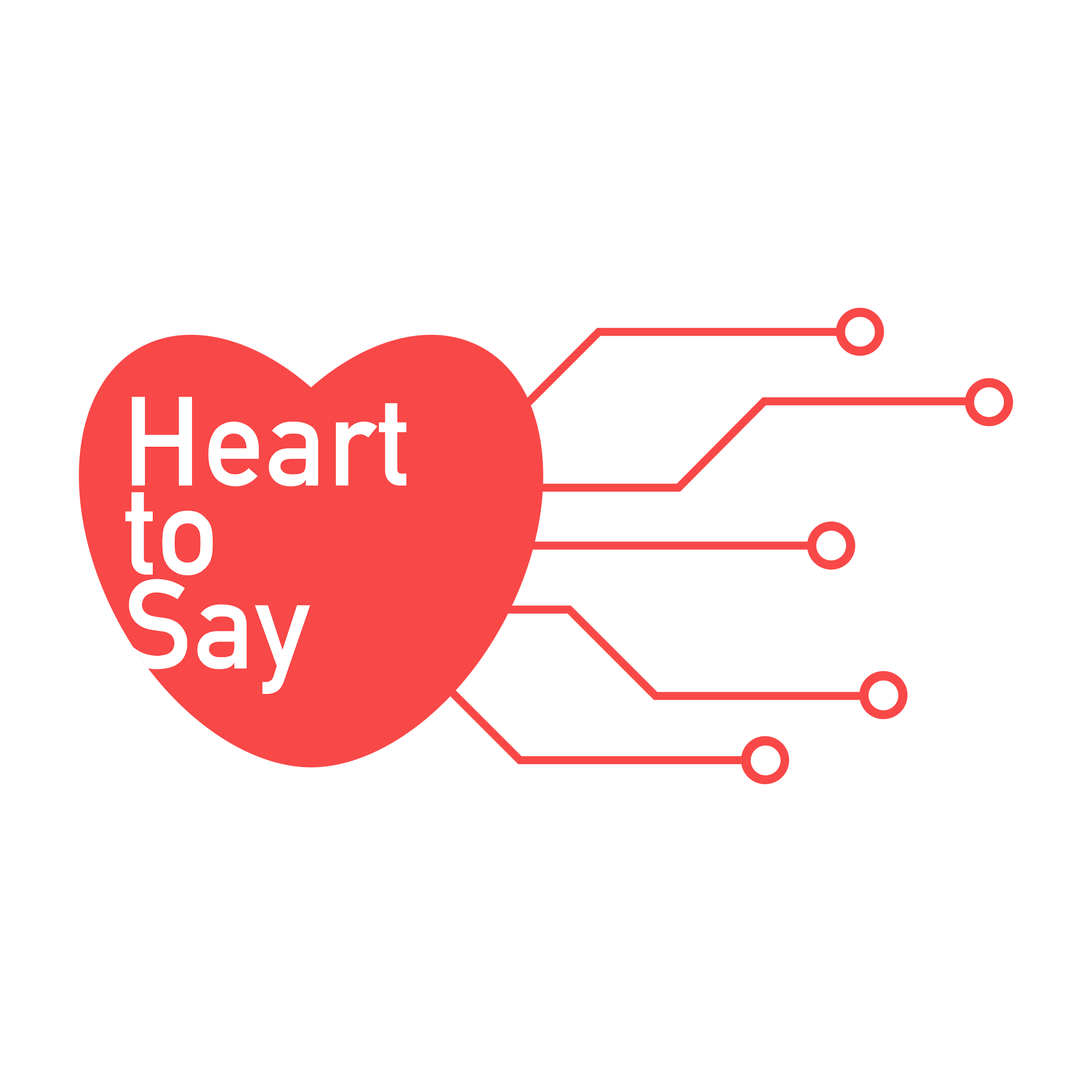
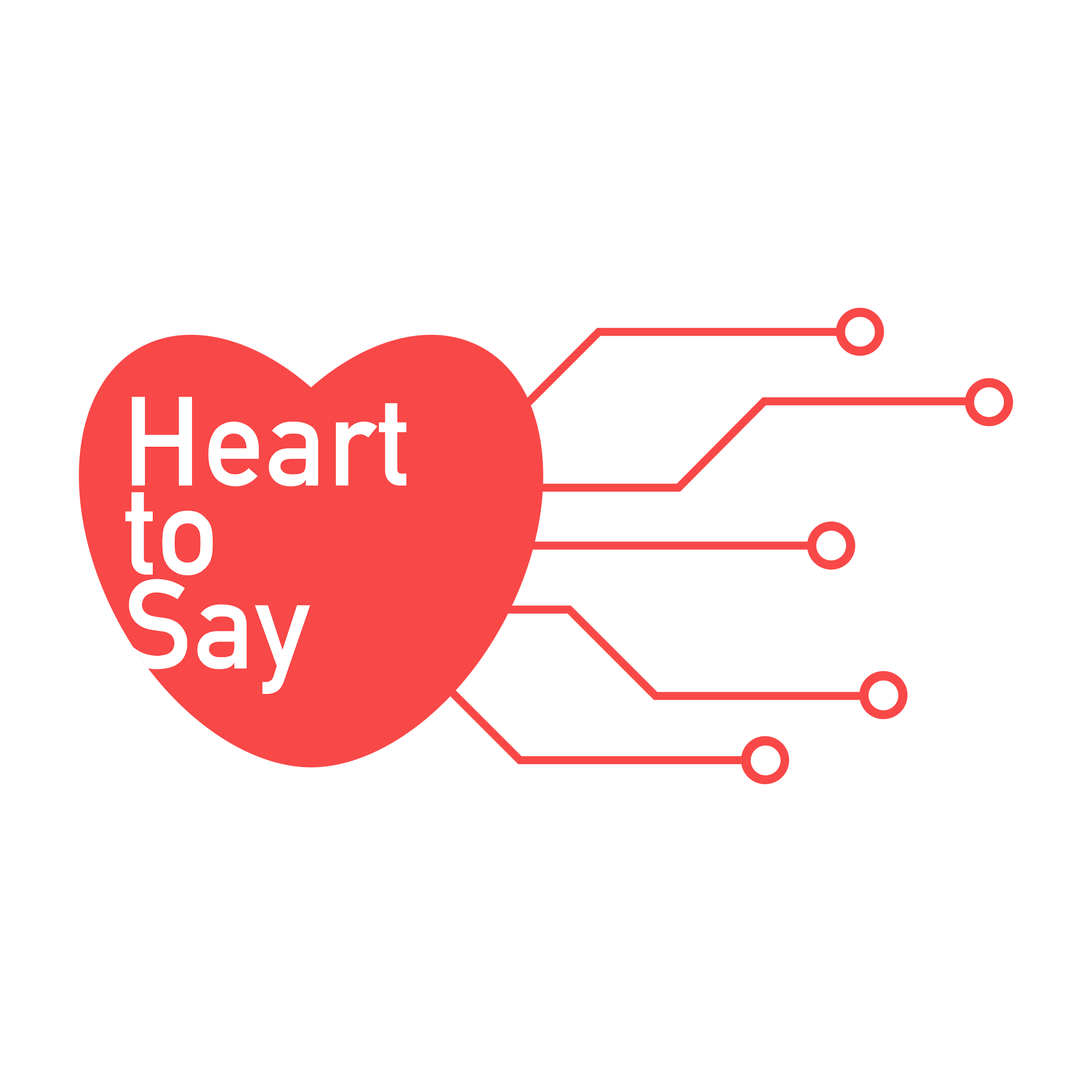
****

