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The Regional Municipality of Durham Report

To: Durham Region Transit Executive Committee
From: General Manager, Durham Region Transit
Report: #2022-DRT-19
Date: December 7, 2022

Subject:

DRT 2022-2026 Data and Analytics Strategy

Recommendation:

That Report #2022-DRT-19 be received for information.

Report:

1. Purpose

- 1.1 This report outlines the five-year strategic approach to advance DRT's Analytics Program, in line with, and in support of, DRT's "Route Ahead" service strategy and the goals of the Durham Transportation Master Plan for elevating the modal shift of public transit in the Region.

2. Background

- 2.1 As part of Durham Region Transit's commitment to the continuous improvement of service delivery and customer service, DRT's Analytics Program was established in 2018 to leverage the power and benefits of applied data and analytics as a leader among its peers.
- 2.2 Leveraging data assets has enabled DRT to accurately assess service maturity, performance and improvement opportunities. As the organization matures and advances the use of technologies and innovations across all business lines, expanding DRT's data and analytics infrastructure and capabilities is critical to successfully monitoring, evaluating and reporting on system performance in a manner that enables effective decision making to achieve service and strategic objectives.

- 2.3 DRT's Analytics Program's mission is to fuel continuous improvement and innovation across DRT by delivering trusted, timely and accessible insights through robust and holistic analytics practices. The program is a key business function that intersects with the interests of all functional teams and stakeholders across the organization at all levels, guided by the following key principles:
- a. Accessibility: Democratizing data science and empowering all levels of staff to participate in and benefit from data and analytics
 - b. Quality: Leveraging accurate data to provide relevant, reliable and actionable insights
 - c. Timeliness: Providing the right insights at the right time to the right audience
 - d. Integrity: Maintaining uncompromising protection for all data assets and respect for privacy rights
 - e. Continuous Improvement: Actively identifying and acting on opportunities for accomplishing data and analytics goals better, faster and more cost effectively over time
- 2.4 DRT's Analytics Program has developed and executed tools and processes to standardize, refine and innovate the delivery of DRT's current reporting needs across all business areas. This includes reporting on key performance metrics provided as part of the General Manager's report at each meeting of the Transit Executive Committee.
- 2.5 In addition to meeting DRT-specific data and reporting needs, DRT's Analytics Program also collaborates with other Regional business teams and other external or community stakeholders to assess and advance new and innovative data and analytics resources that benefit DRT and Regional interests. Examples include:
- a. On Time Performance data lake and interactive dashboard with Corporate Information Technology to standardize and make available data and trends on transit service reliability to operational managers, supervisors and staff; and
 - b. Vehicle incident data dashboard with Durham College's AIHub supporting the tracking and key trends associated with on-road incidents involving DRT vehicles.
- 2.6 The DRT Data and Analytics Strategy will guide the program's development over the next five years following a structured and methodical approach. A foundational element of DRT's strategy is the utilization of a maturity model to clearly identify key goalposts and meaningful objectives in DRT's data and analytics journey. This maturity model is an adaptation of the Maturity Model for Data and Analytics

established by the global technological and research firm Gartner for DRT and the Region's specific context and needs.

- 2.7 Maturity models are common and useful tools used by various government and private sector organizations across a wide spectrum of fields and industry to aid in performing organizational self-assessment of their current levels of capability in specific functional, strategic or organizational areas. The assessment outcomes are then used to establish a common understanding of the changes desired or required to achieve higher levels of maturity over a specified period of time, which are then often used to drive or inform strategic planning.
- 2.8 Variations of Data and Analytics maturity models, similar to that outlined by Gartner, have been promoted and/or are in active use by various organizations around the world, such as the OECD (Organisation for Economic Co-operation and Development), INTEL and Forbes. As an example, the OECD recently published the data and analytics maturity self-assessment results of 41 tax administrations from the Americas, the Asia-Pacific region and Europe based on the organization's Analytics Maturity Model, in June 2022. The OECD is encouraging tax administration regions across the world to utilize these self-assessment outcomes as a useful tool in developing and progressing on strategic analytics objectives and will be tracking their progress and development in the ongoing digital transformation of tax administrations.

