Resultant

| STATEMENT OF WORK |

Campus Analytic Engine | MHEC

2023

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INTRODUCTION

Resultant's Campus Analytics Engine is a highly customizable, highly flexible, data analytics solution that securely consolidates and cleanses data from multiple systems, enables self-service analytics, and utilizes Resultant's student matriculation and retention algorithms. It contains four distinct components that can be utilized separately or together.

DATA LAKEHOUSE

Data pipelines are established between university data systems to consolidate data into a central location for reporting and analytics. Additionally, data is cleansed as it is brought into the cloud-based warehouse. The warehouse is central for data reporting, analytics, and predictive analytics across campus.

SELF-SERVICE ANALYTICS PLATFORM

The self-service analytics module enables university staff to conduct data analysis and reporting in the consolidated data warehouse, a secure, cloud-based environment. The Analytics Module will enable staff to conduct data analysis at all levels (e.g., reporting via Tableau or Power BI, data analysis, advanced analytics, predictive analytics, machine learning, and artificial intelligence leveraging RStudio and Python).

STUDENT MATRICULATION MODULE

The model's focus is to estimate the likelihood that students will enroll, barring any intervention, and recommend an additional financial award to increase the likelihood of students enrolling in the university. The additional award recommended optimizes profitability to the university based on the university's financial model and applicant population. This will result in an increased conversion rate for students targeted by the university.

STUDENT RETENTION MODULE

The model estimates the likelihood of retaining students barring any intervention and identifies the reason(s) behind student risk of attrition. This will result in understanding which students are at risk of leaving the institution, the financial and non-financial factors that are important to each student, and the ability to develop a more informed intervention strategy for each student.

Resultant recognizes that each student's experience impacts their university, affecting recruiting and enrollment and ultimately shaping the resources an institution draws upon to serve its student population. Universities thrive when they have the tools to maximize student experience. Recruiting students and supporting them toward their greatest academic and career success depends upon developing a full view that includes not just performance but extracurricular activities, health and well-being, social engagement, and various other factors. It also differentiates between dropout rates that deter new students and graduates who become full-throated advocates.

SCOPE OF WORK

1. Data Lakehouse

A data warehouse serves as the central repository for data reporting and analytics across the enterprise. The Resultant team will implement the data repository on top of the data lakehouse architecture which combines the advantage of both data lake and traditional data warehouse.

1.1. Conduct Discovery

INFRASTRUCTURE AND INTEGRATION

The Resultant Solution Architect will conduct a system assessment to understand and document the existing data infrastructure, such as application, database, business intelligence software, network topology, and integration points. The assessment will inform the design of the data lakehouse architecture and implementation roadmap.

DATA MATURITY

The Resultant Data Architect and Data Engineer will assess the existing data repositories from the following functional areas. The assessment will be focus on the data model, data quality, and data synchronization. The outcome is a data maturity report that defines how mature your data is today. The Data Assessment provides documentation of the current state, maturity rating, gaps, and a proposed solution architecture. The recommended solution architecture targets gaps identified in data governance, data quality, data security and data movement.

Systems reviewed in the data security assessment will include:

- Student Information System (SIS) or equivalent Enterprise Resource Planning (ERP) system
- Customer Relationship Management (CRM)
- Learning Management System (LMS)

1.2. Design Data Lakehouse

Resultant partners with various of data warehouse platform vendors to implement data lakehouses for our clients. Resultant will provide options for the customer based on the information collected during the discovery phase. We will develop and deploy the data lakehouse on top of the cloud-based ecosystem chosen by the customer, such as Google BigQuery or Azure Databricks.

During the implementation phase, the raw data from source systems (such as SIS, LMS, and CRM) is ingested into cloud storage through the ETL tool, such as GCP Data Fusion or Azure Data Factory. The data will be stored in their original formats, such as csv, xlsx, parquet, pdf, png, or txt, and various computing engines can process it. In the case of direct connection, the data lakehouse also supports creating external data set links to import data from the SQL database through a JDBC connection. Both batching and streaming ingestion are supported and can be implemented based on the feasibility of existing vendor products.