**Heart to Say**

project charter - group a

# TABLE OF CONTENTS

[**TABLE OF CONTENTS 1**](#_i68xzjz5692q)

[**1. Introduction 2**](#_63k7g9v5ppe1)

[1.1. Purpose of the Project Charter 2](#_6g3hni1ppzlx)

[**2. Project and product overview 2**](#_fa3dpv680cgv)

[**3. Justification 3**](#_u1o8rhwxzuvh)

[3.1. Business needs 3](#_9rm3l8n44aw2)

[3.2. Public health and business impact 3](#_uzifwpidnwn5)

[3.3. Strategic alignment 4](#_gte13oby8cbc)

[**4. Scope 5**](#_1djr0as9rm4n)

[4.1. Objectives 5](#_8wsjtr8f9zzo)

[4.2. High-level requirements 5](#_87p20hyrqvf3)

[4.3. Major deliverables 6](#_gnbla8g55eh7)

[4.4. Boundaries 6](#_bt4rxcvr1bcn)

[**5. Duration 7**](#_libpf3chx5eu)

[5.1. Timeline 7](#_mjdc7m9bkqj4)

[5.2. Executive milestones 7](#_2o65dwvdg5l5)

[**6. Budget estimate 8**](#_qy1s1hvjcedx)

[6.1. Funding source 8](#_gpbn5e792wg6)

[6.2. Estimate 8](#_6861xy21ncyh)

[**7. High-level alternatives analysis 8**](#_qswouu9lz555)

[**8. Assumptions, constraints, and risks 9**](#_yxjtc95q00ft)

[8.1. Assumptions 9](#_1e82rzvnk56n)

[8.2. Constraints 10](#_qfi5ieymq1ve)

[8.3. Risks 10](#_r1ootv8uonku)

[**9. Project organization 11**](#_7v7z6kpkavbb)

[9.1. Roles and responsibilities 11](#_p25n7ipluf3)

[9.2. Stakeholders (internal and external) 12](#_dltwpxcjjuj8)

[9.3. Development approach 13](#_tkr10b3sibcr)

[**10. Project charter approval 14**](#_2c65k6dlv71i)

**R**[**eference 15**](#_qky0o3p9ea6m)

# introduction

## purpose of the project charter

The project charter documents and tracks the necessary information required by decision-makers and stakeholders to approve the project for funding. The comprehensive documentation and tracking will include essential information, manage changes effectively, and ensure fulfillment of requirements. It will serve as a crucial tool for maintaining detailed records of project progress and modifications, thereby supporting effective oversight and accountability throughout the project's lifecycle.

# project and product overview

The **Heart to Say** project aims to build a web-based medical dashboard that supports physicians to predict the risk of mortality due to heart failure. Physicians will be able to reassess treatment plans, explore alternative therapies, and closely monitor patients to help mitigate the risk of mortality. Prescriptive analytics will be used on patient data to help physicians identify specific factors contributing to elevated mortality risk. Thus, it will provide recommendations based on existing medical guidelines to guide in clinical decision-making on an individual basis for prevention and/or mitigation of mortality due to heart failure.

