Clarivate™

Report 1: Results of User Research

Design and Early Implementation

ADC EPS 24-N5

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Contents

America's DataHub Consortium (ADC), a public-private partnership, implements research opportunities that support the strategic objectives of the National Center for Science and Engineering Statistics (NCSES) within the U.S. National Science Foundation (NSF). These results document research funded through ADC and are being shared to inform interested parties of ongoing activities and to encourage further discussion. Any opinions, findings, conclusions, or recommendations expressed above do not necessarily reflect the views of NCSES or NSF. Please send questions to ncsesweb@nsf.gov. This product has been reviewed for unauthorized disclosure of confidential information under DRN NCSES-DRN25-071.

Patchy and intermittent funding has failed to build broadly relevant empirical or theoretical knowledge about how to make better use of evidence, or to build the communities required to act on this knowledge.

In short, our research systems are not guided by current theory about what types of knowledge are most valuable to help address societal problems, or how to produce useful evidence, or how to use this knowledge in policy and practice settings.

We observe that much of the very limited funding to investigate evidence production and use has gone to either developing metrics or tools to increase uptake, to the relative neglect of everything else.

Oliver & Boaz (2019)

1. Introduction

1.1 Report Overview

In this interim report we present highlights from the first three months of our *National Secure Data Service-Demonstration* (NSDS-D) project[1]. The report focuses on the design and early implementation of the activities that will ultimately contribute to the development of a framework for aspects of the NSDS Concierge Service that pertain to policymaking at the federal level. *A Vision for a Future NSDS*[2] offers an early glimpse of the nature and scope of an NSDS within or alongside which a Concierge Service would reside.

1.1.1 Report Purpose

The purpose of this interim report is to provide sufficient detail on our approach to the project and specifically the User Research phase to orient the funder and policy stakeholders. Our intent is to use this interim report as a prompt for soliciting stakeholder input on the design, prior to implementation. This report demonstrates that User Research is currently underway, but the results are yet to come.

1.1.2 Organization of the Report

This report, which provides a high-level overview of our progress thus far is in four sections. This introduction to *Report 1: Results of User Research* (section 1) is followed by updates on progress to date in creating the foundational design documents

[1] Engaging Policy Stakeholders to Inform a Future National Secure Data Service (ADC EPS 24-N5)
[2] https://www.americasdatahub.org/what-could-an-nsds-look-like/

required for User Research implementation. The purpose of the Literature Review summarized in section 2 is to inform (1) the support role of a NSDS Concierge Service and (2) the questions and protocols to be used for stakeholder engagement over the course of this project. In section 3 we describe the Stakeholder Engagement Plan by providing an overview of the participant selection rationale for co-researcher and research subject roles. In section 4 we describe the two use cases developed in collaboration with the National Science Board members (NSB) and the NSB Office staff (NSBO) that will be used together with the findings of the literature review to inform our engagement with stakeholders.

The rest of this introductory section provides: (1) an overview of the entire project to set the context for the *User Research* that is the main subject of this report and (2) a description of the preliminary design considerations and foundational documents that inform our evolving approach to the User Research needed to contribute to the design of a framework for the NSDS Concierge Service. We also describe the first iteration of the information we need to address the research questions and discuss how stakeholder engagement and the research process are intertwined.

1.2 Project Overview

1.2.1 NSDS-D

The introductory paragraph of the National Secure Data Service Demonstration project website[3] states:

> *The National Secure Data Service Demonstration (NSDS-D) project is required under the 2022 CHIPS and Science Act to inform a governmentwide effort on strengthening data linkage and data access infrastructure. This effort facilitates statistical activities in support of increased evidence building for the American public. The goal of the NSDS-D project is to inform efforts for developing a shared services model that would streamline and innovate data sharing and linking to enable decision-making at all levels of government and in all sectors.*

While the final form of NSDS remains to be determined, it is currently envisioned as an essential component of the federal data ecosystem where the presumption of accessibility to US government data will be a reality. The NSDS is conceptualized as a multi-tiered, shared services platform that supports use of federal data for evidence and informed decision making. It is important to note that although the secure access tier of the NSDS may facilitate access to federal and other data for approved users within agency and Federal Statistical Research Data Centers (FSRDC) data enclaves, the NSDS itself is not a data warehouse.

For the NSDS to more readily achieve its desired purposes, the Advisory Committee on Data for Evidence Building (2022) has recommended that data concierge services

[3] https://ncses.nsf.gov/initiatives/national-secure-data-service-demo

be available to offer direction and support that enables users to navigate the federal data ecosystem and enhance their capacity to find and use the information they need to make informed decisions. In that context, the user research conducted by this project will inform the development of a framework for a continuum of proposed Concierge Services for the NSDS that have potential to address the specific evidence building needs expressed by federal policymakers.

1.2.2 Project Purpose

Our research will contribute to the design of the NSDS Concierge Service which is already underway through other NSDS-D projects[4].

Data Concierge. Our focus is on developing an alternative blueprint for those aspects of the Concierge Service that include support to the federal policy community using the NSDS for policy purposes. The primary aim for the study, is on obtaining evidence to support federal policymaking using the NSDS to navigate and access the federal data ecosystem.

Capacity Building Infrastructure. Although our primary focus is on the needs of federal policy stakeholders to use the NSDS for policy purposes that can be met by a data concierge, this project will also contribute to the requirements for other capacity building services and infrastructure as envisioned by the NSDS-D. A broader vision for NSDS capacity building infrastructure could exist alongside, or encompass, the Concierge Service that supports policy and other uses. We include providing input about the role of infrastructure because we will have access to federal policymakers with insights and opinions about the capacities required for the effective use of the NSDS platform not only for input into policymaking but for research as well.

1.2.3 Theoretical Framework for the Project

To work toward that purpose, the first phase of the project focuses on designing and conducting User Research to "document the needs of federal policy stakeholders to plan, identify, acquire, access, and use statistical data and information to inform their work" (RFS[5], 2024). Therefore, we include a theoretical framework to guide our approach to studying the interaction(s) between the federal data ecosystem, the NSDS platform, and policy stakeholders. This theoretical framework provides the lens through which we will examine the role of evidence in the work of policy stakeholders that an NSDS Concierge Service might address.

We view the federal data ecosystem from the perspective of socio-technical systems (STS) theory (Bostrum & Heinen, 1977). STS theory is important because it offers high-level view of the constructs and relationships we will need to explore to determine

[4] See for instance, Models for a Data Concierge Service for a National Secure Data Service (DSCS-23-NO3) https://www.americasdatahub.org/award-dcs/.

[5] Request for Solutions (RFS), RFS Title: Engaging Policy Stakeholders through a Future National Secure Data Service. Issued Jun 12, 2024.

where the NSDS might have the most potential to serve the evidence-building needs of policymakers.

STS posits that the interactions between the social and technical aspects of work, influence the extent to which an innovation can improve the efficiency or effectiveness of the work performed by its users (Van den Heever & Oosthuizen, 2022). Ultimately the NSDS is being designed to contribute to increased use of data for decision-making by users (i.e., federal policy stakeholders) as expected (Trist, 1981). Appreciation of STS insights will help the reader understand how the literature review contributes to the development of key STS constructs in later sections of this report.

Technical sub-system. The NSDS will enable use of all types of data (for example, administrative, business, private, alternative, program, evaluation data, etc.) [6] The technical sub-system in this study is bounded by the technical and functional specifications for building the NSDS[7]. The technical specifications describe the technology needed for NSDS to do its work (for example, system architecture, hardware and infrastructure, software and programming languages, privacy and security measures). The functional specifications describe the services and tasks that an NSDS will need to support (for example, user interface and experience, workflow, and process automation, reporting and analytics, integration with other systems).

Social sub-system. The social sub-system creates the conditions which influence whether the NSDS (including the Concierge Service and other supports) will enable federal policy stakeholders to use information as intended (Margherita & Braccini, 2021). For this study, the social system is bounded by agency specific structures (for example, evidence culture, policy lifecycle) as well as the characteristics (for example, user policy stakeholder type, role, position description, disciplinary affiliation) and capabilities (for example, user attitudes, knowledge, skill, and practices) of the people who could use the shared services made available through the NSDS to do their work.

1.2.4 Project Goal

A cursory examination of the distribution of the projects funded to date by NSDS-D shows that nearly all focus on the NSDS technical sub-system, which includes for example, interoperability, privacy-preserving record linkage techniques and methods. Several studies, including this one, are different from the technology focused efforts in that they respond to recent recommendations by the Advisory Committee on Data for Evidence Building (ACDEB) for the NSDS to elevate the importance of capacity building[8]. Capacity building (for example, training, tools, and

[6] Such as administrative, business, proprietary program, evaluation data
[7] See ACDEB Reports 1 and 2 for details.
[8] See for instance, https://www.americasdatahub.org/building-capacity_adeb-24/, https://www.americasdatahub.org/award-iebc/, https://www.americasdatahub.org/award-dcs/

technical assistance) influences the attitudes, knowledge, skills, and practices of users (social sub-system) which in turn influences the ability of the technical sub-system to improve the evidence-based work of policy stakeholders (ACDEB, 2022).
The goal for the project is to identify the needs, gaps, successes, and challenges faced by the federal policymaking community when attempting to address policy questions using federal data to explore and address policy issues of national significance. The key focus questions for the project, posed by the funder are:

1. What unique approaches and support do policy stakeholders need for evidence-driven decision making?
2. How can a Concierge Service support the needs[9] of policy stakeholders?

1.2.5 Use-Inspired Research and Human Centered Design

This project is an application of use-inspired research, which is different in some ways from the basic, curiosity-driven research readers might be most familiar with. Like basic research, use-inspired research is often grounded in a scoping review of the most relevant literature. Typically, basic research is not participatory and there is a clear separation between the researcher and the subjects of the study. In addition, it has been shown that use-inspired research that includes stakeholder and beneficiary participation in the research, like that in Human Centered Design (HCD), reduces the time for the emergence of practical solutions to societal problems.

