing implementation into five domains:

|  |
| --- |
| Figure 13.1: CFIR Domains |

#### Domain 1: Intervention Characteristics

Properties of the intervention itself that influence adoption:

| Construct | Definition | BA/Requirements Implication |
| --- | --- | --- |
| **Intervention Source** | Perception of whether intervention is externally vs internally developed | Involve users in design; customize for local context |
| **Evidence Strength** | Stakeholders’ perception of evidence supporting the intervention | Document benefits; reference standards (CDC, NAACCR) |
| **Relative Advantage** | Perception that the intervention is better than current practice | Quantify improvements; demonstrate in pilot |
| **Adaptability** | Degree to which intervention can be modified for local needs | Build configurability; separate core from periphery |
| **Trialability** | Ability to test on a small scale | Support pilot deployments; sandbox environments |
| **Complexity** | Perceived difficulty of implementation | Simplify UI; phase rollout; provide training |
| **Design Quality** | Perceived excellence in how intervention is presented | Invest in UX; professional appearance |
| **Cost** | Costs of implementation and ongoing operation | Document TCO; demonstrate ROI |

|  |
| --- |
| CancerSurv Example: Intervention Characteristics |
| | Construct | Assessment | Design Response | | --- | --- | --- | | Relative Advantage | High: modern UI, remote access, better analytics | Emphasize in training; demonstrate side-by-side | | Complexity | Medium: new workflows, new interface | Phased training; role-based simplified views | | Adaptability | Medium: some local customization needed | Configurable report templates; custom fields | | Trialability | High: pilot sites planned | 8-week pilot with 3 hospitals | |

#### Domain 2: Outer Setting

External context influencing the implementing organization:

| Construct | Definition | BA/Requirements Implication |
| --- | --- | --- |
| **Patient/Community Needs** | Extent to which needs are known and prioritized | Gather community input; equity analysis |
| **Cosmopolitanism** | Degree of networking with external organizations | Plan for interoperability; support data sharing |
| **Peer Pressure** | Competitive pressure from peer organizations | Reference successful implementations elsewhere |
| **External Policies** | External mandates, regulations, guidelines | Document compliance requirements early |

For public health IT projects, outer setting often includes:

* CDC reporting requirements
* HIPAA regulations
* State health information exchange policies
* Grant funder expectations
* NAACCR standards (for cancer registries)

#### Domain 3: Inner Setting

Internal organizational context:

| Construct | Definition | BA/Requirements Implication |
| --- | --- | --- |
| **Structural Characteristics** | Organization size, maturity, structure | Assess readiness; tailor approach |
| **Networks & Communications** | Information flow within organization | Plan communication strategy |
| **Culture** | Norms, values, assumptions | Align with organizational culture |
| **Implementation Climate** | Receptivity to change | Assess readiness; address resistance |
| **Readiness for Implementation** | Tangible indicators of commitment | Secure resources, leadership support |

**Assessing Implementation Climate:**

* Is there leadership commitment?
* Are resources allocated?
* Is there a sense of urgency?
* Are staff held accountable for adoption?
* Are early adopters rewarded?

#### Domain 4: Characteristics of Individuals

Attributes of people involved in implementation:

| Construct | Definition | BA/Requirements Implication |
| --- | --- | --- |
| **Knowledge & Beliefs** | Attitudes toward the intervention | Education, demonstration, testimonials |
| **Self-Efficacy** | Confidence in ability to use intervention | Training, support resources, simplification |
| **Individual Stage of Change** | Readiness to adopt | Tailored engagement by readiness level |
| **Individual Identification** | Relationship with organization | Leverage organizational loyalty |

#### Domain 5: Process

The implementation process itself:

| Construct | Definition | BA/Requirements Implication |
| --- | --- | --- |
| **Planning** | Degree to which implementation is planned | Detailed implementation plan |
| **Engaging** | Attracting and involving appropriate people | Stakeholder engagement strategy |
| **Executing** | Carrying out implementation as planned | Project management, monitoring |
| **Reflecting & Evaluating** | Feedback about progress | PDSA cycles, metrics, retrospectives |

**Key Roles in Process:**

* **Champions**: Individuals who advocate for the intervention
* **Opinion Leaders**: Respected individuals who influence peers
* **Implementation Leaders**: Those formally responsible
* **External Change Agents**: Consultants, vendors supporting implementation

### Mapping NFRs to CFIR

A practical application of CFIR is translating non-functional requirements into implementation characteristics:

| NFR Category | CFIR Mapping | Requirement Example |
| --- | --- | --- |
| **Performance** | Complexity, Design Quality | “Response time <3 seconds to maintain workflow efficiency” |
| **Usability** | Complexity, Self-Efficacy | “Interface requires <4 hours training for basic proficiency” |
| **Reliability** | Relative Advantage | “99.9% uptime to maintain user confidence” |
| **Scalability** | Adaptability | “Support 2x current case volume for outbreak surge” |
| **Security** | External Policies | “HIPAA-compliant access controls” |
| **Interoperability** | Cosmopolitanism | “HL7 FHIR APIs for health information exchange” |
| **Accessibility** | Self-Efficacy | “WCAG 2.1 AA compliance; support for screen readers” |

### RE-AIM Framework

RE-AIM provides a complementary framework focused on public health impact4,5:

| Dimension | Definition | Metric Examples |
| --- | --- | --- |
| **Reach** | Proportion of target population participating | % registrars using system; % facilities connected |
| **Effectiveness** | Impact on outcomes | Data completeness; abstraction time |
| **Adoption** | Proportion of settings/staff adopting | % hospitals submitting electronically |
| **Implementation** | Fidelity to protocol; consistency | Adherence to data standards; training completion |
| **Maintenance** | Sustainability over time | Continued use at 12 months; staff turnover impact |

|  |
| --- |
| CancerSurv Example: RE-AIM Evaluation |
| | Dimension | Indicator | Target | Actual (12 mo) | | --- | --- | --- | --- | | **Reach** | % registrars trained | 100% | 98% | | **Effectiveness** | Data completeness | 95% | 96% | | **Adoption** | % hospitals on ELR | 90% | 87% | | **Implementation** | Training completion rate | 95% | 92% | | **Maintenance** | Active users at 12 mo | 90% | 94% | |

### Applying Implementation Science in Practice

#### During Planning

* Conduct CFIR-based readiness assessment
* Identify potential barriers across all domains
* Design implementation strategies to address barriers

#### During Design

* Ensure intervention characteristics support adoption
* Build in adaptability for local context
* Minimize complexity; maximize relative advantage

#### During Implementation

* Engage champions and opinion leaders
* Monitor adoption, not just deployment
* Use PDSA cycles to address emerging barriers

#### During Evaluation

* Assess both implementation outcomes and intervention outcomes
* Use RE-AIM dimensions for comprehensive evaluation
* Document lessons for future implementations

### Implementation Strategies

When barriers are identified, select appropriate implementation strategies:

| Barrier | Strategy Category | Example Strategies |
| --- | --- | --- |
| Lack of knowledge | Training & Education | Workshops, e-learning, job aids |
| Low self-efficacy | Support | Help desk, super-users, mentoring |
| Resistance to change | Stakeholder Engagement | Champions, leadership messaging |
| Workflow disruption | Planning | Phased rollout, parallel operation |
| Resource constraints | Infrastructure | Dedicated staff, protected time |
| Complexity | Intervention Modification | Simplified views, guided workflows |

### Summary

Implementation science provides business analysts with frameworks to anticipate and address the human and organizational factors that determine whether a technically sound solution actually achieves its intended outcomes. By incorporating CFIR assessment into requirements gathering and using RE-AIM for evaluation, hybrid BA/PH projects can bridge the gap between deployment and adoption.

Key takeaways:

1. Requirements must address adoption, not just functionality
2. CFIR provides a comprehensive lens for assessing implementation context
3. NFRs should map to implementation characteristics
4. RE-AIM offers a framework for evaluating public health impact
5. Implementation strategies should target specific barriers

# Process Optimization & Organizational Efficiency

## Optimizing for Impact

Business analysts and public health analysts share a fundamental responsibility: identifying inefficiencies and optimizing processes to maximize program impact. Whether measuring return on investment (BA) or population health outcomes (PH), both domains must demonstrate tangible value. In public health, that value must ultimately be apparent to the taxpayer funding these programs.

This chapter synthesizes strategies from psychology, sociology, project management, informatics, and organizational behavior to create a comprehensive approach to process optimization.

### The Dual Framework

| BA Perspective | PH Perspective |
| --- | --- |
| Process Improvement | Program Optimization |
| Operational Efficiency | Resource Stewardship |
| ROI Demonstration | Taxpayer Value |
| Automation Strategy | Scalable Interventions |
| Change Management | Implementation Science |

### The Optimization Hierarchy

Before optimizing a process, apply this decision framework:

|  |
| --- |
| Figure 14.1: Process Optimization Decision Tree |

|  |
| --- |
| Core Principle |
| **Automation and scale should be prioritized above aesthetics.** A functional, scalable system that processes 10,000 records reliably is more valuable than a beautifully designed system that handles 100. Invest in robustness first; polish later. |

## Foundations of Organizational Efficiency

Process optimization does not happen in a vacuum. Organizations are complex systems where psychological, social, and structural factors interact. Understanding these foundations helps analysts anticipate barriers and design interventions more likely to succeed.

Each section below identifies common barriers alongside practical remedies. These tables are not exhaustive but represent patterns frequently encountered in both BA and public health contexts.

### Psychological Foundations

Understanding human motivation and well-being is essential for sustainable process improvement. Optimizing systems without considering the people who operate them leads to burnout, resistance, and ultimately failure.

#### Meaning and Purpose (Frankl)

Victor Frankl’s logotherapy, developed from his experiences surviving Nazi concentration camps, posits that the primary human drive is the search for meaning. People who find purpose in their work can overcome extraordinary barriers; those who do not will struggle to sustain motivation beyond basic needs.

| Principle | Workplace Implication |
| --- | --- |
| **Will to meaning** | People seek work that matters, not just paychecks |
| **Meaning through contribution** | Staff must see how their work affects outcomes |
| **Suffering with purpose** | Difficult work becomes tolerable when meaningful |
| **Choice of attitude** | Even constrained roles allow choice in how we engage |

**Application to Public Health Programs:**

Public health work is inherently meaningful: protecting communities, preventing disease, saving lives. Yet this meaning can become invisible when staff are buried in data entry, compliance paperwork, or bureaucratic processes. Leaders must actively connect daily tasks to population-level impact.

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| The Meaning Imperative |
| People who experience a strong sense of meaning at work can overcome many barriers to achieve impact. Conversely, if staff feel their contributions lack purpose, motivation will not exceed what is required to pay bills and care for family.  **Make impact direct and observable.** Ensure your team understands not just *what* they do, but *why it matters* and *who benefits*. |

#### Self-Determination Theory (SDT)

Deci and Ryan’s Self-Determination Theory identifies three innate psychological needs that drive motivation:

| Need | Description | Process Implication |
| --- | --- | --- |
| **Autonomy** | Control over one’s work | Allow flexibility in *how* tasks are completed |
| **Competence** | Mastery and effectiveness | Provide training, feedback, and achievable challenges |
| **Relatedness** | Connection to others | Foster team collaboration and shared purpose |

SDT complements Frankl’s insights: autonomy, competence, and relatedness are the conditions under which meaningful work flourishes. Without these, even purposeful work becomes draining.

**Application to Process Design:**

* Automated systems should augment, not replace, human decision-making
* Staff should understand *why* processes exist, not just *how* to follow them
* Build in opportunities for skill development as systems evolve

#### Barriers and Remedies

Common human-factor barriers that undermine optimization and efficiency, with practical alternatives:

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Invisible impact** | Work feels meaningless, motivation limited to extrinsic rewards | Make outcomes visible; share success stories; connect tasks to beneficiaries; celebrate contributions to mission |
| **Bullying or intimidation** | Staff silence concerns, errors go unreported, talent leaves | Establish psychological safety as a core value; enforce clear anti-bullying policies; provide anonymous reporting channels; train managers to recognize and address harmful behaviors |
| **Poor communication styles** | Misunderstandings, duplicated effort, delayed decisions | Adopt structured formats (SBAR for updates, decision logs for choices); practice active listening; summarize and confirm understanding before acting |
| **Disruptive interpersonal patterns** | Unpredictable decisions, fear-based culture, high turnover | Address observable behaviors rather than speculating on motives; document conduct expectations; use HR processes and governance to protect team function |
| **Leadership lacking domain expertise** | Misprioritized work, unrealistic timelines, poor resource allocation | Pair leaders with subject matter experts; require decision review gates for technical choices; schedule regular domain briefings |
| **Absence of visionary leadership** | No compelling narrative, team drifts, purpose erodes over time | Articulate clear vision; regularly connect work to mission; share impact stories; model commitment |
| **Resistance to change** | Slow adoption, workarounds, shadow systems | Co-design solutions with end users; run small pilots before full rollout; provide training and support; align incentives with adoption |

#### Visionary Leadership

Visionary leadership plays a critical role in sustaining meaning and motivation. Leaders who articulate a compelling vision of impact help teams persist through challenges that would otherwise lead to disengagement.

| Leadership Behavior | Effect on Team |
| --- | --- |
| **Articulates purpose** | Connects daily work to mission |
| **Makes impact visible** | Shares outcomes, success stories, beneficiary feedback |
| **Models commitment** | Demonstrates personal investment in the work |
| **Celebrates contributions** | Recognizes how individual efforts advance the mission |
| **Provides context** | Explains decisions in terms of program goals |

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| CancerSurv Example |
| The CancerSurv project lead began each sprint review by sharing one story: a cancer cluster identified early, a disparity revealed by the data, or a researcher whose study was enabled by registry completeness. These brief moments connected the team’s technical work to real public health impact, sustaining motivation through difficult implementation challenges. |

#### Psychological Safety

Amy Edmondson’s research on psychological safety demonstrates that teams perform better when members feel safe to take risks, ask questions, and admit mistakes without fear of punishment.

| Safety Element | Process Design Implication |
| --- | --- |
| **Speaking up** | Create feedback channels for process improvements |
| **Risk-taking** | Allow experimentation with PDSA cycles |
| **Mistake tolerance** | Design systems with error recovery, not just prevention |
| **Help-seeking** | Document processes so staff can learn independently |

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| CancerSurv Example |
| When implementing CancerSurv, the state registry created a “no-blame” error reporting system. Registrars could flag data quality issues or workflow problems without fear of criticism. This resulted in:   * 47% more process improvement suggestions in the first quarter * Identification of a critical duplicate detection gap that would have affected NPCR submission * Higher staff satisfaction scores (3.2 → 4.1 on 5-point scale) |

#### Job Demands-Resources Model

The JD-R model explains that job stress results from imbalance between demands and resources:

| Job Demands | Job Resources |
| --- | --- |
| Workload | Autonomy |
| Time pressure | Social support |
| Complexity | Feedback |
| Ambiguity | Growth opportunities |

**Process optimization should reduce demands while maintaining or increasing resources.** Automation that simply increases throughput expectations without adding support leads to burnout.

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| Human-Factor Guardrails |
| Design processes that protect well-being:   * Set realistic throughput targets aligned to available resources * Provide recovery mechanisms when errors occur * Rotate high-stress tasks to avoid fatigue concentration * Include regular check-ins focused on workload and support needs |

### Sociological Foundations

Organizations are social systems. Process changes must account for group dynamics, power structures, and cultural norms.

#### Organizational Culture (Schein)

Edgar Schein’s model describes three levels of organizational culture:

1. **Artifacts**: Visible structures and processes (what we see)
2. **Espoused Values**: Stated strategies and goals (what we say)
3. **Basic Assumptions**: Unconscious beliefs (what we actually believe)

Process optimization often fails when it addresses only artifacts while conflicting with basic assumptions. A new data system requiring transparency may fail in an organization where the underlying assumption is “information is power.”

#### Barriers and Remedies

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Unhealthy competition** | Information hoarding, territorial behavior, duplicated effort | Establish shared goals that require collaboration; use team-based (not individual) incentives; conduct cross-team reviews to surface dependencies |
| **Political factors** | Decisions driven by influence rather than evidence; resource allocation disconnected from priorities | Document decision criteria transparently; maintain decision logs accessible to stakeholders; require conflict-of-interest declarations for major choices |
| **Misalignment across teams** | Conflicting priorities, duplicated work, wasted resources | Use cascading OKRs to connect team goals to organizational objectives; align work to shared logic models; maintain visible roadmaps showing dependencies |
| **Isolation of opposing views** | Blind spots in planning, groupthink, low trust from excluded parties | Practice structured dissent (assign devil’s advocate roles); use red teaming to stress-test plans; ensure facilitation includes diverse perspectives |
| **Informal leadership undermining formal roles** | Fragmented decision-making, unclear accountability, team confusion | Define RACI for all key processes; formally appoint accountable owners; channel leadership energy into collaborative problem-solving rather than competing authority |

#### Communities of Practice

Wenger’s Communities of Practice (CoP) concept describes how learning and knowledge sharing occur through social participation:

| CoP Element | Application to Process Optimization |
| --- | --- |
| **Domain** | Shared competence (e.g., data quality) |
| **Community** | Members who interact and learn together |
| **Practice** | Shared resources, tools, and approaches |

**Establish cross-functional communities** to prevent silos and ensure process improvements are adopted across the organization.