The project will adapt a dataset from Chicco D et al. on patients with heart failure in Pakistan, collected in 2015 [1, 2]. The dataset includes demographic information (age and gender), smoking status, and the presence of comorbidities such as anemia, diabetes, and hypertension, all of which are factors positively correlated with heart failure [3-10]. It also includes laboratory test data, including creatinine phosphokinase (CPK) levels, platelet counts, serum creatinine levels, serum sodium levels, and ejection fraction percentages [1]. The factors/features for the prediction modeling will be chosen once the diagnostic analysis of the dataset has been conducted. Feature engineering as well as preprocessing of the dataset will be conducted before using it for prediction modeling.

The project is led by **Team N+an**, a health informatics team based in Stockholm, Sweden, with diverse expertise in healthcare and technology. The project will run from September 2024 to October 2024, with an estimated budget of 1,100,000 SEK. The project is aimed at finalizing a prototype, hence the short deadline. The finalization of the project will necessitate an additional month of work, contingent upon receiving approval.

The project’s deliverable will be an interactive web-based medical dashboard designed for physicians. The dashboard will feature four tabs:

1. **Data Overview**: Displays heart failure patient data in Sweden, enabling physicians to view prevalence based on age, gender, smoking status, comorbidities, and laboratory test results.
2. **Risk Factor Correlations**: Highlights the correlations and patterns between heart failure risk factors and mortality, offering a comprehensive overview of clinical governance.
3. **Mortality Prediction**: Enable physicians to input data on heart failure risk factors and predict the likelihood of critical conditions that could lead to mortality.
4. **Project Information**: Provides details about the project, the developers, and contact information.

# justification

## business needs

Cardiovascular disease (CVD) is the leading cause of death worldwide, with an estimated 20.5 million deaths reported in 2021 [11, 12]. Among CVD conditions, heart failure often presents a survival prognosis comparable to that of severe cancer types [11, 13]. Studies indicate that elderly patients [14, 15] and men [15] face higher mortality rates in heart failure cases. Other risk factors, including smoking [15], anemia [4-7], diabetes [8-10], and hypertension [15-17], are also linked to increased mortality.

A study conducted in Sweden, the United Kingdom, Japan, and the USA revealed that more than half of the deaths occurring after the onset of heart failure transpire outside the hospital [18]. The study also observed a substantial increase in hospital costs associated with heart failure management, highlighting the need for enhanced intervention strategies. Accurate forecasting is therefore vital, as it enables efficient time management and the timely implementation of appropriate treatment strategies to prevent mortality due to heart failure or management of the condition [18, 19]. With this in mind, The **Heart to Say** project aims to build a prediction model to estimate the likelihood of mortality in heart failure patients using the dataset adapted from Chicco D et al [1, 2]. It will initially be deployed in Stockholm, Sweden for evaluation, with plans for distribution nationally and eventually globally.

## public health and business impact

The development of a web-based health platform for heart failure patients will provide data on the incidence and mortality rates of heart failure cases. The data offers valuable insights for public health strategies through continuous monitoring. Furthermore, it enables the implementation of appropriate measures, such as establishing guidelines for heart failure management, to help reduce mortality rates.

The project aims to improve patient care for heart failure patients and, in the long term, provide societal and health organizational benefits by reducing costs for managing these patients. It will contribute to a better quality of life and a reduced mortality rate from heart failure. Additionally, it has the potential to influence health informatics practices, enhancing the integration of data-driven approaches into clinical decision-making and policy development.

Currently, the project is set to be tested in Swedish primary care units and cardiology departments. Following the trial and evaluation phases, and based on scientific reports, the project aims to proceed with broader implementation. Further data collection will be essential for training the model more effectively, thereby improving its performance in data evaluation metrics. With the increased volume of data integrated into the prediction model, the model will assist in monitoring trends in heart failure and evaluating the impact of implemented strategies. Ultimately, it will help assess any changes in mortality rates resulting from these interventions.

## strategic alignment

| **Goal** | **Project Response Rank** | **Comments** |
| --- | --- | --- |
| *Scale*: **H** – High, **M**- Medium, **L** – Low, **N/A** – Not Applicable | | |
| **CDC** | | |
| * Data Collection and Analysis:   Gather and analyze data to monitor trends and inform public health authorities [20].   * Enhance Accessibility:   Promote the accessibility of digital health technologies [20].   * Support Research:   Foster research in digital health to advance public health and improve overall healthcare [20]. | H | The project aligns with CDC's strategic goals in Digital Enablement of Health Systems, Data-Driven Decision Making, Improving Health Equity, Enhancing Surveillance and Predictive Analytics, Shared Digital Platforms, and Interoperability [20] |
| **Karolinska Institutet** | | |
| * Conduct needs-driven research [21]. * Enhance clinical practice through informatics [21]. * Integrate novel, evidence-based insights into patient care, prevention, and self-management [21]. | M | The project aligns with the Karolinska Institutet (KI) research group led by Lars Lund, focusing on "Heart Failure with Reduced and Preserved Ejection Fraction" [22]. This group receives support and funding from various sources, including KI, Region Stockholm, the National Institutes of Health (NIH), the European Research Council, the Swedish Heart-Lung Foundation, the Swedish Research Council, and the Erling Persson Family Foundation. |
| **SwedeHF** | | |
| * Improve management of patients with heart failure [23]. * Reduce morbidity and mortality of heart failure patients [23]. * Deliver cost-effective care for heart failure patients [23]. * Maintain epidemiological research [23]. | H | The project aligns with SwedeHF, the Swedish Heart Failure Registry, as one of its long-term goals is to reduce mortality among heart failure patients [23]. |
| **RISE Research Institutes of Sweden** | | |
| * Ensure high standards in research [24]. * Foster partnerships between academia, industry, and the public sector [24]. * Manage testbeds that address industry-relevant challenges [24]. * Ensure a sustainable future [24]. | H | RISE has a project on “Advancing Heart Failure Management through AI-Driven Telemonitoring in Specialized Home Care Setting” with a total funding of 9,983,333 kr from Vinnova for the period of 1 September 2024 until 31 August 2027 [25]. |