All the phases of this project rely heavily on engagement with federal policy stakeholders who are familiar with the vision for an NSDS and those who are not. Each phase of the project focuses on a step in the Human Centered Design (HCD) innovation process. HCD is a problem-solving framework that helps make systems and products more responsive to the needs of the people who use them (IDEO, n.d.).

Federal agencies are beginning to use the HCD approach to stakeholder engagement as they produce their Learning Agendas and other Foundations for Evidence-Based Policymaking Act of 2018 (Evidence Act) deliverables (General Services Administration, n.d.). Using an HCD approach to work with policy stakeholders to refine User Research methods, process and prioritize the User

[9] These needs go beyond data discovery and navigation support proposed for the Data Concierge to include tools and services mentioned in the middle layer of the NSDS shared services platform (for example, serving as a clearing house for information on the federal data ecosystem, synthetic reviews of literatures that discuss the use of different types of data, subject matter expertise including analytical methods. policymaking toolkits, and data use and access considerations as envisioned in https://www.americasdatahub.org/what-could-an-nsds-look-like/,

Research findings makes it possible to surface and address needs perhaps not yet recognized by the community developing the NSDS[10].

1.2.6 Project Applications

The findings from this project will contribute to the knowledge base about the capability (for example, attitudes, knowledge, skills, and practices) of federal policy stakeholders to plan, identify, acquire, access, and use data to generate evidence that informs their work. The application of the findings from this effort will provide the input for building the suite of services and tools offered under a future NSDS, including but not limited to a Concierge Service framework that will function at the nexus of data, evidence, and policy. In addition, this project will inform the use of a theoretical model (such as STS, in this case) to prime and expedite HCD efforts such that HCD might become more widely adopted as a research and facilitation tool in government and other settings.

1.3 Initial Approach to User Research

This sub-section describes: (1) the design considerations identified during proposal development that indicate how agency-specific organizational and individual factors may influence the extent to which an NSDS is used by policy stakeholders as intended and (2) an overview of the foundational documents completed. Drafts of the foundational documents will follow this Introduction in sections 2, 3, and 4.

1.3.1 Design Considerations

Our approach to User Research[11] flows from STS theory described in 1.2.3. Two initial overarching considerations for the design of our User Research approach were identified in the initial literature review conducted to inform the development of our proposal. It is important that in addition to capturing the evidence needs held in common across a representative group of policy stakeholders, we will want to be able to detect key differences and their influence on evidence use.

The following issues raise interesting boundary setting questions about the nature and purpose of the Concierge Service however, we posit no opinion on whether these questions might be addressed within a future NSDS. We want to surface these

[10] Typically, HCD does not start from a theoretical framework, the framework emerges from the process. This takes much longer than the project's duration and demands more stakeholder time than likely to be feasible for those engaged in Federal policy work. As a remedy, we jumpstart User Research by presenting a straw model for a literature informed view of a selected set of the potential challenges encountered using an NSDS in Federal policy work. For the first phase of the project, where stakeholders are introduced to HCD, we use a draft model to stimulate discussion and deliberation about what is right, wrong, and missing based on their unique experiences. The draft model of Current State is then revised.

[11] Phase 1. User Research includes literature review, use cases, and policy stakeholder interviews. This information will be used to produce the personas and journey maps, as well as to create the SWOT tables and Gap analyses, needed to frame the Current State of the use of an NSDS by federal policy stakeholders. These findings from User Research will be used to produce visualizations and summaries that will serve as inputs to the first HCD session in Phase 2. In addition, User Research will include information about the desired Future State to be used in the second HCD session in Phase 3.

considerations as part of the study context but acknowledge the conceptualization of the data concierge is already underway and limited by initial resources. Our primary task is to determine which policymaker needs can be addressed by a data concierge as currently envisioned. However, along the way we may surface other policymaker needs that might be better addressed in the future by other capacity building supports outside the scope of the current role for the data concierge.

Consideration 1: Capacity for Research vs. Policy Inquiry. As mentioned previously, NSDS-D is already considering the use of data concierges and technical assistance infrastructure to build the capacity of policy stakeholders and other NSDS users to refine research questions as well as identify, access, and use relevant data. However, we assert that the intended outcome of increased evidence-based policymaking, might be outside the scope of the NSDS. The NSDS might set expectations for what kind of contribution a shared services platform can make to this end. At the outset, we understand that data concierge services will focus on technical sub-system user tasks—such as finding relevant sources of information to address policy questions. These task capacities are important and necessary for NSDS use for policy purposes but are not likely sufficient to support the full range of evidence building needs using the NSDS for policy purposes.

Design Response 1. Emphasis on Policy Inquiry. Our approach to User Research will surface needs expressed by policy stakeholders related to the use of a NSDS for basic research already considered by NSDS developers informed by NSDS-D projects exploring a variety of user needs (including concierge service models). However, our primary User Research emphasis will be on identifying the support a NSDS can provide to increase evidence-based policymaking; primarily, through guidance and services provided by a data concierge regarding gaining access to information and its use. Given our intent to discover, yet unmet, policy stakeholder needs, we are designing our User Research to also illuminate the contribution if any, of the social sub-system to NSDS use as intended (for example, the evidence culture and individual capacity for policy inquiry). It is important to note the NSDS will not provide policy information, and that the data concierge will not make policy recommendations.

Consideration 2. Technical vs Social Sub-systems In addition to reliance on STS theory as the frame for the entire project, this approach to User Research also builds on a National Research Council Report (2012), *Using Science as Evidence in Public Policy,* that stated, "...our research framework argues for more careful study of policy argumentation, as well as for increased roles for the psychology of decision making and for systems perspectives." This NRC report signals the importance of the social sub-system and its interaction with the technical sub-system. NSDS technical sub-system is a constant for the project. How and whether the technology and tasks made available by an NSDS get used as intended by policy stakeholders will depend to some degree on the set of skills valued and developed by agencies for people in

policy roles and the nature of the policy issues being addressed. It is important for the NSDS to recognize its sphere of influence. Many of the factors shown in the literature to influence whether evidence is used for decision making are beyond the access to information provided by the NSDS.

Design Response 2. Focus on Agency Policy Decision-making. Given the lack of expedient access to Congressional level policymakers and the high variability in the policy environment at the agency level shown in the literature (Bandola-Gill, 2024; Christensen & Hesstvedt, 2024) we will examine the use of federal data from the perspective of agency specific decision-making in the context of the agency's policy lifecycle and evidence culture. Our User Research focuses on examination of the relationship between the potential services of a future NSDS and the role of evidence throughout the policy lifecycle for a representative set of agencies. In this way, we might determine the extent to which there are unanticipated stakeholder needs beyond those already known about information access and use of a future NSDS by a wide range of communities of research and practice (for example, evaluators, non-profits, State/local governments, etc.).

Implications for the Concierge Service Framework. We posit that the suite of services and resources for an NSDS will need to address questions that go beyond the technical needs already identified by other NSDS-D projects, which might emerge from our User Research. Thus, there will also be policy and decision-making specific capacities required to use the future NSDS to engage in evidence building. To determine the extent to which this assertion holds true, will require close attention to the attributes of the social sub-system, that is the evidence culture and the needs of the policymakers, influencers, advisors, and evaluators that go beyond access to information through the NSDS.

1.3.2 Overview of Foundational Documents

The Literature Review (section 2), Stakeholder Engagement Plan (section 3), and the National Science Board Use Cases (section 4) provide the foundation for how the project will conduct use-inspired research to ultimately inform the Data Concierge Service framework (being developed by the NSDS DS-23 project). These Use Cases are focused narrowly on the needs of federal policymakers, influencers, analysts, and evaluators. We will use stakeholder engagement as a core research strategy to draw from the literature and the work of those projects already funded by the NSDS-D. These foundational documents describe the current state of our understanding, however; as we learn from our engagement with stakeholders, our literature informed initial approach might evolve.

Literature Review Purpose. We conducted a literature review to provide a basis for further explication of the initial STS underpinning to the study: (1) key constructs and mechanisms, (2) measures and indicators, and (3) selection criteria for a representative set of co-researchers and research subjects. These elements are

important to establish before the implementation of the project's Phase 1: User Research[12].

Literature Review Outputs. The Literature Review also speaks to the role of evidence and the relevance of social sub-system factors that contribute to the use of a future NSDS for policy purposes. After consultation with the funder and selected policy stakeholders, the literature review will be used to construct an initial theory of change (mental model) and logic model (implementation model). These conceptual models will describe the activities and outcomes related to the use of an NSDS to support complex federal policy purposes in the context of the policy landscape. The literature review reveals the roles, augmented, perhaps by artificial intelligence (AI), that a Concierge Service could play in improving the technical sub-system by providing navigation and analytics support, training, and in curating a repository of data relevant materials to complement the data available from the federal data ecosystem. Stakeholder feedback will be used to revise the conceptual models which inform measurement decisions. Stakeholder engagement at this stage assures that we define the constructs, indicators, and measures of the barriers and facilitators that may be faced by federal policy stakeholders when using a future NSDS. In this way, our research will inform the development of the NSDS Concierge Service such that it may consider incorporation of alternative functionality that may matter most to federal policymakers.

Solutions Proposed. We have also noted in our review of the literature that there are many steps spanning gaining access to data to producing policy relevant evidence. This support will likely be both human and AI-driven to direct people where they need to go. In addition, the ability to simulate policy decisions and their potential consequences could prove to be very helpful to the NSDS users as they explore options for application of NSDS suite of services to support policy work in the future. Flexibility is an important feature of the design of a Concierge Service framework because the future NSDS will remain a work in progress, and the services and tools offered through an NSDS will have to reflect the changing demands and adapt to them.