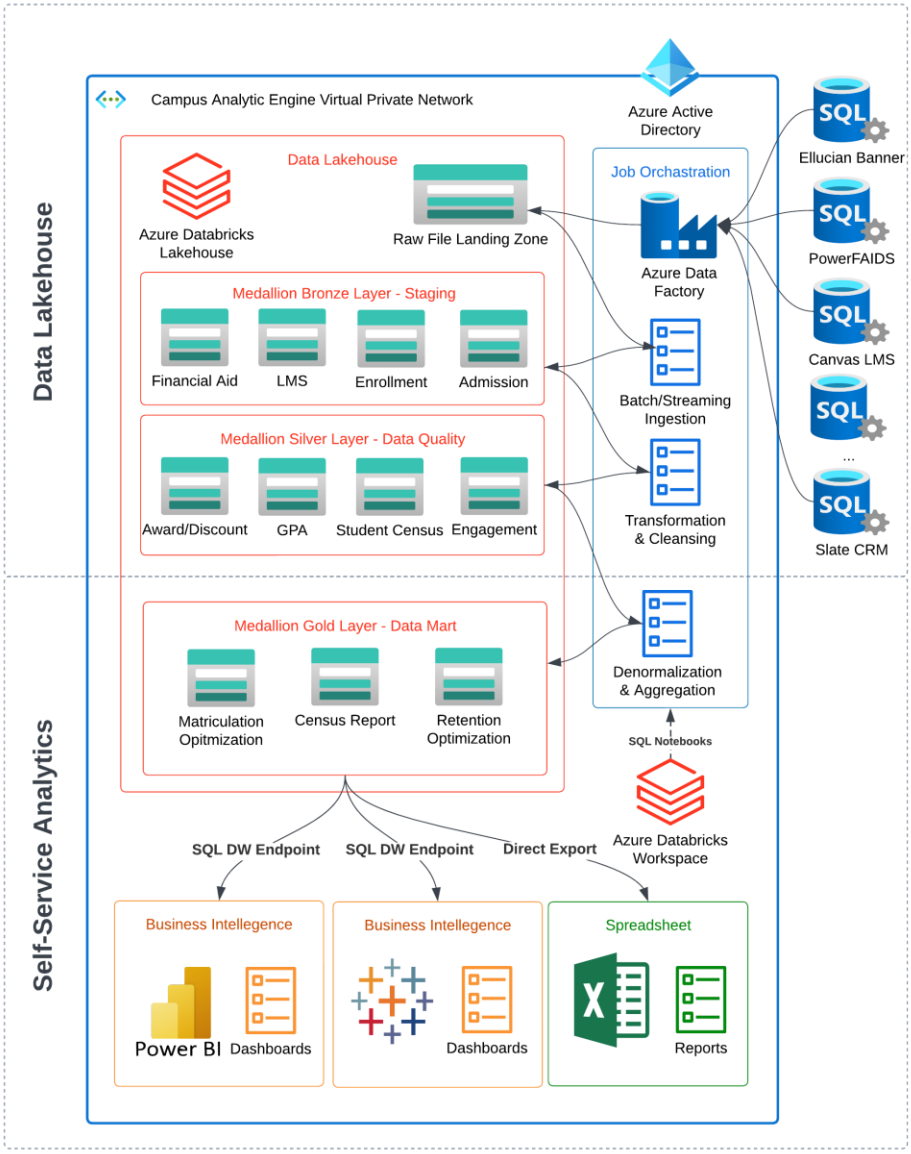


Figure 1. Example Architecture (Azure Cloud with Databricks Ecosystem)

1.3. Implement Data Lakehouse

DATA ARCHITECTURE AND MODELING

The Resultant data architect will develop the Data Architecture Entity Relation (ER) diagram that consolidates all feasible data sources. Our Data Engineer will build the data model according to the ER diagram and enable data refresh automation. A data dictionary will be included in the deliverable. The number of data sources included depends on the complexity of their integration. We will determine the complexity from the following aspects:

- Network topology, such as on-prem or cloud, network peering, etc.
- Number of entities, such as schema, table, column
- Data volume

ETL INTEGRATION

The Resultant Data Engineer will develop a new ETL pipeline or integrate the existing pipeline to ingest data from all feasible data sources into the data lakehouse.

DATA QUALITY ENHANCEMENT AND MONITORING

Resultant will define and apply general data quality rules to the data staged in the lakehouse. These rules are generic to any use case and are meant to be simple. The Data Science team will define and apply data quality rules to the data in the data mart. These data quality rules will be soft business rules that apply only to a certain use case, such as matriculation or retention.