# scope

## objectives

The objectives of the **Heart to Say** project are as follows:

* Physician and patient
  + Utilize clinically significant data to predict mortality rates in patients at risk of or diagnosed with heart failure.
  + Aid physicians in monitoring the factors influencing the rate of mortality
  + Aid physicians in intervening when the risk of mortality is heightened
  + Provide prescriptive measures for physicians to manage patients with heightened risk of mortality
* Public health
  + Provide guidance in intervention strategies or treatment
  + Aid authorities and health boards in monitoring the factors influencing the rate of mortality
  + Decrease the mortality rate of patients with heart failure in the general population
  + Decrease the burden of medical and societal costs
  + Improve management of heart failure patients
  + Apply health informatics to enhance practices and outcomes in cardiology
  + Contribute to health informatics and advancements in cardiology

## high-level requirements

The following table presents the requirements that the project’s result must meet in order for the project objectives to be satisfied.

| **Req. #** | **Requirement Description** |
| --- | --- |
| 1 | Leverage publicly available real-world data on heart failure for use in the initial stage of the prediction model. |
| 2 | Develop a prediction model that provides outcomes consistent with existing scientific literature and guidelines, unless it yields novel findings (which need to be tested and explored further before the model can be deployed). |
| 3 | Include a prescriptive model to provide support on managing high-risk patients (prevention and intervention). |
| 4 | Enable the incorporation of new data entries for training purposes to enhance the model's performance metrics. |

## major deliverables

The following table presents the major deliverables that the project’s result must meet in order for the project objectives to be satisfied.

| **Major Deliverable** | **Deliverable Description** |
| --- | --- |
| 1 | Data sourced from open-access databases and research repositories must provide valuable insights into patient demographics, treatment outcomes, and disease progression, which can be instrumental in developing and refining predictive models. |
| 2 | Model results align with existing evidence-based practices and established consensus. |
| 3 | Deliver prescriptive measures utilizing existing guidelines, following an "if this, then that" approach to recommend specific interventions based on identified risk factors. |
| 4 | Future data collection will help refine the model, increasing its performance in predicting outcomes. |

## 

## boundaries

The project will have the following inclusion criteria:

1. The project is specifically designed for patients diagnosed with heart failure.
2. It will initially be implemented locally in Stockholm, Sweden, meaning that patient data collected for the dashboard will be from Swedish heart failure patients.

The exclusive boundaries for the project are:

1. Patients diagnosed with any conditions other than heart failure.
2. Factors such as age may have varying impacts on heart failure globally [12]. However, there are reports indicating an age variation of 66.5 ± 12.5 years, which contributes to a higher risk of heart failure (data from Spain) [11]. It is anticipated that, after exhibiting the prototype, additional data from the local population (for example Sweden) will be incorporated to make the prediction model more accurate for local use.
3. The project will exclude specific medication prescriptions as suggestions, as guidelines and supporting evidence may vary at local, national, or global levels. However, general recommendations based on local requirements may be incorporated into the model.

# duration

## timeline

The project timeline is divided into four sprints: team rules creation, project charter development, text mining, and final prototype deliverables, all scheduled between September and October 2024. The first sprint, involving the establishment of team rules and the development of a paper prototype, was successfully completed on September 8, 2024. Currently, the project is in the second sprint, focusing on the creation of the project charter, with an expected completion date of September 22, 2024. The final two sprints will run in parallel to reevaluate and resolve any issues, while also incorporating additional ideas as needed, to ensure the project remains on track and meets the established time constraints. The Gantt chart below outlines the complete project timeline.

