
THEIA

**Indoor Navigation System
Vision**

Version 1.0

Revision History

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Vision

1. Business Requirements

1.1. Background

Everyday billions of people have a destination they need to get to for them to achieve their goals for the day. Whether that's going to work or getting into the kitchen to make a meal. Now imagine you can't see and you need to get to that destination? This is a situation where those who are visually impaired have to deal with on a daily basis. This is where the idea for this project began, it was to create a more modern way for people to get around buildings. As a side note, it is different from how a GPS works using a map application that can take you from one radius of a destination to another at a large scale. This means it's not precise enough to do this inside of buildings to get from one room to the other.

So a tool that will become the product of this project will allow any such user of the product, not only visually impaired, to use the product to navigate through an entire building including major changes to the environment. This modern way of navigation will be done using a mobile device.

1.2. Business Opportunity

We want to remove all the negatives that come from using other methods of transportation or even add to them which can improve the user experience by having the advantages of both for navigating a building. This can help those who are visually impaired get around yes but also helpful for those new to a building, large buildings that are hard to navigate, and even buildings that go through renovation and room changes.

The current market shows potential for consumers however seems more industrialized and used by businesses currently. This means the technology is there but just hasn't been developed to provide assistance for the target audience we are wanting to provide to. The competition can exist but currently isn't in the running. Using the product will guarantee a user is safely directed from one room in a building to the other room with nothing else but a mobile device. Human assistance will always be available for a safe guard in case of failures or emergencies. To accomplish our goal we will need the use of most modern mobile device sensors including the camera for object detection. Other such possible technologies such as IOT Devices and GPS.

Currently there are many ways for visually impaired users to move locations however these tools such as canes, care-takers, service dogs, etc... have their limits and disadvantages. Some may cost money while others can only do so much for them when getting to their destination. Meaning most of the time getting to a location requires having a memory of paths taken. This can be a problem for changing environments and forgetfulness. The product removes this worry but contains all this information itself and being provided updates by building owners for these users to navigate successfully to their respected destination.

This is where the product comes into play as the idea for the product is to identify the best path for the user to take. Then it will guide them along their journey alerting them of any possible problems along the way. Usually whenever those who are visually impaired or even younger users that get into an emergency don't have anyone to help them from where they are at. The product will have been set up before the user visits the building such that some assistant is on stand by for such a scenario.

1.3. Business Objectives

The objectives we want to achieve can be listed in the following two tables of financial and non financial that is the core of our product,

Financial
reduce the cost of using alternatives by using our product by 50%-75%

gain a market share of 45% before the 3rd year of initial release
profit from revenue generated from product from the 2nd year of initial release
lower the maintenance costs from the initial release to the ending release by 65% within 8 months

Non-Financial
reduce the amount of injury/fatal emergencies by 95%
have a 100% accuracy of pathing in navigation
no visibility interface for users with low to no eye vision.
building data is kept up to date within 3 months of environmental changes
recommendations based on previous usages are correct 50% of the time
decrease time need to navigate from location to destination by 35%-65%

To achieve these goals we must focus on the product while keeping these objectives in mind giving us a threshold to uphold. The financial objectives are formed to give a rough estimate and best outcome of the product that shows we are doing the correct things during the process of building/developing the product. As well as as we test the product we will be looking at the rate in which we can obtain the goals set forth by the non-financial objectives.

1.4. Success Metrics

To successfully pull off the business objectives we need to identify a unit of measure for each and the how of doing so. This will come from the objectives themselves and point towards a specific feature that will be used to do so. When it comes to finances however this metric can be done this way also but comes down to more financial analytics then the features themselves.

Let's first evaluate the financial objectives. The way we can evaluate this is by increasing the amount of automation within the system. This can reduce the amount of maintenance needed meaning the more automation included in the product can be analyzed to create a percentage. This as well as keeping the costs of building the product within a margin to gain profit in later times which coincides with the reducing the product cost due to low building costs. Gaining market share can be measured by the amount of users that exist for a need of the product and other products like it and can advise a plan to advertise to increase that number.

For non-financial objectives we can evaluate them more according to the features. The injury/fatal emergence is reduced and can be detected by near changes of collision with objects and queries to the assistance of the users. Having 100% accuracy in pathing navigation can be found by testing the path calculation system and seeing if they always reach a target destination requested. Other such testing can be done with the no visibility interface by using a tester to simulate such actions or a potential user as a tester. For keeping up the 3 months of environmental changes that are more time based but can be captured through logs of communication between building owners, navigation users, and our company through some automation such as surveys to the navigation users and upload times of owners between renovated completed documents and updates to building data. Surveys can also be used when finding out if users have been given a good recommendation for a path or other. Lastly surveys and testing can be done before release to test the amount of time it would take to navigate from one location to the other using the product

and other existing solutions including a combination of them all. For us to keep on track with business objectives we will be using these exact or similar methods to keep the projected estimates in line for success.

