MET CS682: Team B

Project Proposal Paper #2

Boston University Digital ID

1. Introduction

This project aims to develop a Digital ID application for **BU Students and Staff**. Our mission is to **save BU administration time, resources & cost** it takes to generate traditional physical student pass, parking access, library access, residence building access and meal plan access.

The proposed solution would be an application which integrates all the above accesses based on the user type.

The **future** of this app is to further expand **to record student attendance, display menus for BU cafes, order take-outs from BU cafes**, **advertise for books and other BU accessories** and potentially **integrate with Terrier transit app** to show nearest campus building and parking spaces.

As mentioned in the introduction of the Business Report, the purpose of the rest of this paper is to write a proposal and present it to the BU Administration. In this proposal an **alternative matrix** will be presented. The best option will be chosen based on the attained highest score by each nominee. After that, we cover technical hardware and software that will be used in this project, and the user interface features. Finally, we go through the **feasibility analysis** section of our proposal and finish with **cost benefit and return on investment analysis**.

2. Description of the Design Strategy:

System As a Service - It encompasses several user oriented features thus adding convenience and undertaking the security aspects. The market availability of the components i.e NFC token cards can be outsourced thus making the system more scalable. The scope for software enhancement and future upgrades becomes relatively easy. It lowers the future costs as the hardware integration is a one time cost for initial setup.Thus on the long run the overall operational costs reduces and makes the entire system cost effective for the Business Owner. At the user end the accessibility features are readily enhanced without being dependent on any physical card as existed in the previous system.

3. Hardware and Software Requirements:

The major objective of this project is to create a secured and convenient digital platform that integrates the access points to university campuses for different users based on their authorization.

1) Hardware: Building a mobile based digital card is a lucrative idea. However, it involves several factors and layers of complexity in creating something useful and responsive. This may involve hardwares and servers:

Essential Hardware - Minimal Required NFC card reader installation at accessible points with microchips. Enabled existing BU Servers for Databases.

2) Software:

a) **Platform -** Both iOS and Android are used as the application platforms. Development for Android and iOS has distinct characteristics. When building a mobile app, selecting a platform is an important step because it affects the budget, the user it will serve, the intricacies of the app's development, and its marketing.

b) **Database** - Without a backend server, no app will be able to communicate with the user. If you need to send the user something or ask them to send something to you. A backend server is needed. Although many other languages are available, the most popular ones for creating backend servers are **PHP and Python**. This is used to manage backend operations while the server and client communicate. The user's data, advertisements, or media will be stored and made available by this app's backend server and processes.

Cloud-based storage and file-sharing services that can be accessed using a mobile device are also useful for information management, since it allows users to store, update, and share documents or photographs with others without exchanging a flash drive or CD

c) **Tech Stack -** Considering software technologies holistically, identifying whether ones are gaining traction or are mature with a solid ecosystem and proof points. Nobody wants to pick a tech stack that is so cutting edge that it could be dangerous. Favorable consideration should be given to reliable and "tried-and-true" items.Due to the single code base, cross-platform development is less expensive and expedites the creation of

Digital apps. In this case, **Xamarin** or the arch-rivals React, or Flutter will be useful. The creation of mobile Digital apps is more productive with React.

Android: Kotlin is now frequently utilized for the creation of mobile digital applications. Compared to Java, it is more lightweight and less complicated.

Apple-approved language Objective-C is used to create iOS applications. It provides a useful runtime environment and object-oriented possibilities. But more developers favor Swift due to its intricacy. **Swift** offers a quick development cycle, enables better performance and safety, but it has limited interaction with other tools and IDEs.We think that this idea will be helpful when making decisions because there are many subtleties to be considered before the introduction of mobile applications which will replace the existing system.

4. As-Is To-Be Models:

As-Is To-Be:

The primary goal of an As-Is process model is primarily to simplify, eliminate, and improve the To-Be processes. Two ways to reduce buyer power is through switching costs and loyalty programs. The as-is to-be analysis is used to maintain process consistency and track progress and outcomes more effectively.

As-is Process:

An As-Is business process defines the current state of the business process in an organization.The as-is state of a process can also be defined as the "now" state. It's how the process operates before you make any changes or improvements.

To-Be Process:

A To-be business process defines the future state of a business process in an organization. To-be analysis maps where you want them to be. This analysis is also used as a guide for implementing changes in the process.