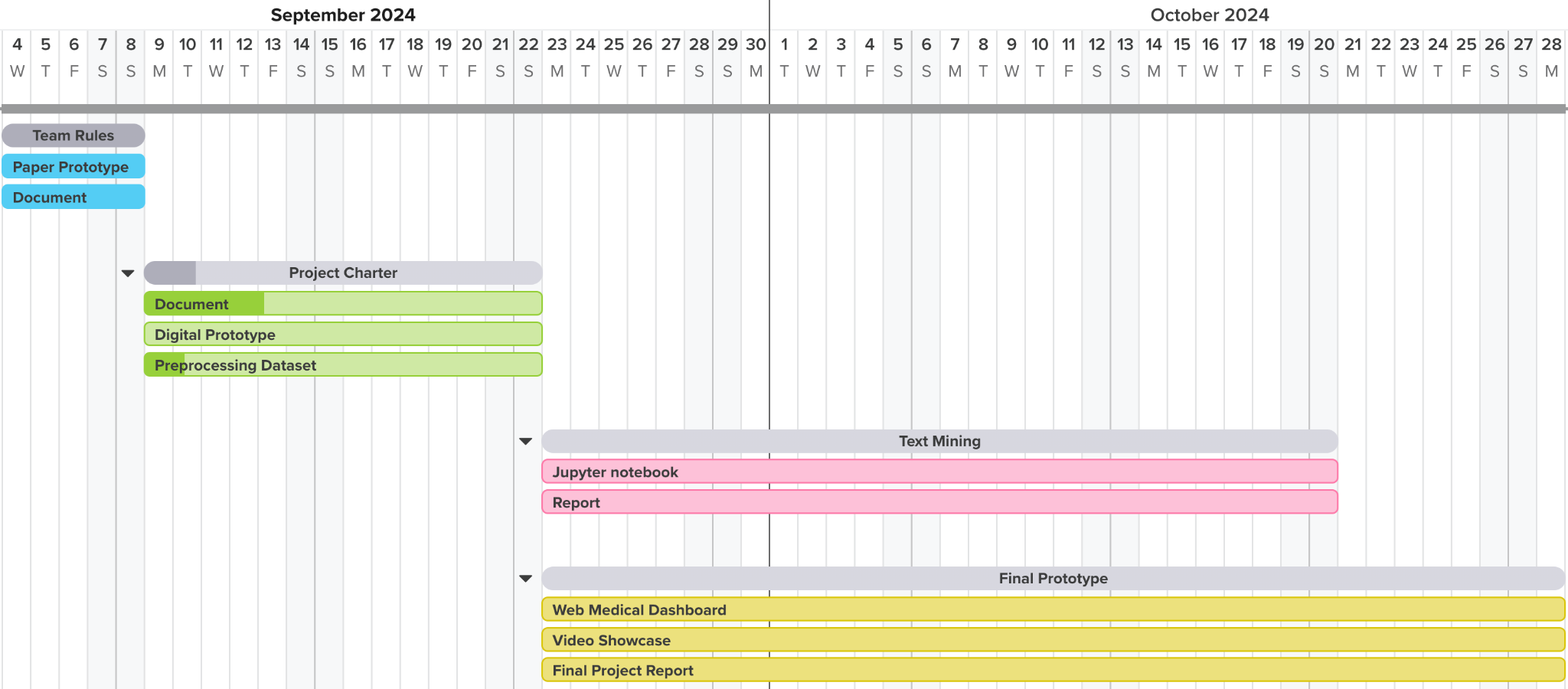
**

Figure 1. Project timeline in a Gantt chart format

## executive milestones

The table below lists the high-level Executive Milestones of the project and their estimated completion timeframe.

| **Executive Milestones** | **Estimated Completion Timeframe** |
| --- | --- |
| Selection of the dataset to build a predictive model, critical for the project’s success. | 08 September 2024 |
| Assigning project leads for each sprint to ensure focused leadership and accountability | 08 September 2024 |
| Agreeing on the development method approach and tools to streamline project execution | 08 September 2024 |
| Completion of a paper prototype for the web-based medical dashboard, providing a clear vision of the project's end goal. | 08 September 2024 |
| Finalization of the project timeline and the proposed budget to guide resource allocation | 22 September 2024 |
| Successful completion of the machine learning-based predictive model | 27 October 2024 |
| Launch of the fully functional interactive web medical dashboard prototype | 27 October 2024 |
| Completion of a video showcase, presentation slides, and project report for the stakeholders' and sponsors' engagement and review | 27 October 2024 |

# budget estimate

## funding source

The project is sponsored and supported by the following institutions and organizations:

* Stockholm University
* Karolinska Institutet
* Karolinska University Hospital
* Region Stockholm
* SwedeHF (Swedish Heart Failure Registry)
* Swedish Cardiology Association (Svenska Kardiologföreningen, SvKF)
* Swedish Heart-Lung Foundation (Hjärt-Lungfonden)
* Swedish eHealth Agency (e-hälsomyndigheten)
* Public Health Agency of Sweden (Folkhälsomyndigheten)
* Swedish National Board of Health and Welfare (Socialstyrelsen)

It is anticipated that the allocated resources will be fully utilized for the project without exceeding the budget. This is crucial for demonstrating the project's feasibility and preventing cost overruns.

## estimate

The project is planned to take place from September 2024 to October 2024, with an estimated total budget of 1,100,000 SEK for the full investment lifecycle. This estimated cost is derived from salary projections for five IT consultants in Sweden and the anticipated development expenses for small software projects in 2024 (IT consultant salary 55,000 SEK/month; operational cost 550,000 SEK) [26, 27].

# high-level alternatives analysis

Project Goal: Develop a model to predict mortality risk for heart failure patients.

* **Option 1**: Develop a custom system

| **Cost** | The investment in producing a custom system is high since it involves further development of software for use in this project. |
| --- | --- |
| **Functionality** | Customized software will provide additional flexibility in development, allowing the project to be tailored to the specific needs and requirements of both stakeholders and the team. |
| **Timeline** | Extended development time and additional sprints |
| **Scalability** | Higher options to scale the custom systems require more resources and maintenance |
| **Maintenance** | Maintaining custom systems requires up-to-date management and resources to ensure their continued functionality and performance. |

* **Option 2**: Use a COTS (Commercial Off-The-Shelf) Product

| **Cost** | Cost of licensing fees for COTS software/systems. |
| --- | --- |
| **Functionality** | COTS software/systems are limited to the functionalities they offer and may not fully meet all project requirements/needs. |
| **Timeline** | Development time will be shortened as the focus will primarily be on producing the prototype. |
| **Scalability** | Depends on the COTS software/systems functionalities. |
| **Maintenance** | Product vendors are responsible for providing updates and iterations. |

The investment in developing custom systems is high, as it adds additional pressure to the development process alongside the machine learning component. However, the advantage is the ability to offer greater customization to meet the project’s specific needs. On the other hand, COTS software/systems eliminate the need for further development costs, reduce time, and require less maintenance. Therefore, Option 2 (COTS) is the preferred choice. In specific cases where additional customization is required, a combination with Option 1 (custom systems) will be considered.