Stakeholder Engagement Plan Purpose. The Stakeholder Engagement Plan is the "how" and "who" of stakeholder participation in all phases of the research conducted by this project. We have learned from the literature about the technical and social sub-system factors that influence the use of evidence as inputs to the policy lifecycle. These factors vary by agency and individual, so it is essential that we purposefully engage with a representative set of policymakers, influencers, analysts, and evaluators in each phase of this project. We want to discover and focus on high

[12] The literature review also informs the data collection, analysis, interpretation, and reporting for the project that will follow over the next year.

priority needs, that if addressed by the Concierge Service or other NSDS features, have the potential to improve the work of policy stakeholders.[13]

Stakeholder Engagement Plan Outputs. This document describes our use of the literature review to operationalize our understanding of the policy stakeholder roles and characteristics of the individuals we need to participate in the research. This information will feed the refinement of the five ways policy stakeholders may engage in this product development research. These include participation in: (1) an Insight, Interpretation, and Innovation Panel (I3P) of representative thought leaders from across the federal policy ecosystem who will serve as co-researchers for the study, (2) User Research interviews that will contribute to the personas and journey maps needed to illustrate and summarize the user characteristics and social-subsystem attributes that influence the use of a future NSDS for policy-informed inquiry, (3) an in-depth pair of use cases that examine and contrast the strengths and limitations of policy stakeholders using the federal data ecosystem to inform the framing of a policy issue of national significance, (4) the Human Centered Design process that refines and prioritizes the challenges and solutions identified in the User Research findings and (5) strategic communication efforts such as serving as a champion for federal policy stakeholder support services framework proposed by the project.

Use Case Purpose. The purpose of a Use Case is to illustrate the needs, gaps, successes, and challenges that are faced by federal policy stakeholders as they use federal data to support the development of policy recommendations of national significance. This component of User Research differs from the retrospective approach planned for the Stakeholder Interviews, in that it will surface real-time problems and provide opportunity to explore solutions and pathways to address encountered barriers for data-related needs specific within the use case. Lessons learned from the use case will also inform the recommendations for data concierge and other capacity building supports specific to the use of evidence by federal policymakers[14].

Use Case Outputs. The outputs of the use case include: (1) an approach and plan to produce the deliverable, (2) notes on the progress made during the initial stages of use case development, and (3) information that contributes to the development of personas and journey maps. The Use Case, in addition to providing input to User Research, presents a real-time test of a potential prototype Concierge Service feature to address an urgent policy information need expressed by the agency hosting the use case.

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[13] This is the Insight, Interpretation, and Innovation Panel (I3P) that is described in Section 3.

[14] The use case portion of the project will not provide policy recommendations or policy framing related to the case studies or other aspects of the project.

2. Literature Review

2.1 Background

This review focuses on the use of evidence in policymaking at the federal government level with specific reference to the needs of four types of policy users of an NSDS, as stipulated in the Request for Solutions for this project, namely the policymaker, policy influencer, policy analyst and policy evaluator. The focus of this review is on the gap between the structured technical requirements for a National Secure Data Service (NSDS) to assist with encouraging use of public data, if available, for the users' needs; to assist in the process for identifying and acquiring restricted use data, as needed; and meet the socially constructed, messy user requirements of policy inquiry to support policymaking. It is in this context that this literature review informs the framework for the design of a Concierge Service. We are focusing on an even narrower aspect of the Concierge Service which is designed to facilitate the use of the future NSDS to support evidence generation that informs policymaking and policy action at the federal level (Leigh, 2009; Weiss, 1977).

This literature review builds on the concepts identified in socio-technical systems theory. The reader will recall that STS theory describes the relationships among the components of the technical and social sub-systems for a given type of work that an NSDS, would serve to optimize. The topics in the literature review point to where we most need to focus on those unique aspects of the policy ecosystem and policy work that the technology (known) and capacity building supports (not yet known) provided through NSDS and will be designed to optimize: (1) structure, (2) tasks, and (3) people. Structure and tasks are covered in the sub-sections 2.2 and 2.3 below. The policy stakeholder roles and characteristics are woven throughout.

2.2 Policy Process and Evidence Culture

The model for the Concierge Service and types of support that will be provided is evolving. For example, the service could help users navigate to multiple agencies or points of contact for specific answers to their questions. It could help identify public and proprietary data sources. It could point people to the shared services such as the Data Usage Platform or other toolkits offered through a future NSDS. While the precise nature of the future NSDS is in flux, it is instructive to briefly summarize pertinent topics from the literature on public policymaking to understand the roles of policymakers and policy influencers. It is also useful to understand the public policy process (Dunn 2018) or lifecycle, which includes problem identification, policy formulation, implementation, and evaluation (Peters, 2018; Weible and Sabatier, 2018). This sub-section of the literature review covers the roles of policy stakeholders in problem identification and policy formulation as well as policy analysis and synthesis, interpretation, and implementation. In addition, we will touch upon topics such as context, different types of evidence cultures, the influence of legislation and

organizations on the evidence culture, and other factors, which play a role in defining the role of an NSDS and its Concierge Service in supporting evidence-based policymaking by federal policymakers.

2.2.1 Problem Identification

Problem identification is relatively straightforward because there is no shortage of problems in a society. For Dunn (2018) a public policy problem is an unrealized need, value, or opportunity. It is the government's job to solve public problems through the creation of policies and implementing solutions. This problem-solving effort, according to the Foundations for Evidence-Based Policymaking Act of 2018 must be informed by evidence.

2.2.2 Policy Formulation

Although the literature emphasizes the importance of a well-structured problem formulation (Heylighen, 1988), to date there is no algorithm or recommended approach to problem formulation or design such that it lends itself to systematic and rigorous analysis. The difficulty in arriving at a unique problem formulation is that problem definition is value laden and in public policy contexts, which are usually complex, value conflict is usually the norm. Thus, the challenge of problem formulation that is acceptable to all stakeholders, is politically and emotionally fraught and does not lend itself to a simple solution. (Nisbet, and Mooney, 2007)**.**

To help fix ideas about the complex process of and barriers to policymaking, and specifically, problem formulation, consider the welfare of the elderly as an example of a policy problem that most nations attempt to address.

Welfare of the elderly is a nebulous concept that must be formulated as an addressable problem that lends itself to systematic inquiry such that it can be solved, resolved, or dissolved. In the US in the early part of the 20th century after years of debate, President Franklin D. Roosevelt, in an address to Congress, formulated the welfare of the elderly as an economic problem and invested his political capital in addressing it. The policy outcome was the Social Security Act which he signed in 1935 to help the elderly deal with economic uncertainties in their lives. Thirty years later, the welfare of the elderly was reformulated in terms of healthcare and Medicare was established as Title XVIII of the Social Security Act and was signed into law by President Lyndon B. Johnson. Although drugs administered by doctors in their offices were covered by "Original Medicare," self-administered prescription drugs were not. Hence, in yet another reformulation of the welfare of the elderly as an economic and healthcare issue, Part D of Medicare was included in the Medicare Modernization Act of 2003. To this day, Social Security and Medicare continue to evolve as public

policies designed to enhance the welfare of the elderly. This problem evolution is then addressed by the enactment of legislation by policymakers.

In this story, the role of the policymakers and policy influencers is to formulate the problem and provide input for a legislative solution. The Concierge Service can be of little assistance to the policymaker or influencer in problem formulation because it is motivated more by political considerations than evidence. Policy formulation can perhaps be aided by AI once the problem, the policymaker's values and criteria are described, but AI's value is likely higher to policy analysts and evaluators in helping identify data, gain access to data and to facilitate their use to yield the evidence necessary to address the problem once formulated (Béland and Cox, 2024).

2.2.3 Legislation Influences the Evidence Culture

Recent legislation is calling for improvements in the evidence cultures across federal agencies. In years past, public officials were trusted to use their best judgment in making policy decisions. However, in more recent years we, as a society, expect decision makers to support their choices with "objective" evidence. With the passage of the Evidence Act of 2018, this turn towards evidence-based policymaking (EBPM) has been codified into law. This legal requirement has resulted in several policy briefs, guidance, and other forms of grey literature that are included in this review. Organizations such as the Data Foundation[15] and the Coleridge Initiative[16] are excellent sources of data, and materials about the Evidence Act. Memoranda from the White House Office of Management and Budget[17], responses of federal and state governments as well as other materials of interest to the evaluation and data analytic communities have begun to emerge to provide guidance on how to meet the requirements of the Evidence Act. Terms such as Learning Agendas and "evaluator" as a job category are no longer a novelty and websites maintained by the federal government such as evaluation.gov are excellent resources for learning about different types and sources of data, including administrative data, oftentimes as substitutes for survey data. Logic Models have begun to accompany program descriptions and evaluation plans often accompany strategic plans in government agencies. The Evidence Act has attracted the attention of academics and practitioners, but there are essential differences in the outputs of these two communities. A comparison of evidence-based medicine and evidence-based policymaking is provided below to highlight the similarities and differences between the work of researchers and that of policy stakeholders.

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[15] https://datafoundation.org/

[1616] https://coleridgeinitiative.org/

[17] See for instance, Office of Management and Budget Memorandum "Phase 2 Implementation of the Foundations for Evidence-Based Policymaking Act of 2018: Open Government Data Access and Management Guidance (M-25–5).

Evidence based Medicine

Evidence based medicine (EBM) is the concept of using scientific evidence, in contrast to opinion or experience to inform medical practice and teaching decisions. (Achilleas, Felmont and Eaves, 2015; Sackett, Rosenberg, Gray, Haynes, and Richardson, 1996/2007). Sackett, commonly recognized as the father of EBM, defined it as "is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, 1997).

Users of EBM have developed a hierarchy by which to judge the quality of the research that yields the sound evidence upon which medical decisions are made (Guyatt, Sackett, Sinclair, Hayward, Cook, and Cook, 1995). Doctors are encouraged to assess the quality of the research and the resulting evidence according to this hierarchy. Quantitative analyses have higher status and at the top of this methodologically based hierarchy are randomized clinical trials and systematic reviews or meta-analyses of such trials, while expert opinion or anecdotes are at the bottom. In between are clinical trials without proper randomization, natural experiments, quasi-experimental designs, time-series analyses with or without intervention, and regression discontinuity designs that rely upon methodological rigor in the absence of randomization. Of lower status, but more authoritative than expert opinions, are well-conducted case studies. Scholars and practitioners in the social and policy sciences have applied this hierarchy in evidence-based practice and evidence-based policy (Boruch & Rui, 2008; Leigh, 2009).