Steps involved in As Is To Be Process:

- Documenting the As-Is Process

  Before documenting the process, research has to be performed. It can be done in any form such as:

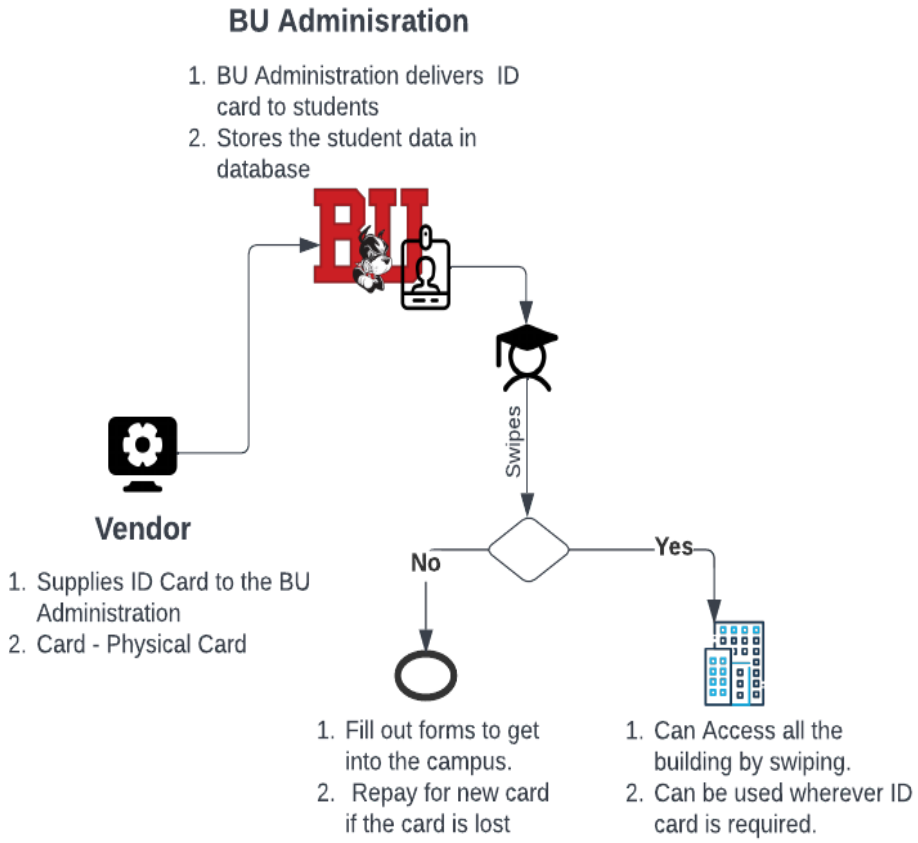
  - ➢ Observation – The most straightforward approach. It is nothing but observing the process as it's going on.
  - ➢ Interviews – Personal interviews with employees working on the process.
  - ➢ Questionnaires – Surveys on the process in question. More efficient than holding interviews, but generally less informative.
  - ➢ Project Teams – A special team composed of individuals who are either employees working on the process itself, or process improvement experts

- Analyzing the As-Is Process and Finding Improvements:

  The as-is process needs to be analyzed and find any inefficiencies and flaws, some of which can be a bit hard to spot. Since every business has completely different processes, there's no one sure-fire way to do this.
- Documenting and Implementing the To-Be Process:

  After the analysis phase, the ideas for the To-be model can be mapped to the to-be process map. A flowchart is created like the As-is process with the adjustments.

<u>As-Is Model:</u> (Fig 4.1)



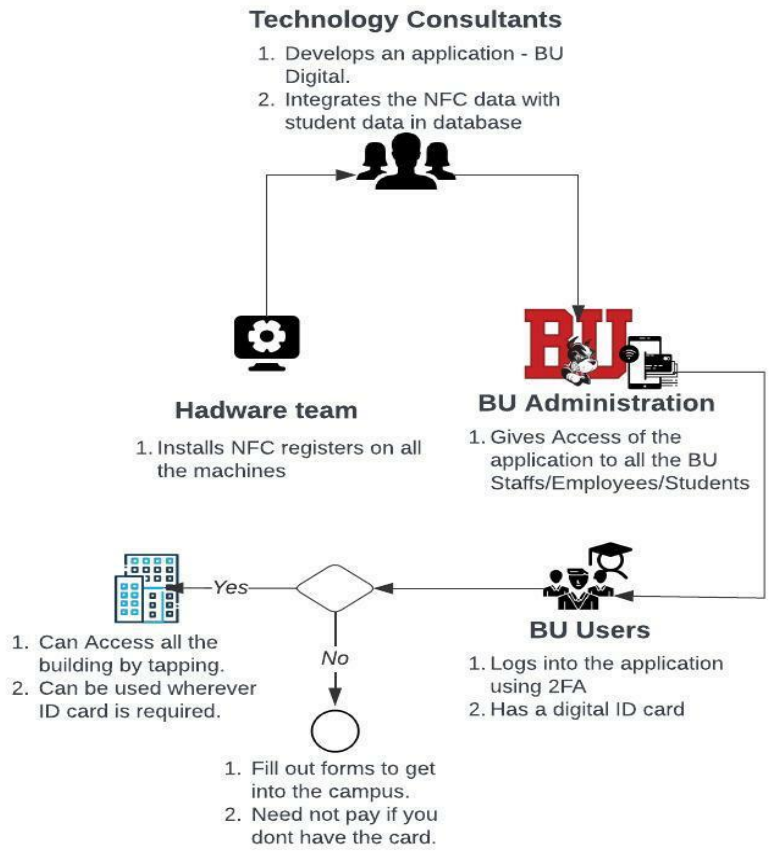
The steps followed in the Existing model are,