#### Deduplication of Effort

One of the most significant inefficiencies in organizations is duplicated work: multiple teams solving the same problem independently. This represents wasted resources and inconsistent outcomes.

| Problem | Solution | Mechanism |
| --- | --- | --- |
| Multiple teams cleaning the same data | Centralized data team | Shared Bronze/Silver data layers |
| Parallel development of similar tools | Internal tool registry | Searchable repository of existing solutions |
| Reinventing processes | Process documentation | Wiki/knowledge base with templates |
| Redundant meetings | Meeting audit | Regular review of recurring meetings |

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| Centralization Principle |
| **Core functions should be centralized.** If multiple groups rely on the same data, that data should be centrally stored, cleaned, and documented. This ensures consistency, reduces duplicate effort, and allows specialized expertise to develop.  Examples of centralizable functions:   * Data cleaning and standardization * Report generation and dissemination * Training material development * Compliance documentation |

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| Silo Risks |
| Deduplication fails when:   * Goals and definitions differ across teams * Shared repositories lack findability or curation * Incentives reward local optimization over system impact   Remedies: establish taxonomy and metadata standards, maintain an internal tool registry, and set a review cadence for shared assets. |

### Project Management

Effective process optimization requires disciplined project management. However, organizations often struggle not just with *which* framework to use, but with fundamental questions about *who* should manage projects and *what* project management actually entails.

#### The Project Manager Role

One of the most significant inefficiencies in public health and research organizations is role confusion between project managers, subject matter experts (SMEs), and leaders. Each role serves a distinct function, but organizations frequently conflate them, leading to wasted expertise and frustrated professionals.

| Role | Primary Function | Core Skills | Decision Authority |
| --- | --- | --- | --- |
| **Project Manager** | Coordinate execution | Planning, scheduling, risk management, stakeholder communication | *How* and *when* work gets done |
| **Subject Matter Expert** | Provide technical direction | Domain expertise, scientific judgment, methodological rigor | *What* work should be done and *why* |
| **Leader** | Set vision and strategy | Inspiring others, resource allocation, organizational navigation | *Where* the program is going |

**Common Anti-Patterns:**

| Anti-Pattern | What Happens | Impact |
| --- | --- | --- |
| **SME as PM** | Scientists or epidemiologists spend time scheduling meetings, tracking tasks, and chasing deliverables | Domain expertise wasted on administration; scientific work suffers; SME frustration and burnout |
| **PM as SME** | Project managers attempt to make technical decisions or navigate scientific nuances they do not understand | Poor technical choices; SMEs must re-explain concepts repeatedly; project delays from misunderstanding requirements |
| **PM as Leader** | Project managers expected to set strategic direction without authority or organizational perspective | Scope confusion; PMs blamed for decisions outside their control; actual leaders abdicate responsibility |
| **Leader without domain grounding** | Executives set direction without understanding technical constraints or scientific realities | Unrealistic expectations; misprioritized work; staff demoralization when told to “just make it happen” |

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| The Expertise Investment Problem |
| Scientific and technical expertise takes years to develop. When organizations require SMEs to perform project management tasks, they effectively pay expert rates for administrative work that could be done by dedicated coordinators. Simultaneously, the scientific work that *only* the SME can do goes undone or is rushed.  **The math is stark:** An epidemiologist spending 20 hours per week on project coordination is not doing 20 hours of epidemiology. That expertise gap cannot be filled by anyone else on the team. |

**Productive Role Separation:**

| Function | Assigned To | Examples |
| --- | --- | --- |
| **Scheduling and logistics** | Project Manager | Meeting coordination, timeline tracking, resource scheduling |
| **Stakeholder communication** | Project Manager (with SME input) | Status updates, risk escalation, expectation management |
| **Technical decisions** | SME | Methodology selection, data interpretation, scientific quality |
| **Strategic direction** | Leader (often SME or Sponsor) | Program priorities, resource allocation, vision articulation |
| **Process improvement** | Collaborative | PM identifies bottlenecks; SME validates solutions; Leader authorizes changes |

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| CancerSurv Example |
| The CancerSurv implementation initially struggled because the lead epidemiologist was expected to manage the project while also defining data quality standards, training registrars, and conducting analyses. After three months of missed deadlines and staff frustration, the team restructured:   * **Project Manager**: Hired a dedicated PM to handle vendor coordination, sprint planning, and stakeholder reporting * **Lead Epidemiologist**: Focused on data quality specifications, NAACCR standards compliance, and analytic methodology * **Program Director**: Provided strategic direction, secured resources, and resolved organizational barriers   Result: The epidemiologist’s scientific output increased by 60%, sprint velocity improved by 40%, and team satisfaction scores rose from 2.8 to 4.2 (on a 5-point scale). |

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| Right-Sizing Project Management |
| Not every project needs a full-time PM. Consider these models:   * **Small projects**: SME leads with lightweight PM support (administrative assistant, shared coordinator) * **Medium projects**: Dedicated part-time PM or PM supporting multiple related projects * **Large/complex projects**: Full-time PM with clear authority over coordination; SMEs retained for technical direction * **Programs**: Program manager coordinates across projects; individual PMs or coordinators for each workstream   The key is ensuring *someone* is responsible for coordination so that SMEs can focus on what only they can do. |

#### Project Management Frameworks

Choose frameworks appropriate to your context. The framework matters less than consistent application and clear role definition.

| Framework | Best For | Key Features |
| --- | --- | --- |
| **Agile/Scrum** | Evolving requirements, software | Iterative, adaptive, team-based |
| **Kanban** | Continuous flow, operations | Visual, WIP limits, pull-based |
| **Waterfall** | Fixed requirements, compliance | Sequential, documented, predictable |
| **Hybrid** | Public health programs | Grant milestones + iterative delivery |

#### Project Management Tools

| Capability | Commercial Options | OSS/PH Options |
| --- | --- | --- |
| **Full PM Suite** | Jira, Azure DevOps, MS Project | [OpenProject](https://www.openproject.org/), [Taiga](https://www.taiga.io/) |
| **Kanban Boards** | Trello (paid), Monday.com | Trello (free tier), [Wekan](https://wekan.github.io/) |
| **Task Management** | Asana, ClickUp | [Nextcloud Tasks](https://nextcloud.com/), GitHub Issues |
| **Communication** | Slack, MS Teams | [Mattermost](https://mattermost.com/), [Zulip](https://zulip.com/) |

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| Tool Selection Criteria |
| When selecting project management tools:   1. **Visibility**: Everyone should know goals, objectives, roles, and responsibilities 2. **Accountability**: Tasks should have clear owners and deadlines 3. **Integration**: Tools should connect to reduce manual status updates 4. **Accessibility**: All team members should be able to access and use the system 5. **Data sovereignty**: Consider where project data is stored, especially for sensitive public health programs |

#### The Iterative Imperative

**Avoid spending months developing systems that do not meet critical needs.** Systems should be iteratively developed with priority functionality assessed at each step.

| Anti-Pattern | Better Approach |
| --- | --- |
| 12-month development before user feedback | 2-week sprints with demos |
| Complete feature set before release | MVP with core functionality first |
| Comprehensive documentation before coding | Just-in-time documentation |
| Perfect architecture upfront | Evolutionary architecture |

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| Figure 14.2: Iterative Development with Value Assessment |

#### Barriers and Remedies

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Poor leadership** | Scope drift, low morale, unclear direction | Establish clear project charter with defined authority; provide leadership coaching; implement governance oversight with regular check-ins |
| **No clear goals** | Scattered effort, difficulty measuring progress, weak demonstrated value | Define measurable outcomes upfront; adopt OKRs connecting daily work to strategic objectives; align deliverables to logic model outcomes |
| **Disorganization** | Missed deadlines, rework, lost information | Implement lightweight rituals (standups, retrospectives); use visual management (Kanban boards); establish regular planning and review cadence |
| **Misalignment across workstreams** | Conflicting priorities, duplicated effort, integration failures | Conduct cross-functional prioritization sessions; maintain a single prioritized backlog; map and communicate dependencies explicitly |
| **Overemphasis on aesthetics** | Delayed value delivery, resources diverted from core function | Prioritize scalability and reliability first; defer visual polish until core functionality proven; measure success by outcomes, not appearance |
| **Unrealistic expectations** | Burnout, quality shortcuts, failed delivery, eroded trust | Use evidence-based estimation (historical velocity, throughput data); align commitments to actual capacity; set SLAs based on demonstrated capability |
| **Shifting expectations (scope creep)** | Constant rework, team churn, inability to complete anything | Implement formal change control process; refine backlog regularly with stakeholders; document scope decisions; re-baseline schedules with explicit stakeholder sign-off when scope changes |

*Note: Role confusion between PMs, SMEs, and leaders is addressed in detail in* [*The Project Manager Role*](#the-project-manager-role) *section above.*

### Communication and Transparency

Clear communication is the foundation of organizational efficiency. Teams cannot avoid duplicating work if they do not know what others are doing.

#### Communication Hierarchy

| Level | Content | Frequency | Tool |
| --- | --- | --- | --- |
| **Strategic** | Goals, priorities, resource allocation | Quarterly | All-hands, leadership memo |
| **Tactical** | Project status, blockers, decisions | Weekly | Team meetings, PM tool |
| **Operational** | Task updates, questions, collaboration | Daily | Chat, task comments |
| **Ad-hoc** | Urgent issues, clarifications | As needed | Direct message, huddle |

#### RACI Matrix for Process Clarity

Define roles clearly to prevent gaps and overlaps:

| Role | Definition |
| --- | --- |
| **Responsible** | Does the work |
| **Accountable** | Ultimately answerable (one person only) |
| **Consulted** | Provides input |
| **Informed** | Kept updated |

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| CancerSurv Example |
| **RACI for Data Quality Process:**   | Activity | Data Analyst | Data Manager | Epidemiologist | IT Support | | --- | --- | --- | --- | --- | | Receive hospital files | I | R | I | C | | Validate file format | C | R | I | A | | Clean demographic data | R | C | I | I | | Apply edits/business rules | R | C | A | I | | Generate quality report | R | I | A | I | | Resolve data issues | R | C | A | C | |

#### Poor Styles and Productive Alternatives

| Poor Style | Typical Outcome | Productive Alternative |
| --- | --- | --- |
| **Vague updates** (“Things are going fine”) | Confusion about actual status, surprises, rework | Use **SBAR format**: Situation (what’s happening), Background (context), Assessment (analysis), Recommendation (proposed action) |
| **One-way broadcasting** (announcements without dialogue) | Low engagement, unaddressed concerns, passive resistance | Practice active listening; explicitly solicit questions; summarize decisions and confirm understanding |
| **Unstructured meetings** (no agenda, no outcomes) | Wasted time, repeated discussions, unclear decisions | Publish agenda with specific objectives; timebox each topic; end with documented decisions and assigned next steps |
| **Email-only coordination** for complex work | Slow responses, fragmented context, lost threads | Use shared PM tools for task tracking; maintain threaded discussions tied to work items; keep decision logs for reference |
| **Public criticism** of individuals | Fear, defensiveness, hidden problems | Provide feedback privately; focus on specific behaviors rather than character; reinforce expected norms constructively |

### Educational Foundations

Process optimization requires ongoing learning and skill development.

#### Adult Learning Principles (Andragogy)

Malcolm Knowles identified key principles for adult learners:

| Principle | Application |
| --- | --- |
| **Self-directed** | Provide resources for independent learning |
| **Experience-based** | Connect new processes to existing knowledge |
| **Relevance-oriented** | Explain *why* processes matter |
| **Problem-centered** | Frame training around real challenges |
| **Internally motivated** | Appeal to professional growth, not just compliance |

#### Building Technical Capacity

**Desktop data management tasks should be scripted.** Manual data cleaning in spreadsheets is error-prone, non-reproducible, and does not scale.

| Manual Approach | Scripted Approach |
| --- | --- |
| Copy-paste in Excel | R/Python script |
| Point-and-click transformations | Documented code |
| “I remember how I did it” | Version-controlled workflow |
| One person can do it | Anyone can run it |

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| Learning Path Recommendation |
| Encourage all analysts to learn basic programming:   1. **Start with R or Python**: Both are free, well-documented, and widely used 2. **Focus on data manipulation first**: tidyverse (R) or pandas (Python) 3. **Learn version control**: Git fundamentals for collaboration 4. **Build incrementally**: Automate one task at a time 5. **Share and document**: Create institutional knowledge   **Recommended resources:**   * [R for Data Science](https://r4ds.hadley.nz/) (free online book) * [Python for Data Analysis](https://wesmckinney.com/book/) (O’Reilly) * [The Carpentries](https://carpentries.org/) (workshops for researchers) |

#### Barriers and Remedies

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Leadership lacks domain expertise** | Misguided priorities, unrealistic technical decisions | Pair leaders with SMEs for technical decisions; schedule regular domain briefings; require review gates before committing to technical approaches |
| **Training deprioritized** | Persistent skill gaps, reliance on few experts, fragility | Invest in microlearning (short, focused modules); build practice into regular work; establish mentorship programs pairing experienced and developing staff |
| **Tool resistance** (“I’ve always done it this way”) | Manual work persists despite better options, inconsistent outputs | Provide low-stakes practice environments; pair resistant staff with supportive peers; share concrete success stories showing time saved |
| **Knowledge silos** | Rework when experts unavailable, inconsistent methods across team | Develop shared curricula documenting standard approaches; host brown-bag sessions for knowledge sharing; consider internal certifications to validate and spread expertise |

## Automation Strategy

### The Automation Spectrum

Not all automation is equal. Consider the level appropriate for each process:

| Level | Description | Example | Human Role |
| --- | --- | --- | --- |
| **Manual** | Human does all work | Ad-hoc data requests | Full control |
| **Assisted** | Tools support human work | Spell-check, templates | Decision-maker |
| **Partial** | System handles routine; human handles exceptions | Auto-coding with review queue | Exception handler |
| **Conditional** | System does most; human monitors | Scheduled reports with alerts | Supervisor |
| **Full** | System operates independently | Automated backups | Oversight only |

### Automation with Accountability

**Systems that are automated sometimes miss critical requirements.** Automated systems should be flexible enough to adjust to evolving demands.

| Requirement | Implementation |
| --- | --- |
| **Flexibility** | Configurable rules, not hard-coded logic |
| **Auditability** | Logging of all automated decisions |
| **Override capability** | Human can intervene when needed |
| **Feedback loops** | Mechanism to report automation failures |
| **Version control** | Track changes to automation rules |

#### The AI Accountability Challenge

Artificial intelligence presents unique challenges for process automation:

| AI Challenge | Mitigation Strategy |
| --- | --- |
| **Lack of accountability** | Assign human owner for AI-assisted decisions |
| **Inconsistent reliability** | Implement confidence thresholds and fallback processes |
| **Volume of output** | Train more reviewers; focus review on high-risk items |
| **Opacity (“black box”)** | Require explainable AI or human decision for critical paths |
| **Drift over time** | Regular performance monitoring and recalibration |

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| AI Oversight Principle |
| **There should always be someone who reviews critical operations.** AI can accelerate work, but lacks the accountability and judgment required for consequential decisions.  The challenge: humans cannot review the vast amounts of AI-generated output. Solutions include:   * **Risk-based review**: Focus human attention on high-stakes decisions * **Sampling**: Statistically valid review of AI output subsets * **Building reviewer capacity**: Train more staff to critically evaluate AI outputs * **Automated validation**: Use rule-based systems to catch obvious AI errors |

#### Barriers and Remedies

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Resistance to tool adoption** | Parallel manual processes undermine efficiency gains, inconsistent outputs | Co-design automation with end users from the start; pilot features with willing early adopters; identify champions and super-users to support peers |
| **Rigid automation** (hard-coded logic) | System cannot adapt to legitimate exceptions, workarounds proliferate | Build configurable rules rather than fixed logic; ensure human override capability; plan for rapid iteration as requirements evolve |
| **Opaque AI decisions** | Low trust, reluctance to rely on system, manual double-checking negates efficiency | Require explainability for consequential decisions; implement confidence thresholds that trigger human review; maintain fallback to human judgment for edge cases |
| **Over-automation** (removing humans entirely) | Brittleness when exceptions occur, catastrophic failures without intervention | Keep humans in the loop for exception handling; monitor automated systems actively; recalibrate regularly based on performance data |

### Scripting Desktop Tasks

Transform manual data management into reproducible workflows:

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| Figure 14.3: From Manual to Scripted Data Workflow |

**Benefits of scripted workflows:**

| Benefit | Description |
| --- | --- |
| **Reproducibility** | Same code produces same results |
| **Auditability** | Code documents exactly what was done |
| **Scalability** | Process 10 or 10,000 records identically |
| **Error reduction** | Eliminates copy-paste mistakes |
| **Knowledge transfer** | New staff can run existing scripts |

## Informatics Systems: Enabler or Barrier

Informatics systems are the backbone of modern public health operations. When well-designed and implemented, they accelerate every aspect of program delivery. When poorly conceived or executed, they become obstacles that consume resources, frustrate staff, and ultimately harm the populations they were meant to serve.

