

# State of North Dakota Longitudinal Data System Strategic Roadmap Executive Summary

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## 1.0 Executive Summary

Each biennium, North Dakota and its citizens invest billions of dollars across many state agencies to maintain and improve the quality of life for residents of the state. Each program operated by these agencies collects some type of performance data to measure short-term and medium-term outcomes. However, data collected within a program does not always provide a fuller picture of longer-term, or “longitudinal” outcomes, for how the program and its participants fared over time.

This report, the State of North Dakota Longitudinal Data System Strategic Roadmap, lays out the planning, development, and budget efforts that are required to realize a data repository that unifies key data from public PK-12, higher education, and workforce development initiatives and provides the analytical insight to better administer state services and foster economic development. The LDS Strategic Roadmap presented here is a product commissioned by the state’s Longitudinal Data System (LDS) Committee, which was formed in 2007 after interest in data warehousing was expressed by several state agencies.

### 1.1 Understanding Data Warehousing

The creation and adoption of a strategic roadmap for a state longitudinal data system (LDS) first requires an understanding of a LDS and its basic building blocks: data, data warehousing, and business intelligence tools.

*Data warehousing* is the logical and strategic ordering and storage of data into a central repository thereby allowing easy and intuitive analysis and reporting. Several steps are required for an entity, such as a state agency, to achieve a data warehouse. First, the agency must gather and integrate data from its multiple sources. Additionally, it must establish *data governance* including rules for reporting and processing data to enforce data quality over a period of time. Next, the agency can utilize the warehouse to effectively use data for planning, decision making, and program improvement. Data warehouses can store data over short or long periods of time and are scalable from an agency-based to a statewide system.

*Business intelligence tools* are software tools used in conjunction with databases to facilitate access to and analysis of data for informing a business or entity’s decision making. Typically, business intelligence tools are purchased in a bundle to provide a robust reporting environment with its own portal and administrative capabilities that may be used to manage data reporting.

A *state longitudinal data system* consists of a statewide data warehouse that allows program evaluation over single or multiple years. It integrates data from several state agencies for cross-agency analysis. Generally, an agency data warehouse includes all data relevant to the mission, programs and operations of an agency. However, a LDS that maximizes efficiency and performance only extracts and includes the portion of an agency’s stored data that is required for cross-agency analysis. A LDS applies a business intelligence tool on top of the data warehouse to provide authorized users direct access to analytical tools and data in one interface.

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## 1.2 Evaluating Program Outcomes Using Cross-Agency Data

The state LDS – a powerful combination of an easy-to-use business intelligence tool and a state data warehouse populated with select data from multiple agencies—empowers and enlightens state leaders by providing answers to questions that are essential for meeting North Dakota’s education and workforce goals. A few of these questions include

- How many students who graduated from a North Dakota school district needed to take remedial courses in reading, math or writing when they enrolled in North Dakota community colleges or North Dakota colleges and universities?
- Are students enrolled in college courses that lead to high demand occupations that are experiencing workforce shortages?
- How does student performance in college correlate with student performance on high school achievement tests, and/or earlier achievement tests?
- How well do workers in the university system Workforce Training Programs do in terms of employment and future earnings gains?
- How does student achievement in college programs correlate with workforce participation and workforce earnings?

## 1.3 LDS Roadmap Methodology

To construct the Longitudinal Data System (LDS) Strategic Roadmap, Claraview applied its Education Analytics Maturity Model (EAMM) as a framework to examine North Dakota’s current practices in data governance, data collection and sharing, and data analysis. Claraview developed the EAMM to aid states in planning and attaining an optimized longitudinal data system capable of leveraging data from multiple sources to benefit the state as a whole. It starts with a foundation of education data and grows to include data from other related agencies such as departments of labor, health, corrections, and human services.

First, the consultant team reviewed current reports and associated documentation provided by state agencies related to education and workforce. Next, the team interviewed state agency representatives to learn their current data practices and how they would ideally like to use data in the future. During these individual interviews with each agency, state staff indicated what data and infrastructure would be needed to achieve increased functionality and effectiveness as the state moves toward a shared LDS. The consultant team compared information from the current or ‘As Is’ description and the ideal future or ‘To Be’ picture to create a gap analysis identifying what changes are required to achieve a robust multi-agency state LDS that will assist state agencies in meeting North Dakota’s goals. The team then developed several solution options describing how to resolve the gap in data functionality and attain a state enterprise-wide education and workforce data system. Finally, the consultants provided cost estimates for each solution option based on Claraview’s experience delivering similar data warehousing solutions and by gathering quotes from product vendors.