1. Vendor prints the Physical ID Card and delivers it to the BU Administration department.
2. The BU Admin department gives the ID card to the BU students,Faculties,staff and Employees.
3. The BU Users swipes the ID card wherever it is required.

4. If the machine reads the card, the user can enter the building
5. If it doesn't read, they have to fill out few forms to get in
6. If the user has lost the BU ID card, they have to pay certain amount of money for the new card

The problems that are being faced in the existing system is that the user does not carry the physical card to all the places and the possibilities are high that the card can be lost.

<u>To-Be Model:</u> (Fig 4.2)

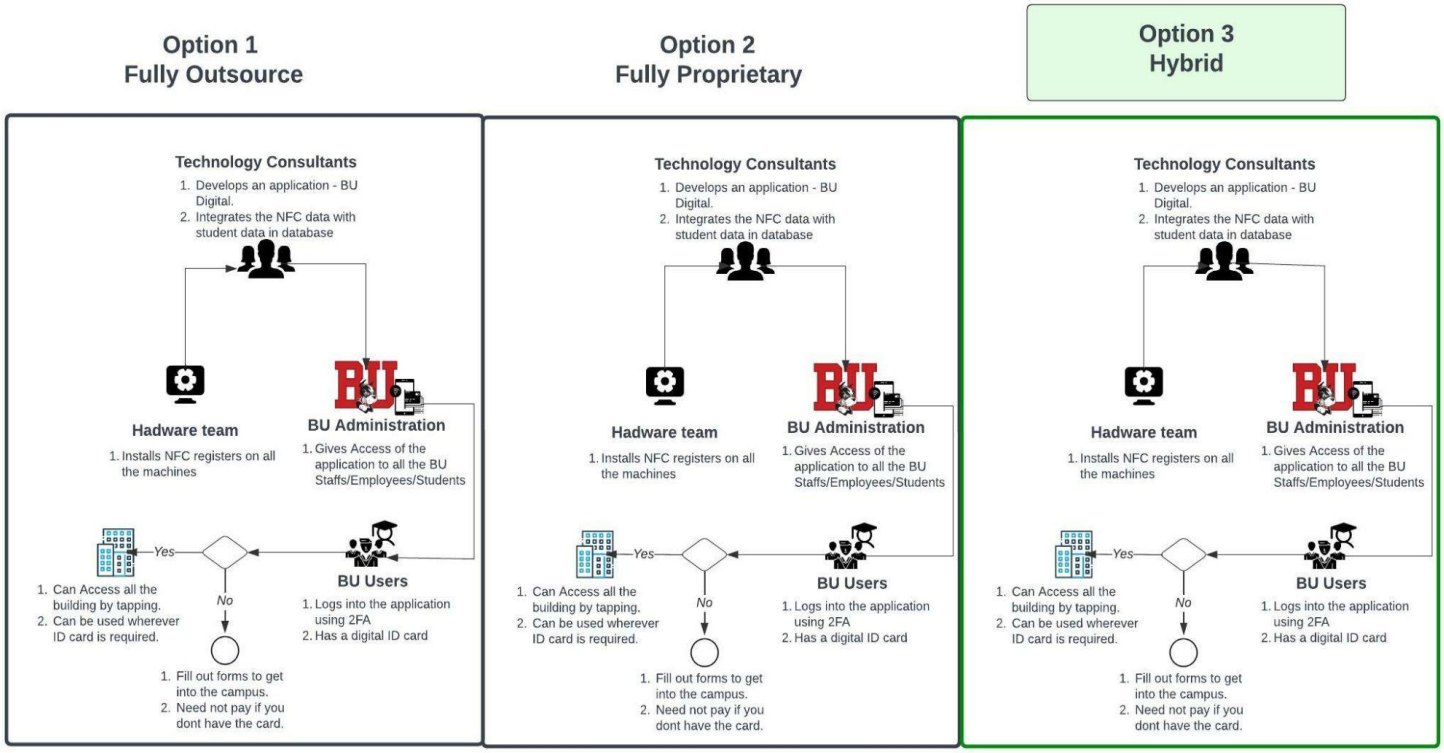


The steps followed in the proposed system are:

1. The hardware team installs the NFC registers in all the machines.
2. The Consultants develops an application (BU Digital) with the support of NFC reader / QR code / Barcode and the application is delivered to the BU Administration
3. The NFC readers are integrated with the existing BU database.
4. The BU user logs into the application using Two Factor Authentication.
5. Digital ID card option can be selected.

6. The user can tap in the phone which also requires a wifi connectivity in order for the phone to be scanned.
7. The user can use this wherever required.

5. Alternatives:



Full proprietary :

It would take a lot of time to develop the system and we'll have to provide components all by ourselves which could be costly.

Hybrid Solution:

The Hybrid solution is ranked as the top one because of how economical it is and how easily it would be implemented. We can develop the software features by ourselves or we can even hire consultants to help us with the process. Either way, its not gonna cost as much as the other two systems. We only have to be worried about that because the hardware stuff would be managed by a third party member.

Full Outsourced :

This would take relatively less time than developing everything by ourselves. This would take a little more time because of the requirement gathering part that has to be done back and forth. Like information about how the system has to be built should be updated every once in a while to keep the project on track.

So we are going with option 3 which is the hybrid method

5.1 Alternative Matrix :

In the Alternative Matrix table below, three distinct methods are presented as to how the system could be built and is evaluated based on the weighted score they achieve in **technical**, **operational**, **economical** and **schedule** categories. The alternative was developing the app using our resources or outsourcing it to a third party vendor. In terms of **technicality** if the app were to be developed by ourselves, it would consume a lot of resources which is not the most efficient way of building it, the second option (**Hybrid Solution**) would have the desired features, but the and we do not have to spend a lot on the system. The third option could take up a lot of time and would not be cost-efficient. In terms of **operational feasibility**, even though providing software and hardware facilities seem like the best option, assigning the hardware part of the project to a third party vendor could help with a better, efficient system. With regards to the **budget** the second option scored best, and it has the most affordable pricing. Conversely, the third option was the most expensive one. Lastly, when it comes to **meeting the timeline**, it would take the longest to go with developing a new application from scratch and that's why it achieved a low score. If the second option is chosen, very less time would be required, thus making it the best option out of the two other options.

Alternative Matrix Evaluation is objectively reviewing each of your solution options as related to the various criteria you need to consider in order to come to a decision about which solution to implement. This is done in order to invest in the right system to meet our needs: right functionality, right size, and for the right price. Basically, This is to provide alternative build options and to give you an overview of why it is right to build the system this way.

Coming to how we created this alternative matrix, we listed the alternative options that can be considered to build the system, identified different possibilities, narrowed them down and established a rating scale for those fields. We used the rating scale to calculate the final scores and that is how we ended up with the hybrid solution.

We have established some feasibility criteria to help decide a way to build this system. They include technical, operational, economic and schedule feasibility

- Technical feasibility is to decide about how the system would be built. (If it would be done by ourselves or if we'll outsource it)
- Operational feasibility tells a lot about the type of resources that would be provided and how they are provided
- Economical feasibility is to decide which option is affordable
- Schedule feasibility is just the timeline within which the project can be completed.

Table 1. Alternative Matrix

Feasibility Criteria	Weightage	Rank	Alternative #1 (Full Proprietary)	Rank	Alternative #2 (Hybrid Solution)	Rank	Alternative #3 (Full Outsourced)
Technical feasibility	30	3	System will be designed and created by ourselves. It will be developed from scratch. 90	4	Both internal and external members (such as a 3rd party member)would be included to develop the system. 120	2	Contracting off all of the developments process to a 3rd party vendor.They also take care of the maintenance part. 60
Operational feasibility	30	4	Software and Hardware will be provided by us, so that the system meets its requirements. 120	3	Hardware will be obtained from a 3rd party company and software will be offered by us. 90	3	Both hardware and software would be provided by a 3rd party vendor. 90
Economic feasibility	20	4	This is considerably affordable compared to the fully outsourced option but the investment is high 80	5	This is the most economical among the other options since we have to pay only for the hardware 100	2	Least affordable option 40
Schedule feasibility	20	3	12 to 16 months 60	5	6 to 9 months 100	3	12 to 16 months 60
Ranking	100		350		410		250

6. User_Interface

Works Offline

The mobile ID cards do not need an internet connection to be displayed.