EBM is not without its critics (Clinicians for the Restoration of Autonomous Practice Writing Group, 2002; Koretz, 2019). Obvious criticisms of EBM include practical considerations such as cost, timeliness, feasibility, and distribution of resources as well as intangible considerations such as tradition and experience. Reliance on randomized clinical trials as the gold standard and research-based decision making might be feasible in medicine, but it is not practical in most other contexts, especially in public policymaking and management. Even specialized areas of medicine may not be well served by EBM. For instance, in mental health care, relationship-focused therapy, such as psychotherapy, does not lend itself to randomized clinical trials in the same way as technique-focused therapy, such as cognitive behavioral therapy (Tanenbaum, 2006). As a result, when using EBM as guidance for clinical decision making, process-based therapies are necessarily marginalized. Tonelli (2006) has suggested broadening the notion of EBM to include evidence not restricted to research findings and clinical trials.

Proponents of good government have argued that common sense, good judgment, good intentions, intuition, and experience are not sufficient for defending policy claims promoting one policy option over another. Evaluation analysts have celebrated the introduction of evidence-based practice and evidence-based policy

(Pawson, 2002). However, identifying promising practices is more straightforward in medicine than in policy contexts. The policy literature includes substantial evidence on "what works" from various state level "experiments" in welfare reform (Blank, 2008), the provision of Medicaid services, programs to reduce recidivism in the criminal justice system, education (Ladd, 2012), and a variety of other public programs (Bogenschneider & Corbett, 2010). However, success in a given context or identification of a best practice under a specific formulation of a problem does not guarantee success in a different context or with a slightly different problem formulation.

Evidence-based policymaking

Evidence-based practice or policy are the most recent manifestation of empirical investigation as it introduced evidence-based medicine (EBM) to the literature. It has taken foothold not only in medicine, but in a variety of other contexts, including public policy (Heinrich, 2007; Meier & O'Toole, 2009; Oliver, Harden, Rees, Shepherd, Brunton, Garcia, & Oakley, 2005; Pawson, 2002).

In policy contexts, no two situations are alike, particularly across time and space. The complexity of policy issues is such that the issues lend themselves to multiple problem formulations, where each formulation determines what might be considered relevant evidence. Unlike medicine, where there is considerable uniformity in the nature of the problems and approaches for addressing them, policy contexts tend to be one of a kind. Even in instances where there is debate regarding the efficacy of one medical procedure over another, well established protocols exist to help resolve the conflict. Unfortunately, empirical support is not effectively transferable from one policy context to another because evidence for policy inquiry is often context dependent. Each policy problem is unique, and the nature of the need and resource capacity varies across communities. Context matters, meaning that general principles or laws, even if they are determined through rigorous research, do not apply in every situation. As a result, evidence requires a thoughtful argument to describe how the evidence will be applicable and effective in a specific context.

As we have noted above, beneath the "genteel veneer" (Lindblom, 1980:17) of policy analysis is a decision maker with certain perspectives who sets agendas (Kingdon, 1995) and frames problems (Haas, 2004), thereby determining the types of analyses and solutions that are considered acceptable. Further, the evidence derived from policy inquiry is imbued with assumptions that are value-driven rather than evidence-driven. Decisions about what questions to ask and which observations to consider when answering a policy question allow for variation in outcomes not attributable to data. Although there is some measure of disagreement in health care about the definition of health, the discussion is narrower than the disagreements among decision makers and policy analysts regarding the definition of the health of society.

As a result, evidence gleaned through policy inquiry will necessarily be less focused and less easily transferable than evidence derived from medical research. As shown above, the influence of NSDS on the work of policy stakeholders will depend more heavily on the interaction between people and structures (i.e., the social sub-system) to interpret and make sense of the available data.

2.2.4 The Role of Experts and the P*olis*

Bardach's *Practical Guide for Policy Analysis* (2000) focuses on "the rationalist model enshrined in traditional economic logic and used in policy training"(Hawley, 2020). Policy relies on experts to offer sage policy advice and solutions (Adams, 2004). This rationalist model generally works for uncomplicated problems such as trash collection and fixing potholes where there is no value conflict regarding the importance of the problem and the knowledge and technology for fixing the problem are readily available. This rationalist model aligns with how one might envision the use of data for research.

However, when there is disagreement in values and there are conflicts among the underlying motivations such as morality, altruism, and the public interest, a different model, as suggested by Deborah Stone (2012), in her book *Policy Paradox,* might be more effective. In contrast to an expert driven model of decision making, she suggests a public interest-based *polis* model, which is community centered and includes both cultural and political aspects. Adams (2004) criticises the current policymaking environment to be dominated by a "cult of expertise" with a reliance on deductive reasoning and formal modelling. He offers examples of what he refers to as "Community knowledge" and suggests how such information can enhance current expert-based knowledge. This concept of *polis* resonates with our assertion of the importance of STS theory and the social sub-system as we consider what an NSDS needs if it is to enhance the work of the policy community.

The literature also points to the importance of policy analysis as one of the major instantiations of the work of policy stakeholders. Policy analysts and evaluators are shown to serve primarily as the providers of evidence and policymakers and influencers as evidence consumers.

2.3 Tasks: Policy Analysis

The policy analysis literature (Weimer and Vining, 2017) focuses more on how to do policy analysis than on building the capacity for producing good policy (Mintron 2019). Systems thinking is playing a larger role in the literature on public policy analysis and practice to align policy theory with practice. Systems thinking focuses on interactions and interdependencies among individual skills, experience, and methods and organizational or community cultures, structures, and processes (Blomkamp,

2022; Howlett, 2014; Thomas 2020). The intertwining of these two individual and organizational perspectives leads to the design of policies that are more effective.

The set of services offered within an NSDS must serve the full spectrum of problems that range from those where there is full agreement on values and there is no uncertainty regarding the knowledge needed to solve them to the messy, wicked problems that lack agreement on motivations and values and there is uncertainty regarding the knowledge and technology for solving them.

2.3.1 Role of Data

The National Secure Data Service has a coordination and service role within the federal data ecosystem. In the context of federal policymaking, its services can include help with navigating the ecosystem; serving as a clearing house for information, research other materials regarding the sources and use of data and evidence for multiple research, decision and policymaking purposes; providing training for potential users of the federal data ecosystem; identifying sources, expertise, and experts to assist users develop a nuanced understanding and utility of the federal data ecosystem; and other assistance which goes beyond the common misconception that data are sufficient for policymaking (Esty and Rushing 2007). Data are often thought of as objective, value free measures of facts, which when made available to a policymaker, speak for themselves.

Data do not speak

In a paper read before the 41st annual meeting of the American Historical Association in 1926, Carl Becker wrote that "I wish to inquire whether the historical fact is really as hard and stable as it is often supposed to be" (1955:328). He proceeded to ask three seemingly simple questions: "(1) What is the historical fact? (2) Where is the historical fact? (3) When is the historical fact?" (Becker, 1955:328). He noted that every generation observes the same data on historical events but interprets them in a different way. He concluded that "one of the fondest illusions of nineteenth century historians was that the historian, the 'scientific' historian, would do just that: he would 'present all the facts and let them speak for themselves'" (Becker, 1955:334). Just as with Becker's historical fact, data do not speak for themselves. In fact, data do not speak at all (Weinberger, 2012).

Data technology and improving access

The NSDS technology used in data-based decision making is an important consideration in building an infrastructure for decision making. Originally, data for agencies was provided to analysts through CD-ROM or other hardware, often requiring significant paperwork and auditing to ensure the media were secure. The NSF files, such as the SDR or SED, were restricted to access using these mechanisms, just as research specific data files such as the NLS (National Longitudinal Surveys)

from the Bureau of Labor Statistics were offered to researchers. Many systems moved in the 2010s to dissemination of a public use file via a web download (such as the NLS) or maintenance of the data behind a secure data enclave such as NORC. In more recent years in response to the NSDS pilot, agencies have moved to a single access point for data governance, America's Shared Data Hub or data.gov for public use files, and the research.data.gov site for application to analyse restricted use data. This change in the storage and access to data is designed both to increase transparency of government data, and also to ensure that applications to use secure data are happening in standardized environments that maintain the integrity of the systems (Lane, 2020).

Technology also depends on an evolving system of privacy protections for data systems. Most broadly there has been practical changes in the privacy protections for government statistics. In a 2014 book, Lane, Stodden, Bender & Nissenbaum describe how big data challenges the ability to maintain confidentiality and requires additional rules to ensure consent is in place. While we all gain from the ability to link data, for example to ensure individuals are able to access services they are eligible for, on the other hand the increase in analytical capacity also means that individual identify is more difficult to secure. In response to this potential erosion of privacy, data providers in government have adopted different strategies. For example, many agencies have experimented with increasing use of aggregate files which do not include individual level data (indeed the National Center for Science and Engineering Statistics (NCSES) has done this extensively). Other agencies have worked to increase the use of restricted data through Census RDC (Research Data Centers). Thirdly, a number of agencies have worked to increase access to microdata through mechanisms such as the Coleridge Initiative's Administrative Data Research Facility (ADRF), which offers FedRAMP (Federal Risk and Authorization Management Program) compliant data access through a secure enclave outside of the RDC system.

Data and knowledge management

Although the NSDS will not serve as a data repository, the role of data in the policy process is important to consider. Many of the NSDS-D projects funded until now have focused on the technical aspects of the socio-technical system that that facilitate the access to, and use of data housed across the federal data system to meet the expectation of federal legislation. It is the role of agencies and other federal data providers to assure the quality of the data they make available. The literature on knowledge management makes distinctions among data, information, knowledge, and wisdom. These distinctions are useful for informing the data concierge framework to support the work of federal policymakers. (Nonaka and Takeuchi,1995; Zeleny, 1987).