2. Self-Service Analytics Platform

The Self-Service Analytics platform enables all operation researchers with various analytic skill sets to analyze data in a single unified workspace where their work can be referenced and shared seamlessly. The platform allows the administration to apply the best data governance practice to regulate and audit the lineage of data usage across use cases. Tools such as SQL, Python, and dashboard builder are generally available for researchers to develop and demonstrate their stories.

2.1. Conduct Discovery

ORGANIZATIONAL ASSESSMENT

Resultant Organization Change Management consultants will conduct an assessment focusing on the functional administration group's analytic and data-driven decision-making culture. Leveraging the Prosci change management methodology, organizations move through three phases to prepare, manage, and reinforce the change. The assessment report will summarize the administration team's analytic background, skills, and tools.

DATA GOVERNANCE ASSESSMENT

A Resultant Enterprise Solution Architecture and Data Governance Specialist will assess the current data-sharing strategy across different functional teams and provide recommendations on collaboration based on data analytics use cases.

2.2. Design Self-Service Analytic Platform

Resultant can integrate the Self-Service Analytic Platform with the out-of-box data lakehouse in Resultant's Campus Analytic Engine solution. We can also integrate directly with an existing data warehouse. Below is an example of integrating Azure analytic tools with Ellucian Banner data warehouse.