## 1.4 Current Environment

North Dakota’s current data environment for its education and workforce efforts is driven by a need to collect and report specified data used to measure state agency program performance. Just as each agency has its own set of programs to administer, each program has its own set of state



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or federally required performance measures. The dynamics of multiple education and workforce programs administered across six agencies—Department of Public Instruction (DPI), North Dakota University System (NDUS), Department of Career and Technical Education (CTE), Job Service North Dakota (JSND), Department of Commerce, and Department of Human Services (DHS)—results in a high degree of variation in the hardware and software tools, and methodology used to handle data demands. Several agencies already have well-established databases that are primed for transitioning into agency-based data warehouses.

Agencies have a well-established history of gathering and reporting data. Some agencies have nearly 20 years of historical program data. Each agency has a regular schedule for data collection and reporting generally based on state and federal reporting requirements. That said, data collection is not as streamlined as it could be. The absence of data governance councils at the state and agency levels creates a data system void of the data definitions, rules, and processes needed to ensure data consistency, quality and reliability. Data is collected via paper, electronic files and face to face interviews, yet agencies are not collecting all the data they believe are needed to inform and improve program operations.

Current data reporting practices, which sometimes involve combining data across agencies, meet immediate needs to provide an agency accounting of program performance as set forth in state and federal legislation. The state is working on adopting a tool for matching an individual's files from one agency to another. The inability to match data files coupled with data quality concerns are the greatest reporting challenges. While some in-house analysis takes place, a large share of the reporting effort is provided by FINDET, a state supported follow-up data reporting service. FINDET also provides data matching for any reports requiring related data from more than one agency. The current data environment has served the state well, but does not yet meet its full potential.

## **1.5 Future Environment**

The future data environment for North Dakota should include a state longitudinal data system that supports the sharing of quality data across agencies. It first establishes a data governance council to ensure data are complete, valid, and reliable, and to make decisions regarding what and how data should be shared. Building on a foundation of quality data, a state data warehouse is established, integrating select education and workforce data across agencies. Master Client Index software is used to confidently match data records enabling longitudinal analyses of education and workforce programs and participant cohorts across agencies.

In addition to data system integration improvements, the future environment supports highly expanded analytic capabilities. It provides user friendly business intelligence tools that present data in multiple formats to easily reveal trends. It uses maps and charts to provide regional information. Most importantly, it allows agencies to independently access the full array of data needed to not only meet government reporting requirements, but also perform additional intra-agency and interagency analyses to examine and improve program performance.

## **1.6 Themes and Policy Challenges**

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Several consistent themes were identified during the LDS Roadmap interviews and analysis including:

- 1) There is strong support across state agencies to share key information and leverage the benefits of longitudinal data analysis that a state LDS can provide
- 2) There are data quality challenges surrounding the implementation of a state LDS that must be solved to achieve a successful project
- 3) Opportunities exist for each agency to enhance its data warehousing and data analytics capabilities.

Similarly, a few policy challenges were revealed that should be considered in designing and selecting an approach to a state LDS:

- 1) A process for maintaining the state ID in a student's postsecondary records for a former North Dakota K-12 student transitioning to higher education.
- 2) NDUS needs to adopt a process for enrolling or registering workforce students in ConnectND upon their participation in NDUS workforce training programs.
- 3) The state LDS, and in which agency it is placed, needs to be compliant with federal privacy laws, and should meet the Data Quality Campaign's (DQC) ten essential elements and fundamentals for P-12 longitudinal data systems.

## 1.7 Recommendations

### Data Warehousing Capabilities

- **Implement a State Longitudinal Data Warehouse.** A state-level LDS that integrates data from multiple government agencies will provide a stable, scalable, and sharable data repository for cross-agency longitudinal data analysis.
- **Implement a K-12 Data Warehouse.** DPI should acquire or build a state-level K-12 data warehouse that includes a business intelligence reporting capability.
- **Implement Agency-Specific Data Warehouses [optional].** As an optional recommendation, each agency (NDUS, JSND, DHS, and Commerce/Workforce) should consider implementing agency-specific data warehouses to centralize and integrate data from multiple operational systems within each agency.
- **Allow Continued Viewpoint™ Rollout Among School Districts.** Today, local school districts have the ability to license Viewpoint, a K-12 data warehousing system. Viewpoint provides local districts the ability to load data into a data warehouse and build sophisticated analytical reports.
- **Define a Data Integration Strategy.** An important byproduct of implementing any data warehouse is the integration, consolidation, and governance of an organization's data. North Dakota will realize these benefits during and after implementing the state LDS.

