DHPO210 Applied Project

Virtual Care Goal 1

Project Plan

V2.0

Group 5

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Document Control [1]

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[1] (Adopted from Project Plan Template, 2023)

1 Planning Basis

1.1 Project Context

Virtual care, often defined as medical care provided from a distance with the help of technology, has been around since the 1970s. However, before the COVID-19 pandemic, only a small fraction of physicians were engaged in delivering virtual care. With the onset of COVID-19, a majority of physicians in Ontario transitioned to providing virtual care (Bhatia et al., 2021) (Stamenova et al., 2021). Nonetheless, the proportion of virtual appointments has since witnessed a decline, influenced by various factors such as the easing of pandemic restrictions (COVID-19's Impact on Physician Services | CIHI, n.d.) and alterations in the Physician Service Agreement (PSA) policy.

Acknowledging the significantly lower virtual appointment rates before COVID-19, a moderated adjustment towards those initial rates is expected, albeit with a sustained positive impact from the pandemic experience. The intricacies of the PSA, alongside these dynamics, may play a pivotal role in shaping the projections for the 'Ideal virtual care target'. It's imperative to incorporate these factors when forecasting virtual care volumes and defining realistic targets, leading to a pragmatic target suggestion based on this project's findings.

1.2 Project Objectives and Scopes

For our project, it is crucial to clearly define our objectives and scope to ensure alignment with business needs and to set a roadmap for our team's efforts. The following tables lay out the specific objectives we aim to achieve and the scope of activities encompassed in our approach:

Objectives	Details
Business Understanding	Identify and clarify the precise business issues or objectives targeted by the data science project. Understand the current state, including virtual care trends, PSA influence, and anecdotal expectations.
Historical Analysis	Analyze past trends of virtual care volumes to comprehend patterns before and after the introduction of the PSA.
Predictive Modeling	Utilize various statistical and machine learning models to forecast the future volume or percentage of virtual visits based on existing time-series data.
Determine Virtual Care Target	Based on the projected metrics, define an ideal target for virtual care that aids in strategic planning and operational readiness.
Impact Analysis	Evaluate the influence of PSA changes, post-pandemic activity levels, and preferences of patients and providers on virtual care volume.
Insights & Recommendations	Offer actionable insights and recommendations to tackle the anticipated decline and establish a sustainable route for virtual care services.

Scopes	Details
Data Collection	Gather detailed time-series data from Virtual Care at University Health Network (UHN) with relevant timestamps.
Data Cleaning	Using Structured Query Language (SQL) or Python (Numpy & Pandas), preprocess and clean the dataset ensuring it's ready for analysis. Handle anomalies, outliers, and other inconsistencies.
Exploratory Data Analysis (EDA)	Leverage Python or PowerBI/Tableau for a preliminary examination to discern data nature, spot trends, seasonality, and patterns.
Modeling	Implement various models: Statistical (ARIMA, Holt-Winters), machine learning (Gradient Boosted Trees, Random Forest) via Scikit Learn, and deep neural networks (GRN, LSTM (Guan & Engelhardt, 2019), Attention Mechanisms (Bahdanau, Cho, & Bengio, 2014)) using TensorFlow or PyTorch.
Validation	Adopt appropriate metrics to validate the predictive models' accuracy and reliability, harnessing Python's machine learning libraries.
Stakeholder Feedback	Engage with primary stakeholders to accumulate qualitative insights which can complement the project's quantitative findings.

Reporting	Develop a comprehensive report, visualized with tools like PowerBI or Tableau, detailing the findings, insights, and suggestions, aimed at virtual care at UHN's decision-makers.

Limitation: The proportion of future virtual appointments as projected by our model heavily relies on the data given by virtual Care at UHN, which is limited to data from July 2022 to September 2023. The lack of data longitudinally (prior to July 2022) limits the accuracy of projected post-pandemic proportions.