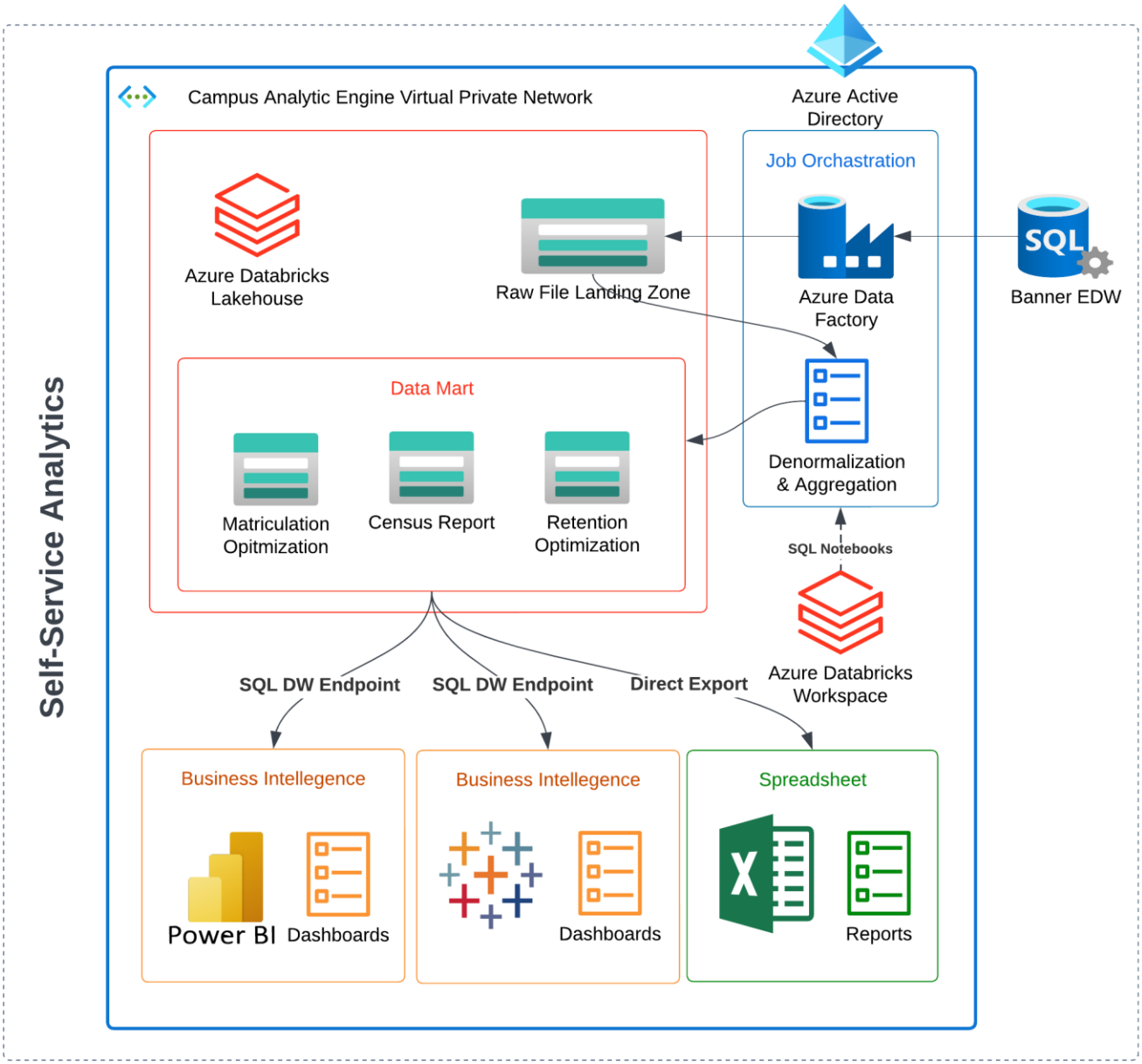


Figure 2. Example Architecture (Azure Cloud integrate with Ellucian Banner EDW)

2.3. Implement Self-Service Analytic Platform

The Resultant team will recommend an analytics platform based on the outcome of the analytic capability assessment. The technical team will deploy and integrate the product approved by the customer. Resultant engineers specialize in the following cloud-based analytic platforms:

- Google Cloud Platform
- Azure
- Amazon Web Service
- Snowflakes
- Databricks
- Alteryx

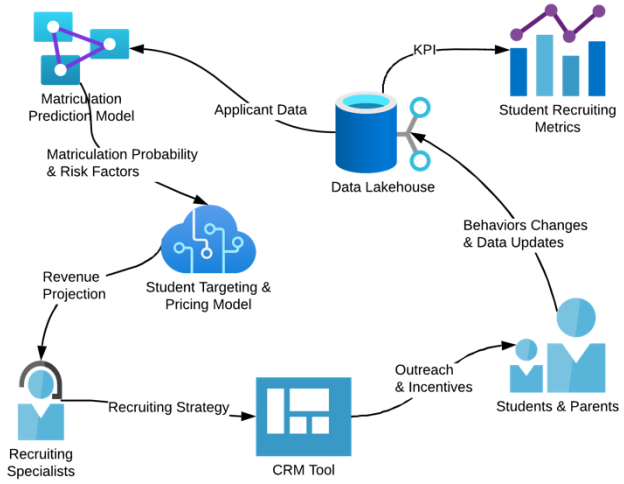
BUSINESS INTELLIGENCE (BI) INTEGRATION AND ADVANCED ANALYTICS TOOLKIT

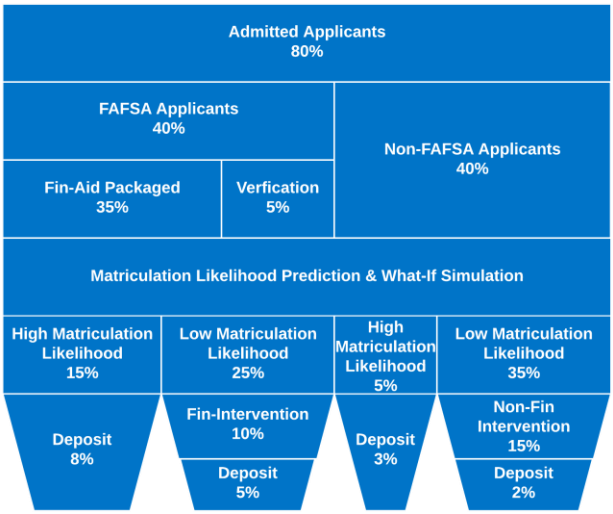
The Resultant team will integrate your BI solutions with the Self-Service Analytic workspace. Resultant DevOps team can install necessary tools and open-source libraries as needed.

TRAINING

Resultant offers knowledge transfer sessions throughout the various implementation phases. The delivery includes documentation for the data lakehouse foundation and training materials for open-source tools like SQL and Python. Additional on-demand training will be available through the OEM partner (e.g., Google offers free trainings and technical support on various products in GCP, Databricks offer free training through partner academic portal, etc.) Training from any non-partner licensed tools, such as Microsoft Office or SAS, is not included.

3. Student Matriculation Module





Resultant's Student Matriculation Module dynamically segments the applicant population based on their likelihood of enrolling at a given time spot during the six-to-eight-month admission period. The Resultant data science team leverages the matriculation funnel chart to illustrate the high-level recruiting patterns for the university.