Push Notifications

Cardholders can opt in to receive important messages from their institution through the app.

Cardholder Signature

The app allows cardholders to add a signature to their mobile ID card.

Up to 12 Card Fields

The mobile ID cards provide up to 12 fields to add important card information.

Add Multiple Cards

Users can add and store multiple digital ID cards in the app.

App Integration

Using deep links, cardholders can launch their digital ID card from another mobile application.

Scannable Barcode

Cardholders can scan the barcode on their digital ID card using a third-party barcode scanner.

In-App Photo Submission

Users can take their own ID photo in the app or upload one from their photo library.

7. Feasibility Analysis:

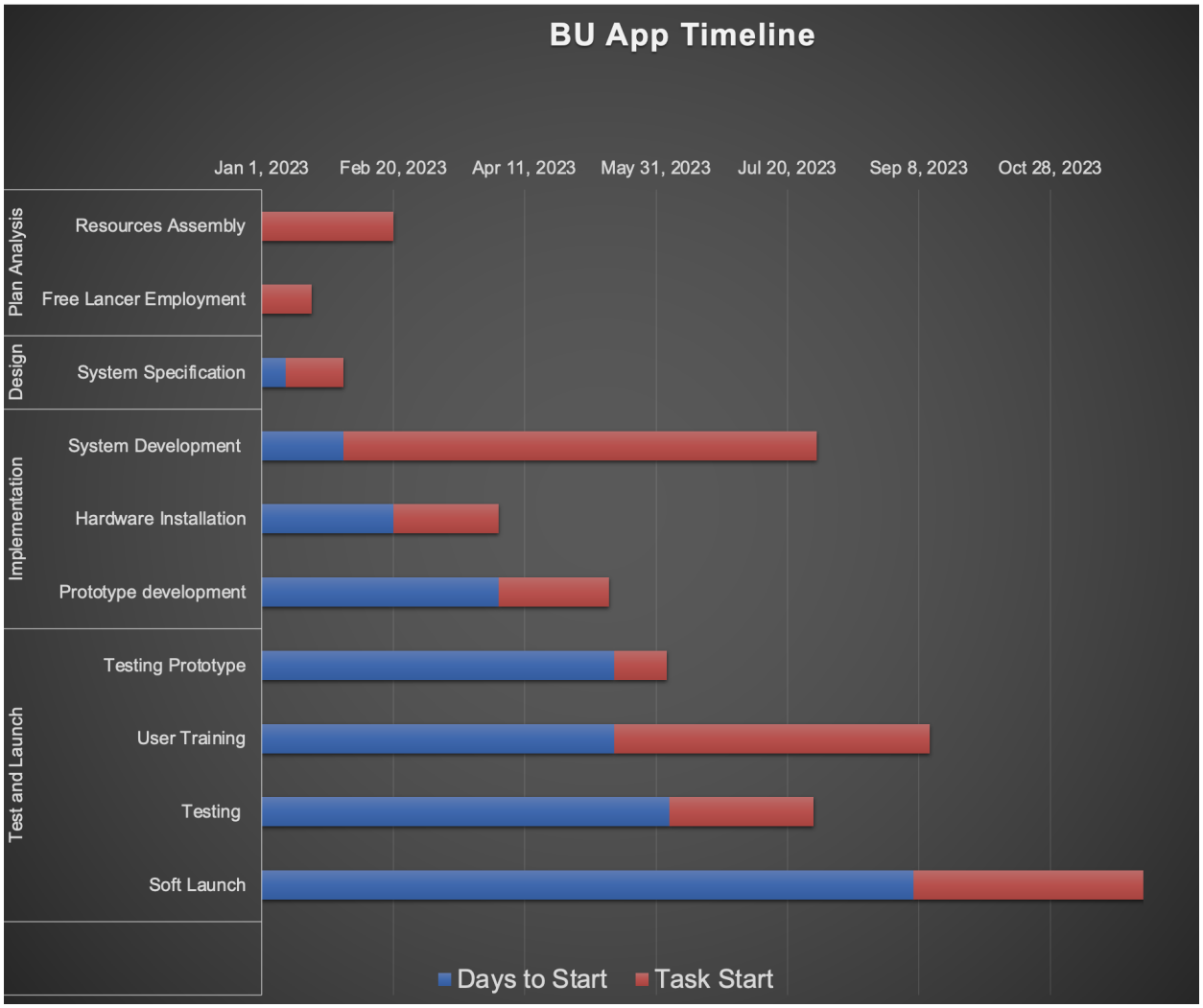
7.1 Technical feasibility:

- **Centralized System** (Already implemented in many organization)
- **SWOT** analysis helped us **to improve more technically**
- **Technical Questions** has been investigated and **provided with Appropriate solutions**

7.2 Economic & Organizational Feasibility:

- Marketing and Merchandising costs
- Materials, Supplies and Equipment
- Cost-Effectiveness
- Plastic production will become zero , we have seen that on an average 10,000 cards are printed every semester . We as a humans should look for a solution where we can use minimal of the nature sources and to have maximum output
    - One place in all – It will help in reducing the monitoring of server
    - Faster, better product delivery
    - Faster issue resolution and reduced complexity
    - Greater scalability and availability
    - More stable operating environments
    - Better resource utilization
    - Greater automation
    - Greater visibility into system outcomes
    - Greater innovation

8. Time Scheduling



Here is our project timeline represented in a Gantt chart. The blue represents the days to the start of the task and the red represents how long the task will take and when it should get done. We plan on starting the project 1st of January, having a soft launch for a limited number of users (Business students) for the 2023 Fall semester and if all goes well, having a hard launch after the 2023 Fall semester.

The Plan analysis phase consists of getting the developer team together and assembling the NFC token and barcode contractors. Then in the System Specification phase the developer team will be introduced to the project and get familiarized with the BU system. Next in the Implementation phase the hardware installation of the barcodes for the NFC tokens happens and the developer team starts working on developing the system. The system should be developed a couple weeks before the start of the Fall 2023 semester, so it can get tested before the soft launch. The prototype also gets

developed in the Implementation phase once the system gets developed about 1/3 through. Finally, in the Test and Launch phase the testing of the prototype and the actual system occurs. In this phase the user gets trained, first on the prototype and then the actual app. After all the testing occurs, the app will have a soft launch for the 2023 Fall semester.

8. Cost Benefit Analysis and Return on Investment:

Cost-Benefit Analysis						
	2023	2024	2025	2026	2027	Total
Cost						
Installation	$2,000.00	$0.00	$0.00	$0.00	$0.00	$2,000.00
NFC Token/Barcode Contractors	$1,240.00	$0.00	$0.00	$0.00	$0.00	$1,240.00
Freelancer Developers	$75,000.00	$0.00	$0.00	$0.00	$0.00	$75,000.00
Training of BU IT Staff	$5,000.00	$0.00	$0.00	$0.00	$0.00	$5,000.00
Maintenance	$8,500.00	$8,500.00	$8,500.00	$8,500.00	$8,500.00	$42,500.00
TOTAL	$91,740.00	$8,500.00	$8,500.00	$8,500.00	$8,500.00	$125,740.00
PV of Costs	$84,944.00	$7,327.00	$6,855.00	$6,439.00	$6,071.00	$111,636.00
Cummulative PV of cost	$84,944.00	$92,271.00	$99,126.00	$105,565.00	$111,636.00	
Benefits						
Card Replacement	$2,480.00	$2,480.00	$2,480.00	$2,480.00	$2,480.00	$12,400.00
Bu Alumini Donation	$35,000.00	$0.00	$0.00	$0.00	$0.00	$35,000.00
Card Generation	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$4,800.00	$24,000.00
Staff reduction	$23,500.00	$23,500.00	$23,500.00	$23,500.00	$23,500.00	$117,500.00
Total	$65,780.00	$30,780.00	$30,780.00	$30,780.00	$30,780.00	$188,900.00
PV of Benefit	$60,907.00	$26,534.00	$24,823.00	$23,318.00	$21,986.00	$157,568.00
Cummulative PV of Benefit	$60,907.00	$87,441.00	$112,264.00	$135,582.00	$157,568.00	
Total Project Benefit Cost Ratio			1.41			
Yearly NPV	$ 24,037.00	$ (19,207.00)	$ (17,968.00)	$ (16,879.00)	$ (15,915.00)	$ (45,932.00)
Cummulative NPV	$24,037.00	$ 4,830.00	$ 13,188.00	$ 30,017.00	$ 45,932.00	
Return on Investment			41%			
Break-even point (Years)				2.12		
Intangible benefits	Positive effect on Environment, Makes student life easier, automated, Makes Bu look inovative					

Figure 2:Cost benefit analysis

The Cost-benefit analysis we produced, is for the next 5 years. For the costs we have included the installation, which covers the configuration of the already existing barcode readers, that are installed in the library, Fit Rec and other places around the campus, where our app will be used. Next, we must pay NFC token contractors, which is not a big cost, as NFC tokens range from 0.1-0.4$, when bought in bigger batches. Another cost, we must cover, are free-lance developers. For our project we decided to outsource 2 free-lance full stack developers and 1 front end designer. We decided to go with the free-lance developers, as they are cheaper than software companies. We realize they need more management too, but we are happy to provide that. Then we have the one-time cost of training for the BU staff, mainly the IT department, that we must cover. This consists of training the IT department on the different functions of the

system and the different functionalities of the admin user.