The knowledge management, **DIKW,** pyramid offers a way to think about the transformation of data into wisdom or evidence. In this framework, **D**ata must be structured or given form to produce **I**nformation, which when contextualized yields **K**nowledge. **W**isdom is attained when the person understands the value of the knowledge for making wise decisions. It is worth noting that the data in the federal data ecosystem are structured and therefore constitute information in the context of the DKIW hierarchy. This information must be summarized, analyzed, synthesized, and interpreted to produce knowledge which when embedded within a value structure yields wisdom. Thus, in the context of evidence-based policymaking, evidence, as wisdom, informs policy making not data in their raw form (Ackoff, 1989, Cleveland, 1982; Davenport and Prusak,1998; Nonaka and Takeuchi,1995). NSDS, as a suite of services has a much broader role within which specific features for the Data Concierge Service could be considered to assist the policy analysts and policy evaluators make sense of the available information in the context of their problem as formulated by the policymaker or influencer. The task of the policy analyst and evaluator in support of evidence-based policymaking is to obtain the relevant evidence to help the policymakers or influencers make the case for their policy positions based on the available evidence.

2.3.2 Inference

The strongest form of evidence for evidence-based policymaking is that which links a specific cause to an outcome. The literature on causes and explanation offers valuable insights regarding the value of information as the evidentiary basis for a decision or a policy claim. Data are useful for description, they can perhaps enhance understanding, but by themselves they do not offer explanation. An explanation requires the ability to infer something from the data that can eventually lead to a decision or action.

Statistical inference

Until recently, in the social sciences, statistics has had a virtual mono-method monopoly for the analysis of numerical information. In addition to providing advice on data collection (for example, sampling methods) the role of statistics is to summarize data and to seek patterns. In this context, statistical inference serves two purposes: (1) it generates estimates (for example, mean, variance, regression coefficients) and (2) it tests hypotheses (for example, two data samples come from the same population, the observed data pattern is due to chance). The notion of 'correlation is not causation' is so deeply ingrained in statistical sensemaking that statistics has nothing to say about the causal significance of a statistically significant result or the interpretation and sense-making of statistical results (Silvey, 1970). Statistical inference stops at saying that there is a relationship among certain variables, it does not tell us why the relationship exists. For example, the question of why there is a statistically significant relationship between say, an illness and its cause has long been believed to be unanswerable by statistical inference (Fisher 1958).

Causal inference

The reluctance to go beyond the data, most famously perhaps in the case of smoking and lung cancer (Fisher 1958, Stolley 1991) is perhaps unnecessary given the existence of statistical methods and constructs developed over the last century. In 1763 Reverend Thomas Bayes had discussed conditional probabilities and made progress towards addressing the complexities of policy problems (Bayes, Rice, 1763). Almost a century and a half later, Sewall Wright (1920, 1921, 1923) laid the foundations of path analysis and structural equation modelling (SEM). These developments, taken together with counterfactual thinking, mediating and moderating variables, and causal modelling lead to evidence as justification for belief (Pearl and Mackenzie 2018). Thus, causal inference, which is a necessary aspect of linking data to evidence is feasible in light of these statistical constructs and methods taken together.

2.3.3 Evidence

Unfortunately, there is no consensus in the scientific literature about what constitutes evidence in support of a hypothesis (Achinstein, 2010). Defining evidence by *a priori* reasoning does not work. Because of the complexities of the causal chains in public policy, it is easy to find examples of situations where it is difficult to assess what constitutes evidence for a policy decision or action. Consider poverty, which is often associated with joblessness. However, although the probability of being poor is higher if a person does not have a job, that is,

$$P(\text{poor} \mid \text{no job}) > P(\text{poor})$$

joblessness is neither necessary nor sufficient as evidence of poverty.

Evidence is problem specific

As illustrated by the example of the public policy efforts to protect the elderly from the uncertainties and vagaries of life, the question of welfare of the elderly has been reframed and addressed by legislative action in the US several times over the last century. With each reframing and reformulation of welfare of the elderly as an addressable problem, the evidence needs and the policy arguments supporting the legislation and its eventual implementation have changed. So, although the data sources (Bureau of the Census, the Bureau of Economic Analysis, National Center for Health Statistics) and the types of data (demographic, economic, health) have remained consistent, the evidence garnered to support the different arguments for policy change and policy outcomes has been different in each formulation of problem of the welfare of the elderly.

Evidence is value laden

Evidence and data are different in that data are found and are value free, whereas evidence is inferred and is value laden. As noted above, wisdom in the knowledge management DIKW pyramid is tantamount to evidence in the context of evidence-based policymaking (Ackoff, 1989). Information must be accompanied by an explanation (causal inference) to obtain evidence (Pearl and Mackenzie 2018). For a change to be considered desirable, there must be value laden evidence that demonstrates that the outcome of a change due to a policy action resulted in a preferred state compared to the current state.

Evidence is context dependent

A well-known observation in international development organizations such as US Agency for International Development or the World Bank or the Inter-American Development Bank is that evidence of what works in one country is not transferable to other countries because of a host of factors such as culture, traditions, attitudes, and path dependencies. Within the US, the Centers for Disease Control has explored whether successful healthcare strategies in one state are transferable to other parts of the country. The consensus is that evidence for policymaking does not travel well across space and time.

2.3.4 The Logic of Policy Claims

For there to be evidence-based policymaking there is one more step in the policy cycle and that is the link between evidence and a policy claim. It is important to understand that the same evidence can support multiple policy claims and counter claims. A role of the policymaker or policy influencer is to take the evidence and to interpret it within a specific value system with an internally consistent set of assumptions that can be used to make arguments for policy claims and specific policies. In a democracy, it is the role of the political process to arrive at a synthesis or compromise that is acceptable to a majority of the stakeholders to take the resulting policy and implement it in the form of policy action (Fang, Wang, and He, 2020).

Decision-making informed by evidence

Although it may not be possible to *a priori* claim something as evidence to conclusively justify a belief or to seamlessly transfer what has been found to work in one context to a different context, all is not lost. It is possible for policy inquiry to produce evidence to inform and influence, not *determine,* policy decisions and actions. Effective policy decision making is based on evidence embedded in an argument that connects the evidence to decision and action claims necessary to address the policy issue.

The first step is to recast the role of the policy analyst. The policy analyst is not a mere technician, producing objective knowledge in a value-free environment. According to Majone (1989), policy inquiry is conducted by someone who is a

> *producer of policy arguments, more similar to a lawyer – a specialist in legal arguments – than to an engineer or a scientist. His basic skills are not algorithmical but argumentative: the ability to probe assumptions critically, to produce and evaluate evidence, to keep many threads in hand, to draw for an argument from many disparate sources, to communicate effectively. He recognizes that to say anything of importance in public policy requires value judgments, which must be explained and justified and is willing to apply his skills to any topic relevant to public discussion. (1989:21-22)*

Policy Argumentation

Policy arguments are how policy debates are conducted (Dunn, 1981; Fischer, and Forester, 1993). Arguments and argumentation are based on an informal logic of reasoning, which provides a framework for the critical evaluation of individual worldviews as well as claims made by those making the arguments (Toulmin, 1958).

Toulmin's (1958) theory of *argumentation* is an alternative to formal syllogistic logic. A syllogism is simply a logical set of premises that lead to a logical conclusion, but it never asks 'how' or 'why' and, therefore, it does not advance knowledge. In Toulmin's view, people do not communicate in syllogisms. He developed the theory of argumentation to explain how an argument occurs in the natural process of everyday life and as a method for gaining knowledge.

Policy arguments advance reasoned claims using the following six elements (adapted from Dunn, 1981:41-42). Although argumentation is presented here is a six-step linear process, it is, in fact a complicated dynamic process with feedback. This process also suggests a role for AI in the NSDS Concierge Service in mediating the creation of evidence from information.

1. ***Policy Relevant evidence***: Policy relevant evidence serves as the basis for policy arguments. It comes in many forms. For instance, outcomes of forest management policy analysis might be expressed (1) in the form of a statistical generalization: Results of firefighting experiments show that creating gaps in the forest is more effective than attempting to fight fires without such breaks; (2) as the conclusion of experts: The panel of experts reports aggressive firefighting resulted in fires that burned with greater intensity and caused more damage than if small fires had been allowed to burn through; or (3) a value or need: Logging, if properly done, contributes to both the economic vitality of a community and controlling forest fires. Policy relevant evidence, when used in an argument, becomes the basis of the evidentiary claims in the context of the policy issues.

2. ***Claim***: A claim is the final product of an argument. Various types of claims, such as claims about values or about which actions to take or policies to pursue, can result from arguments. Claims are typically subject to disagreement or conflict among different segments of the community. For example, the advocative claim that the Forest Service should invest in protecting endangered species may not be a value shared by all stakeholders. The argument provides a logical link, usually in the form of a "therefore," between relevant evidence and the ensuing claim. So, if we value biological diversity or we have evidence demonstrating that the spotted owl is in danger of extinction, then it follows that (therefore) the government must protect the owl in some fashion. Hence policy claims are the logical consequence of policy relevant evidence.
3. ***Warrant***: A warrant is a conceptual link between policy relevant evidence and a policy claim. It is a reason for accepting the claim. A warrant may be an assumption regarding causes, values, or simply pragmatism. For example, a warrant for the claim that the Forest Service must fight forest fires might be expressed as simply as "life and property must be protected."
4. ***Backing***: If the warrant is not accepted at face value, then backing provides support through additional assumptions or arguments. The backing for warrants could be in the form of evidence, principles, expert knowledge, or appeals to ethical or moral consideration.
5. ***Rebuttal***: A rebuttal is a second conclusion, assumption, or argument that states that the conditions under which an original claim is unacceptable or under which it may be accepted only with qualifications. Taken together, policy claims and rebuttals form the substance of policy disagreements among different segments of the community about alternative courses of government action. The consideration of rebuttals helps the analyst anticipate objections and serves as a systematic means for criticizing one's own claims, assumptions, and arguments.
6. ***Qualifier***: Often expressed in probabilistic terms, a qualifier expresses the degree to which the analyst is certain about a policy claim. Qualifiers are only necessary when there is uncertainty about a claim, in which case the level of certainty is expressed as a probability, such as "95 percent level of confidence."