The matriculation likelihood is determined from data acquired from recruiting activities, such as marketing campaign response, financial aid data, family education background, high school performance, and academic interests. To generate the likelihood, a predictive model matches student's profile with historical applicants' profile and use the matriculation outcome from the matched historical applicants to measure the student's likelihood to enroll. In addition to the likelihood score, a list of actionable interventions is provided to the admission and marketing team to determine the best incentives to matriculate the applicants, such as showing the incremental matriculation probability for a student for different financial award amounts.

3.1. Conduct Discovery

The goal of discovery is to identify specific data that can be utilized to develop a recruiting model specific to your institution. Discovery work will include qualitative discovery, focused on general factors that influence an applicant's decision to enroll (financial and non-financial), and quantitative discovery, focused on quantifiable features in the data (financial and non-financial) that exist in university data sets. Discovery will center around known key data fields for Resultant's proprietary matriculation mode. It will not be limited to these fields alone and will be extended to university-specific data fields. Groups included in discovery may include:

- Financial Aid
- Admissions
- Marketing
- IT and Institutional Research
- Leadership

After data sets and features that may influence the model are identified, and access to these sources has been granted, Resultant will conduct hypothesis testing on potential features to determine the predictive ability of each. We will test these potential features against applicant subgroups. The result will be access to new, relevant data sets for repeat analysis, an understanding of which features are important, and how each feature impacts different applicants' likelihood to enroll.

3.2. Refine Data Model

The Resultant team will incorporate data from the discovery phase into the data model. We will refine a custom model for your institution, which will help:

- Estimate the likelihood of an applicant enrolling, barring any intervention.
- Determine which students are highly sensitive to marginal increases in awards.
- Determine the award amount recommended for each student to increase enrollment profitably.

Model performance will also be assessed throughout development, and the model will be tuned to meet your institution's financial goals.

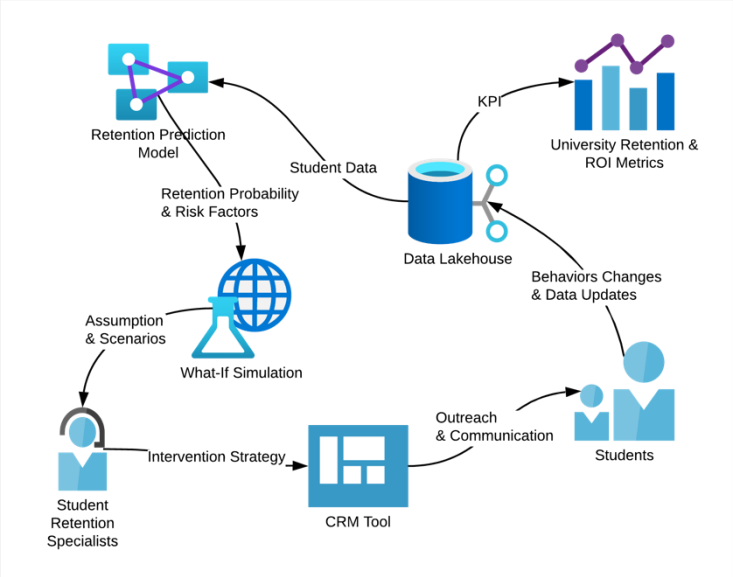
3.3. Implement Student Matriculation Module

The Resultant team will work closely with the admissions team to deploy the recruiting model and dashboard that enables interactive intervention and analysis. The tool will enable the admissions team to view the initial matriculation likelihood for all applicants and simulate the impact of the intervention. The Resultant team will provide training

materials documenting the methodology and a knowledge transfer session allowing hands-on experience for your internal staff.

4. Student Retention Module

Resultant's Student Retention Module identifies critical factors that cause student attrition using two coupled components:



- **Attrition Prediction Module**: Consumes data from different dimensions such as academic performance, financial situation, sense of belonging, engagement, and family demographics. This data evaluates students' likelihood of short- and long-term success. This model also identifies students' success and risk factors to give insight into which students are at risk and why they are at risk.
- **Intervention Pilot Module**: Breaks down the student's attrition process into five key stages: pre-entry engagement, onboarding and adaptation, comfort period, departure decision-making, and attrition. The predictive model leverages granular data factors to determine the student's current stage and generate alerts for faculties to apply the proper intervention to improve the student's likelihood of success. In a typical deployment, the model consumes between 200-500 distinct featured and is updated weekly to provide a new prediction for each student. For example, when the model alerts students who experience academic difficulty during their onboarding period, the faculty help them connect with instructors who can provide in-time support or pair them with instructional tutoring service. On the other hand, when the model detects that the students are likely to transfer because they are less engaged with coursework and have inquiries about other programs, the faculty may quickly reach out to them and offer immediate incentives to help students remain active.