Next, I am going to talk about the benefits of our app. One of them is cost reduction for card replacement. On average 19% of students lose their student IDs each year. BU has 32,551 students, which means that 6200 students lose it. The cost of production of a card is roughly 0.4$ and that's how we got the car replacement benefit. Next, we will request $35,000 from the BU alumni fund. This might seem like a lot, but BU receives a little over $3 millions of alumni donations each year, and 35,000 is a little over 1% of that, therefore we think this number is realistic. Our app also has the benefit of staff salary reduction. We calculated this benefit by getting the hourly rate of BU staff administration, dividing it by 4(BU administration spends roughly 15 minutes entering information student information and generating the BU student ID) and then multiplying it by the number of lost student id each year. This gives us a monetary value on time that the BU staff must spend on generating a new student ID for a student that lost it. The Card generation benefit is the cost reduction of generating a new BU student ID card for a new incoming student/staff.

Our application also generates intangible benefits, such as positive effects on the environment, as plastic consumption is reduced. The application also makes the student life easier by atomizing a lot of tasks and they don't have to pay a $40 fee each time they lose their card. Our application also makes BU look more innovative and prestigious and that is another reason we believe we should get the alumni funding.

After we calculated all our costs and benefits, we calculated the present value and the cumulative present value of costs and benefits. For these calculations we used an inflation rate of 8%. Once we got the present values, we were able to find the net present value and the cumulative net present value, by finding the difference between the present value of the costs and benefits. Our total net present value ended up being $45,932, which is good, as this means that our project will profit, as it is a positive number.

We then calculated the return on investment by taking the total net present value and divided it by the total present value costs ((45932/125740) *100). This turned out to be 41% over the course of 5 years, which means that the investment will come back with an extra 41% profit.