Effective policymaking uses evidence embedded in an argument that connects the evidence to the policy and action claims necessary to address the policy issue. All empirical research rests upon some conceptual understanding of the issues, causal explanations, and evidence on which to base the claims. What is perhaps different about this claim is that it formalizes the need for the careful development of arguments supported by evidence for evidence-based policymaking. These steps point to the range of policy specific knowledge and skills needed by all policy stakeholders, but in particular for policy analysts and advisors.

2.4 Implications for the Concierge Service

In this context the proposed NSDS Concierge Service takes on an added importance because of its role in making NSDS easier to access and use for policy analysis and policymaking. It is also clear that simply making the information easily available is not sufficient. The literature suggests several roles that such a service can play. Although the primary focus of this research project is on the identification of Concierge Service for use by federal policymakers, this study also may include additional solution features that support the use of the NSDS shared service platform for policy purposes by policymakers,

The push for use of evidence in the development and evaluation of public policies is not unique to the US, and the global scholarly and practice literatures have insights that are of relevance to the design of a Concierge Service. Of note is the role AI can play in this context (Adams, 2004; Béland and Cox, 2024; Bell, 2004; OMB, 2024; Parsons, 2004; O'Toole, Turbes, Freeman, 2024; Salaha, Halbusib and Abdelfattahc, 2023).

2.4.1 Complementary data sources

It is important for federal policymaking is to have an understanding of non-federal databases, other publicly available data, and proprietary databases. For example, education and workforce data are two instances of federal data that have complementary, perhaps more detailed state-level data, that would provide valuable context and evidence for federal policymaking (Hawley, 2020). Thus, an added feature of the Concierge Service that would be "nice-to-have" is the identification other data and data sources that historically have been used in conjunction with federal data by policymakers, analysts, and researchers.

A service that the Concierge Service could provide is access to meta data dictionaries that could identify other associated and complementary data that could be used. Such information could be provided in real time using AI and a query system that could suggest and guide the user through a variety of additional data and data sources, including proprietary databases.

2.4.2 Clearinghouse

The potential meta data dictionary also suggests the need for examples of when, where, and how a database has been used in other policy relevant contexts. A common approach to meeting such need is to create a clearinghouse of examples of the use of the evidence. However, that is not a trivial undertaking, because it requires subject matter expertise and knowledge of the policy context. Here again, AI can be of value in developing good systematic reviews of the literature to produce syntheses as a quick introduction to the specific subject matter to assist a general policy analyst. (Oliver, Harden, Rees, Shepherd, Brunton, Garcia, & Oakley, 2005; Sutherland and Wordley, 2018)

2.4.3 Role of AI

Although AI, as a technology, has been around for decades, access to it has been limited to experts. The ease of access that today's, quickly improving, AI user interface tools allow is becoming comparable to a policymaker engaging with a well-informed policy analyst. As indicated by the policy analysis literature, information is not ready as an input in the policymaking process. An AI assisted Concierge Service can play an important role in making a future NSDS, readily accessible by non-technically oriented policy analysts and policymakers and influencers. It is important to keep the NSDS neutral and to not offer interpretation or policy recommendations. As planned, NSDS 1.0 will only assist in identifying and accessing official statistics from statistical agencies through the use of an AI chatbot. However, several intriguing additional possibilities to consider in the future for the use of AI follow below.

As noted above, AI can help identify the types of evidence necessary to make policy claims. AI trained with examples of the use of the NSDS information can be used to identify data that commonly co-occur in analyses with the information sought by the policymaker or analyst. Noting that the same evidence can support multiple claims depending upon the nature of the assumptions, having access to information use in different contexts, especially with examples of their use can help analysts generate evidence for their policy arguments. Such assistance, further augmented by AI, can potentially reduce the need for subject matter experts in simple policy situations.

If and when administrative data from the federal agencies that are the source of the NSDS information are also available, they will provide the rich administrative and policy context of the agency, enhancing the value of the Concierge Service.

2.4.4 Technical training for NSDS users

The focus of the Concierge Service is meeting the information needs of the users, helping them navigate the sea of publicly available data of various types, collected using a variety of tools and methods, stored in systems of different ages, using designs and protocols that were probably the state-of-the-art at the time the system was created but are now obsolete, with their own maintenance calendars and updating procedures, in multiple formats with custom designed retrieval systems. In brief, the current public data systems include a wide array of databases that were not designed to facilitate collective use across databases or by users with varying levels of knowledge and skill in extracting and using the information. In spite of the current lack of interoperability across these databases, a fully functional NSDS will meet the majority of the needs of its users.

A future NSDS already has use cases demonstrating the feasibility of bringing different databases online for users to temporarily link the databases to provide access to the information users need. With the development of user-friendly interfaces, the need for customized data integration and task specific instructions for each user request will also be reduced.

2.4.5 A Capacity Building Center

There is another need that could be satisfied, which is policy analysis capacity building specific to NSDS. Washington (2022:283) writes "framing of policy capability as an infrastructure broadens the definition of policy capability from a narrow focus on people and skills to a systemic approach that includes the range of systems and processes that enable and support good government decision-making." And further "argues that the policy capability infrastructure could serve as a useful and generic analytical framework for describing, assessing, and improving policy capability in teams, organizations, or across an entire public service."

This capacity building entity is already included the vision for the NSDS and could serve as a resource for training and as a clearing house for information, white papers, blogs, scholarly research, and other materials, which would help individuals learn about the capabilities of an NSDS and its use for purposes other than to support the policy life cycle. There is a parallel for such capacity building infrastructure in the design of the national Safeguarding the Entire Community of the U.S. Research Ecosystem (SECURE) Center. This Center, funded by NSF, has a narrower mission, but its support for evidence use is similar in many aspects to the role of the future NSDS in that it "will empower the U.S. research community to address critical issues of research security and integrity."[18]

2.4.6 Training literature

As the literature suggests, although evidence-based policymaking might be a new framing of systematic and rigorous policy analysis, the use of evidence in public policymaking is not a novel phenomenon nor is educating individuals about policymaking, the policy process, and policy analysis. In addition to academic programs and courses in public administration, public management, public policy, and public policy analysis that exist in various universities around the world[19] the literature mentions several models for non-degree-oriented training activity for analysts involved in supporting policymakers and policymaking.

Useful input for the design and creation of services and infrastructure to support skill development can be found in the policy literature that focuses on the training of policy leaders and analysts. Gluckman (2004), New Zealand's chief science advisor, offers ten principles for building trust, influence, engagement, and independence by the policymaking community. Parsons (2004) discusses the theory and practice of building policy in his theory-oriented discussion of the relationship between knowledge and policymaking. Governments regularly publish materials that provide guidance on how to implement policies, for instance, the UK government publication, the *Magenta Book*, "is written for the policy, delivery, and analytical professions, all of which are responsible for securing and using good evidence." It has an excellent

[18] https://www.hcde.washington.edu/news/article/2024-07-24/nsf-secure

[19] Network of Schools of Public Policy, Affairs, and Administration https://www.naspaa.org/

section introducing the value of complexity theory and systems thinking in policymaking, analysis, and evaluation, which are all useful topics to be considered in the design of capability building for a future NSDS. Podger (2004) the Australian Public Service Commissioner announced the creation of "a series of capability development guides, which will include a profile of each person's level and the next level, and tools to help them assess their capability level and produce a development plan."

2.4.7 In-house Training

The recently formed SECURE Center[20] at the University of Washington has plans to develop a training unit, which could offer some lessons that an NSDS could draw upon.

In-house training can range from passive offerings such as a repository of education tools and resources to curated webinars, presentations, and discussions maintained in an online library for NSDS users to develop their skills at their own pace.

2.4.8 Certification and ad hoc Training

Several professional associations and societies provide training and education resources for their members and others interested in the subject matter, which can serve as good models and examples of capacity building that an NSDS could emulate. Perhaps closest to the needs of the future NSDS are the America Evaluation Association's (AEA) programs[21] which provide a variety of options ranging from workshops aligned with their annual conference to online coursework and webinars. Every year, their Summer Evaluation Institute offers workshops on a core set and new evaluation topics. The National Center for Science and Engineering Statistics (NCSES) could offer such training by drawing upon its staff and researchers who have been funded by the NSDS-D.

2.4.9 Role of AI

According to Laswell (1971) there are two aspects to the policy sciences: (1) knowledge **of** the policy process and (2) the relevance of knowledge **in** the policy process. Policy analysts know the policy process, what they do not know for each policy question is the relevance of specific knowledge in the process. That is an area where AI is ideally suited to assist. It can help clarify policy objectives and then assist in identifying the knowledge necessary for policy design.

2.4.10 Role of Simulation

Policy argumentation allows policymakers to test their assumptions, evidentiary claims, and the logic they use to link the evidence to the policy claims. Such examination is possible if the problem is simple, but policy problems are rarely that.

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[20] Safeguarding the Entire Community in the U.S. Research Ecosystem https://www.securecenter.uw.edu/

[21] https://www.eval.org/Education-Programs

Computer simulation as an analytical method, allows the analyst to model complex policies and system interactions and interdependencies in a systematic and rigorous fashion. Modelling the system makes all the underlying assumptions and relationships explicit and transparent to the user (Scherer, Sabrina; Wimmer, Maria A.; Markisic, Suvad, 2013). Such modelling and analytical capability within the Capacity Building Center could be used to train analysts and allow them to test assumptions, examine relationships and interdependencies and explore the consequences of policy actions without having to wait for the policies to be implemented and tested in practice (Desai, 2011; Ghaffarzadegan, Hawley, and Desai, 2014; Gilbert, 2008; Scherer, Wimmer, Lotzmann, Moss, and Pinotti, 2015; Yücel, and van Daalen 2009).