### The Dual Nature of Informatics

The same system can be an enabler or barrier depending on design choices, implementation quality, and organizational context:

| Dimension | Informatics as Enabler | Informatics as Barrier |
| --- | --- | --- |
| **Data access** | Self-service queries empower analysts | Locked-down systems require IT tickets for every request |
| **Workflow integration** | Systems fit existing work patterns | Staff must adapt to rigid, unintuitive interfaces |
| **Interoperability** | Standards-based data exchange (HL7, FHIR) | Proprietary formats create data silos |
| **Scalability** | Architecture handles growth and surges | Systems buckle under increased load |
| **Adaptability** | Configurable rules accommodate change | Hard-coded logic requires vendor involvement |
| **Usability** | Intuitive design reduces training burden | Complex interfaces increase error rates |
| **Documentation** | Clear specifications enable troubleshooting | Undocumented systems create key-person dependencies |
| **Maintenance** | Modular design allows incremental updates | Monolithic systems require risky big-bang changes |

### Design Principles for Enabling Systems

Informatics systems that enable efficiency share common characteristics:

#### User-Centered Design

| Principle | Implementation |
| --- | --- |
| **Involve end users early** | Conduct contextual inquiry; observe actual workflows before designing |
| **Prototype iteratively** | Show working software, not just specifications; gather feedback continuously |
| **Minimize cognitive load** | Reduce clicks, eliminate redundant data entry, provide smart defaults |
| **Design for errors** | Assume mistakes happen; make recovery easy; prevent catastrophic actions |
| **Support diverse users** | Accommodate varying technical skill levels; provide progressive complexity |

#### Technical Architecture

| Principle | Implementation |
| --- | --- |
| **Modular design** | Separate concerns; allow components to be updated independently |
| **API-first approach** | Expose functionality through well-documented interfaces |
| **Standards compliance** | Adopt industry standards (HL7 FHIR, USCDI) for interoperability |
| **Scalable infrastructure** | Design for 10x expected load; plan for surge capacity |
| **Security by design** | Build authentication, authorization, and audit into the foundation |

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| CancerSurv Example |
| The CancerSurv system was designed with a clear separation between:   * **Data layer**: Centralized data warehouse with Bronze/Silver/Gold architecture * **Business logic layer**: Configurable rules engine for edits and validations * **Presentation layer**: Role-based interfaces for registrars, epidemiologists, and administrators * **Integration layer**: HL7 FHIR APIs for hospital and lab connectivity   This modular approach allowed the team to update the duplicate detection algorithm without touching case abstraction screens, and to add new hospital integrations without modifying the core data model. |

### Common Informatics Barriers

Recognize and address these patterns that transform systems into obstacles:

#### System-Level Barriers

| Barrier | Impact | Remedy |
| --- | --- | --- |
| **Legacy system lock-in** | Cannot adopt modern approaches; vendor dependency | Plan migration paths; negotiate data portability; avoid proprietary formats |
| **Technical debt accumulation** | Increasing fragility; slower development; higher maintenance costs | Allocate time for refactoring; track and prioritize debt reduction |
| **Integration failures** | Data silos persist; manual reconciliation required | Invest in middleware; adopt standards; establish data governance |
| **Performance degradation** | Staff workarounds; delayed operations; missed deadlines | Monitor proactively; plan capacity; optimize before crisis |
| **Security vulnerabilities** | Data breaches; compliance failures; loss of public trust | Regular assessments; patch management; security-aware development |

#### Organizational Barriers

| Barrier | Impact | Remedy |
| --- | --- | --- |
| **Misaligned procurement** | Systems selected for features not used; actual needs unmet | Involve end users in selection; weight usability heavily; pilot before commitment |
| **Insufficient training** | Powerful features unused; errors from misunderstanding | Budget for training; provide ongoing support; create user communities |
| **Change resistance** | New systems underutilized; parallel manual processes persist | Co-design with users; demonstrate value; provide transition support |
| **Vendor over-dependence** | Slow response to needs; high costs for changes; strategic constraints | Maintain internal expertise; document configurations; plan exit strategies |
| **Governance gaps** | No clear ownership; conflicting priorities; stalled decisions | Assign system owners; establish steering committees; define decision rights |

### Informatics Maturity Model

Assess your organization’s informatics capability to identify improvement priorities:

| Level | Characteristics | Indicators |
| --- | --- | --- |
| **1. Ad-hoc** | No formal systems; spreadsheet-based; individual solutions | Data inconsistency; key-person dependencies; no audit trail |
| **2. Defined** | Standard tools selected; basic documentation; some training | Consistent formats; documented procedures; identifiable system owners |
| **3. Managed** | Integrated systems; performance monitoring; governance structures | Automated workflows; SLAs tracked; regular reviews |
| **4. Optimized** | Continuous improvement; advanced analytics; predictive capabilities | Data-driven decisions; proactive issue detection; measurable outcomes |
| **5. Transformative** | Systems enable new capabilities; strategic asset; innovation driver | New programs enabled; cross-program insights; national leadership |

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| Maturity Assessment |
| Most public health programs operate between levels 2 and 3. Advancing maturity requires sustained investment in:   * **People**: Training, hiring, retention of informatics talent * **Process**: Governance, standards, continuous improvement practices * **Technology**: Modern architecture, interoperability, maintainability   Focus on foundational capabilities before pursuing advanced features. A well-implemented level 3 system delivers more value than a poorly implemented level 4 system. |

### Barriers and Remedies Summary

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Poorly designed systems** | User frustration, workarounds, data quality issues, wasted effort | Apply user-centered design; prototype iteratively; conduct usability testing; involve end users throughout |
| **Legacy system constraints** | Inability to modernize, vendor lock-in, accumulating technical debt | Plan migration incrementally; negotiate data portability; maintain internal expertise; document thoroughly |
| **Interoperability failures** | Data silos, manual reconciliation, incomplete picture, duplicated effort | Adopt standards (HL7 FHIR, USCDI); invest in integration infrastructure; establish data governance |
| **Insufficient informatics capacity** | Over-reliance on vendors, slow response to needs, inability to optimize | Build internal team; provide career paths; partner with academic programs; cross-train existing staff |
| **Misaligned system selection** | Features unused, actual needs unmet, costly customization | Involve users in procurement; weight usability; pilot before committing; define requirements clearly |

## Centralization and Shared Services

### The Medallion Architecture for Shared Data

When multiple teams rely on the same data, implement a centralized data architecture:

|  |
| --- |
| Figure 14.4: Centralized Data Architecture |

**Centralization benefits:**

* **Consistency**: All consumers use the same cleaned data
* **Expertise**: Data team develops specialized cleaning skills
* **Efficiency**: Clean once, use many times
* **Quality**: Single point of accountability for data quality

### Shared Services Model

Extend centralization beyond data to other core functions:

| Function | Centralized Model | Benefits |
| --- | --- | --- |
| **Data cleaning** | Central data team maintains Silver layer | Consistent quality, reduced duplication |
| **Report generation** | Shared reporting infrastructure | Standard formats, automated distribution |
| **Training development** | Central learning team | Consistent messaging, professional quality |
| **Compliance documentation** | Compliance office coordinates | Complete coverage, expert interpretation |
| **Tool administration** | IT manages shared tools | Security, licensing, support |

## Establishing Accountability Structures

### Clear Governance

**Clear structures should be in place to ensure responsibility and accountability.** Without governance, process improvements drift and deteriorate.

| Governance Element | Purpose | Example |
| --- | --- | --- |
| **Process owner** | Single point of accountability | Data Quality Manager |
| **Steering committee** | Strategic decisions, resource allocation | Monthly leadership review |
| **Working groups** | Operational improvements | Data Quality Working Group |
| **SLAs/OLAs** | Documented expectations | 99.9% uptime, 48-hour response |
| **Escalation paths** | Clear routes for unresolved issues | Analyst → Manager → Director |

### Metrics and Monitoring

What gets measured gets managed. Establish metrics for process performance:

| Metric Category | Examples |
| --- | --- |
| **Efficiency** | Time per task, throughput, backlog size |
| **Quality** | Error rates, rework rates, audit findings |
| **Adoption** | Usage rates, training completion, feedback scores |
| **Value** | Cost savings, time saved, outcomes improved |

|  |
| --- |
| CancerSurv Example |
| **Process Optimization Dashboard:**   | Metric | Baseline | Target | Current | Status | | --- | --- | --- | --- | --- | | Case abstraction time | 15 min | 8 min | 9.2 min | 🟡 | | Data completeness | 89% | 95% | 94.3% | 🟡 | | Duplicate detection rate | 73% | 95% | 96.1% | 🟢 | | Hospital submission lag | 14 days | 7 days | 5.2 days | 🟢 | | Manual interventions/week | 127 | 50 | 43 | 🟢 | | Staff satisfaction | 3.2/5 | 4.0/5 | 4.1/5 | 🟢 |   The dashboard is reviewed weekly by the Data Quality Working Group and monthly by the program steering committee. |

#### Barriers and Remedies

| Barrier | Impact | Productive Alternative |
| --- | --- | --- |
| **Political interference** | Decision volatility, resources redirected without justification, staff demoralization | Establish charter-based governance with documented authority; use transparent criteria for decisions; engage external audit for high-stakes or contentious choices |
| **Ambiguous accountability** | Tasks dropped between roles, finger-pointing when problems arise | Assign explicit process owners with documented responsibility; define SLAs/OLAs for handoffs; establish clear escalation paths when issues arise |
| **Goal drift** | Original value proposition lost, effort disconnected from outcomes | Conduct quarterly goal reviews against original objectives; maintain traceability from daily work to logic model outcomes and grant requirements |
| **Fragmented oversight** | Conflicting directives from multiple authorities, staff confusion | Consolidate to single steering committee with clear authority; integrate calendars to prevent conflicting demands; establish unified reporting cadence |

## Bringing It Together: A Comprehensive Framework

### The Process Optimization Lifecycle

|  |
| --- |
| Figure 14.5: Process Optimization Lifecycle |

### Integration Checklist

When optimizing processes, ensure you address all dimensions:

| Dimension | Questions to Ask |
| --- | --- |
| **Psychology** | Does this support autonomy, competence, and relatedness? Is the environment psychologically safe? |
| **Sociology** | Does this align with organizational culture? Are communities of practice engaged? |
| **Project Management** | Is there a clear plan with milestones? Are tools appropriate? |
| **Communication** | Do all stakeholders know the goals, roles, and status? |
| **Education** | Do staff have the skills needed? Is training available? |
| **Centralization** | Are core functions appropriately centralized? Is duplication minimized? |
| **Automation** | Is the right level of automation applied? Is there human oversight? |
| **Accountability** | Are governance structures clear? Are metrics tracked? |

### The Public Health Value Proposition

Ultimately, process optimization in public health must demonstrate value to the taxpayer. Every efficiency gain should connect to improved health outcomes:

| Efficiency Gain | Taxpayer Value |
| --- | --- |
| Faster data processing | Earlier outbreak detection |
| Reduced manual errors | More accurate surveillance |
| Automated reporting | More resources for intervention |
| Streamlined workflows | Lower cost per case processed |
| Better data quality | More reliable public health decisions |

|  |
| --- |
| The Accountability Test |
| For every process, ask: **“Could I explain to a taxpayer why this is necessary and how it contributes to public health?”**  If the answer is no, the process should be eliminated, automated, or fundamentally redesigned. |

## Visual Framework: Factors Influencing Program Efficiency

The following directed acyclic graph (DAG) synthesizes the key enablers and barriers discussed throughout this chapter, illustrating how foundational factors flow through organizational processes to ultimately affect public health program impact.

|  |
| --- |
| Figure 14.6: DAG: Supporting Factors and Barriers to Public Health Program Optimization |

### Reading the DAG

The diagram illustrates causal pathways between factors affecting public health program optimization:

| Layer | Color | Components |
| --- | --- | --- |
| **Foundations** | Blue | Psychological (meaning, SDT, safety, JD-R, leadership), Sociological (culture, CoPs, power), Educational (andragogy, capacity, knowledge) |
| **Enablers** | Green | Governance, Communication, Iteration, Centralization, Automation, Visionary Leadership, Visible Impact, Enabling Informatics |
| **Barriers** | Red | Intimidation, Politics, Silos, Duplication, Rigidity, Ambiguity, Scope Creep, Invisible Impact, Poor Informatics |
| **Processes** | Orange | Project Management, Change Management, Data Management, Quality Improvement |
| **Outcomes** | Purple | Efficiency, Data Quality, Well-being, Adoption, Meaning |
| **Impact** | Dark Blue | Program Impact & Taxpayer Value |

**Arrow types:**

* **Solid arrows** (→) represent positive causal pathways where factors support or enable downstream elements
* **Dashed arrows** (⇢) represent negative pathways where foundational weaknesses create barriers that undermine processes

|  |
| --- |
| Using This Framework |
| This DAG can serve as a diagnostic tool when assessing program optimization opportunities:   1. **Assess foundations**: Are psychological safety, healthy culture, and technical capacity in place? 2. **Inventory enablers**: Which enabling factors are present? Which are missing? 3. **Identify barriers**: Which barriers are actively impeding progress? 4. **Trace pathways**: Follow the arrows to understand how barriers affect outcomes 5. **Prioritize interventions**: Address foundational gaps and high-impact barriers first |

## Summary

Process optimization requires a multidisciplinary approach that addresses both technical systems and human factors:

1. **Understand human factors**: Motivation, psychological safety, and well-being are prerequisites for sustainable improvement. Processes that ignore people will fail.
2. **Address organizational dynamics**: Culture, power structures, and communication patterns can enable or obstruct change. Work with these forces, not against them.
3. **Apply disciplined management**: Iterative development, clear accountability, and appropriate tools prevent wasted effort. Set realistic expectations and manage scope actively.
4. **Automate thoughtfully**: Prioritize scalability and flexibility over perfection. Maintain human oversight, especially for AI-assisted processes that lack inherent accountability.
5. **Centralize core functions**: Reduce duplication by sharing data, tools, and expertise. Build specialized capability where it matters most.
6. **Demonstrate value**: Connect every optimization to measurable outcomes. In public health, that means taxpayer value and improved health for the populations we serve.

The goal is not efficiency for its own sake, but rather **maximizing public health impact with the resources entrusted to us**.

# Templates & Checklists

## Templates and Checklists

This appendix provides ready-to-use templates for hybrid BA/PH projects. Each template is presented in both BA and PH framings where appropriate.

### Stakeholder / Community Partner Matrix

Use this template to identify and analyze project participants:

| Name/Group | BA Role | PH Role | Interest Level | Influence Level | Engagement Strategy |
| --- | --- | --- | --- | --- | --- |
| *Registry Director* | Executive Sponsor | State Epidemiologist | High | High | Monthly briefings, decision authority |
| *Cancer Registrars* | End Users | Frontline Data Collectors | High | Medium | Training, feedback sessions, super-users |
| *Hospital IT* | Technical SMEs | Data Partners | Medium | Medium | Integration meetings, testing |
| *CDC/NPCR* | Governance | Funder/Standards Body | High | High | Formal reporting, compliance reviews |
| *Cancer Survivors* | Indirect Stakeholders | Rights Holders/Beneficiaries | Low | Low | Advisory input, outcome focus |

#### Analysis Questions

* Who might be missing from this list?
* Are marginalized voices represented?
* Who has formal authority vs. informal influence?
* What are the potential conflicts of interest?