3. Strategic Goals and Objectives

- 3.1 The DRT Data and Analytics Strategy outlines key goals and objectives to elevate DRT from its current data and analytics maturity level ("Aware" and "Reactive") to the next logical maturity level ("Proactive").
- 3.2 An organization at the "Aware" and "Reactive" maturity phase recognizes the value of its data assets in place and has made a commitment to moving towards data-driven decision-making at all levels as an organizational norm. However, there remains a limited depth and breadth of resources and expertise in place to fully realize benefits and efficiencies from data insights. Reporting is supported by basic, standard tools and often managed and executed on an ad hoc and "as needed" basis, with a focus on a limited set of key or priority measures and indicators. Insights from reporting and data analysis typically serve as a "hindsight" approach to determine or assess the root cause of events that have occurred. There may be staff on hand with specialized skills in data and analysis, but they often occupy other primary roles in the organization and are few and far between.

- 3.3 An organization that reaches a “Proactive” level of maturity has fully embraced a data-driven culture, promoting and advancing a norm of data literacy across the organization through tailored training and resourcing strategies. Data and analytics represent a key business function playing an active role in driving innovation and continuous business improvement. More advanced tools and technology that are customised to the organization’s specific needs – like interactive dashboards that are fuelled by automated data processes – are developed or made available through careful investments and targeted collaborations with other progressive stakeholders. The cross-functional collection, management and utilization of data is typically centralized and more efficient and effective with an established operating model of best practices. Insights from reporting and data analysis strive to be more predictive in nature, identifying issues before they occur and identifying needs for future and continued advancements.
- 3.4 To guide DRT’s planned approach for progressing through the maturity phases, distinct capabilities and traits to be achieved or improved are identified for each progressive maturity level.
- 3.5 Key goals and objectives are then developed to focus on addressing existing data and analytics gaps in business and technological capabilities across the following areas:
- a. Organizational Talent and Development
 - b. Strategy and Governance
 - c. Policy and Process
 - d. Technology and Data Architecture
 - e. Culture and Data Literacy
- 3.6 The identified goals and objectives are laid out chronologically as part of a proposed “roadmap” for the next five years. The proposed roadmap items help to coordinate the accomplishment of key objectives while taking into account important pre-requisites or dependencies that may be shared between one or more objectives.
- 3.7 Key outcomes and targets for strategic performance measures and metrics are established and measured against 2021 as the “base year”. Outcomes and performance results will be regularly tracked and assessed and inform ongoing refinement of the strategy.
- 3.8 DRT’s five year Data Analytics Strategy is included in Attachment 1 to this report.

4. Next Steps

- 4.1 Funding for specific initiatives that advance DRT's data analytics strategy will be included as part of the annual budget and business plan process.
- 4.2 Where it is possible or beneficial to do so, DRT data and analytics strategic initiatives will be managed and executed in line and/or in step with other related Region data and analytics initiatives to leverage broader benefits and efficiencies.

5. Attachments

Attachment #1: DRT Data and Analytics Strategy 2022-2026

Respectfully submitted,

Original Signed by

Bill Holmes
General Manager, DRT

Recommended for Presentation to Committee

Original Signed by

Elaine C. Baxter-Trahair
Chief Administrative Officer



DATA AND ANALYTICS STRATEGY

(2022 – 2026)

Fueling the Route Ahead

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INTRODUCTION

Durham Region Transit (DRT) is one of Ontario's largest regional transit systems, serving eight unique area municipalities (Ajax, Brock, Clarington, Oshawa, Pickering, Scugog, Uxbridge, and Whitby) by offering seamless connections to destinations across Durham Region and The Greater Toronto Hamilton Area through an innovative suite of services, including scheduled, On Demand and Specialized.

As part of Durham Region Transit's commitment to the continuous enhancement of its service offerings and customer service, DRT's Analytics Program was established in late 2018. In recent years, applied data and analytics have gradually become a cornerstone of improving and evolving public sector operations across Canada and the world. Valuable insights from a robust analytics program dramatically transform business decision-making and is an invaluable and indispensable resource that should be in every organization's toolbox.