# assumptions, constraints, and risks

## assumptions

This section identifies the statements believed to be true and from which a conclusion was drawn to define this project charter.

1. The project aims to have a positive impact on health informatics and cardiology.
2. The model will assist stakeholders in decision-making, prevention, and intervention related to the risk of mortality among patients with heart failure.
3. The model will identify and highlight the most influential factors contributing to the risk of mortality, providing valuable insights for stakeholders. It will help in prescriptive decision-making.
4. The dataset originates from Pakistan. However, it is presumed that some factors influencing heart failure are globally consistent, as they adhere to established internationally recognized evidence and standards in heart failure diagnosis [11, 12]. Still, some factors such as age may vary (see Boundaries 4.4).
5. All team members will actively participate, collaborate, and contribute equally to the project.
6. All team members will prioritize finalizing the prototype before the final deadline.
7. The budget will be strictly adhered to, and all expenditures will be managed to ensure that the allocated budget is not exceeded.
8. The data will be strictly regulated in accordance with the European Union's General Data Protection Regulation (GDPR) and applicable local data and privacy laws. All team members are assumed to adhere strictly to these regulations to ensure compliance and safeguard data privacy.

## constraints

This section identifies any limitations that must be taken into consideration prior to the initiation of the project.

1. The dataset may include features, such as "age," that vary among heart failure patients who experience death globally. To ensure consistency and accuracy in the prediction model, only standardized features will be utilized.
2. The team's limited documented experience in programming could potentially influence the project's outcome. This lack of expertise may pose challenges that affect the overall quality and effectiveness of the project's execution and deliverables.
3. The current deadline is solely sufficient for developing the final prototype; however, completing the project in its entirety will require additional time beyond this deadline.
4. Prescriptive measures may vary; therefore, the system will refrain from making recommendations. Instead, it will identify and present the most significant contributing factor to higher mortality risk to the user as a prescriptive measure.

## risks

| **Risk** | **Mitigation** |
| --- | --- |
| Breach of data privacy and security | Implement robust cybersecurity measures such as encryption, using secure APIs, and performing routine data backup |
| Failure to meet the deadline | Request external assistance only when absolutely necessary. |
| Prediction model producing results not aligning with conventional findings or giving inconsistent results | Each team member will review the dataset for inconsistencies. Feature engineering will be conducted with preprocessing of the data. Results will be consistently reviewed and compared. Cross-validation techniques will be employed to assess the model's performance across different subsets of the data. |
| Exceeding budget | Resource allocation needs to be approved by majority voting. Cost analysis will be further conducted in the development phase. |
| Failure to achieve approval for the deployment of the project | Maintain constant communication with stakeholders to ensure their requirements and needs are met throughout the project. Regular updates and feedback loops will help address any concerns promptly and keep the project aligned with stakeholder expectations. |

# project organization

## roles and responsibilities

This section describes the key roles supporting the project.

| **Name & Organization** | **Project Role** | **Project Responsibilities** |
| --- | --- | --- |
| * Sabine Koch (Karolinska Institutet) * Patrik Rossi (Karolinska University Hospital) | Project Sponsor | The person is responsible for acting as the project’s champion and providing direction and support to the team. In the context of this document, this person approves the request for funding, approves the project scope represented in this document, and sets the priority of the project relative to other projects in his/her area of responsibility. |
| * Gunilla Nordlöf (Swedish eHealth Agency) * Olivia Wigzel (Public Health Agency of Sweden) | Government Monitor | Government employee who provides the interface between the project team and the project sponsor. Additionally, they will serve as the single focal point of contact for the Project Manager to manage CDC’s day-to-day interests. This person must have adequate business and project knowledge in order to make informed decisions.  In the case where a contract is involved, the role of a Government Monitor will often be fulfilled by a Contracting Officer and a Project Officer. |
| Emma Lennartsson (Region Stockholm) | Contracting Officer | A person who has the authority to enter into, terminate, or change a contractual agreement on behalf of the Government. This person bears the legal responsibility for the contract. |
| Luis Velez Quintero and Alejandro Kuratomi Hernandez (DSV, Stockholm University) | Project Officer | A program representative is responsible for coordinating with acquisition officials on projects for which contract support is contemplated. This representative is responsible for technical monitoring and evaluation of the contractor's performance after the award. |
| Sahid Hasan Rahim  (Team N+an) | Project Manager | A person who performs the day-to-day management of the project and has specific accountability for managing the project within the approved constraints of scope, quality, time, and cost, to deliver the specified requirements, deliverables, and customer satisfaction. |
| Mahmoud Elachi  (Team N+an) | Business Steward | A person in management, often the Branch Chief or Division Director, who is responsible for the project in its entirety. |
| Zhao Chen, Nan Jiang, and Ifani Pinto Nada  (Team N+an) | Technical Steward | A person who is responsible for the technical day-to-day aspects of the system, including the details of system development. The Technical Steward is responsible for providing technical direction to the project. |
| Mahmoud Elachi  (Team N+an) | Security Steward | A person who is responsible for playing the lead role in maintaining the project’s information security. |

## stakeholders (internal and external)

Internal stakeholders

* Physicians and cardiologists
* Stockholm University
* Karolinska Institutet
* Karolinska University Hospital