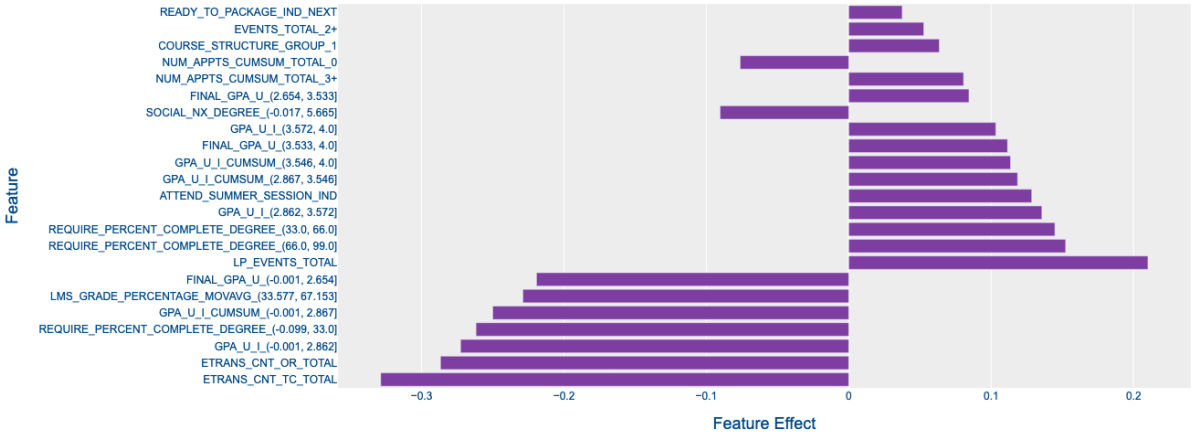


Figure 3. Feature Analysis

4.1. Conduct Discovery

Discovery for the retention model will occur in parallel with discovery for the recruiting model due to the similar nature of the discovery work. The goal of discovery is to identify university-specific data that can be utilized to develop a retention model specific to your university.

Discovery work will take the form of qualitative discovery, focused on general factors that influence a student's decision to retain (financial and non-financial), and quantitative discovery, focused on quantifiable features in the data (financial and non-financial) in university data sets. Discovery will center around key data fields for Resultant's proprietary retention model. Discovery will not be limited to these fields alone and will be extended to university-specific data fields.

Groups for discovery would include:

- Student Success (e.g., student retention specialists, student counselors)
- Financial Aid
- IT and Institutional Research
- Leadership

The goal of discovery is to identify university-specific data sets and features that improve the performance of the retention model. Discovery work will take the form of both qualitative and quantitative discovery. Available data will be compared against a theoretical retention model to identify data gaps and develop strategies to collect additional data to fill these deficiencies in the future.

After identifying data sets and features that may influence the model and access to these sources has been granted, hypothesis testing will be conducted on potential features to determine the predictive ability of each and to test these potential features against applicant subgroups. The result will be access to new, relevant data sets for repeat analysis and understanding which features are important and how they impact different student subgroups.

4.2. Refine Data Model

Data from the discovery phase will be incorporated into the model. The purpose of the model is to estimate the likelihood of retaining students barring any intervention, and to identify the reason(s) behind student risk of attrition. This will result in an understanding of which students are at risk of leaving the institution, an understanding of the financial and non-financial factors that are important to each student, and the ability to develop a more informed intervention strategy for each student.

4.3. Implement Student Retention Module

The Resultant team will work closely with the admission team to roll out the recruiting model and dashboard that enables interactive intervention and what-if study. The retention dashboard contains three components:

- **Students Overview**: This application section contains a high-level view of all students across campus. It shows student success scores and changes in success scores from the prior run of the model at the student level.
- **Student Detailed View**: The student detailed view contains an in-depth look into a single student, providing a history of their success score over the course of their time at the institution, model-output risk, and success

factors for that student to inform interventions, and descriptive statistics giving insight into how well they are doing through the lenses of academics, financial stress, and engagement on campus.