### Logic Model Template

┌─────────────────────────────────────────────────────────────────────────────┐  
│ LOGIC MODEL │  
│ Program: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ │  
│ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ │  
├─────────────────────────────────────────────────────────────────────────────┤  
│ │  
│ INPUTS ACTIVITIES OUTPUTS OUTCOMES │  
│ (Resources) (What we do) (Products) (Changes) │  
│ │  
│ ┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐ │  
│ │ │ │ │ │ │ │ Short- │ │  
│ │ Funding │──────▶│ Develop │───────▶│ Working │──────▶│ term │ │  
│ │ │ │ system │ │ software │ │ │ │  
│ └──────────┘ └──────────┘ └──────────┘ └──────────┘ │  
│ │ │  
│ ┌──────────┐ ┌──────────┐ ┌──────────┐ ▼ │  
│ │ │ │ │ │ │ ┌──────────┐ │  
│ │ Staff │──────▶│ Train │───────▶│ Trained │──────▶│ Medium- │ │  
│ │ │ │ users │ │ users │ │ term │ │  
│ └──────────┘ └──────────┘ └──────────┘ └──────────┘ │  
│ │ │  
│ ┌──────────┐ ┌──────────┐ ┌──────────┐ ▼ │  
│ │ │ │ │ │ │ ┌──────────┐ │  
│ │ Data │──────▶│ Process │───────▶│ Quality │──────▶│ Long- │ │  
│ │ feeds │ │ data │ │ reports │ │ term │ │  
│ └──────────┘ └──────────┘ └──────────┘ └──────────┘ │  
│ │  
├─────────────────────────────────────────────────────────────────────────────┤  
│ ASSUMPTIONS: EXTERNAL FACTORS: │  
│ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ │  
│ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ │  
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└─────────────────────────────────────────────────────────────────────────────┘

#### CancerSurv Logic Model Example

| Inputs | Activities | Outputs | Short-term Outcomes | Long-term Impact |
| --- | --- | --- | --- | --- |
| NPCR grant funding | System development | Operational platform | Improved workflow efficiency | Accurate survival statistics |
| Registry staff | User training | Trained registrars | Reduced abstraction time | Targeted prevention |
| Hospital data feeds | Data integration | Electronic data capture | Increased data completeness | Health disparity identification |
| NAACCR standards | Quality assurance | Validated records | Timely NPCR submission | Evidence-based cancer policy |

### Requirements Specification Template

#### Functional Requirement

| Field | Content |
| --- | --- |
| **ID** | FR-XXX |
| **Title** | [Brief descriptive title] |
| **Description** | The system shall [action] [object] [condition/constraint] |
| **Rationale** | [Why this requirement exists; link to business need/program goal] |
| **Source** | [Stakeholder, document, or session where identified] |
| **Priority** | Must / Should / Could / Won’t (this release) |
| **Acceptance Criteria** | Given [context], when [action], then [expected result] |
| **Dependencies** | [Other requirements this depends on or enables] |

#### Non-Functional Requirement

| Field | Content |
| --- | --- |
| **ID** | NFR-XXX |
| **Title** | [Brief descriptive title] |
| **Category** | Performance / Security / Usability / Reliability / Scalability / Compliance |
| **Description** | The system shall [quality attribute] [measurable target] |
| **Rationale** | [Why this matters; CFIR domain if applicable] |
| **Measurement** | [How compliance will be verified] |
| **Priority** | Must / Should / Could |

#### Example: CancerSurv Requirement

| Field | Content |
| --- | --- |
| **ID** | FR-105 |
| **Title** | Duplicate Case Detection |
| **Description** | The system shall identify potential duplicate case records based on patient identifiers (name, DOB, SSN) and tumor characteristics |
| **Rationale** | Prevents double-counting of cancer incidence; required for accurate epidemiological analysis |
| **Source** | Registrar interviews; NAACCR standards |
| **Priority** | Must |
| **Acceptance Criteria** | Given a new case entry, when patient identifiers match an existing case with confidence >80%, then the system displays potential duplicates for review before saving |
| **Dependencies** | FR-101 (Patient search) |

### CFIR Readiness Assessment Checklist

Use this checklist to assess implementation readiness:

#### Intervention Characteristics

* Evidence of effectiveness documented and communicated
* Relative advantage over current practice clearly articulated
* Core vs. adaptable components identified
* Complexity minimized; training plan addresses remaining complexity
* Pilot/trialability planned

#### Outer Setting

* Regulatory requirements identified (HIPAA, CDC, state)
* External stakeholder needs understood
* Interoperability requirements documented
* Peer organization experiences reviewed

#### Inner Setting

* Leadership commitment secured
* Resources allocated (budget, staff, time)
* Implementation team identified
* Communication plan developed
* Organizational culture alignment assessed

#### Characteristics of Individuals

* User attitudes toward change assessed
* Training needs identified
* Champions identified and engaged
* Self-efficacy barriers addressed

#### Process

* Detailed implementation plan developed
* Key milestones and decision points defined
* Monitoring and feedback mechanisms established
* Contingency plans for common risks

### User Story Templates

#### Standard Format

As a [role], I want [feature/capability], so that [benefit/value].

#### GPS Format (Clinical Contexts)

Given [clinical context/trigger], the [health worker role] should [specific action] to [health outcome].

#### Service-User Scenario Format

[Name], a [demographic description], [presents with situation]. The system must [support their need] while [addressing constraints]. Success means [outcome].

#### Example Set: CancerSurv

**Standard:** > As a cancer registrar, I want to search existing cases before creating a new record, so that I avoid creating duplicate entries.

**GPS:** > Given a new pathology report, the registrar should search for existing patient records using at least two identifiers, to prevent duplicate case creation and ensure accurate incidence counts.

**Service-User Scenario:** > Maria is a senior registrar abstracting cases from a high-volume hospital. She receives 50 pathology reports daily and needs to quickly determine if each represents a new case or an existing patient. The system must support rapid searching with fuzzy matching while flagging potential duplicates. Success means Maria can process her daily queue in under 4 hours with less than 1% duplicate creation rate.

### Test Case Template

| Field | Content |
| --- | --- |
| **ID** | TC-XXX |
| **Title** | [Brief descriptive title] |
| **Requirement(s)** | [FR-XXX, NFR-XXX] |
| **Preconditions** | [System state before test] |
| **Test Data** | [Specific data needed] |
| **Steps** | 1. [Action] 2. [Action] 3. [Action] |
| **Expected Result** | [What should happen] |
| **Actual Result** | [Fill in during testing] |
| **Pass/Fail** | [ ] |
| **Notes** | [Observations, defect IDs if failed] |

### Project Charter Template (Dual-Frame)

| Section | BA Content | PH Content |
| --- | --- | --- |
| **Project Name** | [System name] | [Program name] |
| **Business Need** | [Operational driver] | **Public Health Challenge**: [Health need] |
| **Objectives** | [Business objectives] | **Program Goals**: [Health objectives] |
| **Scope** | [In/out of scope] | **Intervention Boundaries**: [Target population, geography] |
| **Stakeholders** | [Stakeholder list] | **Community Partners**: [Partner list] |
| **Success Metrics** | [KPIs] | **Health Indicators**: [Outcome measures] |
| **Timeline** | [Project milestones] | **Grant Milestones**: [Funder deadlines] |
| **Budget** | [Project budget] | **Funding Source**: [Grant, appropriation] |
| **Risks** | [Project risks] | **Implementation Barriers**: [CFIR-informed risks] |
| **Governance** | [Decision structure] | **Oversight**: [Funder, advisory board] |

### Evaluation Plan Template

| Component | Content |
| --- | --- |
| **Evaluation Questions** | What do we want to know? |
| **Type** | Formative / Summative / Process / Outcome |
| **Indicators** | What will we measure? |
| **Data Sources** | Where will data come from? |
| **Methods** | How will we collect and analyze? |
| **Timeline** | When will we measure? |
| **Responsibilities** | Who will conduct evaluation? |
| **Use of Findings** | How will results inform decisions? |

#### RE-AIM Evaluation Matrix

| Dimension | Indicator | Data Source | Target | Actual |
| --- | --- | --- | --- | --- |
| **Reach** |  |  |  |  |
| **Effectiveness** |  |  |  |  |
| **Adoption** |  |  |  |  |
| **Implementation** |  |  |  |  |
| **Maintenance** |  |  |  |  |

# Development Tools

## Development Tools for Toolkit Contributors

This appendix documents the tools used to build and maintain the Bridgeframe Toolkit. This information is for contributors who want to modify or extend the toolkit, not for practitioners using the toolkit content.

### Technology Stack

The Bridgeframe Toolkit is built with:

| Tool | Purpose | Version |
| --- | --- | --- |
| **Quarto** | Document publishing system | 1.4+ |
| **VS Code** | Code editor | Current |
| **GitHub Copilot** | AI-assisted development | Current |
| **Git/GitHub** | Version control and hosting | N/A |
| **GitHub Actions** | Automated publishing | N/A |
| **Mermaid** | Diagram generation | Built into Quarto |

### AI-Assisted Development

GitHub Copilot is used throughout the development of this toolkit for:

* **Refining ideas**: Brainstorming content structure and terminology mappings
* **Analysis**: Reviewing and improving BA-PH framework alignments
* **Code development**: Generating Mermaid diagrams, R scripts, and configuration files

#### LLM Models Used

GitHub Copilot provides access to multiple large language models:

| Provider | Models | Primary Use |
| --- | --- | --- |
| **Anthropic** | Claude (Sonnet, Opus) | Complex analysis, long-form content |
| **Google** | Gemini | Research, fact-checking |
| **OpenAI** | GPT-4, GPT-4o | Code generation, quick edits |

#### Copilot Features

* **Chat**: Interactive conversation for complex tasks
* **Inline suggestions**: Real-time code and content completion
* **Agent mode**: Multi-step tasks with file creation and terminal access

#### Deep Research Tools

Research and analysis is additionally supported by deep research features in:

* **Google Gemini**: Extended research capabilities for comprehensive literature review and framework analysis
* **OpenAI ChatGPT**: Deep research mode for exploring complex BA-PH terminology mappings and implementation science concepts

These tools complement GitHub Copilot by providing broader research context beyond the immediate codebase.

#### Project Context

The .github/copilot-instructions.md file provides Copilot with project-specific context including:

* Repository structure and conventions
* BA-PH terminology mappings
* CancerSurv case study details
* Formatting standards and style guidelines

### Local Development Setup

#### Prerequisites

1. **Install Quarto**: Download from [quarto.org](https://quarto.org)
2. **Install VS Code**: Download from [code.visualstudio.com](https://code.visualstudio.com)
3. **Install Git**: Download from [git-scm.com](https://git-scm.com)
4. **Install Quarto VS Code Extension**: Search “Quarto” in VS Code extensions

#### Clone the Repository

git clone https://github.com/andre-inter-collab-llc/Bridgeframe-Toolkit.git  
cd Bridgeframe-Toolkit

#### Preview Locally

quarto preview

This starts a local server and opens the book in your browser. Changes to .qmd files automatically refresh.

#### Render the Book

quarto render

Output is generated in the \_book/ directory.

### Repository Structure

Bridgeframe-Toolkit/  
├── \_quarto.yml # Book configuration  
├── \_brand.yml # Branding (colors, fonts, logo)  
├── index.qmd # Landing page  
├── preface.qmd # Author preface  
├── references.qmd # Bibliography  
├── chapters/ # Book chapters  
│ ├── 01-introduction.qmd  
│ ├── ...  
│ └── C-glossary.qmd  
├── assets/  
│ ├── branding/ # Logos, icons, templates  
│ ├── references/ # Bibliography files  
│ └── styles/ # Custom SCSS  
├── .github/  
│ ├── copilot-instructions.md # AI assistant context  
│ └── workflows/  
│ └── publish.yml # GitHub Actions workflow  
└── \_book/ # Generated output (gitignored)

### Configuration Files

#### \_quarto.yml

The main configuration file controls:

* Book metadata (title, author, date)
* Chapter organization
* Output formats (HTML, DOCX)
* Theme and styling
* Bibliography settings

Key sections:

project:  
 type: book  
 output-dir: \_book  
  
book:  
 title: "Bridgeframe"  
 chapters:  
 - index.qmd  
 - part: "Foundations"  
 chapters:  
 - chapters/01-introduction.qmd  
 # ...  
  
format:  
 html:  
 theme:  
 - brand  
 - assets/styles/custom.scss  
 docx:  
 reference-doc: assets/branding/templates/IntersectCollab-reference-doc.docx

#### \_brand.yml

Controls visual branding:

color:  
 palette:  
 blue: "#2494f7"  
 teal: "#00a4bb"  
 # ...  
 primary: blue  
 secondary: teal  
  
typography:  
 base: "Inter"  
 headings:  
 family: "Inter"  
 weight: 800  
 monospace: "Fira Code"  
  
logo:  
 medium: assets/branding/logos/intersect-logo.png

### Writing Content

#### Quarto Markdown Basics

Quarto uses extended Markdown. Key features:

**Headings:**

# Chapter Title (H1)  
## Section (H2)  
### Subsection (H3)

**Callout Boxes:**

::: {.callout-note title="CancerSurv Example"}  
Content here...  
:::  
  
::: {.callout-tip}  
Tip content...  
:::  
  
::: {.callout-warning}  
Warning content...  
:::

**Tables:**

| Column 1 | Column 2 |  
|:---------|:---------|  
| Data 1 | Data 2 |

**Citations:**

According to the BABOK [@babok2015], requirements should be...

#### Mermaid Diagrams

Diagrams are created with Mermaid syntax in code blocks:

```{mermaid}  
%%| label: fig-example  
%%| fig-cap: "Example Diagram"  
flowchart LR  
 A[Start] --> B[Process]  
 B --> C[End]  
```

Common diagram types:

* flowchart: Process flows, architecture
* sequenceDiagram: Interactions over time
* erDiagram: Data models
* gantt: Project timelines

#### Cross-References

Reference figures, tables, and sections:

See @fig-example for the diagram.  
As discussed in @sec-planning...

### Publishing

#### GitHub Pages Deployment

The book automatically publishes to GitHub Pages when changes are pushed to main. The workflow (.github/workflows/publish.yml) handles rendering and deployment.

#### Manual Publishing

To publish manually:

quarto publish gh-pages

This creates/updates the gh-pages branch with rendered content.

#### Initial Setup

For first-time setup:

1. Create .nojekyll file in repository root (empty file)
2. Run quarto publish gh-pages once locally
3. Commit the generated \_publish.yml file
4. Enable GitHub Pages in repository settings (source: gh-pages branch)

### Contributing

#### Branch Strategy

* main: Production-ready content
* Feature branches: For new content or significant changes
* Pull requests: For review before merging to main

#### Content Guidelines

1. Follow the BA-PH dual framing throughout
2. Include CancerSurv examples in callout boxes
3. Use tables for terminology mapping
4. Avoid em dashes and en dashes; rewrite sentences instead
5. Every .qmd file needs YAML frontmatter with at least a title

#### Style Guidelines

* First-person voice only in Preface and personal sections
* Professional/instructional tone for toolkit content
* Academic yet accessible language
* Ground claims in evidence where possible

### Troubleshooting

#### Common Issues

**Quarto preview not updating:** - Check for syntax errors in YAML frontmatter - Restart preview with quarto preview

**Mermaid diagram not rendering:** - Verify syntax at [mermaid.live](https://mermaid.live) - Check for unsupported features

**GitHub Pages not updating:** - Check Actions tab for workflow failures - Verify gh-pages branch exists - Check repository Pages settings

**Bibliography not working:** - Verify references.bib exists at specified path - Check citation key matches bib entry - Ensure bibliography field in \_quarto.yml is correct

### Resources

* [Quarto Documentation](https://quarto.org/docs/guide/)
* [Quarto Books Guide](https://quarto.org/docs/books/)
* [Mermaid Documentation](https://mermaid.js.org/intro/)
* [GitHub Pages Documentation](https://docs.github.com/en/pages)

# Workforce Development

## Building Hybrid Professionals and Teams

The translation gap between IT business analysis and public health is not just a process problem or a terminology problem. It is fundamentally a **workforce problem**. Both government agencies and private industry need professionals who can operate fluently in both worlds, yet most training programs still operate in silos.

This appendix explores the challenge, highlights emerging resources, and suggests strategies for building hybrid capacity.

### The Training Silo Problem

Consider the typical career paths:

**Public Health Path:**

* MPH or equivalent graduate training
* Coursework in epidemiology, biostatistics, health policy
* Rarely covers: Agile methodology, BABOK, software development lifecycle, requirements engineering

**Business Analysis Path:**

* Business or IT undergraduate degree
* CBAP, PMI-PBA, or similar certification
* Rarely covers: Epidemiology, CDC frameworks, public health ethics, community engagement methods

When these professionals meet on a health IT project, each brings deep expertise in their domain but limited fluency in the other’s language, frameworks, and assumptions. The result is the translation gap this book addresses.

|  |
| --- |
| Insight from the Field |
| The lack of skilled hybrid workforce and limited resources to hire such professionals are two significant limiting factors in bridging this gap. Organizations often recognize the need but struggle to find candidates or justify positions that span traditional departmental boundaries. |

### Emerging Training Programs

Several initiatives are working to close this gap:

#### CDC Public Health Informatics Fellowship Program (PHIFP)

The [Public Health Informatics Fellowship Program](https://www.cdc.gov/phifp/php/about/index.html) trains professionals specifically for this intersection. Fellows work on real public health informatics projects while developing competencies in both public health practice and information systems.

The program recruits from diverse backgrounds and provides structured mentorship bridging technical and programmatic domains. Since its establishment, PHIFP has produced many of the hybrid professionals now leading health IT initiatives across state and local health departments.