External stakeholders

* Region Stockholm
* SwedeHF (Swedish Heart Failure Registry)
* Swedish Cardiology Association (Svenska Kardiologföreningen, SvKF)
* Swedish Heart-Lung Foundation (Hjärt-Lungfonden)
* Swedish eHealth Agency (e-hälsomyndigheten)
* Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU – Statens Beredning för Medicinsk och Social Utvärdering)
* Swedish Association of Local Authorities and Regions (SALAR)
* Swedish Research Council (Vetenskapsrådet)
* Public Health Agency of Sweden (Folkhälsomyndigheten)
* Swedish National Board of Health and Welfare (Socialstyrelsen)
* Swedish Ministry of Health and Social Affairs
* The Patient Advisory Committee (Patientnämnden)
* The Swedish Authority for Privacy Protection (Integritetsskyddsmyndigheten)
* European Medicines Agency (EMA)

## development approach

The selected development methodology for the project is Scrum, due to its agile framework [28]. Additionally, Scrum encourages collaboration through regular meetings and continuous feedback. The Scrum methodology, along with the roles and their responsibilities, can be described as follows:

Product Owner (Sahid):

* Focus on maximizing productivity to ensure the team delivers a project with a valuable end result.
* Ensure the delegation of responsibilities and tasks prioritizes those with the highest urgency for completion.
* Be the primary point of contact between stakeholders and the team.
* Consistently refine the requirements (if required) and communicate any changes to the team so each member understands the goals and objectives of the project.

Scrum Master (Ifani):

* Ensure that the project implements the practices according to the Scrum Guide for the team to follow during the development phases.
* Facilitate effective communication and collaboration between the team and stakeholders.
* Forecast and mitigate risks and problems that may hinder the project from progressing. This will ensure that the project workflow remains streamlined.
* Inform and support the team in comprehending and implementing Scrum principles in an effective manner.

Developer (Nan, Zhao, Mahmoud):

* Accountable for developing and delivering a functional increment at each stage of the sprint.
* Ensure that the team adheres to design specifications and rigorously tests project increments to verify they meet the project requirements.
* Accountable for executing and delivering functional increments in accordance with high-quality standards and within the sprint timeframe.
* Perform the sprint planning and review each sprint to gather feedback in order to improve the development process.

Currently, the aim is to hold daily briefings of approximately 20 minutes to review ongoing tasks and immediate objectives. In addition, longer and more comprehensive meetings will be conducted once a week to focus on broader project goals and key requirements. These weekly sessions will allow for in-depth discussions on strategic planning, progress evaluation, and any necessary adjustments to ensure alignment with the overall project objectives. The daily briefings will help in monitoring daily progress and resolve any issues.

# project charter approval

The undersigned acknowledge they have reviewed the project charter and authorize and fund the **Heart to Say** project. Changes to this project charter will be coordinated with and approved by the undersigned or their designated representatives.

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Mahmoud Elachi |  |  |
| Role: | Project Leader |  |  |

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Sabine Koch |  |  |
| Role: | Head of Department Learning, Informatics, Management and Ethics (LIME) Karolinska Institutet |  |  |

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Patrik Rossi |  |  |
| Role: | Acting Chief Executive Officer (CEO), Karolinska University Hospital |  |  |

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Emma Lennartsson |  |  |
| Role: | Region Director, Region Stockholm |  |  |

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Gunilla Nordlöf |  |  |
| Role: | Director General of the E-Health Authority, Swedish eHealth Agency (e-hälsomyndigheten) |  |  |

| Signature: |  | Date: | 22/09/2024 |
| --- | --- | --- | --- |
| Print Name: | Olivia Wigzell |  |  |
| Role: | General Director of Public Health Agency of Sweden (Folkhälsomyndigheten) |  |  |

