**BSc in Computing**

**Team Project & Group Dynamics Module**

***PathFinder***

**Proposal, Technical Project**

**to be presented on *21/10/2019***

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# INTRODUction

## PURPOSE

*Outline the purpose of the project, with a high level description of the product to be delivered, and the expected benefits.*

This project aims to create an indoor navigation application which can be used in any area, be it a building or outdoor area. The product should be able to show you your location and show you a path, along with any information, on the destination you have selected to go to.

This project is looking at using Bluetooth beacons, NFC tags, Barcodes and QR codes. The idea is that the project is not reliant on just one form of technology but will use many technologies to solve a navigation issues for people, in either buildings or outdoor areas. Building could be hospitals, colleges, museums, while outdoor areas could be pet farms, tourist attractions, walking trails, etc.

Since navigation can be done just using barcodes or QR codes, the main cost would be printing off unique codes, laminating the sheets and then placing them where required. This means users can scan the codes to receive information on where they are and what is there. If Bluetooth beacons or NFC tags are used, then this automates more of the application in that the user does not have to manually scan something but can instead just tap a NFC tag, or the app can detect the beacon, and then show the user where they are.

This will benefit anyone who routinely goes into large building like hospitals or colleges. Most verbal instructions can lead a person into somewhere they were not intending to go or back to where they started as there is such an extraordinary number of corridors and rooms within these buildings, it is very easy to get lost. This application will help solve that problem by offering a means to finding out where you are, with instructions on how to get you to your destination.

The basic idea is that each entrance will have a unique code assigned to it. Getting this code into the application will be done either by Bluetooth, NFC Tags, Barcodes or QR codes. The app will then download the map and way points / marked locations / destinations and allow the user to select where they would like to go. The app will then generate a list of directions for the user to follow. At any time, the user can scan, tap or be informed (via Bluetooth Beacons), where they are on there route.

## Background

*Describe the background information about the project, including a description of comparable competitive/existing products You should include any research you have done to date on the market area, for instance if the product was a game, you might discuss type of genre, major titles in that genre, market moves away/to the same.*

As we all know, GPS can’t be used in indoor environments, because signals from satellites do not move easily through solid objects such as brick, metal, stones & wood. All these materials usually used for making buildings & make it very difficult for GPS signals pin your location accurately indoors. That’s why we need to have IPS – Indoor Positioning System, which is the next generation of positioning technology helps to beat limitations of GPS. Indoor Navigations System technologies are being developed by Google, Microsoft, Nokia etc.

We did a variety of research of current indoor GPS navigation systems on the market to better understand advantages & disadvantages of products and how we would make our system better than an existing systems on the market right now by trying to implement different solutions and also by developing a system that is lower cost than bigger companies which charge an extremely large amount of money.

There are several types of wireless technologies are used for IPS: WLAN, Wireless Bluetooth techniques, Infrared (IR) techniques, Ultrasound techniques, Ultra-wideband (UWB), Ultrasonic system & Cellular based techniques. <https://www.hindawi.com/journals/js/2017/2630413/>

Infsoft company from Germany, which provides a leading indoor GPS navigation products such as Indoor Positioning, Tracking & Analytics solutions for businesses, is used to map out warehouses, to track in which zones of store customers spent most of the time for future store optimization & to guide automated vehicles in the same warehouses.

It is really useful to have indoor navigation system in big buildings, where people usually struggle to find their way and because it will save time and nerves.

*New plan for this chapter:*

* *~~GPS technology – why we need to have separate indoor navigation system?~~*
* *What companies used before & now? (technologies & techniques)*
* *~~Advantages & disadvantages of using indoor navigation system?~~*
* *List about 3 best indoor navigation systems offering companies, what products they are offering. Technologies used & pricing*

## Needs STATEMENT

*Provide a brief statement of the business or system needs, and state short-comings apparent in current organization/systems/products available in the marketplace which will be addressed by the project.*

This project aims to create an indoor navigation map for any building using an extremely low cut budget but will be able to deliver an effective and easy to use application, most businesses who offer the same type of application charge an incredible amount of money which is why most businesses who could use this application would never buy it.

The idea behind this app is to make something that is simple to use, simple to maintain and update, and easy for everybody to work with. Due to this, we are focusing on cost as one of the main targets for the project and this is being achieved by using Barcodes and QR codes, which can be easily generated and printed off.

Due to the low cost of implementing this solution, it is envisaged that large buildings that are constantly being used by the public, that there curators would see the advantage of having a system in place that would show to the user, where they are, where they can go and how that can get there, would reduce the number of enquiries from the public to staff, on how to get to places within the structure.