1.5. Vision Statement

The goal for Theia is to be an accessible, reliable indoor navigation app for visually impaired users. Allowing users to comfortably navigate through various buildings while also adapting to changes in building layouts and sounding an alarm for the user to find their device if it has fallen, to name a few examples. Theia provides features like these to solve a problem that standard GPS/navigation apps don't. By prioritizing accessibility, Theia will provide users with a dependable, intuitive way to navigate indoors.

1.6. Business Risks

Because we are offering a reliable product that will not fail the user, various problems can arise. For example, when building layout changes, it will be hard to update the app instantly, depending on how quickly the property owners can fetch the updated data. This can create a brief downtime, potentially leading the user to the wrong area. Because this issue is out of our control, it is hard to keep that promise of reliability. Although the position data is precise, objects like a small table may be moved without notice, and Theia could assume nothing is there, leading the user to bump into the table. While Theia has object detection capabilities, they depend on the camera's orientation, which can cause some objects to be missed. As of now, the app only supports Android, so Theia cannot be used by anyone on an Apple device.

1.7. Business Assumptions and Dependencies

Due to the problems addressed in the previous section, Theia needs to make a few assumptions to function correctly. First, we assume the buildings will have updated data once the change is complete. We also assume that users' devices are equipped with the necessary hardware to support all required features, such as fall detection and position tracking. We also assume that for safety, object detection works as intended. Finally, we assume that the user will have a stable internet connection to allow for stable navigation and updates.

2. Scope and Limitations

2.1. Major Features

Theia will provide essential indoor navigation support through a small set of core capabilities. The app will offer audio-based step-by-step navigation, voice command input for hands-free interaction, real-time obstacle detection using the smartphone camera, and automatic route calculation with the ability to guide users back to their planned path if they drift off-course. It will also include basic emergency handling, such as fall detection and caretaker alerts, along with a simple onboarding experience designed for visually impaired users.

2.2. Scope of Initial Release

The initial release will deliver a simple, foundational version of Theia. It will support three primary functions:

1. audio navigation,
2. basic route calculation, and
3. real-time obstacle detection.

The focus of the first release is to keep the app small and easy to implement while still delivering the essential core functionalities.

2.3. Scope of Subsequent Releases

Later releases will expand Theia's capability beyond the basics. Planned improvements include more

accurate indoor positioning, smarter personalized routing, better emergency support, additional accessibility options, and broader building coverage such as multi-building environments. These enhancements will build on feedback from the initial release and require more complex infrastructure and data management.

2.4. Limitations and Exclusions

Some capabilities will not be included initially. The app will not support outdoor or city-scale navigation, advanced real-time mapping technologies, or specialized hardware beyond standard smartphones. iOS support is deferred until later phases, and emergency alerts will be limited to user-selected contacts rather than emergency services. Navigation accuracy will depend on the quality of building data provided, as automated verification will not be part of the initial system.

3. Business Requirements

3.1. Stakeholder Profiles

Theia's stakeholders include the users who depend on the app for safe indoor navigation, especially individuals with low or no vision who require clear audio guidance and reliable obstacle detection. Building owners and facility managers also play a key role because they must provide accurate and updated building layout information for the app to function correctly. Caretakers or designated contacts are stakeholders as well, since they may receive alerts in emergency situations. Internally, the development team and project sponsors rely on well-defined requirements to ensure the product delivers the expected value in safety, usability, and operational efficiency.

3.2. Project Priorities

The project's highest priorities are safety, accessibility, and reliable navigation. The app must guide users accurately and consistently, using simple audio-based interactions suitable for visually impaired users. Maintaining correct building data is important but follows behind safety and usability. Cost efficiency and maintainability are also considered, but they must not compromise the core goals of dependable navigation and an intuitive experience.

3.3. Deployment Considerations

The initial deployment of Theia will run on standard Android smartphones using built-in sensors, without requiring specialized hardware. Core features such as audio navigation and obstacle detection must work offline, while map updates may depend on network access. The quality of building layout data provided by facility managers will directly affect navigation reliability. The system must also function across diverse indoor conditions, and emergency alerts will operate through preconfigured personal contacts rather than external emergency services.