DRT has continually strived to implement year-over-year improvements and innovation to its offered services, even amidst the unique challenges of a global pandemic for the last two years. In fact, it was during the height of the early pandemic period (late 2020 to early 2021) that DRT has seen impressive growth in its new On Demand service that was introduced in September 2020. Building on continued healthy uptake of this new service and encouraging responses to other system-wide service adjustments, efforts further streamlining DRT's "Demand Responsive" services (Specialized and On Demand) are currently underway.

The ability to leverage our data assets has been and continues to be a key driving force in enabling DRT to accurately assess service maturity, performance and opportunities. Expansion of DRT's data and analytics infrastructure and capabilities is a critical success factor for DRT's service and strategic objectives to bring more transit availability and benefits to our all residents in the Region. There is no better time than "now" to proceed with a comprehensive plan to further advance the maturity and capabilities of DRT's Analytics Program. A proactive approach will ensure that DRT continues the journey as a leader and not a late-to-game follower in this area, and stay ahead of exponential growth in the Region's increasingly complex and demanding transit needs.

This document outlines the initial iteration of a five-year strategic approach for the continued development and evolution of DRT's Analytics Program, in line with, and in support of, DRT's current five-year "Route Ahead" service strategy and recovery plan, as well as the goals of the Durham Transportation Master Plan for elevating the role of integrated public transit.

The strategic approach to DRT's Analytics Program provides a "blueprint" for achieving key outputs and milestones within a five-year timeframe that is specific to DRT's key objectives, prevailing priorities and guiding principles.

Attachment #1

DRT's Analytics Program

Vision and Mission

To fuel continuous improvement and innovation of the Durham Region Transit experience and unrivalled service excellence by delivering trusted, timely and accessible insights through robust and holistic analytics practices.

Guiding Principles

The goals and activities of DRT's Analytics program are guided by and centered around the following five guiding principles:

ACCESSIBILITY	Democratizing data science and empowering all levels of staff to participate in and benefit from data and analytics
QUALITY	Leveraging accurate data to provide relevant, reliable and actionable insights
TIMELINESS	Providing the right insights at the right time to the right audience
INTEGRITY	Maintaining uncompromising protection for all data assets and respect for privacy rights
CONTINUOUS IMPROVEMENT	Actively identifying and acting on opportunities for accomplishing data and analytics goals better, faster and cheaper over time

