IT MODERNIZATION
Centers of Excellence

HUD Data Analytics
Future State Report

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General Services Administration

Data Analytics — Center of Excellence

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Background

The Data Analytics Center of Excellence (Data CoE) at the General Services Administration (GSA) partnered with the Department of Housing and Urban Development (HUD) to assess HUD's analytical maturity and define strategies to transform the organization into a data driven, evidence-based policy making organization that will allow it to place information at the fingertips of its leaders, U.S. citizens and employees. Data Analytics CoE analyzed the organization using a three-pronged People-Process-Technology approach to understand how the data analytics are conducted and facilitated at an enterprise level. As a result, a theory of change model was developed encompassing data/business processes, tools and technology as well as resource empowerment, to create a holistic path to analytics maturity. This document details the findings, conclusions and the path forward for HUD to achieve this target state in a sustainable manner.

Organizational vision for data

HUD's core mission is to provide safe, decent, affordable housing for the American people while being a competent steward of taxpayer dollars. The Department is committed to evidence-based policymaking to implement cost-effective solutions that support the mission. To guide HUD policy in a changing environment, it is essential that the research function be strategic, systematic, and well-structured. To achieve this goal of "Reimagining The Way HUD Works", the organization must:

- **Empower the workforce:** enhance and communicate clear processes and procedures, empower employees with a self-service analytics environment, and equip managers with tools and training to be successful.
- **Strengthen fiscal responsibility and controls:** streamline and improve financial and grants management to reduce material audit weaknesses, increase transparency, and ensure strong stewardship of Federal resources.

Accomplishing this goal requires HUD to review its management of data and how it is being collected and used in decision making. For instance, to empower employees and provide them with the necessary tools and skills, an inventory of existing tools and skill sets must be correlated with organizational needs as well as employee information. Streamlining financial data and thereby reducing fraud, waste and abuse of taxpayer dollars requires a review of business processes, tools/techniques used as well as introduction of advanced analytics tools such as artificial intelligence and machine learning. Additionally, sustaining these advancements and moving toward a data driven future requires a foundational enterprise-wide data governance strategy. Finally, a team of dedicated technical experts and enterprise-wide data stewards led by a Chief Data Officer (CDO) should take ownership of driving and preserving the data analytics transformation throughout the organization.

Target State - HUD Analytics Modernization

Based on Data CoE findings, HUD is at the Descriptive Stage of analytics maturity. The technology infrastructure is available, albeit not easily accessible. Resources and skills are available basic reporting and generating reactive insights, but not used properly due to constraints such as incompatible systems and lack of empowerment. **Figure 5** portrays the overarching stages of analytics maturity, where HUD stands currently, and the core elements that define each stage, which will ultimately guide the transformation needed for HUD to mature into the Diagnostic Stage and beyond.

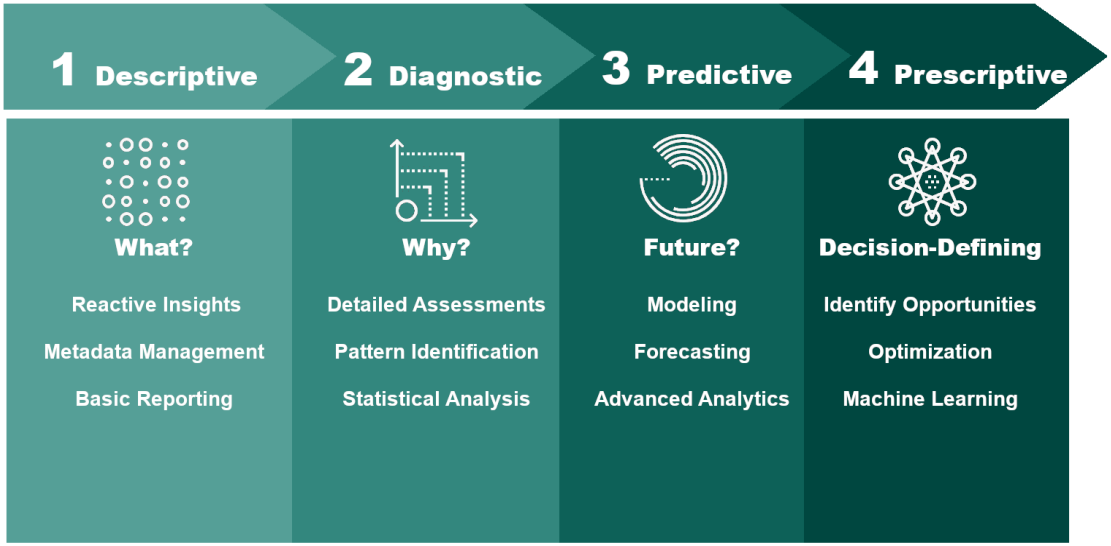

Figure 5. HUD Analytics Analytic Maturity Stages

As an organization progresses through each stage of analytic maturity, it becomes more capable of utilizing data to guide program and policy decisions. The stages listed in **Figure 5** signify the following capabilities:

1. **Descriptive:** an early stage of analytics maturity, managed data is used primarily to report on what is occurring at an organization and react to basic data trends.
2. **Diagnostic:** at this stage, enough data capabilities have been developed to drill down into historical and current data as well as identify trends to understand why the organization is seeing certain data patterns.
3. **Predictive:** this intermediate stage allows for the identification of data clustering, tendencies, and other indicators that allow for the forecasting of future outcomes. Early levels of advanced analytics are available such as predictive modeling.

4. **Prescriptive:** later stage analytics maturity provides the capability to build organization policies using various advanced analytics including machine learning and business rule modeling. Prescriptive stage organizations are heavily data-driven and utilize data to identify future opportunities.

To modernize HUD's analytics practices, a five-pronged approach is required that creates a foundational basis for analytics to take hold and sustain itself within the enterprise. The framework is described below (**Figure 6.** HUD Analytics Modernization Framework).

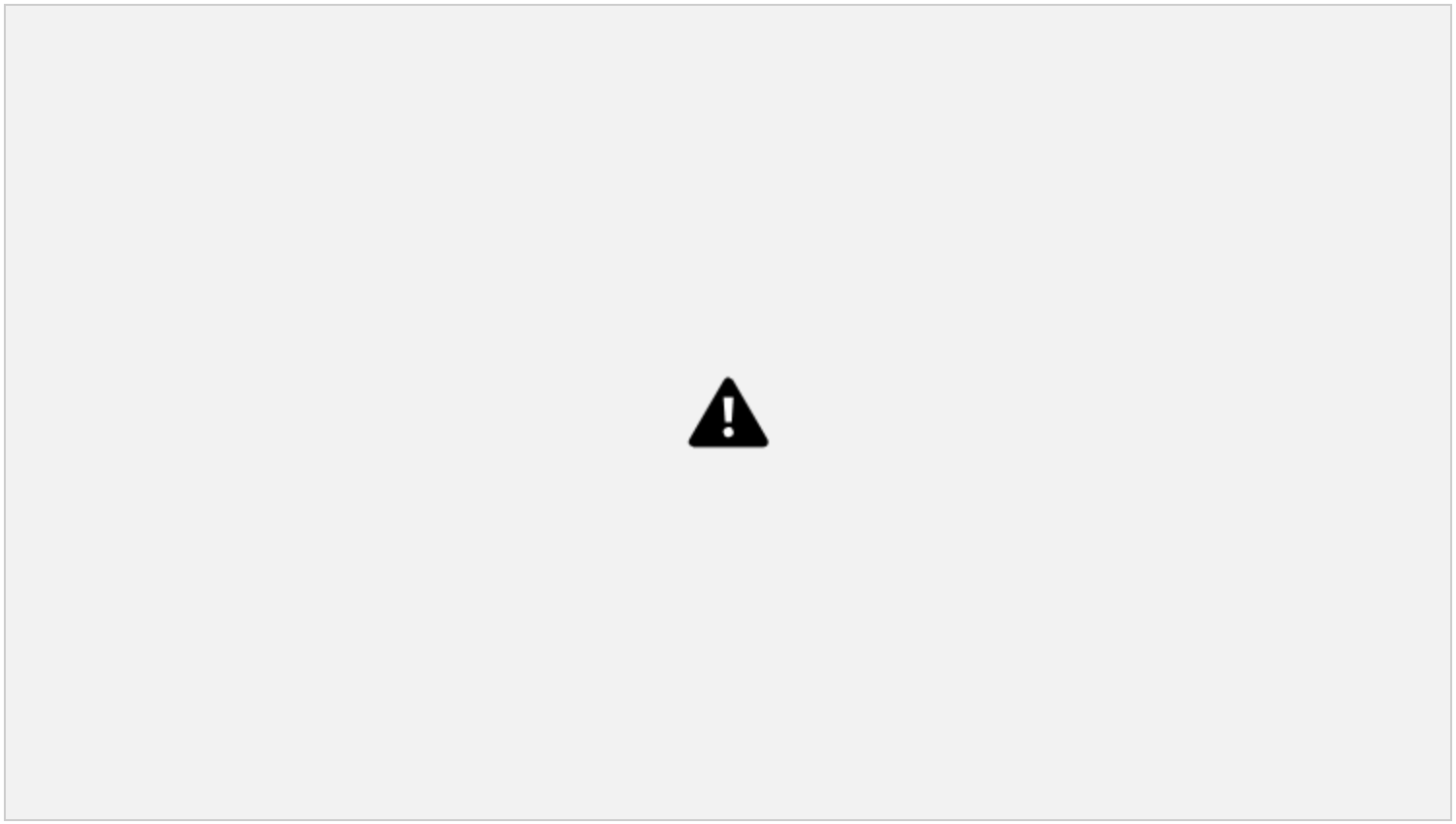

Figure 6. HUD Analytics Modernization Framework

Comprehensive, enterprise adoption of a modern, collaborative **Technical Infrastructure** will create an environment for enabling data systems integration, which will allow HUD to pursue analytics modernization. A clear, easily accessible process document must be made available to program offices to assess migration opportunities. If a migration is not

possible due to obsolescence, then the program office must be able to work representatives from OCIO to form a plan for a complete system overhaul/upgrade to a compatible, OCIO approved tool stack.

Enterprise-wide Data Governance will provide the foundation for data analytics to get established at a micro and macro level within the organization. Data governance strategies formalize processes, policies and procedures to ensure data integrity, availability and usability at an enterprise level. It creates a program-wide framework for data integration and institutes data standards to be promoted across HUD, allowing data to be used as an asset to aid decision making.