1.3 Roles and Responsibilities

It is essential to delineate the roles and responsibilities of each team member. By doing so, we ensure clarity, foster accountability, and optimize resource utilization. The subsequent table provides a detailed breakdown of the roles and their associated responsibilities:

Roles	Responsibility	Description
Project Manager	Planning	Develops the project plan, outlining timelines, milestones, and necessary resources.
	Coordination	Ensures smooth communication and collaboration with stakeholders, mentors, and team members.
	Monitoring	Regularly reviews the project's progress to keep it on track with the planned objectives and timelines.
	Risk Management	Identifies potential project risks and devises strategies to mitigate them.
	Reporting	Reports the project's status and developments to stakeholders.
Data Analyst	Data ETL/ Cleaning	Extract, Transform, Load, and Preprocesses data to remove inconsistencies and enhance its quality.
	Data Exploration	Conducts exploratory data analysis to find patterns and trends in the data, creates reports and visualizations to communicate findings to stakeholders.
	Supporting Modeling	Assists data scientists and machine learning engineers by providing necessary data and analyses.
Data Scientist	Model Development	Designs and develops predictive models utilizing machine learning algorithms.
	Feature Engineering	Enhances the predictive power of the model through feature engineering.
	Data Analysis	Analyzes data to derive insights and identify opportunities to achieve project objectives.
	Validation	Validates the models using various techniques to ensure they meet quality standards.
Machine Learning Engineer	Model Deployment	Oversees the deployment of developed machine learning models into production environments.
	Performance Monitoring	Monitors and adjusts the performance of the models in a production setting to maintain efficiency.
	Technology Integration	Integrates new technologies and tools to enhance the machine learning infrastructure and facilitate model deployments.

1.4 Milestones

To track progress and ensure the timely completion of our virtual care volume project, we have established a set of key milestones. These milestones serve as significant checkpoints, allowing us to assess achievements and re-calibrate if necessary. The following delineation offers an overview of these critical project landmarks:

Milestone	Description	Delivery
Kick-off Meeting	Team aligns on project objectives, scope, and CRISP-DM (2016) approach.	*14/09/2023*
Plan Approved	Project plan reviewed and approved internally, authorizing the execution phase.	*22/09/2023*
Data Quality Verified	Completion of data quality verification, ensuring data meets quality standards.	*22/09/2023*
Preparation Completed	Data cleaned, formatted, and prepared for modelling.	*29/09/2023*
Initial Model Assessed	Initial model built and ready for assessments and iterations.	*06/10/2023*
Model Verified	Model validated, meeting defined quality and performance criteria.	*03/11/2023*
Execution Completed	All CRISP-DM phases successfully completed, readying for deployment phase.	01/12/2023
Project Completed	Successful completion of all project phases.	08/12/2023

1.5 Phases & Activities

Project Phases:

- Project Initiation: Sets the project foundation by defining objectives, assembling the team, and gathering essential materials, while aligning stakeholders through presentations and introductions to the project sponsors.
- Project Planning: Develops a detailed plan outlining tasks, timelines, and resources, aiming to create a roadmap for successful project completion and risk mitigation.
- Project Execution: Implements the plan using the CRISP-DM framework for guiding the data mining process, actively understanding, preparing, and analyzing data to build and evaluate models for achieving project goals.
- Project Closure: Wraps up the project, summarizes outcomes, ensures deliverable satisfaction, and formally closes the project, facilitating a handover of results to stakeholders.

Activities:
It is vital to break down the larger objectives into a series of specific activities. These activities, when sequenced and executed effectively, ensure that the project remains on course and achieves its intended outcomes. The subsequent outline details for each of the activities and the respective tasks in the CRISP-DM execution.

Activity	Task	Description
Business Understanding	Business Objectives	Identify precise business problems or objectives.
	Assess Situation	Review current scenario including resources, constraints, assumptions, etc.
	Determine Data Science Goals	Convert business objectives into data science goals.
Data Understanding	Initial Data Explore	Collect initial data based on objectives and goals.
	Describe Data	Detail the data's format, quantity, and characteristics.
	Explore Data	Perform analysis to understand data patterns and relationships.
	Verify Data Quality	Check for data inconsistencies, missing values, or errors.
Data Preparation	Select/Clean Data	Choose, clean, and prep data for modelling.
	Construct Data	Create/modify data attributes for modelling.
	Integrate Data	Merge data from various sources for analysis.
	Format Data	Structure data for the selected modelling techniques.
Modeling	Select Modeling Technique	Choose the right modelling technique(s) for analysis.
	Generate Test Design	Create a test design to validate model performance.
	Build Model	Construct the predictive model with chosen techniques and prepared data.
	Assess Initial Models	Evaluate initial models for quality and effectiveness.
Evaluation	Evaluate Results	Assess model results against defined objectives.
	Review Process	Review the process, identifying shortcomings and potential improvements.
	Iterative Optimization	Decide on revisions or proceed to the deployment phase.
Deployment	Plan Deployment	Plan the model's deployment, including system integration.
	Dashboard	Create a dashboard for presenting and monitoring model performance.
	Produce Documents	Create documents like project management, technical solutions, engineering schemes, inference codes, Docker Images, etc