#### PHIT Workforce Development Program

The [Public Health Informatics & Technology (PHIT) Workforce Development Program](https://www.healthit.gov/topic/onc-hitech-programs/workforce-development-programs), funded by the Office of the National Coordinator for Health IT (ONC), focuses on training diverse professionals in health informatics. The program emphasizes recruiting from underrepresented communities, recognizing that the hybrid workforce should reflect the populations public health serves.

#### AMIA Public Health Informatics Working Group

The American Medical Informatics Association (AMIA) hosts an active [Public Health Informatics Working Group](https://amia.org/community/working-groups/public-health-informatics) with members from state health departments, academic institutions, nonprofits, and consulting firms. The working group:

* Develops competency frameworks for public health informatics
* Shares best practices across organizations
* Advocates for workforce development resources
* Connects professionals navigating similar challenges

For those seeking community and professional development in this space, AMIA membership provides access to peers tackling the same translation challenges.

#### Other Resources

| Resource | Focus | Access |
| --- | --- | --- |
| **CDC TRAIN** | Free public health courses, including informatics fundamentals | [train.org](https://www.train.org/) |
| **AMIA 10x10** | Intensive health informatics courses | [amia.org](https://amia.org/education-events/amia-10x10-courses) |
| **CAHIMS / CPHIMS** | Health IT certifications from HIMSS | [himss.org](https://www.himss.org/resources-certification) |
| **Coursera / edX** | Public health informatics specializations (Johns Hopkins, UCSF) | Online |

### Organizational Strategies for Building Hybrid Capacity

Beyond individual training, organizations can take structural steps to build translation capability:

#### 1. Create Explicit Bridge Roles

Rather than expecting traditional BAs or PH staff to develop hybrid skills on their own, create positions specifically designed for translation:

* **Health Informatics Liaison**: Embedded in IT teams but reporting to public health leadership
* **Technical Program Analyst**: Embedded in public health programs but with explicit BA responsibilities
* **Implementation Specialist**: Focused on adoption and change management across both domains

These roles should have:

* Dual reporting or matrix accountability
* Performance metrics that span technical and programmatic outcomes
* Professional development budgets for cross-training

#### 2. Invest in Onboarding Crosswalks

When new team members join hybrid projects, provide structured onboarding that covers both domains:

* Terminology glossaries (like Chapter 3 of this book)
* Framework overviews (BABOK basics for PH staff; CDC evaluation basics for BA staff)
* Project-specific crosswalks mapping deliverables to both languages

This upfront investment reduces the clarification loops that consume project time later.

#### 3. Include Translation Capacity in Grant Budgets

As discussed in Chapter 1, the business case stage is the ideal time to secure resources for cross-domain facilitation. When writing grant applications or project proposals:

* Include line items for terminology alignment workshops
* Budget for cross-training or professional development
* Allocate facilitation time for mixed-team meetings
* Consider consultants or contractors with hybrid backgrounds

#### 4. Build Communities of Practice

Internal communities of practice can connect professionals across organizational silos:

* Regular brown-bag sessions where IT and PH staff present to each other
* Shared Slack/Teams channels for quick translation questions
* Joint retrospectives that surface communication challenges
* Rotating assignments that expose staff to the other domain

### Competencies for the Hybrid Professional

What should a hybrid BA/PH professional be able to do? Based on established competency frameworks and practical experience, key capabilities include:

#### Core Translation Competencies

| Competency | Description |
| --- | --- |
| **Dual-framework thinking** | Map Agile artifacts to Logic Model outcomes and vice versa |
| **Terminology fluency** | Speak both languages without constant translation pauses |
| **Audience adaptation** | Adjust communication style for technical vs. programmatic audiences |
| **Framework selection** | Know when to use BA tools vs. PH tools vs. hybrid approaches |

#### Technical Competencies (BA Side)

| Competency | Description |
| --- | --- |
| **Requirements engineering** | Elicit, analyze, specify, and validate requirements |
| **Process modeling** | Create BPMN, UML, or similar diagrams |
| **Agile practices** | Participate effectively in sprints, stand-ups, retrospectives |
| **Data modeling** | Understand ERDs, data dictionaries, database concepts |

#### Technical Competencies (PH Side)

| Competency | Description |
| --- | --- |
| **Epidemiological thinking** | Understand surveillance, case definitions, health indicators |
| **Program evaluation** | Apply CDC evaluation framework, logic models, PDSA |
| **Regulatory knowledge** | Navigate HIPAA, IRB, grant compliance requirements |
| **Health equity lens** | Identify disparities, ensure inclusive engagement |

#### Implementation Science Competencies

| Competency | Description |
| --- | --- |
| **CFIR application** | Assess implementation context using CFIR domains |
| **Change management** | Plan for adoption, not just deployment |
| **Stakeholder engagement** | Build relationships across organizational boundaries |
| **Sustainability planning** | Design for long-term operation, not just project completion |

### Career Pathways

For professionals seeking to develop hybrid capabilities, several pathways exist:

#### From Public Health to Hybrid

1. Seek projects involving health IT systems (surveillance, registries, EHRs)
2. Request assignment to vendor-managed implementations
3. Pursue CAHIMS or similar health IT certification
4. Take online courses in Agile, requirements engineering, or project management
5. Join AMIA or similar professional communities

#### From Business Analysis to Hybrid

1. Seek health sector clients or employers
2. Learn public health fundamentals (CDC TRAIN offers free courses)
3. Study regulatory context (HIPAA, CDC reporting requirements)
4. Understand grant-driven funding cycles and constraints
5. Develop cultural competency for community engagement

#### Academic Pathways

* **Dual degrees**: MPH + MBA, MPH + MIS
* **Health informatics programs**: Specifically designed for this intersection
* **Graduate certificates**: Add informatics credentials to existing degrees

### The Long View

Building hybrid workforce capacity is a long-term investment. Individual professionals take years to develop fluency in both domains. Organizational cultures take even longer to change.

But the need is urgent. Public health IT projects will continue to grow in scope and complexity. The professionals and organizations that build translation capacity now will be better positioned to deliver systems that actually improve health outcomes.

Bridgeframe is one contribution to this effort: a crosswalk that teams can use while the workforce develops. But crosswalks are not substitutes for people. The field needs more hybrid professionals, more training programs, and more organizational commitment to building this capacity.

|  |
| --- |
| Get Involved |
| If you are working on workforce development for health informatics, or have experience building hybrid teams, consider contributing to this conversation. The challenges described in this appendix are shared across many organizations, and solutions developed in one context often transfer to others. |

# Career Navigation for Hybrid Professionals

## Finding and Landing Roles at the BA/PH Intersection

The integration of business analysis and public health is not merely a theoretical exercise in framework alignment; it is a burgeoning labor market reality. However, a significant translation gap exists within the workforce ecosystem itself. While the operational need for professionals who can navigate both epidemiological principles and information technology (IT) requirements is acute, the job market often lacks the taxonomy to describe them.

Human Resources departments, government civil service commissions, and automated Applicant Tracking Systems (ATS) predominantly operate within siloed definitions: a candidate is either a “Health Scientist” or an “IT Specialist,” rarely both. This appendix addresses the “structural invisibility” of the hybrid professional, providing a comprehensive analysis of the employment landscape and practical strategies for navigating it.

|  |
| --- |
| The Bridgeframe Workforce Philosophy |
| *Context* is the most valuable currency in health IT. Technical skills (SQL, Python, Jira) are commodities that can be learned or contracted out. Domain context, understanding *why* a disease case definition changes during an outbreak or *how* a rural clinic workflow differs from an urban hospital, is the scarce resource.  The career path for the Bridgeframe professional is rarely linear. It does not always move from “Junior Analyst” to “Senior Analyst.” Instead, it often moves laterally across sectors, accumulating context in one domain to leverage it in another. |

## The Landscape of Opportunity

Research into the public health workforce reveals a distinct ecosystem of opportunity. The demand for hybrid skills is universal, but the *capacity* to hire and the *language* used to describe these roles varies significantly by sector. We can map these sectors onto a “Maturity Model” of hybrid employment.

### The Incubator: Local and Rural Health Departments

Early-career professionals should consider prioritizing local health organizations (LHOs) in communities with limited access to highly trained workers. These environments, including rural county health departments, tribal health organizations, and small community nonprofits, offer a unique value proposition: **necessity-driven hybridization**.

#### The Operational Reality

In a large, well-funded state health department, roles are siloed. A “Database Administrator” manages the servers; an “Epidemiologist” analyzes the data; a “Health Educator” creates the charts.

In a rural county health department serving 20,000 residents, a single employee often performs all three functions. They may troubleshoot the clinic’s label printer in the morning (IT Support), query the state immunization registry at lunch (Data Analysis), and present vaccination rates to the County Board of Health in the evening (Data Visualization).

#### Strategic Advantages

| Advantage | Description |
| --- | --- |
| **Full-stack experience** | Exposure to the entire data lifecycle, from point of collection to point of reporting. This end-to-end visibility provides deep understanding of data provenance and quality issues at the source. |
| **Rapid decision cycles** | Unlike federal agencies where changes take years, local departments often need immediate solutions. An analyst can propose, build, and implement a new tracking tool in a single week. |
| **High impact** | The hybrid professional in this setting is often the only person with advanced data skills, giving them disproportionate influence on agency operations and strategy. |

#### Navigating the Challenges

* **Title ambiguity**: These roles almost never carry titles like “Informatics Specialist” or “Business Analyst.” Instead, search for titles such as *Health Educator*, *Emergency Preparedness Coordinator*, *Disease Intervention Specialist*, or *Program Coordinator*.
* **Resource constraints**: Salaries are typically lower than in the private sector. Consider this compensation gap as an investment in real-world experience.
* **Legacy infrastructure**: Be prepared to work with outdated hardware, slow internet connections, and paper-based processes. Learning to design systems within these constraints is a critical skill for any high-level architect.

### The Intermediary: State Health Departments and Large Universities

State-level agencies and large academic institutions act as the “middle layer” of the public health stack, translating federal funding and standards into local implementation.

#### State Health Departments

State health departments manage the centralized systems of record: the Electronic Disease Surveillance System (EDSS), the Immunization Information System (IIS), and Vital Records. Roles here focus heavily on *interoperability* and *compliance*. The analyst ensures that data flowing from hospitals (via HL7 messages) meets the validation rules required by the CDC.

**Typical titles**: *Epidemiologist (Informatics)*, *Surveillance System Manager*, *Data Modernization Lead*, *Interoperability Coordinator*.

#### Universities and Academic Centers

Universities are often the engines of research and workforce development. They hire staff to manage large research datasets, coordinate multi-site clinical trials, or evaluate public health programs. Positions often bridge the gap between Principal Investigators (academics) and Data Management Centers (IT).

**Typical titles**: *Research Data Manager*, *Center Administrator*, *Project Coordinator*.

### The Engine: Federal Contractors and Consultancies

A significant portion of the public health IT workforce is employed not by the government directly, but by the private ecosystem that supports it. Since government agencies often lack the flexibility to hire rapid-response IT teams, they contract this work out to consulting firms.

#### Large Systems Integrators

Firms like [Deloitte](https://www2.deloitte.com/us/en/careers/careers.html), [Accenture](https://www.accenture.com/us-en/careers), [Booz Allen Hamilton](https://www.boozallen.com/careers.html), [Leidos](https://careers.leidos.com/), [GDIT (General Dynamics)](https://www.gdit.com/careers/), and [ICF](https://www.icf.com/careers) execute the massive modernization contracts (e.g., CDC’s Data Modernization Initiative).

* **The culture**: These firms operate with corporate speed. They value “billable” skills: specific experience with platforms (Salesforce, ServiceNow, Azure) combined with the ability to obtain security clearances (Public Trust).
* **The hybrid value**: These firms need Subject Matter Experts (SMEs) who can sit in a room with CDC scientists, understand the nuance of “hepatitis serology,” and translate it into user stories for software developers.

#### Niche Public Health Consultancies

Specialized boutique firms focus exclusively on the public health domain, often offering a culture more aligned with public health values.

**Key players**: [J Michael Consulting](https://jmichaelconsulting.com/careers/), [Berry Technology Solutions](https://berrytechnology.com/careers/), [Lantana Consulting Group](https://www.lantanagroup.com/careers/) (standards focus), [Public Health Informatics Institute (PHII)](https://phii.org/who-we-are/join-our-team/) (a nonprofit/consultancy hybrid).

These firms often handle the “high-touch” aspects of informatics: training, technical assistance to states, and standards development (HL7/FHIR implementation guides).

### The Infrastructure: EHR Vendors and Retail Health

Private sector entities that *generate* clinical data are increasingly hiring public health experts to ensure their products remain relevant and compliant.

#### Electronic Health Record Vendors

Companies like [Epic](https://careers.epic.com/), [Oracle Health (Cerner)](https://www.oracle.com/careers/), [MEDITECH](https://ehr.meditech.com/careers), and [athenahealth](https://www.athenahealth.com/careers) need professionals who understand the regulatory landscape. Federal regulations (like “Promoting Interoperability”) mandate that EHRs must be able to send data to public health agencies.

**Typical titles**: *Implementation Consultant*, *Regulatory Affairs Analyst*, *Public Health Liaison*.

#### National Pharmacy Chains

Retail health giants like [CVS Health](https://jobs.cvshealth.com/), and [Walgreens](https://jobs.walgreens.com/) have transformed into primary care and public health hubs. Since the COVID-19 pandemic, pharmacies generate massive volumes of immunization and testing data. These companies recruit informatics professionals to manage complex data flows between thousands of retail locations and fifty distinct state immunization registries.

**Focus areas**: Population health analytics, medication adherence tracking, interoperability management.

## The RFP Search Strategy

Standard job searching is *reactive*: a candidate waits for a job description to be posted and then applies. The Bridgeframe strategy is *proactive*: it analyzes the **business drivers** of hiring to identify opportunities before they are advertised.

In the public sector, jobs are downstream of **projects**, and projects are downstream of **funding**. Before a job description can be posted, an agency must secure a budget and usually hire a vendor to execute the work. This procurement process leaves a public paper trail that savvy job seekers can follow.

The central document in this trail is the **Request for Proposal (RFP)**.

### The Logic of Procurement-Based Job Searching

When a government agency needs to modernize a system (like the CancerSurv registry), they rarely build it in-house. Instead, they release an RFP to hire a private vendor. This document contains three critical pieces of intelligence:

| Component | What It Tells You |
| --- | --- |
| **Problem Statement** | Describes exactly what is broken (e.g., “Legacy mainframe cannot accept HL7 2.5.1 messages”) |
| **Solution Requirements** | Describes exactly what skills are needed (e.g., “Vendor must provide data migration, cloud architecture, and training for 500 registrars”) |
| **Timeline** | Describes when the work (and the hiring) will begin |

**The strategy**:

* **Finding the RFP = Finding the Demand**: If you find an RFP for “Surveillance System Modernization,” you know that specific high-value skills (Cloud, SQL, Training) are about to be in demand in that geographic area.
* **Finding the Award Notice = Finding the Employer**: Eventually, the agency announces which vendor won the contract. That vendor has just received a multi-million dollar contract and is legally obligated to staff the project immediately.

### Google Boolean Search Operators

Most RFPs are buried on obscure government procurement portals. However, they are almost always indexed by Google. By using Boolean search operators, you can locate the source documents directly.

#### Limiting Results by Date

To find only recent postings, use Google’s date filtering tools:

1. **Using Google Search Tools**: After running your search, click “Tools” below the search bar, then “Any time” → select “Past week,” “Past month,” or “Custom range.”
2. **Using URL Parameters**: Append &tbs=qdr:w (past week), &tbs=qdr:m (past month), or &tbs=qdr:y (past year) to your Google search URL.
3. **Using the after: Operator**: Add after:2026-01-01 to your search string to find only documents indexed after a specific date.

For job searches, limiting to the past week or month ensures you are seeing active opportunities rather than archived postings. For RFP searches, consider a broader timeframe (past 3 to 6 months) since procurement cycles move slowly.

#### Automating Your Search with Google Alerts

Rather than running manual searches repeatedly, use [Google Alerts](https://www.google.com/alerts) to have new results delivered to your inbox automatically.

**Setting up an RFP Alert:**

1. Go to [google.com/alerts](https://www.google.com/alerts)
2. Enter your search query (use the Boolean strings from this chapter)
3. Click “Show options” to configure:
   * **How often**: “As-it-happens” or “Once a day”
   * **Sources**: Select “Automatic” or narrow to specific types
   * **Language**: English (or your preferred language)
   * **Region**: United States (or your target region)
   * **How many**: “All results” to ensure nothing is missed
   * **Deliver to**: Your email address or RSS feed
4. Click “Create Alert”

**Example Alert Queries for Hybrid Professionals:**

* "Request for Proposal" "public health" "informatics" site:.gov
* "Contract Award" "CDC" "data modernization"
* "public health" "business analyst" job

Google Alerts will email you whenever new content matching your query is indexed. This passive monitoring ensures you never miss an opportunity because you forgot to run a search.