Mandate and Function

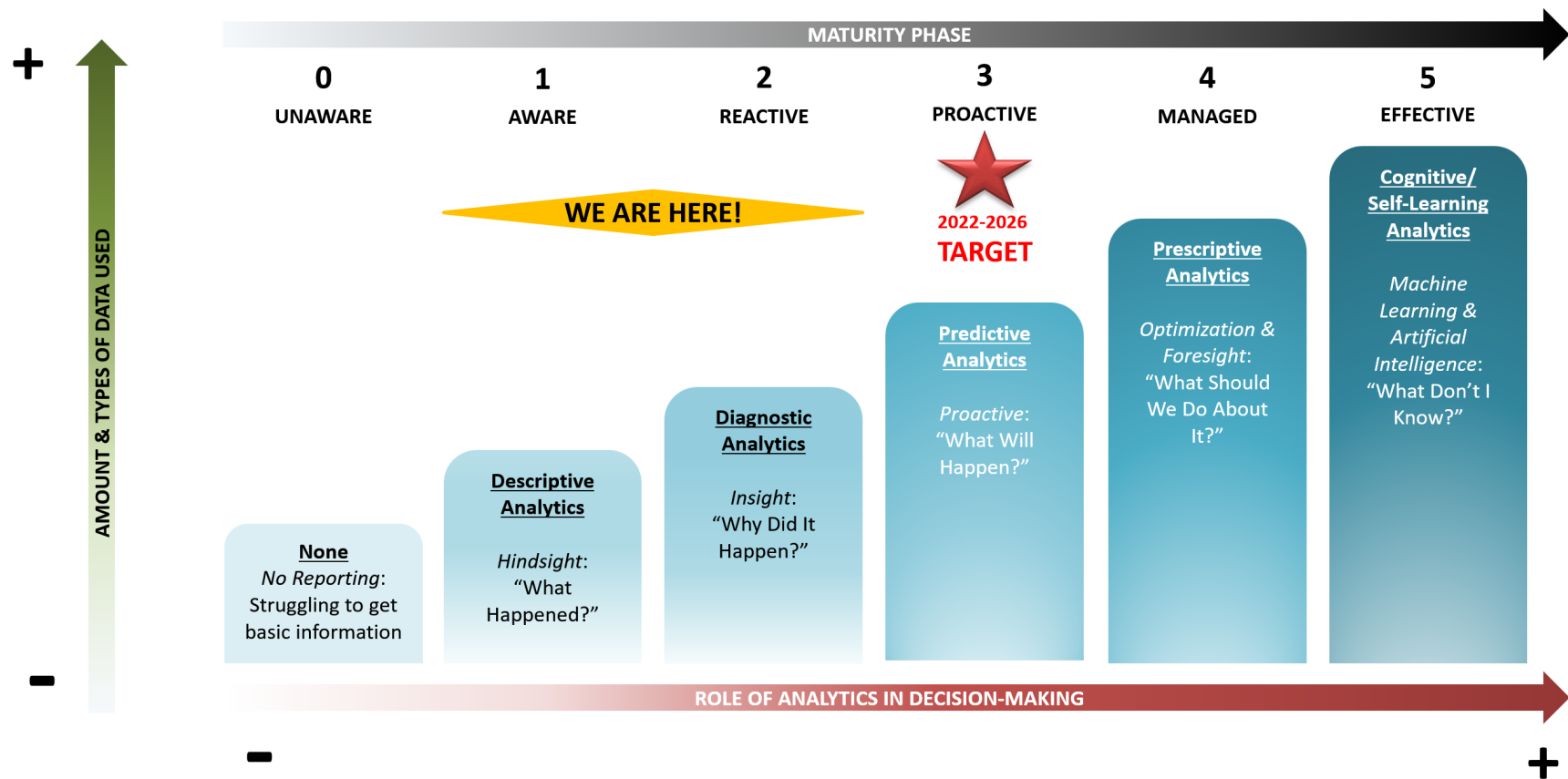
DRT's Analytics Program represents a key business function with objectives and work that intersects with the interests of all functional teams and stakeholders across the organization at all levels. The Program:

- plays key roles in leading and contributing to DRT's strategic interests in data and analytics
- provides key operational support for developing and producing important reporting and other analytics deliverables
- collaborates with internal and corporate partners to advance DRT's data and analytics technological and technical capabilities and competencies
- champions a culture of data literacy and citizen science


BASELINE MATURITY SNAPSHOT




The baseline maturity snapshot for DRT's Analytics Program establishes an initial benchmark of the program's current capabilities against a fixed scale of progress. This then provides DRT with a systematic approach to establish goals for and measure against desired progress over a period of time.














The following represents a high-level self-assessment of DRT's overall Data and Analytics maturity, based on current-day resources, practices and capabilities:



GAPS AND GOALS

The following table outlines various key characteristics and capabilities for each maturity stage against DRT's current state. Items labelled with a  symbol denotes criteria and capabilities informing the goals identified for this 5-year plan:

	Accomplished
	5-Year Strategy Goal
	Future Goal

	1 – AWARE	2 – REACTIVE (Descriptive Analytics)	3 – PROACTIVE (Predictive Analytics)	4 – MANAGED (Prescriptive Analytics)	5 – EFFECTIVE (Self-Learning Analytics)
Organizational Talent & Development	 Additional training specific to data-related skills and competencies provided only as required/relevant for specific job positions	 Distinct job classification(s) requiring specific data-centric competencies and skillsets exist for Data and Analytics positions  Data-focused job positions receive additional additional/advanced training in data-related skills and competencies  Data and Analytics roles recruited/upskilled at a minimum: - Data and Analytics Program Manager - Business Intelligence/Data Analyst(s)	 Job classification(s) for Data and Analytics positions are continuously expanded and/or refined to meet and support organization's evolving data and analytics needs  Data-focused job positions receive ongoing cyclical training in data-related skills and competencies, including certifications where relevant and appropriate  Data and Analytics roles recruited/upskilled at a minimum: - Data and Analytics Program Manager - Data Analyst - Data Scientist	 Additional/ advanced training in data-related skills and competencies are available to all staff, and support the cultivation of "Citizen Data Scientists"  Data and Analytics roles recruited/upskill at a minimum: - Data and Analytics Program Manager - Data Analyst - Data Scientist - Data Engineer/Architect  DRT Data and Analytics staff participate in or contribute through general Data and Analytics initiatives at the enterprise level	 Key Data and Analytics staff have specialist training and certifications  Data and Analytics roles recruited/upskilled at a minimum: - Data and Analytics Program Manager - Data Analyst - Data Scientist - Data Engineer/Architect - AI (Artificial Intelligence)/ML (Machine Learning) Developer/Engineer  DRT is a leader in the development and recruitment of Data and Analytics talent and emerging roles

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	1 – AWARE	2 – REACTIVE (Descriptive Analytics)	3 – PROACTIVE (Predictive Analytics)	4 – MANAGED (Prescriptive Analytics)	5 – EFFECTIVE (Self-Learning Analytics)
Strategy & Governance	<p>✓ Distinct but informal roles for supporting data-related tasks and responsibilities exist within teams to meet team- or function-specific business needs</p>	<p>✓ There is a functional Data and Analytics Team or Program in place with a clear mandate and roles and responsibilities</p> <p>There is a Data and Analytics Strategy for DRT that aligns with and contributes to corporate strategic goals and priorities</p> <p>There is a time-bound action plan for Data and Analytics objectives and initiatives aligned with the overall Data and Analytics Strategy in the Organization</p>	<p>There are standing Data and Analytics Strategy and Action Plans that are reviewed, assessed, and refined on a cyclical and as needed basis, and serves as a key input into corporate/regional strategic planning</p> <p>Data and Analytics is a core business function in DRT with an established budget</p> <p>There is an established Operating Model for Data Processes</p> <p>» Business roles for data and analytics (Data owners, Data Stewards, Stakeholders) are clearly defined and allocated throughout DRT</p>	<p>Traits and capabilities should be aligned with, and in support of, general maturity and direction at the enterprise/corporate level</p>	

	1 – AWARE	2 – REACTIVE (Descriptive Analytics)	3 – PROACTIVE (Predictive Analytics)	4 – MANAGED (Prescriptive Analytics)	5 – EFFECTIVE (Self-Learning Analytics)
Policy & Process	<ul style="list-style-type: none"> ✓ Data is tracked and maintained through informal and formal methods across the organization as a byproduct of established processes and operating procedures. ✓ Reporting is decentralized, unstandard and typically performed on an ad hoc or “as needed” basis. Reporting scope is typically team- or function-specific 	<ul style="list-style-type: none"> ✓ Certain data with immediate relevance to operations is purposefully recorded, maintained and reported/consulted as required to answer or address business questions. ✓ There are standard static reports established and produced for key strategic and operation metrics and measures. ✓ Basic data management and reporting processes are documented and streamlined. 	<ul style="list-style-type: none"> ✗ Any data that can be captured is recorded, stored, and organized in a systematic fashion. ✗ Interactive dashboards and other dynamic reporting tools allow data to be assessed and reviewed “on demand”, as close to real-time as possible. ✗ Standard processes for data lineage, metadata, data processing, data refinement and data analysis are established, documented, and refined on a regular basis. ✗ Established data standards guide and govern the use and management of data 	<ul style="list-style-type: none"> » Data is managed as an asset, with Master Data Management in place either independently within DRT or in collaboration with/as an active supporter at the corporate level » A completed Inventory/Catalogue and Dictionary are in place for all data assets » Data and Analytics standards, procedures and considerations are embedded in all relevant business processes » Clear change Management process and protocols exist for Data and Analytics initiatives 	