### Reporting

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- **Relocate and Reconfigure FINDET.** In the short-term (1-2 years) FINDET should remain as the preferred tool for cross-agency data matching and reporting. In the long-term (beyond 2 years), the state LDS will provide all FINDET reporting capabilities and the FINDET application can be retired.
  - **Select a Business Intelligence (BI) Reporting Tool.** The state should consider investing in an enterprise license with a BI reporting tool. The initial investment in an enterprise license is typically a lower cost decision compared to funding three or four separate agency-wide license agreements.

### **Business Process Re-engineering**

- **Implement an Education and Workforce Council.** It is important to establish a statewide governing body made up of key leaders from each agency to make decisions related to statewide concerns. An Education and Workforce Council (covering pre-K education through higher education and workforce training) should be created to serve in this role and govern the state LDS program.
- **Implement Formal Data Quality Processes.** North Dakota should evaluate its existing data quality processes to determine whether they can support the state LDS program.

### **Operational Support**

- **Rollout PowerSchool™ Statewide.** A majority (92) use PowerSchool™ (a student information system) and more are planning to migrate to PowerSchool™ in the coming year. The state should continue to support the Governor's Education Commission's plan to fund the rollout of PowerSchool™ to all K-12 districts.
- **Educate Users to Develop Data Analysts.** Typical training programs focus on increasing people's skills in using specific tools or applications. North Dakota should look beyond this minimum level of training and strive to improve its staff's ability to analyze data, discover programmatic implications in the interpretation of the data, and also understand the limitations or dangers of improper application of data analysis.

### **Data Governance**

- **Align Student Identifiers.** Identifying and matching student records across state agency data records is a fundamental issue in North Dakota. The success of the state LDS will depend on the state's ability to accurately identify individuals as they move through the educational system, into the workforce, and through other state support systems.
- **Implement Agency-based Data Governance Councils.** To oversee, monitor, and govern all data quality initiatives, North Dakota should implement data governance councils in each participating agency and an Interagency Data Governance Council (IDGC).



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- **Establish and Enforce LDS-wide Data Standards.** The IDGC will oversee and govern the data standards and each agency will use the standards when applicable to establish proper use of existing data assets.
  - **Mitigate Interagency Data Sharing Issues.** North Dakota must decide what data can be loaded and shared in the state LDS.
  - **Implement a Master Client Index Solution.** The state LDS will be required to match student records, client records, and employment records across agency data sources. The state should investigate expanding its use of the Master Client Index solution to use with the state LDS.

### Roadmap Implementation

- **Develop Action Memorandum.** Within six weeks of the issuance of the LDS Roadmap report, the LDS Committee should prepare and submit to the Governor an action memorandum explaining how the Committee and its participating agencies will act upon the recommendations contained in the report.

### Project Milestones

- **2009-2011 Biennium**
  - Implement a Data Governance Program
  - Create a state LDS Infrastructure (established in Phase 1) to replace current FINDET functionality
  - Implement a K-12 Data Warehouse
- **2011-2013 Biennium**
  - Complete state LDS, Phases 2 and 3
  - Establish education program to build analytical capability among users
- **2013-2015 Biennium**
  - Operations, maintenance, and ongoing enhancements to the state LDS

Budget Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Tier I Totals:	\$669,200	\$821,800	\$529,200	\$50,400	\$50,400	<b>\$2,121,000</b>
Tier 2 Totals:	\$2,905,100	\$1,888,430	\$1,884,630	\$1,884,630	\$1,086,630	<b>\$9,649,420</b>
Tier 3 Totals:	\$1,701,025	\$2,349,530	\$553,080	\$553,080	\$553,080	<b>\$5,709,795</b>
<b>LDS PROJECT TOTALS</b>	<b>\$5,275,325</b>	<b>\$5,059,760</b>	<b>\$2,966,910</b>	<b>\$2,488,110</b>	<b>\$1,690,110</b>	<b>\$17,480,215</b>