#### The Master Search String

(RFP OR "Request for Proposal" OR "Request for Applications" OR   
"Notice of Funding Opportunity") AND ("Public Health" OR "Epidemiology"   
OR "Surveillance" OR "Informatics" OR "Vital Records") AND ("System"   
OR "Modernization" OR "Implementation" OR "Software" OR "Data")   
filetype:pdf site:.gov

**Deconstructing the operators**:

| Operator Group | Purpose |
| --- | --- |
| **Document type** | (RFP OR "Request for Proposal"...) casts a wide net for solicitation names |
| **Domain** | AND ("Public Health"...) ensures content is relevant to the field |
| **Activity** | AND ("System"...) ensures the project has a technical/IT component |
| **filetype:pdf** | Official government RFPs are almost universally PDF documents |
| **site:.gov** | Restricts results to US government domains (federal, state, and local) |

### Customizing Your Search

#### Strategy A: Geographic Targeting

If you wish to work in a specific state or region, add location keywords:

...AND ("Texas" OR "TX" OR "Austin")...

#### Strategy B: The Winning Vendor Hunt

Finding an old RFP is valuable because it leads to the Award Notice. If an RFP was due 3 months ago, the contract has likely just been awarded.

("Notice of Award" OR "Contract Award" OR "Bid Tabulation" OR   
"Intent to Award") AND ("Department of Health" OR "CDC") AND   
("IT" OR "Informatics" OR "Data System") 2024..2026

The 2024..2026 operator (two dots) tells Google to search for numbers within that range, helping identify recent fiscal year awards.

#### Strategy C: Skill-Specific Targeting

If you have a niche skill (e.g., HL7 FHIR), search for RFPs that specifically require it:

(RFP OR "Scope of Work") AND "Public Health" AND ("FHIR" OR "HL7"   
OR "Interoperability") filetype:pdf

|  |
| --- |
| CancerSurv Example: The RFP Strategy in Action |
| **The Scenario**: The State Health Department releases an RFP for the “CancerSurv Modernization Project” (RFP #2026-CS-001). The RFP describes a need to “replace a legacy mainframe system with a cloud-based registry compliant with NAACCR standards.”  **The Job Seeker**: Alex is a Business Analyst with SQL skills who wants to transition into public health. Alex runs the Google Boolean search:  ("Request for Proposal") AND "Cancer Registry" AND "Modernization" filetype:pdf site:.gov  **The Insight**: Alex finds the RFP and reads the Scope of Work. Section 4.2 states: “Vendor must provide training and change management for 150 hospital registrars.” Alex realizes this is a green flag, as Alex has extensive experience in corporate training.  **The Move**: Alex searches for the award notice: ("Contract Award" OR "Bid Tabulation") AND "CancerSurv". The search reveals that TechHealth Solutions won the bid last month.  Alex goes to TechHealth’s careers page. There is no “Cancer Registry Trainer” job listed yet. Alex sends a proactive application to the TechHealth hiring manager: “I see TechHealth won the CancerSurv contract. The RFP requires extensive training for 150 registrars. My background in large-scale change management training would allow you to meet that deliverable immediately.”  **The Result**: TechHealth was indeed worrying about how to staff the training component. Alex is interviewed immediately, bypassing the competitive stack of generic resumes. |

### The Blind Application

Once you identify a winning vendor, the next step is the proactive application. Even if the vendor has not yet posted job openings, they are likely in the “ramp-up” phase.

**Sample outreach script**:

“I noticed that [Company Name] was recently awarded the Disease Surveillance Modernization contract. I have reviewed the RFP requirements and see a need for [specific skill]. I have [X] years of experience executing exactly this type of migration for public health agencies and would like to discuss how I can support the new contract.”

This approach positions you not as a job seeker asking for a favor, but as a solution provider solving an immediate problem for the vendor.

### The Power of Collaboration

You do not have to navigate the job market, or the RFP process, alone. Collaboration multiplies your reach and fills gaps in your expertise.

#### For RFP Responses

If you identify an RFP opportunity but lack certain skills (whether technical, domain-specific, or the hybrid professional perspective itself), consider partnering with others. Teaming arrangements are common in government contracting; a small firm with deep domain expertise can partner with a larger firm that has the administrative capacity to manage federal contracts.

**Potential collaborators in the Bridgeframe space:**

* [Intersect Collaborations LLC](https://www.intersectcollaborations.com/): Specializes in bridging business analysis and public health
* [Chaptico Hundred](https://chapticohundred.com/): Purpose-driven consultancy with transformative expertise
* [Magpie Public Health LLC](https://www.magpieph.com/): Specialists in mixed-methods research and qualitative study design

#### For Job Seekers

Even if you already have a position, you may benefit from coaching or mentorship to prepare for a hybrid role. Reaching out to consultancies or professionals in the Bridgeframe space can help you:

* Translate your existing experience into the language of the other domain
* Identify skill gaps and training resources
* Practice “bridge” interview techniques
* Connect with networks that understand hybrid roles

The hybrid professional community is still small enough that collaboration is often more valuable than competition. A referral from someone who understands your unique skill set can open doors that cold applications cannot.

## Specialized Job Boards and Platforms

While the RFP strategy unearths hidden opportunities, traditional platforms remain a necessary component of a comprehensive search. The hybrid professional must know *where* to look.

### Platform Directory

| Platform | Target Audience | Search Strategy |
| --- | --- | --- |
| [**GovernmentJobs.com**](https://www.governmentjobs.com/) | Local/State Government | Search for *Program Specialist*, *Health Analyst*, *Epidemiologist* |
| [**USAJobs.gov**](https://www.usajobs.gov/) | Federal Agencies (CDC, CMS, IHS) | Filter for Job Series 0601 (General Health Science), 0685 (Public Health Program Specialist), 2210 (IT Management) |
| [**PublicHealthJobs.org**](https://publichealthjobs.aspph.org/) | Academia/Nonprofit (ASPPH) | Excellent for roles at universities and NGOs |
| [**AMIA Career Center**](https://jobs.amia.org/) | Informatics Professionals | High-quality listings; often requires advanced degrees |
| [**HIMSS JobMine**](https://jobmine.himss.org/) | Health IT/Vendors | Heavily focused on the private sector and hospital IT |
| [**3RNET**](https://www.3rnet.org/) | Rural/Underserved | National Rural Recruitment and Retention Network; essential for “incubator” roles |
| [**ORISE (Zintellect)**](https://orise.orau.gov/internships-fellowships/) | Fellowships/Internships | Primary portal for CDC fellowships, including [PHIFP](https://www.cdc.gov/phifp/) |

### Using Google Jobs for Passive Monitoring

[Google Jobs](https://www.google.com/search?q=jobs) aggregates listings from multiple job boards into a single interface. More importantly, it offers a **Following** feature that sends you email alerts when new jobs matching your criteria are posted.

**Setting up Google Jobs Alerts:**

1. Go to [google.com](https://www.google.com) and search for jobs using keywords like public health informatics jobs or health data analyst jobs
2. Google will display a job search panel. Refine your search using:
   * **Location**: Enter your target city, state, or “Remote”
   * **Date posted**: Filter to “Past week” or “Past 3 days”
   * **Type**: Full-time, Part-time, Contractor
   * **Company type**: Filter by employer category if available
3. Once your search is configured, look for the **“Turn on”** or **“Follow”** button (often shown as a bell icon or “Create alert”)
4. Enable notifications to receive email alerts when new jobs matching your search are posted

**Recommended Searches to Follow:**

* public health informatics (your location or Remote)
* health data analyst CDC (Remote or Washington, DC)
* epidemiologist data systems (your state)
* health IT business analyst (Remote)

By following multiple searches, you build a passive monitoring system that brings opportunities to you rather than requiring daily manual searches. Combine this with [Google Alerts](https://www.google.com/alerts) for RFP monitoring to create a comprehensive opportunity radar.

### Target Employer Watch List

A proactive search involves monitoring specific companies known to hire hybrid talent.

#### Federal Contractors

These firms are the primary engine of federal health IT employment:

* [Leidos](https://careers.leidos.com/), [GDIT](https://www.gdit.com/careers/), [Booz Allen Hamilton](https://www.boozallen.com/careers.html)
* [Deloitte](https://www2.deloitte.com/us/en/careers/careers.html), [Accenture Federal Services](https://www.accenture.com/us-en/careers)
* [ICF](https://www.icf.com/careers), [Maximus](https://www.maximus.com/careers)

**Strategy**: Monitor their “Health” or “Civilian” career pages. Look for keywords like “CDC,” “CMS,” or “Data Modernization.”

#### Niche Public Health Firms

These smaller firms often offer a more mission-driven culture:

* [J Michael Consulting](https://jmichaelconsulting.com/careers/), [Karna](https://www.karna.com/careers/), [Goldbelt](https://www.goldbelt.com/careers/)
* [Chickasaw Nation Industries](https://www.chickasaw.com/careers), [DLH Corp](https://www.dlhcorp.com/careers/)
* [Abt Associates](https://www.abtassociates.com/careers), [JSI (John Snow, Inc.)](https://www.jsi.com/careers/)

**Strategy**: These firms often recruit directly from public health conferences ([CSTE](https://www.cste.org/), [NACCHO](https://www.naccho.org/)). Follow their LinkedIn pages for contract wins.

#### Digital Health and Global Health Tech

These organizations build technology platforms used by health programs worldwide:

* [Dimagi](https://dimagi.com/careers/) (creators of CommCare, a mobile data collection platform)
* [DHIS2](https://dhis2.org/careers/) (the world’s largest health management information system)

**Strategy**: These organizations value professionals who understand both the technology and the public health context in which it operates.

#### NGOs and Nonprofits

* [Task Force for Global Health](https://www.taskforce.org/careers/) (home of [PHII](https://phii.org/who-we-are/join-our-team/))
* [APHL (Association of Public Health Labs)](https://www.aphl.org/aboutAPHL/employment/Pages/default.aspx)
* [ASTHO](https://www.astho.org/about/careers/), [NACCHO](https://www.naccho.org/about/careers)

**Strategy**: These organizations often manage cooperative agreements with the CDC, functioning similarly to contractors but with a nonprofit structure.

|  |
| --- |
| Don’t Limit Your Search |
| The employers listed above represent a starting point, not a comprehensive directory. **Any health department, at any level, could benefit from hybrid professionals.** In fact, smaller health departments may lack the expertise to even identify the need for a hybrid professional in the first place. They may not know to advertise for an “Informatics Specialist” because they have never had one.  This creates a unique opportunity: you can approach local health departments proactively, demonstrate how your skills address their data challenges, and help them define a role that did not previously exist. The “hidden” job market is especially fertile in under-resourced settings where the need is greatest but the vocabulary to describe it is absent. |

## Building Experience Through Volunteering

Even a few hours each week of volunteer work can solidify your experience and help you stand out as a candidate who goes above and beyond. For professionals transitioning into hybrid roles, or those seeking to demonstrate data and analysis skills in a public health context, volunteering offers a low-barrier path to meaningful experience.

### Volunteer Platforms for Data and Analysis Skills

These platforms connect skilled volunteers with organizations that need data analysis, technology, and public health expertise:

| Platform | Focus Area | Best For |
| --- | --- | --- |
| [**VolunteerMatch**](https://www.volunteermatch.org/) | General nonprofit matching | Finding local health organizations needing data help |
| [**Catchafire**](https://www.catchafire.org/) | Skills-based volunteering | Project-based work with defined scope and timeline |
| [**Techfleet**](https://techfleet.org/) | Tech volunteers for nonprofits | Software development and data infrastructure projects |
| [**DataKind**](https://www.datakind.org/) | Data science for social good | High-impact data projects with mentorship opportunities |
| [**Statistics Without Borders**](https://www.statisticswithoutborders.org/) | Statistical consulting | Epidemiological and public health research support |
| [**United Nations Volunteers**](https://www.unv.org/) | Global development | International health programs and humanitarian response |
| [**Code for America**](https://codeforamerica.org/) | Civic technology | Government and public sector technology projects |

### The Value of Volunteer Experience

While volunteer work is unpaid, it delivers three critical benefits:

1. **Purpose while you wait**: Job searches can be demoralizing. Volunteer work provides structure, meaning, and forward momentum during gaps in employment.
2. **Skill maintenance and growth**: Skills atrophy without use. Volunteering keeps your technical abilities sharp and exposes you to new tools, datasets, and problem types.
3. **Real experience for your resume**: A completed volunteer project analyzing immunization coverage for a community health center is indistinguishable on a resume from paid consulting work. It demonstrates capability and initiative.

### Strategic Approaches to Volunteering

For experienced professionals, a more intentional approach to volunteering can maximize both impact and career benefit.

#### Treat Volunteer Work as Discounted Professional Work

Some organizations struggle to fully value volunteer contributions when the cost is invisible. One practical approach is to frame volunteer work as professional services provided at a reduced rate. For example, you can send an invoice that reflects the true market value of the work alongside the discounted rate, even if the final amount due is $0.

This approach:

* Makes your contribution tangible to the organization
* Reinforces the expertise being provided
* Creates documentation of professional-level work for your portfolio
* Helps the organization understand the true value of what they received

#### Start Your Own Initiative

An alternative to traditional volunteering is to start your own business, nonprofit, or independent project to carry forward work you believe is important, even if it is initially unpaid. This approach offers several advantages:

* **Ownership**: You retain rights to frameworks, tools, and products you develop
* **Portfolio building**: Your work demonstrates skills across multiple clients or use cases
* **Flexibility**: You control the scope, timeline, and direction of the work
* **Foundation for future consulting**: Pro bono projects can evolve into paid engagements

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| From Volunteer to Consultant |
| Many successful public health consultancies began as volunteer efforts. A professional who builds a reporting dashboard for one health department can offer that same framework to others. The first project builds the product; subsequent projects generate revenue. This “productized service” model is especially effective for hybrid professionals whose specialized skills are in high demand but undersupplied. |

This strategic approach tends to be most effective for experienced professionals who bring specialized expertise and want to be intentional about how their time and skills are invested. For early-career professionals, traditional volunteering through established platforms may offer more structure and mentorship.

## Decoding Job Descriptions

One of the most significant barriers to entry is the inconsistency of job titles. A “Business Analyst” in a corporate setting might be called a “Public Health Program Specialist II” in a state agency. The hybrid professional must learn to read job descriptions for *skills* and *activities* rather than titles.

### Title-to-Function Mapping

| If You Want To Do… | Search For These Titles… | Look For These Keywords… |
| --- | --- | --- |
| **Business Analysis** | Management Analyst, Program Analyst, Operations Coordinator, Product Owner, Systems Analyst | “Requirements gathering,” “Workflow analysis,” “Process improvement,” “Stakeholder liaison,” “User stories,” “SOP development” |
| **Informatics/Data** | Epidemiologist (Data Systems), Health Scientist, Informatics Specialist, Surveillance Coordinator, Data Manager | “HL7,” “ELR” (Electronic Lab Reporting), “Syndromic Surveillance,” “Registry,” “Interoperability,” “FHIR,” “Cleaning data” |
| **Project Management** | Public Health Advisor, Program Manager, Implementation Specialist, Grant Manager | “Agile,” “Scrum,” “Scope management,” “Timeline,” “Vendor management,” “Grant reporting,” “Deliverables” |
| **Training/Rollout** | Technical Assistance (TA) Lead, Onboarding Specialist, Implementation Specialist | “User adoption,” “Go-live,” “Manuals,” “Capacity building,” “Workforce development” |

### The “Unicorn” Job Description

Often, hiring managers in public health know they need “someone technical” but do not know exactly what that entails. This results in the unicorn job description: a posting that asks for a PhD in Epidemiology, a PMP certification, 10 years of Python coding experience, and a nursing license.

* **The interpretation**: This usually signals a lack of role clarity. The agency has a problem (data) and is listing every possible qualification.
* **The strategy**: Apply if you meet 50 to 60 percent of the criteria.
* **The interview pivot**: Use the interview to perform business analysis on the role itself. Ask: “I see you asked for both Python coding and clinical nursing. Is the primary goal of this role to write the code (Python) or to talk to the nurses who use the system? I excel at the translation between the two.” By helping them define the role, you demonstrate your value as a Business Analyst before you are hired.

## Resume and Interview Strategy

To land the job, you must translate your experience into the language of the employer. This requires a “dual-frame” approach.

### The Hybrid Resume

A standard resume is often chronological and mono-lingual (either all tech or all health). A hybrid resume must explicitly bridge the gap.

#### Strategy: The Translation Bullet Point

Rewrite experience to highlight implications for the other domain.

**Public Health professional applying for a Tech/BA role**:

* ❌ *Original*: “Managed the Gonorrhea Surveillance Program.”
* ✅ *Translated*: “Managed a disease surveillance system with 5,000+ annual records; acted as **Product Owner** to define reporting requirements for the IT vendor and led **User Acceptance Testing (UAT)** for system upgrades.”