- **Campus-Wide Reporting**: The reporting section of the application provides a high-level visual overview of retention reports across the campus.

The Resultant team will also provide training materials that document the methodology and conduct a knowledge transfer session to allow hands-on experience for your internal staff.

5. Ongoing Support

Resultant will provide **12 months** of support for all solutions. This will consist of regularly scheduled meetings monthly with your institution to check in on solution efficacy and address any questions or issues that arise while using the solutions. For use of the matriculation and retention modules, this will include support surrounding model interpretation, use of the web application, and model tuning as necessary.

DELIVERABLES

DELIVERABLE	DESCRIPTION
DATA LAKEHOUSE	
System Assessment	Text here
Data Maturity Assessment	Text here
Data Governance Recommendations	
Data Architecture Entity Relationship Diagram	
SELF-SERVICE ANALYTICS PLATFORM	
Organizational Assessment	
Data Governance Assessment	
Knowledge Transfer Documentation and Training Session	
STUDENT MATRICULATION MODULE	
Knowledge Transfer Documentation and Training Session	
STUDENT RETENTION MODULE	
Knowledge Transfer Documentation and Training Session	
ONGOING SUPPORT	
Support Meetings	Continued support for solutions and interpretations of model results. We will hold regularly scheduled solution support meetings for 12 months.

TIMELINE

The following table depicts the anticipated timeline and major milestones throughout the duration of the project.

Phase	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Months 13 -24
DATA LAKEHOUSE													
Discovery and Assessment													
Design													
Implementation													
SELF-SERVICE ANALYTICS PLATFORM													
Discovery and Assessment													
Design													
Implementation													
STUDENT MATRICULATION MODULE													
Discovery													
Model Tailoring													
Implementation													
STUDENT RETENTION MODULE													
Discovery													
Model Tailoring													
Implementation													
ONGOING SUPPORT													
Solution Support													

FEES

Fees for this project will be assessed on a fixed-fee basis totaling $450,000.00 over the course of the project, invoiced at the completion of each phase. The parties agree that no additional ad-hoc or on-site work will be performed by Resultant without advance written notice to proceed.

Fees for services outside the scope of this proposal, if any, will be estimated and approved before completion. The level of effort for this role will fluctuate based on the project phase and exact demands of the project. We are committed to the success of the work outlined and will ensure resources applied are sufficient to accomplish this success.

Deliverable	Fee	End Date
Data Lakehouse		
Discovery	$ 20,000.00	End of Month 2
Development	$ 25,000.00	End of Month 3
Implementation	$ 40,000.00	End of Month 5
Self-Service Analytics Platform		
Discovery	$ 25,000.00	End of Month 3
Deployment	$ 75,000.00	End of Month 5
Implementation	$ 75,000.00	End of Month 7
Student Matriculation Module		
Discovery	$ 15,000.00	End of Month 8
Model Refinement	$ 25,000.00	End of Month 11
Implementation	$ 25,000.00	End of Month 12
Student Retention Module		
Discovery	$ 15,000.00	End of Month 8
Model Refinement	$ 25,000.00	End of Month 11
Implementation	$ 25,000.00	End of Month 12
Support		
Ongoing Support	$60,000.00*	End of Month 24
Total Cost	**$450,000.00**	

*Resultant will invoice ongoing support at $5,000/month over the 12 month support time period.

ROLES AND RESPONSIBILITIES

The Resultant team will leverage the following roles and responsibilities to complete work for this project. The level of effort for each role will fluctuate based on the project phase and exact demands of the project. We are committed to the success of the scope of work and will ensure resources applied are sufficient to accomplish this project. Additional delivery resources may be applied to the project as appropriate.