2 Project Schedule [2]

Title	Duration	Start	End	Prerequisites	Assigned
1) Initiation	1w 4d	**2023-09-04, 09:00**	2023-09-14, 18:00		
1.1) Orientation	3d	2023-09-04, 09:00	2023-09-06, 18:00		
1.2) Prj Sponsor Introduction	1h	2023-09-07, 09:00	2023-09-07, 10:00	1.1	
1.3) Stakeholder Presentation	2h	2023-09-07, 10:00	2023-09-07, 12:00	1.2	
1.4) Team Grouping	2h	2023-09-08, 09:00	2023-09-08, 11:00	1.3	PM; DA; DS; MLE
1.5) Collect Materials	1d 2h	2023-09-11, 09:00	2023-09-12, 11:00	1.4	PM; DA; DS; MLE
1.6) Review Literature	1d 2h	2023-09-11, 09:00	2023-09-12, 11:00	1.4	PM; DA; DS; MLE
1.7) Preliminary Meeting	1d	**2023-09-14, 09:00**	2023-09-14, 18:00		
1.7.1) Kick-off Meeting	1d	2023-09-14, 09:00	2023-09-14, 18:00	1.4	PM; DA; DS; MLE
1.7.2) Project Kick-off		2023-09-14, 18:00	2023-09-14, 18:00	1.7.1	
2) Planning	1w	**2023-09-18, 09:00**	2023-09-22, 18:00		
2.1) Produce Project Plan	1w	2023-09-18, 09:00	2023-09-22, 18:00	1.7.2	
2.2) Plan Complete		2023-09-22, 18:00	2023-09-22, 18:00	2.1	
3) Execution CRISP-DM	10w 3d	**2023-09-20, 09:00**	2023-12-01, 18:00		
3.1) Business Understanding	2d	**2023-09-20, 09:00**	2023-09-21, 18:00		
3.1.1) Biz Objectives	2d	2023-09-20, 09:00	2023-09-21, 18:00	1.7.1	PM; DS
3.1.2) Assess Situation	2d	2023-09-20, 09:00	2023-09-21, 18:00	1.7.1	PM; DS
3.1.3) Data Science Goals	2d	2023-09-20, 09:00	2023-09-21, 18:00	1.7.1	DS
3.2) Data Understanding	3d	**2023-09-20, 09:00**	2023-09-22, 18:00		
3.2.1) Initial Data Explore	1d	2023-09-20, 09:00	2023-09-20, 18:00	1.7.1	DA
3.2.2) Describe Data	1d	2023-09-21, 09:00	2023-09-21, 18:00	3.2.1	DA
3.2.3) Explore Data	2d	2023-09-21, 09:00	2023-09-22, 18:00	3.2.1	DA
3.2.4) Data Quality Verified		2023-09-22, 18:00	2023-09-22, 18:00	3.2.3	DS
3.3) Data Preparation	1w	**2023-09-25, 09:00**	2023-09-29, 18:00		
3.3.1) Select/Clean Data	1d	2023-09-25, 09:00	2023-09-25, 18:00	3.2.4	DS
3.3.2) Construct Data	1d	2023-09-26, 09:00	2023-09-26, 18:00	3.2.1	DA
3.3.3) Integrate Data	1d	2023-09-28, 09:00	2023-09-28, 18:00	3.3.2	DA
3.3.4) Format Data	1d	2023-09-29, 09:00	2023-09-29, 18:00	3.3.3	DA
3.3.5) Preparation Completed		2023-09-29, 18:00	2023-09-29, 18:00	3.3.4	
3.4) Modeling	2w	**2023-09-25, 09:00**	2023-10-06, 18:00		
3.4.1) Select Models	4d	2023-09-25, 09:00	2023-09-28, 18:00	3.2.3	DS
3.4.2) Generate Test Design	1d	2023-09-29, 09:00	2023-09-29, 18:00	3.4.1	MLE
3.4.3) Build Models	1w	2023-10-02, 09:00	2023-10-06, 18:00	3.4.2	DS
3.4.4) Assess Initial Model		2023-10-06, 18:00	2023-10-06, 18:00	3.4.3	MLE
3.5) Evaluation	4w	**2023-10-09, 09:00**	2023-11-03, 18:00		
3.5.1) Evaluate Results	2d	2023-10-09, 09:00	2023-10-10, 18:00	3.4.4	DS; MLE
3.5.2) Review Process	1d	2023-10-13, 09:00	2023-10-13, 18:00	3.4.4	DA; DS; MLE
3.5.3) Optimization Iteratively	3w	2023-10-16, 09:00	2023-11-03, 18:00	3.5.1	DS; MLE
3.5.4) Verify Model Quality		2023-11-03, 18:00	2023-11-03, 18:00	3.5.3	PM; DS
3.6) Deployment	4w	**2023-11-06, 09:00**	2023-12-01, 18:00		
3.6.1) Plan Deployment	1d	2023-11-06, 09:00	2023-11-06, 18:00	3.5.4	DS; MLE
3.6.2) Dashboard	2w 4d	2023-11-07, 09:00	2023-11-24, 18:00	3.6.1	MLE
3.6.3) Produce Documents	1w	2023-11-27, 09:00	2023-12-01, 18:00	3.6.2	PM
3.6.4) Execution Complete		2023-12-01, 18:00	2023-12-01, 18:00	3.6.3	PM; DA; DS; MLE
3.7) Paper Manuscript (Optional)	8w	2023-10-09, 09:00	2023-12-01, 18:00	3.4.4	
4) Closure	2w	**2023-11-27, 09:00**	2023-12-08, 18:00		
4.1) Pitch	1w 2d	**2023-11-27, 09:00**	2023-12-05, 18:00		
4.1.1) Produce Deck	1w 1d	2023-11-27, 09:00	2023-12-04, 18:00	3.6.2	PM
4.1.2) Presentation	1d	2023-12-05, 09:00	2023-12-05, 18:00	4.1.1	PM; DA; DS; MLE
4.2) Summary Meeting	1d	**2023-12-08, 09:00**	2023-12-08, 18:00		
4.2.1) Final Meeting	1d	2023-12-08, 09:00	2023-12-08, 18:00	4.1.2	PM; DA; DS; MLE
4.2.2) Project Complete		2023-12-08, 18:00	2023-12-08, 18:00	4.2.1	