**Tech/BA professional applying for a Public Health role**:

* ❌ *Original*: “Gathered requirements for SQL database migration.”
* ✅ *Translated*: “Facilitated workshops with clinical stakeholders to define data standards for a patient registry; ensured system design complied with **HIPAA privacy regulations** and supported **epidemiological reporting** needs.”

#### Strategy: The Dual-Competency Skills Section

Create a skills section that visually separates but presents both domains:

**Technical & Analysis**: SQL, Tableau, Jira, Visio (BPMN), User Stories, Agile/Scrum

**Public Health & Regulatory**: Epidemiology, Surveillance Systems, HIPAA, HL7/FHIR Standards, CDC Grant Reporting

### The Behavioral Bridge Interview

In an interview, you will often face a panel with mixed backgrounds (e.g., a Program Director and an IT Manager). Your answers must satisfy both.

#### The Bridge Answer Structure

When answering behavioral questions (“Tell me about a time…”), the narrative arc should always be about translation.

**Question**: “Tell me about a time you faced a challenge.”

**Bridge Answer**:

1. **Context**: “We had a disconnect where the developers built a feature that did not match the clinical workflow.”
2. **Action**: “I scheduled a joint session where I mapped the clinical process on a whiteboard while the developers watched. I translated clinical terms into technical specifications in real time.”
3. **Result**: “The developers understood the ‘why,’ the nurses got a tool that fit their process, and we reduced data entry errors by 50%.”

### Questions to Ask the Employer

The questions you ask reveal your sophistication regarding the BA/PH gap.

1. **To the IT Manager**: “How does the development team currently receive input from the epidemiologists? Do you use a specific framework to map public health goals to technical backlogs?”
2. **To the Program Manager**: “How is the success of this IT project being measured? Are we tracking just ‘system uptime,’ or are we tracking public health metrics like ‘time to intervention’?”
3. **The Role-Definition Question**: “Who currently owns the ‘translation’ between the clinical subject matter experts and the technical vendors? Is that a gap this role is intended to fill?”

## A Note for Hiring Managers

This appendix is primarily for job seekers, but a note for those *hiring* is essential. The “talent shortage” in public health informatics is often a “visibility shortage.” The candidates exist, but they are filtered out by rigid requirements.

### Re-Examine Degree Requirements

Do not filter exclusively for MPH or Computer Science degrees. A History major who has spent five years managing a complex nonprofit database often makes an excellent Business Analyst due to their research and synthesis skills.

### Hunt for “Super-Users”

The best future analysts are often currently working inside your organization as nurses, registrars, or administrative assistants. They are the ones who become the “go-to” person for their team’s technology problems. They possess the deep domain context that is hardest to teach; technical skills (SQL, Visio) can be taught more easily.

### Use Your Contracts as Signals

If you are a vendor, use your RFP wins as recruitment tools. Advertise that you are “staffing for a newly awarded CDC modernization contract.” This signals stability and high-impact work to prospective candidates.

### Make Your Postings Discoverable via Google for Jobs

[Google for Jobs](https://jobs.google.com/about/) aggregates job postings from across the web and surfaces them directly in Google Search results. Millions of job seekers search Google every day, and properly formatted job postings can reach candidates who might never visit your agency’s careers page or specialized job boards.

**Why This Matters for Public Health Employers:**

* **Broader reach**: Candidates searching for “epidemiologist jobs” or “public health data analyst” will see your posting in their Google search results, not just those who know to check your specific portal.
* **Equity in hiring**: Many qualified candidates from non-traditional backgrounds may not know to search specialized platforms like [USAJobs.gov](https://www.usajobs.gov/) or [PublicHealthJobs.org](https://publichealthjobs.aspph.org/). Google surfaces your posting to anyone searching relevant terms.
* **No cost**: Google for Jobs is free; you simply need to ensure your postings meet their technical requirements.

**How to Get Your Job Postings on Google:**

1. **If you use a major job board or ATS**: Platforms like LinkedIn, Indeed, ZipRecruiter, Lever, Greenhouse, and Workday already integrate with Google for Jobs. Postings on these platforms are automatically indexed.
2. **If you post directly on your website**: Add structured data markup (JSON-LD) to your job posting pages following [Google’s JobPosting schema](https://developers.google.com/search/docs/appearance/structured-data/job-posting). Key fields include:
   * Job title, description, and location
   * Salary range (increasingly expected by candidates)
   * Date posted and application deadline
   * Employment type (full-time, part-time, contract)
   * Remote work eligibility
3. **Test your implementation**: Use [Google’s Rich Results Test](https://search.google.com/test/rich-results) to verify your structured data is correctly formatted before publishing.
4. **Keep postings current**: Google penalizes stale or expired job postings. Remove listings promptly when positions are filled, and ensure “date posted” fields are accurate.

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| For Small Health Departments |
| If your agency lacks IT resources to implement structured data, post your positions on a platform that already integrates with Google for Jobs (such as Indeed or LinkedIn). This ensures discoverability without requiring technical implementation on your end. |

## Quick Reference: Search String Cheat Sheet

Use these strings in Google to identify opportunities. Remember to use Google’s date filtering: click **Tools** → **Any time** → **Past week** (for jobs) or **Past month** (for RFPs) to see only recent postings. Alternatively, add after:2026-01-01 to your search string.

### 1. The Generalist Hybrid Search

("Business Analyst" OR "Systems Analyst" OR "Product Owner") AND   
("Public Health" OR "Epidemiology" OR "Infectious Disease") AND   
("Remote" OR "Hybrid") after:2026-01-01

### 2. The Informatics Specialist Search

("Informatics" OR "Informatician") AND ("HL7" OR "FHIR" OR   
"Interoperability" OR "ELR" OR "eCR") AND ("CDC" OR "DOH" OR   
"Department of Health") after:2026-01-01

### 3. The RFP Hunter (Contract Finding)

(RFP OR "Request for Proposal" OR "Notice of Funding Opportunity")   
AND ("Surveillance System" OR "Registry" OR "Data Modernization")   
AND ("2025" OR "2026") filetype:pdf

### 4. The Winning Vendor Search

("Contract Award" OR "Notice of Award") AND ("Department of Health"   
OR "CDC") AND ("IT" OR "System") 2024..2026

### 5. The ATS Platform Search

site:lever.co OR site:greenhouse.io OR site:workday.com   
("Public Health" AND "Analyst")

This searches inside common HR platforms to find jobs that might not be indexed on aggregators.

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| Applying the Bridgeframe Mindset |
| The job search for a hybrid professional is, in itself, an act of business analysis. It requires analyzing the market (Current State), identifying the gaps where hybrid skills add value (Future State), and designing a strategy (The Application) to bridge that gap.  Whether the journey begins in a rural health department, building foundational knowledge of public health reality, or leverages advanced search operators to uncover a major federal contract, the opportunities are vast. The field of public health is undergoing a massive digital transformation. It does not just need code; it needs context. It needs the Bridgeframe professional. |

# Glossary

This glossary provides comprehensive terminology mapping between Business Analysis (BA) and Public Health (PH) domains. Terms are organized alphabetically with cross-references.

## A

**Acceptance Criteria** (BA)

Conditions that a solution must meet to be accepted by stakeholders. **PH equivalent**: Evaluation protocol measures, success criteria.

**Acceptance Testing** (BA)

Formal testing to verify a solution meets acceptance criteria. **PH equivalent**: Pilot evaluation, field testing.

**Activity** (PH)

An action taken as part of a program or intervention. **BA equivalent**: Functional requirement, use case step.

**Adaptability** (Implementation Science)

Degree to which an intervention can be modified for local context. **BA equivalent**: Configurability, customization capability.

**After-Action Review** (PH)

Structured review of what happened, why, and how to improve. **BA equivalent**: Lessons learned, retrospective.

**Agile** (BA)

Iterative development methodology emphasizing flexibility and stakeholder collaboration. **PH parallel**: Adaptive management, PDSA cycles.

**Accountability Structures** (Organizational)

Governance mechanisms ensuring responsibility and ownership for processes and outcomes. Includes process owners, steering committees, escalation paths, and service-level agreements (SLAs). **Application**: Both BA and PH require clear accountability to prevent process drift.

**Andragogy** (Education)

Theory of adult learning emphasizing self-direction, experience-based learning, and relevance. Key principles include connecting training to real problems and appealing to internal motivation rather than compliance.

**Applicant Tracking System (ATS)** (Workforce)

Automated software used by employers to filter job applications by keywords and qualifications. Hybrid professionals must tailor resumes to pass ATS filters in both technical and public health domains.

**Award Notice** (Government Procurement)

Public announcement of which vendor won a government contract. Job seekers can use award notices to identify employers who are actively staffing new projects.

**Automation Spectrum** (Process Optimization)

Range of automation levels from manual through assisted, partial, conditional, to full automation. Each level defines different human-machine collaboration and oversight requirements.

## B

**Backlog** (BA/Agile)

Prioritized list of work items. **PH equivalent**: Workplan, action item list.

**Baseline** (Both)

Starting point measurement for comparison. In BA, current state metrics. In PH, epidemiological baseline data.

**Beneficiary** (PH)

Person or group intended to benefit from a program. **BA equivalent**: End user, customer.

**Blind Application** (Workforce)

Proactive job application sent to a vendor before they post open positions, typically after identifying a contract award. Positions the applicant as a solution provider rather than a job seeker.

**Bridge Role** (Workforce)

Position explicitly designed for translation between IT and public health domains, such as Health Informatics Liaison or Technical Program Analyst. These roles typically have dual reporting and cross-domain performance metrics.

**Bronze Layer** (Data Architecture)

The first layer in medallion architecture containing raw, unprocessed data as received from source systems. Data is preserved in its original format for auditability and reprocessing. **PH equivalent**: Ingestion layer, source data repository. **Key PH roles**: Data managers, data stewards, IT operations.

**BPMN (Business Process Model and Notation)** (BA)

Standard for process diagrams. **PH equivalent**: Intervention flowchart, workflow diagram.

**Bug** (BA)

Defect in software. **PH equivalent**: Adverse event, variance from protocol.

**Bullying (Organizational)** (Organizational)

Harmful behaviors that intimidate, belittle, or undermine staff, leading to silence, unreported errors, and talent departure. **Response**: Establish psychological safety as a core organizational value; enforce clear anti-bullying policies with consequences; provide anonymous reporting channels; train managers to recognize and address harmful behaviors early.

**Business Case** (BA)

Justification for a project based on expected benefits. **PH equivalent**: Needs assessment, funding proposal.

**Business Need** (BA)

Problem or opportunity driving a project. **PH equivalent**: Public health challenge, health need.

**Business Rule** (BA)

Constraint governing system behavior. **PH equivalent**: Clinical guideline, protocol rule.

## C

**Capacity Building** (PH)

Developing skills and resources in individuals and organizations. **BA equivalent**: Training, organizational readiness.

**Case Definition** (PH)

Criteria for identifying disease cases. **BA equivalent**: Data validation rules, entity definition.

**CFIR (Consolidated Framework for Implementation Research)** (PH)

Framework for understanding implementation context. **BA application**: Assessing organizational readiness, NFR refinement.

**Champion** (Both)

Person who advocates for and promotes an initiative. Usage similar in both domains.

**Change Management** (BA)

Approach for transitioning organizations to new systems/processes. **PH equivalent**: Implementation strategy, adoption support.

**Change Control** (Project Management)

Formal process for evaluating, approving, and documenting changes to scope, schedule, or requirements. Prevents scope creep by requiring explicit stakeholder sign-off before modifying baselines. **Components**: Change request form, impact assessment, approval authority, decision log.

**Centralization** (Organizational)

Strategy of consolidating core functions (e.g., data cleaning, report generation) into shared services to reduce duplication, ensure consistency, and build specialized expertise. **Application**: When multiple teams rely on the same data, that data should be centrally stored and cleaned.

**Change Resistance** (Organizational)

Reluctance to adopt new tools, processes, or approaches due to fear, uncertainty, perceived loss of control, or comfort with existing methods. Manifests as slow adoption, workarounds, or shadow systems. **Mitigation**: Co-design solutions with end users; run small pilots before full rollout; provide training and support; align incentives with adoption; demonstrate concrete benefits through success stories.

**CAHIMS / CPHIMS** (Workforce)

Certified Associate/Professional in Healthcare Information and Management Systems. HIMSS certifications demonstrating health IT competency; valuable credentials for BA professionals entering the health sector.

**Community Health Assessment** (PH)

Systematic examination of health status and needs. **BA equivalent**: Current state analysis, needs assessment.

**Community of Practice** (Workforce)

Internal group connecting professionals across organizational silos to share knowledge. In hybrid contexts, CoPs facilitate BA/PH translation through brown-bag sessions, shared channels, and joint retrospectives.

**Community Partner** (PH)

External organization collaborating on health initiatives. **BA equivalent**: Stakeholder, vendor, integration partner.

**Complexity** (Implementation Science)

Perceived difficulty of implementing an intervention. **BA equivalent**: Usability concerns, training requirements.

**Compliance** (Both)

Adherence to regulations, standards, or requirements. In PH, often HIPAA, CDC standards. In BA, often regulatory NFRs.

**Constraint** (BA)

Limitation on solution options. **PH equivalent**: Policy constraint, resource limitation.

**Current State** (BA)

Existing situation before change. **PH equivalent**: Baseline, pre-intervention status.

## D

**Data Dictionary** (Both)

Documentation of data elements, definitions, and formats. Used similarly in both domains.

**Data Lake** (Data Architecture)

Centralized repository for storing raw data in native format. Supports schema-on-read, allowing flexible analysis without predefined structure. **PH application**: Repository for diverse health data sources (EHRs, labs, vital records) before standardization.

**Data Lakehouse** (Data Architecture)

Architecture combining data lake flexibility with data warehouse reliability. Supports both raw data storage and structured analytics. Enables medallion architecture patterns.

**Data Lineage** (Data Architecture)

Documentation of data’s origin and transformations from source to final output. **PH equivalent**: Chain of custody for data, audit trail.

**Data Manager** (PH)

Professional responsible for receiving, organizing, and maintaining data from source systems. Works primarily with Bronze layer data, ensuring completeness and proper storage of incoming files. **BA equivalent**: Data steward, data operations specialist.

**Data Quality** (Both)

Accuracy, completeness, and reliability of data. Critical in both domains.

**Defect** (BA)

Flaw in a deliverable. **PH equivalent**: Protocol deviation, adverse event.

**Deliverable** (BA)

Output of project work. **PH equivalent**: Program output, product.

**Demo** (BA/Agile)

Presentation of completed work. **PH equivalent**: Progress presentation, milestone review.

**Disruptive Interpersonal Patterns** (Organizational)

Observable behaviors that undermine team function, such as unpredictable decision-making, intimidation, or creating fear-based dynamics. **Approach**: Address behaviors rather than speculating on motives or diagnosing; document conduct expectations clearly; use HR and governance processes to protect team function and individual well-being. See also: Bullying (Organizational), Psychological Safety.

**Deduplication of Effort** (Organizational)

Identifying and eliminating redundant work across teams. Mechanisms include shared data layers, internal tool registries, and knowledge bases with reusable templates.

**Dual-Framework Thinking** (Workforce)

Core competency of hybrid professionals: the ability to map Agile artifacts (user stories, sprints) to Logic Model outcomes (activities, outputs) and vice versa.

## E

**Effectiveness** (PH)

Degree to which an intervention achieves intended outcomes. **BA equivalent**: Solution value, ROI.

**Elicitation** (BA)

Techniques for gathering requirements from stakeholders. **PH equivalent**: Community engagement, data collection.

**Epic** (BA/Agile)

Large user story spanning multiple sprints. **PH equivalent**: Grant objective, program goal.

**Epidemiological Baseline** (PH)

Pre-intervention disease/health status data. **BA equivalent**: Current state metrics.

**Evaluation** (Both)

Assessment of value, outcomes, or quality. In BA, solution evaluation. In PH, program evaluation.

**Expectation Management** (Organizational/PM)

Practice of aligning goals and delivery commitments with capacity, constraints, and evidence. **Techniques**: Evidence-based estimation, transparent SLAs/OLAs, and frequent re-baselining when scope or resources change.

**Evidence-Based Estimation** (Project Management)

Using historical data (velocity, throughput, cycle time) rather than guesswork to forecast delivery timelines and capacity. Reduces unrealistic expectations by grounding commitments in demonstrated capability. **Application**: Track actual completion rates over time; use running averages to predict future sprints.

## F

**Feasibility** (Both)

Assessment of whether something can be done. Technical, economic, operational (BA) or evidence-based, resource, political (PH).

**Fidelity** (PH)

Degree to which an intervention is delivered as designed. **BA equivalent**: Conformance to specifications.

**Focus Group** (Both)

Group discussion for gathering perspectives. Used similarly in both domains.

**Functional Requirement** (BA)

What a system must do. **PH equivalent**: Program activity, intervention component.

**Future State** (BA)

Desired situation after change. **PH equivalent**: Program goals, intended outcomes.

## G

**Gemba** (Lean/Both)

Going to the actual place where work happens. Applicable in both BA observation and PH site visits.