# 

# 

# reference

1. Chicco D, Jurman G. Machine learning can predict survival of patients with heart failure from serum creatinine and ejection fraction alone. BMC Med Inform Decis Mak. 2020 Feb 3;20(1):16.
2. Kaggle. Heart Failure Prediction [Internet]. San Francisco, CA: Kaggle; [date unknown]. [cited 2024 Sep 11]. Available from: <https://www.kaggle.com/datasets/andrewmvd/heart-failure-clinical-data>
3. Petrie JR, Guzik TJ, Touyz RM. Diabetes, Hypertension, and Cardiovascular Disease: Clinical Insights and Vascular Mechanisms. Can J Cardiol. 2018 May;34(5):575-84.
4. Köseoğlu FD, Özlek B. Anemia and Iron Deficiency Predict All-Cause Mortality in Patients with Heart Failure and Preserved Ejection Fraction: 6-Year Follow-Up Study. Diagnostics. 2024 Jan;14(2):209.
5. Siddiqui SW, Ashok T, Patni N, Fatima M, Lamis A, Anne KK. Anemia and Heart Failure: A Narrative Review. Cureus. 2022;14(7):e27167.
6. Groenveld HF, Januzzi JL, Damman K, van Wijngaarden J, Hillege HL, van Veldhuisen DJ, et al. Anemia and Mortality in Heart Failure Patients: A Systematic Review and Meta-Analysis. J Am Coll Cardiol. 2008 Sep 2;52(10):818–27.
7. Xia H, Shen H, Cha W, Lu Q. The Prognostic Significance of Anemia in Patients With Heart Failure: A Meta-Analysis of Studies From the Last Decade. Front Cardiovasc Med. 2021 May 13;8:632318.
8. Dunlay SM, Givertz MM, Aguilar D, Allen LA, Chan M, Desai AS, et al. Type 2 Diabetes Mellitus and Heart Failure: A Scientific Statement From the American Heart Association and the Heart Failure Society of America: This statement does not represent an update of the 2017 ACC/AHA/HFSA heart failure guideline update. Circulation. 2019 Aug 13;140(7):e294–324.
9. Palazzuoli A, Iacoviello M. Diabetes leading to heart failure and heart failure leading to diabetes: epidemiological and clinical evidence. Heart Fail Rev. 2023;28(3):585–96.
10. Siao WZ, Chen YH, Tsai CF, Lee CM, Jong GP. Diabetes Mellitus and Heart Failure. J Pers Med. 2022 Oct 11;12(10):1698.
11. Spitaleri G, Zamora E, Cediel G, Codina P, Santiago-Vacas E, Domingo M, et al. Cause of Death in Heart Failure Based on Etiology: Long-Term Cohort Study of All-Cause and Cardiovascular Mortality. J Clin Med. 2022 Jan 31;11(3):784.
12. Savarese G, Becher PM, Lund LH, Seferovic P, Rosano GMC, Coats AJS. Global burden of heart failure: a comprehensive and updated review of epidemiology. Cardiovasc Res. 2023 Jan 18;118(17):3272-87.
13. Mamas MA, Sperrin M, Watson MC, Coutts A, Wilde K, Burton C, et al. Do patients have worse outcomes in heart failure than in cancer? A primary care-based cohort study with 10-year follow-up in Scotland. Eur J Heart Fail. 2017 Sep;19(9):1095-104.
14. Krittayaphong R, Karaketklang K, Yindeengam A, Janwanishstaporn S. Heart failure mortality compared between elderly and non-elderly Thai patients. J Geriatr Cardiol JGC. 2018 Dec;15(12):718–24.
15. Bozkurt B, Ahmad T, Alexander KM, Baker WL, Bosak K, Breathett K, et al. Heart Failure Epidemiology and Outcomes Statistics: A Report of the Heart Failure Society of America. J Card Fail. 2023 Oct;29(10):1412–51.
16. Oh GC, Cho HJ. Blood pressure and heart failure. Clin Hypertens. 2020 Jan 2;26:1.
17. Triposkiadis F, Sarafidis P, Briasoulis A, Magouliotis DE, Athanasiou T, Skoularigis J, et al. Hypertensive Heart Failure. J Clin Med. 2023 Jan;12(15):5090.
18. Bozkurt B, Savarese G, Adamsson Eryd S, Bodegård J, Cleland JGF, Khordoc C, et al. Mortality, Outcomes, Costs, and Use of Medicines Following a First Heart Failure Hospitalization: EVOLUTION HF. JACC Heart Fail. 2023 Oct;11(10):1320-32.
19. Goff DC Jr, Brass L, Braun LT, Croft JB, Flesch JD, Fowkes FG, et al. Essential features of a surveillance system to support the prevention and management of heart disease and stroke: a scientific statement from the American Heart Association Councils on Epidemiology and Prevention, Stroke, and Cardiovascular Nursing and the Interdisciplinary Working Groups on Quality of Care and Outcomes Research and Atherosclerotic Peripheral Vascular Disease. Circulation. 2007 Jan 2;115(1):127-55.
20. CDC. CDC Global Digital Health Strategy [Internet]. Atlanta, GA: CDC; 2022. [cited 2024 sep 12] Available from: <https://www.cdc.gov/global-health/media/pdfs/GDHS_Strategy2022_REV_508.pdf>
21. KI. About us at HIC [Internet]. Stockholm: KI; [date unknown]. [cited 2024 Sep 12]. Available from: <https://ki.se/en/lime/research-groups-and-units-at-lime/health-informatics-centre-hic/about-us-at-hic>
22. Lund L. Heart failure with reduced and preserved ejection fraction. Clinical and translational aspects. – Research group Lars Lund [Internet]. Stockholm: Karolinska Institutet; [date unknown]. [cited 2024 Sep 12]. Available from: <https://ki.se/en/research/research-areas-centres-and-networks/research-groups/heart-failure-with-reduced-and-preserved-ejection-fraction-clinical-and-translational-aspects-research-group-lars-lund>
23. Uppsala Clinical Research Center. About SwedeHF - RiksSvikt [Internet]. Uppsala: Uppsala Clinical Research Center; [date unknown] [cited 2024 Sep 12]. Available from: <https://www.ucr.uu.se/rikssvikt-en/quality-registry/about-swedehf>
24. RISE. Mission and governance [Internet]. Stockholm: RISE; [date unknown]. [cited 2024 Sep 12]. Available from: <https://www.ri.se/en/about-rise/operations/mission-governance>
25. Vetenskapsrådet. Swecris – search for Swedish research projects [Internet]. Stockholm: Vetenskapsrådet; [date unknown]. [cited 2024 Sep 12]. Available from: <https://www.vr.se/english/swecris.html>
26. Ratsit. Vad tjänar en konsult inom IT [Internet]. Stockholm: Ratsit; 2024. [cited 2024 Sep 11]. Available from: <https://www.ratsit.se/lonestatistik/konsult-it-lon>
27. Dogtiev A. App Development Cost (2024) [Internet]. London: Business of Apps; 2014. [cited 2024 Sep 11]. Available from: <https://www.businessofapps.com/app-developers/research/app-development-cost/>
28. Scrum. What is Scrum? [Internet]. Burlington, MA: Scrum; [date unknown]. [cited 2024 Sep 11]. Available from: <https://www.scrum.org/resources/what-scrum-module>