Thus, simulations can be used to explore different policy characteristics, assumptions, parameters, and options as well as to learn about consequences of exercising different policy options from that exploration. This dual capability makes simulation a powerful tool for capacity building.

2.5 Conclusions from the literature

There are three major takeaways from this examination of the policy literature that are relevant for a future NSDS (NSDS 1.0) and the design of its services and tools, including the Data Concierge Service and the Capacity Building Center.

First, it is the role of policymakers and influencers to make sense of the unstructured policy dilemma and formulate it as a policy problem that lends itself to analysis and an approach for analysts and evaluators to pursue in a systematic and rigorous fashion.

Second, given that the proposed NSDS could include a suite of services an early decision about the nature of these services that would have to be addressed is the level of customization of the services to meet users' needs. While assistance in navigating the federal data ecosystem could be considered a basic service, helping the user make sense of the information that is potentially available from the federal data ecosystem would be a major undertaking. A possible service, in this context, could be to help identify and provide access to expertise, expert knowledge, and experts that could help users make sense of the information and help them understand the nature of the evidence that can be obtained from the information in the federal data ecosystem. However, such a service with access to experts could be prohibitively resource intensive.

A possible, relatively inexpensive, alternative could be AI-assisted systematic reviews of the scholarly and grey literatures. References to recent work, especially preprints and working papers could identify subject matter experts in the relevant policy area.

Third, the role of policy analysts or evaluators, in collaboration with the policymaker and the influencer is to make an argument to support the policy

claims they wish to promote. In this context, the purpose of the Concierge Service is to assist in the transformation of information into evidence.

3. Stakeholder Engagement Plan

As mentioned in the Introduction, this document is central to the execution of this project. It is here where we establish how and where the information about the NSDS technical and social sub-systems (for example, technology, tasks, structures, and people) interact in ways that contribute to NSDS challenges and optimization. We need to be able to determine who among policy stakeholders have the (1) will, capacity and agency support to participate as co-researchers and/or research subjects and (2) interest and influence to act as champions for the Concierge Service framework recommendations derived from the findings of this research.

The Stakeholder Engagement Plan has four components:

1. **Stakeholder Analysis.** Defines policy stakeholder types for the project and maps (Figure 2) their relative level of interest and influence in the outcomes of this project. This component provides an input to selection of co-researchers and research subjects as well as informing an initial approach to strategic communication about the research and its results.
2. **Stakeholder Participation.** Describes the ways that the level of interest and influence among policy stakeholders will inform their participation in the project. Participation opportunities include the: 1) co-researcher role, (2) service as User Research subjects, and (3) attending the Human Centered Design sessions. Each of these participation opportunities will be described below.
3. **Stakeholder Communication.** Describes the information needs, communication modalities, and frequency of updates for each policy stakeholder type by their level of interest and influence. This information will be used later to develop a strategic communication plan for securing support for Concierge Service suite of tools and resources that emerge from the HCD process as the highest priority solutions to the highest priority challenges identified by policy stakeholders.
4. **Timeline.** Describes the main sequence of stakeholder engagement activities.

3.1 Stakeholder Analysis

3.1.1 Purpose

Stakeholder analysis is the first component of our approach to stakeholder engagement. The purpose of the stakeholder analysis is to inform the development of two of the required deliverables: the *Stakeholder Engagement Plan* and the *Strategic Communication Plan*.

3.1.2 Scope

This study is limited to the US Federal policymaking ecosystem with a focus on agency capacity and experience in responding to the Evidence Act of 2018; however, there is substantial heterogeneity in the attitudes, knowledge, skills, and behaviors among policy stakeholder roles that may influence the degree to which each stakeholder supports, accesses, and uses NSDS as intended (Phillips, 2000). Stakeholder analysis at the outset of the study enables us to begin to identify the characteristics and preferences needed to create personas that represent the spectrum of potential NSDS users and champions[22].

Stakeholder Categories[23] The stakeholders who will be engaged in this effort either by participating directly in study activities or serving as the audiences for targeted communication are described below:

Policymakers Individuals at the highest levels of agency decision making on substantive policy topics of Congressional interest (for example, Advisory Board and Committee members, Senior Leadership, Chief Data Officer (CDO), Chief Evaluation Officer (CEO) and Chief Statistical Official (CSO)[24].

Policy Analysts Agency analysts and other staff providing various types of data to meet the evidence needs of policymakers on substantive topics of Congressional interest.

Policy Influencers Individuals outside the agency who engage in policy education and other activities related to substantive agency policy direction of Congressional interest.

Policy Evaluators Agency and government-wide staff with responsibilities for determining and/or providing evaluative evidence on the efficiency and effectiveness of agency Federal policies and programs.

Policy Community Broad set of individuals from across the policymaking ecosystem such as researchers, agency grantees, agency program beneficiaries and others that contribute to and are affected by Federal policies and programs.

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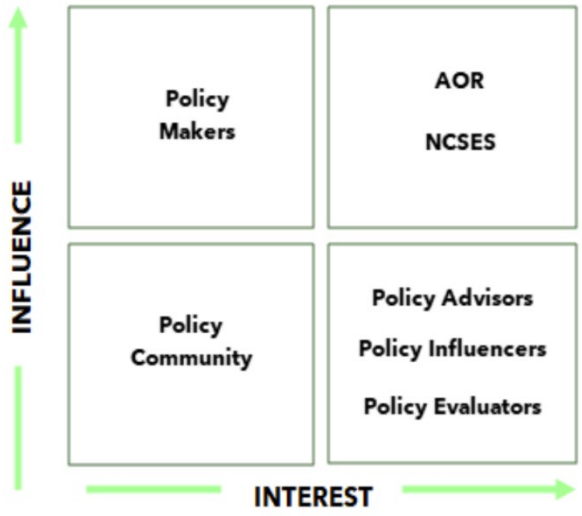
[22] The characteristics of NSDS users and champions will be revised based on stakeholder input and used to create Personas, as results of User Research becomes available.

[23] The first four categories were named in the RFS. The fifth was added by the study team. A common or consistently cited listing, definition, and description of the policy stakeholder categories was not readily available in the materials included in the Literature Review. One of the objectives for the first HCD session is to refine the policy stakeholder list and definitions presented here.

[24] Access to these individuals may be limited by availability and/or advice of AOR. Use of data from sources outside those already available for statistical purposes is also excluded.

3.1.3 Stakeholder Interest and Influence

Figure 2 below, maps our initial assumptions about how the level of interest and influence among the key NSDS Federal policy stakeholder user groups[25] can be used to select study participants and shape communication.



Level of Interest Identifies Participants. The position of a stakeholder role on the horizontal axis represents our perception of their level of interest and involvement in the use of NSDS for Federal level policymaking. A high rating on this dimension identifies NSDS user categories we believe most likely to be willing and able to articulate their current needs and actively shape future expectations for the use of NSDS to inform federal policy.

Level of Influence Identifies Champions. The position of a stakeholder role on the vertical axis reflects our understanding of their level of influence on the adoption of this study's recommendations. A high rating on this dimension identifies those stakeholders who require focused communication and engagement in decision-making to assure alignment and support for study objectives.

Figure 2. Policy Stakeholder Interest and Influence.

3.1.4 Stakeholder Characteristics and Preferences

In addition to expected differences across policy stakeholder roles and agency specific contexts, it is important to use stakeholder analysis to identify other areas of potential variability that should be considered when developing a *Stakeholder Engagement Plan* or a *Strategic Communication Plan* for NSDS. Stakeholder characteristics and preferences, identified by the literature review as relevant to the study, will be used to: (1) purposefully select those research participants most likely to be agency thought leaders and able to provide the input needed to develop the user requirements for a NSDS Concierge Service and (2) tailor audience specific communication efforts to share study results and the framework in ways that contribute to the outcomes sought for this project. From our collective experience and the findings from the literature, the team posits a set of initial non-technical[26] user habits of mind and practice that may contribute to the creation of user personas and mapping of common user journeys stipulated as study outputs.

Habits of Mind. Describe the range of knowledge and experience where variability is likely to surface priorities for what the study needs to discover

[25] User Research will generate evidence to confirm or refute our initial categorization. Stakeholder interviews will include questions about interest and influence that will be included in the development of the four User Personas. In addition, the interviews will solicit nominations of stakeholders whose experience and perspectives could add value to subsequent Human Centered Design activities.

[26] Non-technical is defined in this study as the attributes of the people in the NSDS social sub-system.

about current and desired future "user" capabilities most useful to the design of a Concierge Service. These capabilities reflect the individual attitudes, knowledge, skill, and practices that contribute to an agency's evidence culture, namely, (1) the decision-making dynamics that influence the policy lifecycle (for example, values, complexity, conflict), (2) evidence building (for example, data selection, analysis, and interpretation, (3) evidence use (for example, claims, constructing effective arguments), and (4) time and resource availability to support utilization.

Habits of Practice. Describe the range in system interaction, products, and mechanisms that are deemed effective in supporting the use of NSDS information for policy use by policy stakeholders. These attributes are where observed variability is likely to show potential solutions to increase evidence use among policy stakeholders and shed light on tailored communication strategies. User preferences like these can identify priority areas with the potential to increase the will and capacity of policy stakeholders to envision opportunities where the NSDS Concierge Service supports measurable progress toward agency policy goals. The initial set of these characteristics, derived from the literature review, include (1) system interaction (for example, direct self-service, indirect assisted service), (2) product types (for example, data, data summaries and estimates produced from statistics, and analyzed data coupled with interpretation[27], (3) product delivery mechanisms (for example, web, email, live or remote presentation, degree of stakeholder engagement and interaction), and (4) degree of contextualization (for example, description of information sources and quality, population demographics, historical trends, appropriate use guidelines).