<p>Technology & Data Architecture</p>	<ul style="list-style-type: none"> ✓ Standard/existing office productivity tools and applications are leveraged to extract, process, compile and present data and reports ✓ Basic and/or native query and reporting tools exist and are utilized as needed within existing applications ✓ Reporting typically consist of pre-packaged reporting resources ✓ There is an awareness of gaps and limitations in data quality and availability. 	<ul style="list-style-type: none"> ✓ Online Analytical Processing (OLAP) and visualization tools are commonly used to support reporting needs and tasks, but still generally under-utilized ✓ Structured data extracts utilizing in-house technologies are available and rely on manual ETL (Extract, Transform, Load) services for data quality and exception processes ✗ Working mechanisms or workarounds exist to correct data quality issues at the source ✓ Available data are hosted and managed in silos or distinct/separate vendor systems ✓ Requirements for addressing data limitations and constraints are shaped by immediate business needs and priorities ✓ Insights from analytics are focused on problem-solving and “fire-fighting” 	<ul style="list-style-type: none"> ✗ Dashboards and scorecards support performance monitoring and management, complemented by self-service Business Intelligence ✗ Available data is stored and managed in a central data repository or repositories owned and managed by DRT, or with the support of corporate resources ✗ Routine and automated ETL (Extract, Transform, Load) and exception handling processes are in place, with data enrichment through data-processing algorithms ✗ There are early efforts at layering multi-dimensional data on a small scale and incorporating unstructured data ✗ Requirements for addressing data limitations and constraints are increasingly influenced by future data needs and forward-looking business objectives. 	<ul style="list-style-type: none"> » There is real-time analysis of data and availability of operational intelligence » Data architecture in place supports data structures with multi-dimensionality, with layering of data reflecting considerable breadth and depth » Infrastructure enabling and supporting robust master data management is in place » Simulations and scenario development are common tools to aid business considerations » The incorporation and of unstructured data into analysis tasks is substantial and sophisticated » Insights from analytics drive decisions and help to shape business strategy and direction 	<ul style="list-style-type: none"> » There is minimal human intervention in routine data processing and analysis tasks (autonomous analytics), which are enhanced by machine learning algorithms » Artificial Intelligence is operationalized or plays a role in augmenting, refining, and enhancing analytics outputs and insights » Infrastructure and tools in place support a data science sandbox environment and approach to Data and Analytics » AI-driven analytics automate key business decisions
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	1 – AWARE	2 – REACTIVE (Descriptive Analytics)	3 – PROACTIVE (Predictive Analytics)	4 – MANAGED (Prescriptive Analytics)	5 – EFFECTIVE (Self-Learning Analytics)
Culture & Data Literacy	<ul style="list-style-type: none"> ✓ The organization places increasing value on, and preference for, data-driven decision-making ✓ Tracking and monitoring various operational and business metrics gradually becomes more commonplace across the organization 	<ul style="list-style-type: none"> Staff working indirectly or directly with data or in data-related roles receive basic data literacy training and education Data-driven decision-making is the norm ✓ Metrics and measures are identified for key business outputs and objectives 	<ul style="list-style-type: none"> All staff across the organization have basic data literacy training and education There are well-established, efficient, and effective cross-functional data collaboration and workflows within the organization 	<ul style="list-style-type: none"> » All staff have access to advanced data training » There is an established and comprehensive DRT-specific in-house data training program and/or community of practice » “Data Heroes” across business units and teams actively lead and champion Data and Analytics initiatives at all levels » There are well-established, efficient, and effective cross-functional data collaboration and workflows within the organization, with corporate partners and other external peer agencies and community organizations 	<ul style="list-style-type: none"> » DRT’s analytics excellence is a differentiator in the field » A “citizen data scientist” mentality and approach is prevalent in the organization » Rapid and iterative Data and Analytics initiatives are supported and encouraged » There are expanded community and industry networking and collaboration on Data and Analytics interests

Attachment #1

A few important notes about the table above:

- The pace of new technologies and approaches in the field of data and analytics have been growing exponentially in recent years. As such, any references to specific tools, technology and competencies in the table above and throughout this document is meant to be a snapshot in time given current considerations and criteria, to be revised and updated as appropriate over the span of the plan. Tools, technology and competencies documented in this plan are not intended to be an exhaustive list.
- Progression from phase to phase will not necessarily advance in a linear fashion (ie. take the same amount of time, effort or investment) depending on various factors and other dependencies.
- The table above represent criteria tailored to DRT's Analytics Program, and has not incorporated wider corporate objectives or any elements from a broader enterprise roadmap.