ROLE	RESPONSIBILITIES
Executive Director	• Advises on escalated issues • Provides guidance and oversight at key checkpoints throughout the engagement • Advises on strategic partnerships
Project Director	• Consults with project team to ensure continuity across all Resultant projects at [CLIENT NAME] • Ensures the project team meets project goals and objectives • Provides alignment on priorities for project team and [CLIENT NAME] strategic goals
Technical Solution Owner	• Oversees technical requirements and ensures that plans fit requirements • Reviews [INSERT name] for quality and maintainability • Ensures overall solution is stable, secure, and scalable
Business Solution Owner	• Guides project vision and helps to ensure high quality outputs • Allocates Resultant resources to support project implementation • Advises on project risks and roadblocks • Provides recommendations on resolution of scope-related matters
Project Manager	• Oversees detailed project delivery • Collaborates with stakeholders to refine requirements and solution design • Prioritizes and schedules the team's activities • Coordinates efforts between Resultant, the government, and any other appropriate third parties • Identifies risks and issues and takes appropriate actions
Solution Architect	• Works with project stakeholders to convert business requirements to technical requirements • Creates technical roadmap for fulfilling requirements • Oversees implementation of roadmap • Reviews designs for risks and adjusts accordingly

ROLE	RESPONSIBILITIES
Senior Software Engineer	• Oversees the implementation of the technical roadmap • Works with the Solution Architect on any required changes in implementation • Reviews all code for quality and adherence to established best practices • Develops features and functionalities
Software Engineer	• Develops features and functionalities • Participates in planning and retrospective meetings
Quality Assurance Specialist	• Reviews requirements for completeness including acceptance criteria • Reviews all features created to ensure that acceptance criteria is met • Creates and adjusts test plans for regression testing new features • Performs test plans and records results for the development team
Business Analyst	• Creates and submits deliverables and work products • Supports requirements gathering activities • Supports testing activities • Documents training materials
DevOps Engineer	• Executes cloud architecture plan • Provides ongoing environment support during the support period
Cloud Architect	• Works with solution architect to understand technical requirements and designs • Creates cloud infrastructure to support development efforts • Monitors deployed cloud environment to ensure highest ratio of performance to cost savings is achieved
Machine Learning Engineer	• Designs, develops, and productionizes machine learning models • Works with data scientists and engineers to deploy models for use in end-user applications • Builds and maintains pipelines for model training and development
Data Architect	• Interprets data architecture and modeling requirements • Advises on data architecture and modeling capabilities and limitations • Identifies opportunities for improvement and provides recommendations • Creates and deploys data architecture specifications according to requirements • Communicates issues and roadblocks to project team
Data Engineer	• Builds the data pipelines • Integrates data to support the analysis • Supports QA testing activities

ROLE	RESPONSIBILITIES
Data Scientist	• Leads the model/framework for program efficacy • Support feature identification of health outcome models • Develop mind map • Build accelerator data sets for use with external agencies and third parties
Senior Data Scientist	• Provides guidance and oversight of data science thread • Develops data algorithms for health outcome analysis • Guides the development of descriptive statistics about the population
Technical Writer	• Coordinates project deliverables and any necessary documentation • Edits and formats documentation for consistency and clarity

ASSUMPTIONS

Resultant has made the following assumptions in preparing this scope of work, fees, and timeline.

1. The priorities and schedules of client resources and other third-party vendors associated with this work are aligned with this effort, and the parties mentioned in this Statement of Work will participated as described herein. Delays in resources from the client, or from other third-party vendors associated with this work, will delay project efforts.
2. This effort may require business exception approvals. If these are delayed or declined, the effort will be affected.
3. Access to data will be granted in a timely manner.
4. This plan was devised with the assumption that secure access to client data environments from cloud and on-premise resources will be available.
5. A single point of contact at will be identified at the client to facilitate answering business questions.
6. A single point of contact at will be identified at the client to facilitate answering technical questions.
7. Data Engineers at the client will be available to facilitate configuring data pipelines to the data warehouse for repeat analytics.
8. Development efforts will be conducted to a significant degree remotely and will not require the use of client-issued devices as long as appropriate secure network access is achieved in a timely manner.
9. Our timeline and fees assume reasonable and timely cooperation from Indiana Tech and that unusual or unexpected circumstances do not occur during the project.

RISKS

The following section describes the known and/or anticipated risks associated with the project and our team's mitigation strategies.

1. Difficulty engaging subject matter experts, client leadership, or competing priorities that cause project inefficiencies.
2. Changing rules and regulations or existing restrictions of use of student data.
3. A lack of robust historical data that is required to complete the project.
4. Issues with data quality that may impede model development.
5. Gaining timely access to data that is required to complete the project.
6. Slow decision-making or changes to decisions by client leadership.

APPROVALS

[Client Name]

_____
Signature

_____
Name

_____
Title

_____
Date

Resultant

_____
Signature

_____
Date