These lists of attributes are explanatory factors presented for illustrative purposes; they are not exhaustive. These factors relating to stakeholder contribution to agency evidence culture and stakeholder preferences for addressing evidence needs will be revised during the HCD process. Some attributes might emerge from the HCD process that are not yet in the literature.

3.2 Stakeholder Project Participation

There are four ways stakeholders have opportunity to participate in the project. Reiterating those named in the Introduction, these include: (1) the I3P, (2) User Research interview subjects, (3) Use Case participants, and (4) contributors to the HCD process.

[27] Products of this type include infographics, issue briefs, and detailed reports.

3.2.1 Insight, Interpretation, and Innovation Panel (I3P)

The I3P will serve as a technical work group (i.e., co-researchers) for the project and be involved with the Agreement Officer's Representative (AOR) and study team in planning, implementation, and reporting for the project. The I3P consists of policymakers, analysts, influencers, and evaluators. The I3P is in the process of being constituted with individuals across the National Science Foundation (NSF) and National Institutes of Health (NIH) (research funding policies); the Small Business Administration, Department of Commerce, Department of Justice (regulatory policies); US Agency for International Development (USAID) and the Corporation for National and Community Service (CNCS) (public good policies). In addition, representatives from other government agencies and non-governmental organizations will be nominated.

These panel members will bring their own diverse federal policy experiences and perspectives to enhance the insights we glean about the federal policymaking needs that will have to be met by the Concierge Service. If necessary, they will also be able to recommend other individuals who we might interview to gain additional insights regarding the framework for the Concierge Service to meet federal policymaker needs.

3.2.2 User Research Interviews

In addition to the participants from the I3P and the two use cases, other policy stakeholders will be nominated to participate in user research interviews. The selection of interview participants and development of interview processes will be informed by the literature review and input from the AOR and I3P. The insights gleaned from the interviews will serve as input (for example, personas and journey maps) into our HCD engagement with a broader group of stakeholders.

3.2.3 Use Cases

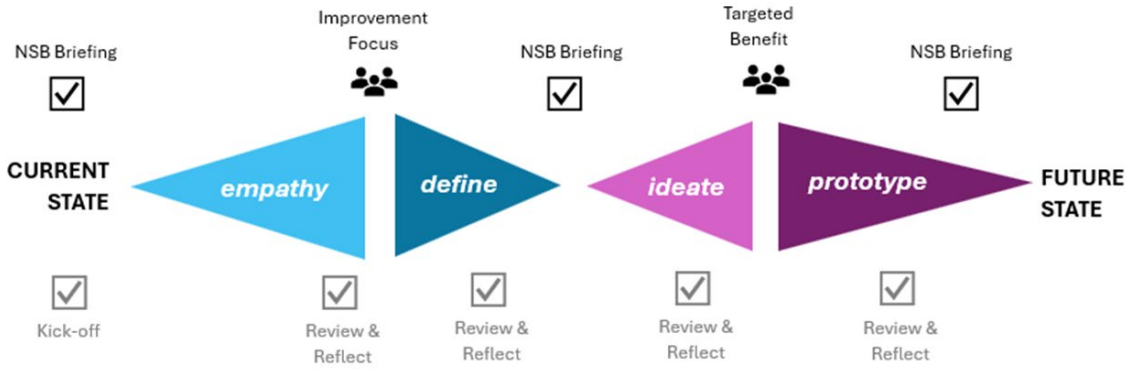
The focus of the use cases has been the National Science Board and their policy interests. It suffices to say that they represent a select type of policy concerns, focused primarily on science and technology research, education, and infrastructure policy. National Science Board (NSB) members and NSB Office (NSBO) staff began participating in the National Defense Education Act 2.0 use case in late 2024 and the *Talent is the Treasure*[28] use case engagement will begin in late Q1 2025 with a focus on specific workforce policy issues. The use cases are also a form of user research

[28] https://www.nsf.gov/nsb/publications/2024/2024_policy_brief.pdf

predicated on the role of NSB members as policymakers and NSBO staff as policy analysts. More information about the Use Cases is provided in Section 4.

3.2.4 HCD Process

HCD, as used in our project, is a problem-solving approach that uses the double diamond model of two cycles of convergent and divergent stakeholder engagement activities that result in innovative products that meet user needs (British Design Council, n.d.). There are four steps to the HCD[29] process that reflect the four phases of our service development project: (1) *empathy* creates personas and journey maps that illustrate the Current State of Evidence Use from the outputs of the Literature Review, the two Use Cases, and the User Research Interviews, (2) *define* presents the personas and journey maps for prioritization of the user capabilities and "pain points" most relevant to the challenges a Concierge Service might address, (3) *develop* engages stakeholders in brainstorming and prioritizing solutions with the potential to advance to (4) *deliver* where a prototype is developed for the highest priority solution recommended as a potential Concierge Service offering. Figure 3 illustrates how the HCD process drives our use-inspired research.



	PHASE 1	PHASE 2	PHASE 3	PHASE 4
HCD definition	Learn about users and their unmet needs	Create a point of view based on user needs and insight	Brainstorm and generate numerous creative solutions	Build a representation of the best solutions to share
PURPOSE	Conduct research to develop understanding of the characteristics of users and the influence of social and technical factors on decision-based evidence use	Facilitate stakeholder engagement in the prioritization of user characteristics and their interaction with the social and technical elements of system design to determine focus areas for improved decision support	Facilitate stakeholder engagement in idea generation to explore the findings from review of selected NDS reports to generate and prioritize ideas with potential policy stakeholder benefits	Produce recommendations for a framework, resources, and tools that could be communicated across the federal policy community and used to support further efforts to meet the evidence needs of federal policy stakeholders.

Figure 3. Schematic of Human Centered Design

[29] Although our approach to HCD was informed by process developed by IDEO (IDEO, n.d.) the application of HCD to our product development research was adapted from the Double Diamond (

4. NSB Use Cases

To better understand the current challenges faced by policy analysts to make sense of the complexities of producing evidence from NSDS information and to support making policy arguments we are developing two use cases. To do that, we engage with policy analysts using publicly available data and walk alongside them on a part of their journey to evidence generation using information to support the policy arguments by NSB for the National Defence Education Act (NDEA) 2.0. Learning firsthand about the experience of policy analysts generating evidence for policymaking is invaluable for understanding the types of needs a concierge service can address. This experience will help us understand not only the role of the Concierge Service but also provide insights into the types of capabilities of the analysts necessary to support policymaking.

4.1 National Defence Education Act 2.0

For the first use case regarding the National Defence Education Act 2.0 (NDEA) we have begun to collaborate, in an advisory capacity, with the National Science Board Office (NSBO) staff as they provide evidentiary and policy support for developing the National Science Board's input into the legislative discussion surrounding the NDEA 2.0. Lessons learned from this exercise will include the nature and scope of NSB's evidence needs that can be met by NSDS, which, in turn will inform our understanding of the potential demands placed by policymakers and their staff on the NSDS Concierge Service.

For the NDEA 2.0 use case we are walking alongside the policy analysts to understand their needs and the challenges and hurdles they encounter in seeking data and building supporting evidence for policymakers. The NSBO have limited their data search to publicly available federal data, that is, the type of data to be found through NSDS. Understanding the limits of available data and an appreciation for other types (administrative, blended) and sources (state level, proprietary, social media) of data that could be relevant for informing NDEA 2.0. Over the course of our discussions with NSBO, it is becoming clear that for policy analysts, knowledge of and access to other information is important for building evidence to address national policy issues.

A natural next step could be to determine to what extent should such knowledge be made available to the users of NSDS and whether the Concierge Service should provide information on adjacent, complementary, or other forms of relevant information and their sources as well as information on quality, timeliness, and other characteristics.

4.2 Talent is the Treasure

The second use case will focus on NSB's policy brief, *Talent is the Treasure*. We will conduct a desk review of materials used in the creation of that policy brief and, depending upon availability, meet with NSBO staff and others involved in the policy brief development to gain other perspectives on how data might be used to develop such briefs.

Although the *Talent is the Treasure* use case will also rely upon an examination of the same issues encountered by the policy analysts and policymakers in the NDEA 2.0 use case, it is different in that we will be examining a completed policy development task. The data for this use case will be obtained from the participants as they recount their experiences and through desk review.

Work on *Talent is the Treasure* use case will begin in the first quarter of 2025 after we have made sufficient progress on the NDEA 2.0 use case to inform the Human Centered Design engagement.

4.3 Building a Journey Map

We have begun to map the journey that the NSB Office staff have embarked upon in support of the creation of NSB's position paper for the National Defence Education Act 2.0. Formulation of the problem and NSB's position was articulated by the then Chair of the NSB in his testimony before Congress. In other words, the problem was formulated at a high level of generality in the testimony before Congress. The NSB with support from NSBO gave further clarity to the problem formulation, the analysis for which has thus far been limited to data available from publicly available sources.

Conversations with NSBO staff have included discussions about the need for seeking other data sources and data types to adequately address the policy questions the NSBO will encounter. Such discussions and the subsequent analytical tools and modelling necessary to analyze and interpret the data and build the evidence will be invaluable for our understanding of the nature and scope of the capabilities of the Concierge Service.

5. Next Steps and Timeline

All the stakeholder engagement activities will occur in consultation with and potential participation of the AOR.

1. Complete engagement with NSBO for the National Defense Education Act 2.0 use case in Spring 2025.
2. Introductory meeting of the constituted I3P in February 2025.

3. Start engagement with NSBO for the *Talent is the Treasure* use case in Q1 2025.
4. I3P (and other stakeholders) user research interviews in early 2025.
5. I3P (and other stakeholders) human centered design sessions in mid-2025.
6. I3P (and other stakeholders) review of Service Blueprint recommendations in Fall 2025.

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