Advanced Analytics builds on the foundation established by technical infrastructure and data governance and enables the use of advanced tools such as predictive modeling, artificial intelligence and machine learning to transform decision making. It provides a scientific basis for reporting (e.g. risk scores for claims, invoices) and establishes an enterprise-level knowledge base for identifying and executing against opportunities with artificial intelligence, optical character recognition, and geospatial analytics. Advanced analytics can also be used in non-traditional areas such as human resources for predicting resourcing requirements during peak times to better align and prepare for trends in service requirements.

Data Visualization provides an interactive platform to share and disseminate information gathered through data analytics. It establishes end-to-end data flows within HUD, connecting program information to financial and human capital information, and enables enterprise-wide measuring of program effectiveness and outcomes. Data Visualization provides increased data transparency regarding services rendered to general public and maximizes opportunities for resource management efficiencies.

Finally, **Office of Chief Data Officer (OCDO)** empowers data stewards and uses enterprise data strategy to drive HUD towards an analytics self-service model, with the CDO as the integrator. The CDO will manage data as a strategic asset by setting data strategy, solidifying program-level data collection and processing standards, influencing data-related technologies, and improving data-driven decision-making capabilities. CDO serves as the glue between program areas, administrative offices, technology modernization activities, and external stakeholders. CDO and CIO will maintain evolving needs of the organization as new technology and processes emerge in the industry.

Roadmap to Target State

HUD's analytics modernization will be achieved in phases and will build upon the best practices that are currently in place at the organization. The details of those best practices and core activities undertaken in future Phases to reach the Diagnostic Stage and further modernize analytics are illustrated below.

Leveraging current best practices

To successfully integrate analytics best practices into HUD's future culture and infrastructure, it is important to understand what HUD is doing well currently. The following section describes HUD's successes in terms of analytics. (**Figure 7.** Leveraging HUD's best practices)