## Project Scope

**Goals:**

The Product scope requires a website that organizations can register and log onto, they will be able to upload, delete, and edit new Maps of their buildings with information on each checkpoint.

The product scope also requires a database that will store information on both the website and application.

The product scope for the application requires that the user will be able to use our application to download a map from any listed buildings, the user will scan a QR code to check there current location, this will be a checkpoint, the user will then select another checkpoint on the map and an icon or waypoint will be displayed to them to guide them to their destination.

**Project Scope**

**Cost:**

The cost involved in our project will be 100 euro to buy the NF, Bluetooth beacons that we will use.

**Deadlines:**

Our deadline and roles have been laid out in our gantt chart, which display all features and their breakdown and including the manhour’s each section will take.

## Project Members

*In a table provide information on the team members and their agreed roles within the project. The list should contain any information that properly identifies the person, their role within the project, how to reach them and what are their responsibilities.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Team Member** | **Role** | **Contact Information** | **Responsibilities** |
| Kevin Dunne | Champion /  Developer | Student Email | Back End Database, research, Literature Review, Web based design, Web front-end, App Development |
| Christopher Costelloe | Developer | Student Email | Web based design, Web front-end, App Development |
| Kate Pavlenko | Designer /  Developer | Student Email | Database, Web based design, Web front-end, App Development |

# Proposed TECHNICAL APPROACH

## Requirements

*Present the requirements as understood at this time. The requirements should consider user (features to be implemented) and system requirements. Include a high-level diagram such as a use case system diagram or block diagram to capture the situation being addressed if appropriate.*

In order to implement this system, we are looking at;

* Azure Hosting of the Database.
* Web Hosting for the users / companies – show info on the production for users and to allow companies to upload their data and waypoints.
* Android App will be the main user interface and will consist of
  + Landing screen
  + Ability to capture where the user is and what maps / waypoints are needed
  + Allows user to select where they need to go
  + Show instructions on “how to get there” form where the user currently is
  + (Optional) Message to inform user when they have reached their Destination

High level diagram showing cloud with database server, linked to a network (for users to chek in at home / companies to upload data), business place/college/hospital and user connecting to database to get required details to find the route to where they need to go.

## Application mechanics

*Outline the constructs of rules or methods designed for interaction with the game state, thus providing gameplay.*

The proposed solution has two different interfaces for the users and the companies. In the story board below, both are shown.

The web site will allow the user to preview what the application can do. For business, there is an option to register to use the application / database. This will be used to contact the company and setup required information. Companies, once approved, can then login and setup their maps and waypoints. A “Contact Us” page will be available for all general enquiries on the application.

For the Android Application, one launched, the user will have simple instructions on how to use the app. The user then obtains the company information (maps and waypoints) by either Bluetooth, NFC tags, barcodes or QR codes. Once done the map is then presented to the user with a drop-down allowing the user to select where they would like to go. The list of instructions is then generated and show to the user. The user can obtain updates along the way, either by Bluetooth, NFC tags or by scanning other Barcodes and QR codes.

## prototype/storyboard

*Provide screenshots of your prototype (built in Construct 2), or the storyboard.*

A screenshot of a social media post

Description automatically generated

A screenshot of a cell phone

Description automatically generated

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## Architecture Design

*Explain the technology to be used in the project. Describe hardware, software, or network components as relevant and as understood at this time. Draw a high-level architecture diagram to illustrate the proposed system components and the relationships between them. Outline any alternatives considered, and state your reasons for choosing these particular components*

We will be using Azure hosting as this is what research has shown best suits our current requirements. This hosting will be for the database and the website. This is one half of our solution and the other will make use of Android phones / tablets.

We are not considering the Apple systems at this point in time, as there is insufficient project time available to support two App developments.

Bluetooth beacons and NFC tags will be supported so that the application can be more automated and easier for the users of the application.

Barcodes and QR codes can also be used but these need to be scanned in by the user and increase the complexity of the application use. It would be easier for the user to use either Bluetooth beacons or NFC tags but all methods can be used, and all can be available for a business (mix and match approach).

High level diagram anybody

## Implementation

*Outline which development methodology have you chosen to follow, and the reasons for the decision*

The Development Methodology that we has a group have decided to implement is the Sprint Agile development module, the reason we chose this methodology is because since we have started this course this is the development methodology that has been constantly praised and we have been told that this is now becoming the industry standard.

This has lead each of us to research and study the agile module over the previous years and to base the majority of our projects around this method which has now become second nature to us, this is the reason we as a group have decided to use this development methodology.