[2] (Generated by OmniPlan for Mac)

3 References

Bahdanau, D., Cho, K., & Bengio, Y. (2014). Neural machine translation by jointly learning to align and translate. arXiv preprint arXiv:1409.0473.

Bhatia, R. S., Chu, C., Pang, A., Tadrous, M., Stamenova, V., & Cram, P. (2021, January). Virtual care use before and during the COVID-19 pandemic: a repeated cross-sectional study. CMAJ Open, 9(1), E107–E114. https://doi.org/10.9778/cmajo.20200311

COVID-19's impact on physician services | CIHI. (n.d.). https://www.cihi.ca/en/covid-19-resources/impact-of-covid-19-on-canadas-health-care-systems/physician-services

Guan, G., & Engelhardt, B. E. (2019). Predicting sick patient volume in a pediatric outpatient setting using time series analysis. In Machine Learning for Healthcare Conference (pp. 271-287). PMLR.

Project Plan Template. (2023, September 14). ProjectManager. https://www.projectmanager.com/templates/project-plan-template

Stamenova, V., Chu, C., Pang, A., Tadrous, M., Bhatia, R. S., & Cram, P. (2021, September 7). Using Administrative Data to Explore Potentially Aberrant Provision of Virtual Care During COVID-19: Retrospective Cohort Study of Ontario Provincial Data. Journal of Medical Internet Research, 23(9), e29396. https://doi.org/10.2196/29396

W.(2016, July 26). CRISP-DM – a Standard Methodology to Ensure a Good Outcome. Data Science Central. https://www.datasciencecentral.com/crisp-dm-a-standard-methodology-to-ensure-a-good-outcome/