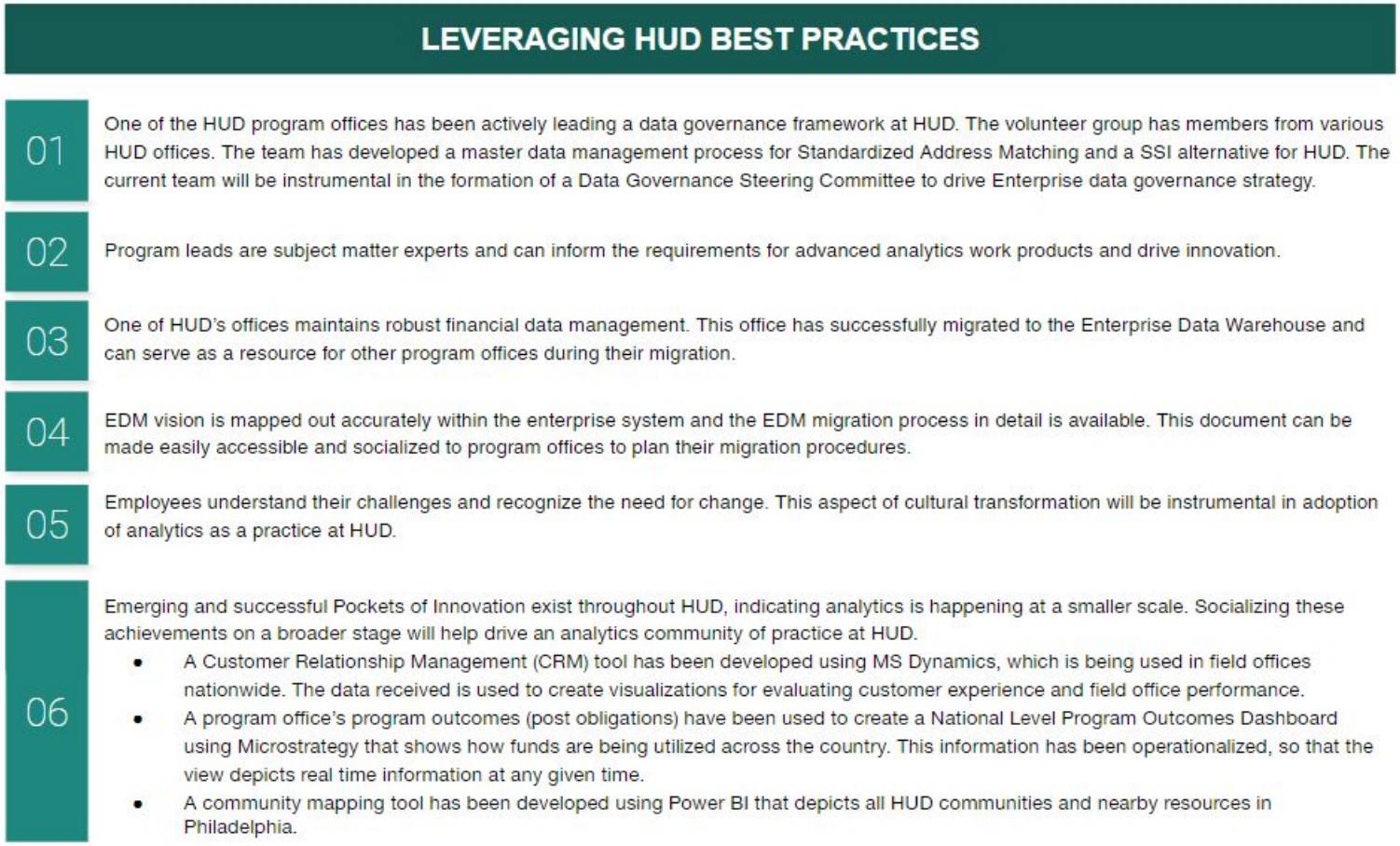

Figure 7. Leveraging HUD's best practices

Roadmap

In accordance with the five-pronged approach described in **Figure 5**, the roadmap below expresses the core activities the Data CoE will lead and support during Phase I C and Phase II of the engagement.

ROADMAP

	Phase I C	Phase II
OCDO	Support the identification of components and development of a Congressional submission package for OCDO establishment	Partner with HUD to support the Congressional review and approval process; collaborate with data governance units to establish base functionalities for an OCDO
Data Visualization	Develop requirements for financial dashboards and detail data flows; Leverage the prototype to drive requirements gathering	Implement requirements gathered with support from respective program offices; Operationalize prototypes with directly connected, live data feeds; Create documentation and training materials
Advanced Analytics	Validate and operationalize the claims audit prototype; Identify more use cases for additional application of AI/ML	Operationalize additional use cases; Incorporate machine learning components to train models and improve accuracy; Create documentation and training materials
Data Governance	Prioritize and support data governance roadmap tasks, including determining level of effort and resources required	Support HUD to institute data governance policies and practices, including: data quality and data certification policies, data asset catalog, and business glossary
Technical Infrastructure	Collaborate with OCIO to socialize the EDW system migration plan and assess gaps/deficiencies related to current migration efforts with respective Program Areas	Collaborate with OCIO to inform, implement, and train Program Offices on available analytics tools; Assist in the further development of EDM and community of practice for analytics

Figure 8. Five-Pronged Roadmap to Target State