PROPOSED ROADMAP OF OBJECTIVES

The table below proposes key strategic goals to be achieved to arrive at the target Data and Analytics maturity phase for DRT, within the context of a high-level suggested order and timeline until the next update of DRT's Data and Analytics Strategy.

Please note that the table below does not represent a detailed list of individual planned initiatives and their key milestones – information that should be contained in a detailed action or project plan.

	2022	2023	2024	2025	2026
Organizational Talent & Development	Recruit second Data Analyst		Recruit additional generalist and/or specialist Data Analysts		Create new job classification for Data Scientist role
			Establish cyclical training program and requirements for DRT Analytics roles		
Strategy & Governance	Establish and execute first multi-year DRT Data and Analytics Strategy	Establish framework for DRT Analytics Governance and Operating Model (potential for partnership with corporate teams, eg. CSIT, Innovation etc.)		Establish DRT Analytics Working Committee	Generate 5-year "Report Card" and Update DRT Data and Analytics Strategy
	Establish capital and operational budget for DRT's Analytics Program	Secure additional required funding for planned Analytics initiatives and expanding data storage and processing needs			
Policy & Process	Ensure documentation is created for all Analytics team reporting outputs and a process for ongoing maintenance and updates is established		Data catalogue and dictionary of all DRT data inputs and outputs is compiled		
Technology & Data Architecture*	Deploy self-serve, interactive Business Intelligence dashboards for On Time Performance and Collisions	Deploy additional self-serve, interactive Business Intelligence dashboards for other DRT key performance measures			
	Develop initial DRT Data Lake for On Time Performance Data (Scheduled Service)	Augment DRT Data Lake with On Time Performance data for Specialized and On Demand services			
			Augment DRT Data Lake with other Performance data for all DRT services		
Culture and Data Literacy		Establish and roll-out basic data literacy course and cyclical training program for all DRT staff			

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*Note: Scope and timing for technology and Data Architecture initiatives will be dependent on available/secured funding, as well as the availability of qualified in-house, partnered or vendor resources.

KEY OUTCOMES AND MEASURES

The following table outlines key desired and expected outcomes as a result of completing planned objectives and their accompanying performance measures and targets.

Outcomes	Measures	Target	Current Estimated Performance/Status
DRT's Analytics team is appropriately staffed for current and expected operational and strategic demands	# of Data Analysts (Generalists and Specialists)	4 by 2026	2
DRT's Analytics program maintains relevant skills and competencies that are up-to-date and progressive	# of annual cyclical training hours per individual (specific to data and analytics competencies) completed	15 annual total	0
Notable improvements to the effectiveness, efficiency, and productivity of DRT's Analytics Program	% overall increase in standing/scheduled data and analytics deliverables produced	20% by 2026	18
	% overall reduction in manual processing effort for data and analytics deliverables	30% by 2026	Average 3 days
	% overall reduction in request-to-output time for data and analytics deliverables	20% by 2026	Average 3 days
	% overall increase in active and completed data and analytics initiatives for innovation or service enhancement	100% by 2026	Average 3 annually
An increase in the awareness of, and proficiency with, data and analytics concepts, principles, and tools across DRT	% overall increase in requests for data and analytics outputs and deliverables	15% year-over-year	Average 2 daily
	% overall increase in use of self-serve data and analytics tools	15% year-over-year	N/A
	# of DRT employees that have completed basic data literacy training	25-200 by 2026	0
	# of active and completed data and analytics process improvement initiatives specific to a business unit or functional area	4 annually	Average 1 annually

2021 will be used as the "base year" for relevant measures that require a "base year" for the determination and comparison of measure results.

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Both measures and targets will be assessed over time as work progresses towards established objectives. As a result of such assessments, adjustments may be made to measures and targets as appropriate.