Using this Methodology enables us to do quick developments each week, to show progress of the project, to test and verify what we are doing is the end requirement needed, to keep us focused on getting small bits done quickly so that the project proceeds and can be delivered in good time and to a high standard.

## Quality Assurance Plan

*Describe the potential risks related to the software quality. Outline how you intend to manage these risks.*

As the primary purpose of this software is to get a user from one point on a map to another point on the map, we have to make sure that the user is urged to follow the suggested path while taking care of their surroundings (walking on paths, crossing roads with due diligence, etc.)

In order to achieve this and ensure the quality of our software, testing of all sprint aspects must be done by all team members to ensure that there are no issues with the software, the results and the maps, instructions that are shown to the user.

If the software if not of high enough quality, then the following is possible;

WEB

* Site not available for users
* Site not allowing users to login / logout
* Site not updating companies’ data correctly
* Site not responding to app api requests

Detailed testing of each sprint and the system components will ensure that the site is working and responding as needed

Android App

* Not launching correctly
* Does not scan (barcodes or QR Codes)
* Bluetooth and / or NFC not working
* Incorrect Maps / Way Points downloaded
* Bad path to destination generated (long way instead of best way)
* App not updating correctly

Detailed testing of each sprint by all team members will ensure that we develop the app as needed and that all features work as per expectations.

# Expected Project Results

*List deliverables expected to be produced for the project*

The expected deliverables for the project are as follows;

* Working web site
  + User can find and use the web site
  + Companies can register for user of site
  + Companies can log into the site, update their information, map and way points and logout
  + Anybody can send on a query regarding the site and application
* Hosted Database
  + Storage of company data
  + Storage of maps
  + Storage of waypoints
* Android Application
  + Launch screen
  + Ability to capture where the user is (Bluetooth beacons, NFC tags, Barcodes, QR Codes)
  + Show maps and places user can navigate to
  + List of instructions / steps on how to get to the destination

## MEASURES of SUCCESS

*Describe an assessment plan that will identify the success/suitability of the project. List a measure and an acceptable value range. A measure should also correspond to the stated objectives of the project, for example one of your objectives is a “highly responsive game”, you need to consider whether to use 30fps or 60fps, and a suitable measure of success would be 3/60th.*

In order to determine the success of the project, the following goals should be achieved:

1. user can find the web site
2. Company can register with the site
3. Company can log into the site and upload maps and waypoints
4. User can view company maps and way point in a browser
5. User can sideload the app onto a phone and use the maps and way point to get to a destination

.

# project management

## DEVELOPMENT METHODOLOGY

The development methodology to be used to deliver the project will be Scrum Agile – Sprints, which is time limited iterations of continuous development cycles. Sprint is a planned amount of work to be done and reviewed by team. Duration of a Sprint usually up to 2-4 weeks. To help implement this development methodology, we are going to use also Gantt’s chart and Backlog. Gantt’s chart is a visual way to track tasks across the project’s lifecycle. Using Gantt’s chart and Backlog is a helpful way to capture and plan our work.

*More about Sprints, pros & cons*

*Gantt’s chart & backlog description in details – how to use in Agile Software Development*

## schedule

Need to insert either the Excel spreadsheet or the Gantt chart

*Attach a project plan (in Gantt chart format) for the project. Identify the major components/tasks/milestones that will need to be met, and the deadline date for the same.*

*Here, we are looking to see that you have thought through your project and have a handle of what will be involved in your project and are being realistic in allocating time to achieve this.*

*If you are choosing Agile development, the primary purpose of this methodology is to enable developers to react to changing requirements faster, and updating a Gantt chart will slow this process down. However you should still include a timeline that identifies any pre-sprint work, and includes deadlines/milestones dates. Sprints can be shown as ‘phase’ bar. You should however include your prioritized Feature Breakdown Structure.*

## Budget

*Unless there are budget considerations beyond using your own or department resources, enter “No budget required.” Otherwise include needed items.*

## communication & collaboration plan

*Provide a synopsis of your communication plan. How often will you meet? How will you delegate tasks to be completed? How will you share information? What collaboration tools will you use?*

Our communications will be through quick daily catch-ups with a formal meeting that will be held every week where the contents of the meeting are minuted. These minutes then form a part of the next weekly meeting, allow for coherence between meetings.

We have created a github account / site for the storage of all information, documentation, research and program code.

Google Docs is being used for the collaboration of any documents that are in the process of being created, and worked on. This allows for many users to work on the same document at the same time.

Microsoft Project is being used the generation of our Gnatt chart and this will then be used as our schedule for work.

# References