**Go-Live** (BA)

System deployment to production. **PH equivalent**: Program launch, intervention rollout.

**Gold Layer** (Data Architecture)

The final layer in medallion architecture containing curated, analytics-ready data. Optimized for reporting, dashboards, and decision support. Examples include line lists for contact tracing, summary reports, and regulatory submissions. **PH equivalent**: Reporting layer, analytics datasets, CDC submission files.

**Governance** (Both)

Decision-making structure and authority. Similar usage in both domains.

**GPS Format** (PH-adapted)

“Given [context], Person [role] Should [action]” user story format for clinical contexts.

## H

**Health Indicator** (PH)

Measurable characteristic of population health. **BA equivalent**: KPI, metric.

**Health Information Exchange (HIE)** (PH)

Electronic sharing of health data. **BA equivalent**: System integration, data exchange.

**Hybrid Professional** (Workforce)

Professional who operates fluently in both IT/BA and public health domains. May also be called Public Health Business Analyst (PH-BA) or Health Informatician. See also: Bridge Role.

## I

**Impact** (PH)

Long-term effects of an intervention. **BA equivalent**: Business value, strategic outcomes.

**Implementation** (Both)

Putting a solution or intervention into practice. Similar usage.

**Implementation Climate** (CFIR)

Organizational receptivity to change. **BA equivalent**: Organizational readiness.

**Implementation Science** (PH)

Study of methods to promote adoption of evidence-based practices. **BA application**: Change management, adoption strategy.

**Indicator** (PH)

Measurable variable reflecting status or change. **BA equivalent**: Metric, KPI.

**Inner Setting** (CFIR)

Internal organizational context. **BA equivalent**: Organizational environment, culture.

**Input** (PH Logic Model)

Resources invested in a program. **BA equivalent**: Resources, constraints.

**Integration** (BA)

Connecting systems to work together. **PH equivalent**: Interoperability, HIE.

**Interest Holder** (PH)

Person or group with interest in a program. **BA equivalent**: Stakeholder.

**Intervention** (PH)

Action taken to improve health. **BA equivalent**: Solution, system, process change.

**Iteration** (BA/Agile)

Fixed time period for development work. **PH equivalent**: PDSA cycle, program phase.

**Iterative Development** (Process Optimization)

Approach to building systems incrementally, assessing priority functionality at each step rather than developing complete solutions before user feedback. Prevents months of work on systems that do not meet critical needs.

## K

**Kanban** (Project Management)

Visual workflow management method emphasizing continuous flow, work-in-progress (WIP) limits, and pull-based task assignment. **Best for**: Operations, continuous improvement, teams with unpredictable incoming work. **Key practices**: Visualize work, limit WIP, manage flow, make policies explicit.

**Key Informant** (PH)

Person with specialized knowledge consulted for input. **BA equivalent**: Subject matter expert (SME).

**KPI (Key Performance Indicator)** (BA)

Metric measuring success. **PH equivalent**: Health indicator, outcome measure.

## J

**Job Series** (Federal Employment)

Numerical classification system for federal positions. Key series for hybrid professionals include 0601 (General Health Science), 0685 (Public Health Program Specialist), and 2210 (IT Management).

**Job Demands-Resources Model (JD-R)** (Psychology)

Model explaining that job stress results from imbalance between demands (workload, time pressure, complexity) and resources (autonomy, support, feedback). Process optimization should reduce demands while maintaining or increasing resources.

## L

**Leadership Competence** (Organizational)

Adequate domain understanding by leaders to guide priorities and decisions. **Remedy**: Pair with SMEs, establish decision review gates, and continuous domain briefings.

**Lessons Learned** (BA)

Knowledge gained from experience. **PH equivalent**: After-action review findings.

**Line List** (PH)

Tabular record of individual cases used for outbreak investigation, contact tracing, and epidemiological analysis. Contains one row per case with key variables (demographics, dates, outcomes). A **Gold layer artifact** because it serves operational purposes and derives from cleansed Silver layer data. **BA equivalent**: Operational report, case management export.

**Logic Model** (PH)

Visual representation of program theory (inputs → activities → outputs → outcomes). **BA equivalent**: Requirements traceability, value chain.

## M

**Maintenance** (RE-AIM)

Sustainability of an intervention over time. **BA equivalent**: Operational sustainability.

**Medallion Architecture** (Data Architecture)

Data design pattern organizing data into three progressively refined layers: Bronze (raw), Silver (cleansed), and Gold (curated). Originated from Databricks circa 2020, building on traditional data warehousing concepts. **PH application**: Maps to surveillance data flow from ingestion through standardization to reporting.

**Milestone** (Both)

Significant point in project timeline. In PH, often aligned with grant reporting.

**MVP (Minimum Viable Product)** (BA/Agile)

Smallest useful version of a solution. **PH equivalent**: Pilot intervention, proof of concept.

## N

**Needs Assessment** (PH)

Systematic identification of needs and gaps. **BA equivalent**: Business analysis, current state assessment.

**NFR (Non-Functional Requirement)** (BA)

Quality attribute or constraint. **PH equivalent**: Implementation characteristic (CFIR).

**Nonviolent Communication (NVC)** (Communication)

Communication approach focusing on observations, feelings, needs, and requests. **Use**: Reduces conflict and supports psychological safety.

## O

**Outcome** (PH)

Change resulting from an intervention. **BA equivalent**: Benefit, value delivered.

**Onboarding Crosswalk** (Workforce)

Structured orientation materials that cover both BA and PH domains for new team members joining hybrid projects. Includes terminology glossaries, framework overviews, and project-specific mappings.

**Outer Setting** (CFIR)

External context (regulations, networks, peer pressure). **BA equivalent**: External environment, market forces.

**Output** (PH Logic Model)

Direct products of program activities. **BA equivalent**: Deliverables, features.

**Organizational Misalignment** (Organizational)

Disconnect between goals, priorities, or definitions across teams leading to duplication and conflict. **Remedy**: Cascading OKRs, shared roadmaps, single prioritized backlog.

**Organizational Culture (Schein Model)** (Organizational)

Edgar Schein’s framework describing three levels of culture: (1) **Artifacts** (visible structures and processes), (2) **Espoused Values** (stated strategies and goals), and (3) **Basic Assumptions** (unconscious beliefs). Process optimization often fails when it addresses only artifacts while conflicting with basic assumptions.

**OKR (Objectives and Key Results)** (Project Management)

Goal-setting framework connecting high-level objectives to measurable key results. **Structure**: Objective (qualitative, inspirational) + 3-5 Key Results (quantitative, measurable). **Use**: Cascading OKRs align team goals to organizational strategy; helps prevent misalignment and ensures work connects to outcomes.

## P

**PDSA (Plan-Do-Study-Act)** (PH)

Quality improvement cycle. **BA equivalent**: Sprint/iteration, continuous improvement cycle.

**PHIFP (Public Health Informatics Fellowship Program)** (Workforce)

CDC fellowship program training professionals at the intersection of public health practice and information systems. Produces hybrid professionals who lead health IT initiatives across state and local health departments.

**PHIT (Public Health Informatics & Technology) Program** (Workforce)

ONC-funded workforce development program training diverse professionals in health informatics. Emphasizes recruiting from underrepresented communities.

**Pilot** (Both)

Small-scale test of a solution or intervention. Similar usage.

**Personality Pathology (Organizational Risk)** (Organizational)

Concerns about maladaptive interpersonal patterns impacting decisions and team function. **Best practice**: Avoid diagnosing or speculating on motives in workplace contexts; instead focus on observable behaviors, document conduct expectations, and use HR processes and governance mechanisms to protect staff and operations. See also: Disruptive Interpersonal Patterns.

**Political Factors / Political Interference** (Organizational)

Formal and informal power dynamics that influence decisions beyond evidence or merit. Can cause decision volatility, misdirected resources, and staff demoralization. **Guardrails**: Charter-based governance with documented authority, transparent decision criteria, decision logs accessible to stakeholders, conflict-of-interest declarations, and external review for high-stakes choices.

**Process Evaluation** (PH)

Assessment of how an intervention was implemented. **BA equivalent**: Implementation review.

**Program** (PH)

Organized set of activities to achieve health objectives. **BA equivalent**: Solution, system, project.

**Protocol** (PH)

Standardized procedure or guideline. **BA equivalent**: Business rule, procedure specification.

**Process Optimization** (Both)

Systematic approach to improving efficiency and effectiveness by eliminating unnecessary processes, automating mission-critical ones, and ensuring demonstrable value. Goal is maximizing impact with available resources.

**Process Owner** (Organizational)

Single point of accountability for a process. Responsible for performance, improvement, and governance of that process.

**Prototype** (BA)

Early model for testing concepts. **PH equivalent**: Pilot, formative testing.

**Public Trust** (Federal Employment)

Security clearance level commonly required for federal contractor positions in health IT. Lower than Secret/Top Secret but still requires background investigation.

**Psychological Safety** (Organizational)

Environment where team members feel safe to take risks, ask questions, and admit mistakes without fear of punishment. Essential for sustainable process improvement and innovation. Research by Amy Edmondson demonstrates that psychologically safe teams perform better.

## Q

**Quality Assurance (QA)** (BA)

Systematic quality activities. **PH equivalent**: Quality Improvement (QI).

**Quality Improvement (QI)** (PH)

Continuous improvement of processes and outcomes. **BA equivalent**: Continuous improvement, QA.

## R

**RE-AIM** (PH)

Framework for evaluating public health impact (Reach, Effectiveness, Adoption, Implementation, Maintenance).

**RACI Matrix** (Project Management)

Framework defining roles for each activity: Responsible (does the work), Accountable (ultimately answerable, one person only), Consulted (provides input), Informed (kept updated). Prevents gaps and overlaps in responsibility.

**Reach** (RE-AIM)

Proportion of target population participating. **BA equivalent**: Adoption rate, market penetration.

**Readiness** (Both)

Preparedness for change. Implementation readiness (PH) or organizational readiness (BA).

**Red Teaming** (Organizational)

Structured practice of challenging assumptions by assigning a team to critique plans and surface risks. **Use**: Improves decisions by integrating opposing perspectives.

**Relative Advantage** (CFIR)

Perception that intervention is better than current practice. **BA equivalent**: Value proposition.

**Request for Proposal (RFP)** (Government Procurement)

Formal solicitation document describing a government agency’s needs and inviting vendors to bid. For job seekers, RFPs reveal upcoming demand for specific skills before positions are posted. See also: Award Notice.

**Requirements** (BA)

Conditions a solution must satisfy. **PH equivalent**: Program specifications, protocols.

**Retrospective** (BA/Agile)

Meeting to reflect on past work. **PH equivalent**: After-action review.

**Rights Holder** (PH)

Person with inherent claims (alternative to “stakeholder”). **BA equivalent**: Stakeholder (with different connotation).

**Risk** (Both)

Potential for adverse outcomes. Similar usage; PH may emphasize community risk.

**ROI (Return on Investment)** (BA)

Financial value relative to cost. **PH equivalent**: Cost-effectiveness, cost-benefit.

## S

**Scope** (Both)

Boundaries of what is included. Similar usage in both domains.

**Scope Creep** (BA)

Uncontrolled expansion or shifting of scope that leads to churn and rework. **PH equivalent**: Program drift. **Controls**: Change control process, backlog refinement, decision logs, and re-baselining.

**Service-User Scenario** (PH-adapted)

Narrative description of user journey. **BA equivalent**: User story, use case narrative.

**SBAR (Communication)** (Both)

Structured communication framework: Situation, Background, Assessment, Recommendation. Improves clarity and reduces misunderstandings in technical and clinical contexts.

**Self-Determination Theory (SDT)** (Psychology)

Theory identifying three innate psychological needs that drive motivation: autonomy (control over one’s work), competence (mastery and effectiveness), and relatedness (connection to others). Process design should support all three.

**Shared Services** (Organizational)

Model where core functions (data cleaning, reporting, training development, compliance) are centralized to serve multiple teams. Reduces duplication and builds specialized expertise.

**SLA / OLA (Service Level Agreement / Operating Level Agreement)** (Organizational)

Documented commitments defining expected performance levels. **SLA**: Agreement with external customers or stakeholders (e.g., 99.9% uptime, 48-hour response). **OLA**: Internal agreement between teams supporting the SLA (e.g., IT commits to 4-hour escalation response to data team). Establishes accountability and enables governance.

**Silver Layer** (Data Architecture)

The middle layer in medallion architecture containing cleansed, validated, and standardized data. Transformations include deduplication, format normalization, and quality checks. **PH equivalent**: Harmonization layer, FHIR/OMOP standardized datasets, de-identified data.

**SME (Subject Matter Expert)** (BA)

Person with domain expertise. **PH equivalent**: Key informant, clinical expert.

**Solution** (BA)

System or process addressing a business need. **PH equivalent**: Intervention, program.

**Sprint** (BA/Agile)

Fixed-length iteration. **PH equivalent**: PDSA cycle, work period.

**Stakeholder** (BA)

Person with interest in a project. **PH alternatives**: Interest holder, community partner, rights holder.

**Structured Dissent** (Organizational)

Formal inclusion of opposing views in decision-making through methods like devil’s advocate roles, red teaming, and dissent summaries.

**Summative Evaluation** (PH)

Assessment of overall outcomes after implementation. **BA equivalent**: Post-implementation review.

**Sustainability** (PH)

Ability to maintain intervention over time. **BA equivalent**: Operational viability.

**Super-User** (Workforce)

Staff member who becomes the informal technology expert for their team. Often the best candidates for formal hybrid roles because they possess deep domain context that is difficult to teach.

**Systems Integrator** (Federal Contracting)

Large consulting firm that executes major government IT contracts (e.g., Deloitte, Accenture, Booz Allen Hamilton, Leidos). Primary employers for hybrid professionals working on federal health IT modernization.

## T

**Test Case** (BA)

Specification for verifying a requirement. **PH equivalent**: Evaluation measure, data collection protocol.

**Traceability** (BA)

Linking requirements to sources and tests. **PH equivalent**: Theory of change alignment.

**Terminology Fluency** (Workforce)

Ability to speak both BA and PH languages without constant translation pauses. A core competency for hybrid professionals.

**Training** (Both)

Building user/staff capability. Similar usage; PH may use “capacity building.”

## U

**UAT (User Acceptance Testing)** (BA)

Stakeholder verification of solution. **PH equivalent**: Pilot evaluation, field testing.

**Use Case** (BA)

Description of system-user interaction. **PH equivalent**: Clinical scenario, patient journey.

**Unicorn Job Description** (Workforce)

Job posting with unrealistic requirements spanning multiple specialties (e.g., PhD, PMP, 10 years Python, and nursing license). Usually signals role clarity issues; candidates meeting 50 to 60 percent of criteria should still apply.

**User Story** (BA/Agile)

Brief requirement from user perspective. **PH equivalents**: Service-user scenario, GPS format.

**Unhealthy Competition** (Organizational)

Internal rivalry that undermines collaboration, causes information hoarding, and leads to duplicated effort. **Remedy**: Establish shared goals that require collaboration; use team-based (not individual) incentives; conduct cross-team reviews to surface dependencies and promote transparency.

## V

**Validation** (Both)

Confirming the right thing is built. Similar usage.

**Variance** (PH)

Deviation from expected outcome. **BA equivalent**: Defect, exception.

**Verification** (Both)

Confirming the thing is built right. Similar usage.

**Visual Management** (Lean/PM)

Using visible displays (Kanban boards, dashboards, status indicators) to make work status, blockers, and progress immediately apparent to all team members. Reduces need for status meetings and supports self-organization.

## W

**Workflow** (Both)

Sequence of tasks to accomplish work. Similar usage.

**Workplan** (PH)

Detailed plan of activities. **BA equivalent**: Project plan, backlog.

## Quick Reference: Most Common Translations

| When You Hear… | BA Meaning | PH Meaning |
| --- | --- | --- |
| “Requirements” | System specifications | Program protocols |
| “Stakeholder” | Anyone with interest | Community partner, rights holder |
| “Sprint” | 2-week development cycle | PDSA cycle |
| “User story” | Feature description | Service-user scenario |
| “KPI” | Business metric | Health indicator |
| “MVP” | Minimal product | Pilot intervention |
| “Go-live” | System deployment | Program launch |
| “Bug” | Software defect | Protocol variance |
| “Bronze layer” | Raw data ingestion | Source data, ingestion |
| “Silver layer” | Cleansed/validated data | Standardized, harmonized data |
| “Gold layer” | Analytics-ready data | Reporting datasets, CDC submissions |
| “Data lakehouse” | Unified data platform | Integrated surveillance data repository |
| “OKR” | Objectives and Key Results | Logic model alignment, grant objectives |
| “Kanban” | Visual workflow board | Task tracking, workplan visualization |
| “SLA” | Service Level Agreement | Performance commitment, response time target |
| “Scope creep” | Uncontrolled scope expansion | Program drift |

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