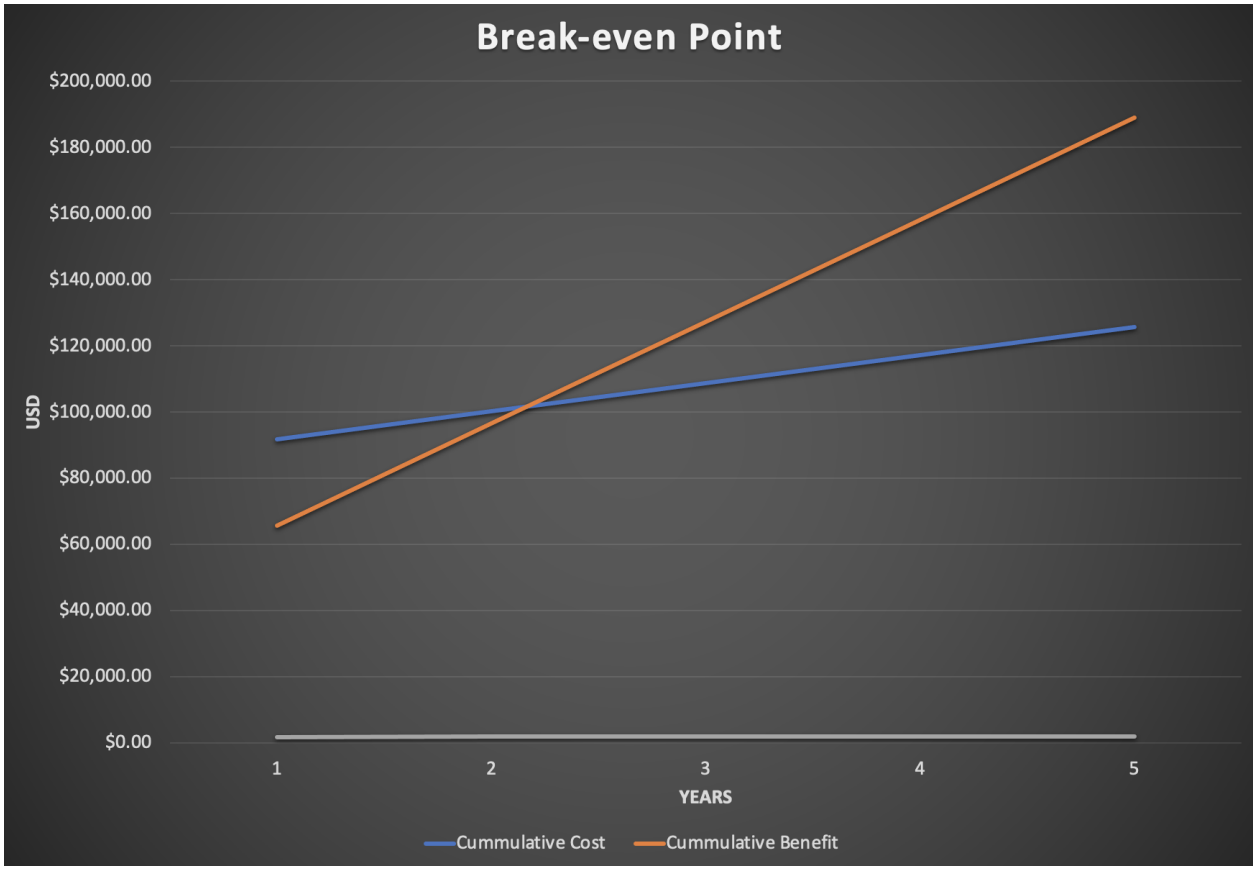


Figure 3: Graph of Break Even Point

Finally, we have plotted our cumulative cost and cumulative benefit in our Break-even point graph. The break-even point demonstrates how long it will take for the project to pay back the investment. The intersection happened at 2.12 years, which means that the investment will come back in 2.12 years.

9. Benefits of the Selected Model

- **Attendance Tracking:**

  Digital ID cards allow users to check-in and out of classes, work or group events automatically using their mobile devices and making attendance less time consuming and hassle-free.
- **Access Control:**

  Secure access to buildings, floors, events, and resources by scanning and validating the barcode with a known database of employees or students.
- **Secure Digital ID Issuance:**

  Control the distribution of ID cards by sending unique activation codes. Prevent non-users from creating invalid ID cards.

- **Self-Provisioning:**
  Simplify the distribution of ID cards and control which devices they are installed on.
- **Take Your Own Photo:**
  Users can take their own ID picture using the built-in camera on their device or select an image from their photo library.
- **Secure Cloud Storage:**
  Allows you to safely store, recover or delete any ID cards remotely, in the case of a lost or replacement device.
- **Send Notifications:**
  Send notifications to your users' mobile devices about school or office closings and special events.
- **Emergency Tracking:**
  In an emergency, a digital ID card can be used to quickly make sure all students/employees are present and identify who is missing.
- **No More Lost IDs:**
  Users never have to worry about losing their ID cards again. IDs can be easily accessed or removed from any of their devices.
- **No Wi-Fi, No Problem**
  No network connection needed to use digital ID cards that have been stored on the device.
- **Temporary Digital IDs and Guest Passes**
  Issue temporary ID cards or guest passes that have preset expiration dates.
- **Oversee Issued Digital IDs:**
  Remotely manage all active ID cards. You can remotely add, update, remove or temporarily disable any issued IDs.

Benefits and Monetization:

- Tangible benefit
- Intangible benefits

10. Risk management

- Risk management process include 4 steps which we need to follow –

  Step 1 – Identify the treat

Step 2 – Asses the treat

Step 3 – Treat (what it is ?)

Step 4 – Monitor and report

- In our project we have realized that we can face 2 kind of threats

    1. Losing your phone and falling into

    2. Electrical breakage will block your access

Conclusion:

The scannable ID codes will maximize efficiency and convenience for students and faculty members alike. No longer will a lost ID card force a college student to cough up an exorbitant replacement fee. With smartphone compatibility, almost every student will have easy access to this service. In an increasingly digital world, plastic ID cards have proven themselves to be relics of the past that have yet to be replaced. BU Digital Card is the replacement: it is the innovation that is required to progress in a field wherein noteworthy updates have not been made in far too long. While a final price for our service has not yet been determined, we are confident that it will be feasible for universities to easily adopt BU Digital Card. We expect our service will challenge plastic ID prices and fit in the $5-20 range per student. Our potential customers would probably be willing to pay even more than that expected value due to the extremely innovative and student-friendly nature of the application. Our team has become extremely invested in the future and success of IDeal, and we hope to attract investors and mentors alike to assist us in finally making this vision a reality.