Final Report

Professional Engineering

1P03

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Abstract

Every university student faces problems in terms of not being able to go to classes on time because of the large distances between buildings, or bad weather, or both. MacIN solves those problems by the design of the new MacIN transit system that will be available on McMaster University's campus. This transit system will allow the students to easily get to their classes in shorter times and in safer conditions. The transit system will consist of two main vehicles that serve its purposes: the MacIN Bike, and the MacIN Car-Train. The transit system will reduce the students' stress on getting to class late and missing important information, as well as creating employment and CO-OP opportunities for students. Research also says that if McMaster University adopts this idea it will assert itself as a model to other universities for creating a positive student experience and for working hard to increase their productivity.

Introduction

The problem at hand is that students are having trouble getting to class on time when they only have 10 minutes to traverse the McMaster University campus. Rushing puts unneeded stress on the students, resulting in an overall negative impact on their academic performance, and subsequently the university's reputation. Concurrent with this issue is that of heavy pedestrian traffic, which can cause extreme frustration in drivers as they are outpaced by cyclists who do not have to stop at crosswalks for minutes at a time. The primary aim of the MacIN system is to reduce the amount of time students spend in transit, not only reducing their stress but that of motorists as they will not be stopped by the heavy flow of people between classes. A secondary effect is that this will create employment and CO-OP opportunities for students, as the system will have to be implemented and maintained. This system is an important undertaking as the

university should foster an environment that supports learning, and places as little stress as necessary on students during their academic years. By implementing this system, McMaster University will see increased productivity amongst its students, and will establish itself as a leader for other universities in creating a positive student experience.

Research

The stakeholders whom are involved in the MacIN system and will be affected by it are McMaster students, McMaster visitors, and the university itself. However, the primary stakeholders associated are McMaster students, as they are affected the most by the problem. They are also the ones who will make the most use of the MacIN system. McMaster students, however, do not constitute the entire stakeholder demographic. The secondary stakeholders are any McMaster visitors who may come to visit the university for whatever reasoning they have. This can include high school students, parents, and first-year students during the frosh week. All of the previously mentioned stakeholders will be lost when visiting campus without some directions or guidance, which is the reason why they are stakeholders for the MacIN system. Moreover, McMaster University itself will also be an important stakeholder. The transit system will be beneficial to the university in a different manner, as it will be able to get people a ride; it can also make McMaster popular for using this type of system which other universities are not using.

The MacIN system is designed to be totally environmentally friendly. The idea is to have two main products: the MacIN Bike, and the MacIN Car-Train. The first product, the MacIN Bike, is will be running and powered using a normal bike's system, a pulley system. This system and the technology behind it is relatively simple and well known to almost everyone as the

cleanest way of transporting or travelling. Therefore, the MacIN Bike, will be totally clean to the environment. The second product, the MacIN Car-Train, is also to be powered using clean energy. Although a similar product to the MacIN Car-Train, called the "Old Trolley tour train" (Figure 1), already exists for tours in some cities around the world [1], the product used has some problems in it as it is not fuel efficient, not environmentally friendly, and is noisy. Thus to solve this problem other power sources and technologies will be taken into consideration to be used to power the MacIN Car-Train; for example electric, air pressure, and solar power. The previously mentioned renewable energies are all well known for the fact that they are environmentally friendly. They also solve the loud noise problem as all of the mentioned technologies are known to make their motor way quieter than those using fuel.

Figure 1: An Old Trolley tour train

To successfully build this idea, a couple of technologies were researched to reach the best solution to be built. The first technology researched to use in the MacIN Bike is a pulley system. The idea behind this is to have the front half of a normal bike with one wheel, and a seat attached to the back of it for the students to set. It can also have some sort of luggage space at the back to

keep the student's bags and belongings (Appendix A). Furthermore with all of the previously mentioned details, the pulley system used for the MacIN Bike might need to be upgraded to multiple pulleys. Another idea is to have some sort of electric motor with the pulleys. The reason behind those ideas is to help reduce the torque from the pedals, thus making the Bike easier to drive.

On the other side, the technologies researched for that could run the MacIN Car-Train were: electric energy (i.e. batteries), air pressure, and solar power. Although the mentioned power sources are all relatively new, they could still be used for such a small product like the MacIN Car-Train. Those technologies have actually been used to build many products that do exist today like Smart cars, Mini-golf cars (which are already available on McMaster campus), and the Airpod, which is a car that runs on air pressure as its source of power (Figure 2). Those products have been reviewed and used by a large number of people which proves their success in the market. Also, the shift in today's market and the carmakers towards the previously mentioned technologies proves their huge success and the promising future they hold for their users.

Electric Energy

Electric energy is a well developed field of renewable source of energy used to power vehicles. The way it works is by using electric energy stored in batteries to power the motor for cars instead of gasoline. This requires a strong battery replacing the ones used in existing cars to hold a large amount of energy to fully power the car [3]. There are many famous examples of electric cars that are available and successful, (for example the Smart cars, and Tesla Roadster). Although both cars might not use electric energy 100%, it is used for most of the parts in them. Table 1 shows the difference in using different type of technologies to run cars [2].

Table 1: A comparison between the usage existing technologies [2]

Technology	Example Car	Gas mileage	Well-to-Wheel Efficiency	Well-to-Wheel CO_2 Emissions	0 to 60 mph Acceleration
Electric	Tesla Roadster	110 Wh/km	1.14 km/MJ	12.6 g/km	3.9 sec
Gasoline Engine (Turbo 6-cyl)	Porsche Turbo	22.0 mpg	0.22 km/MJ	64.7 g/km	4.2 sec
Gasoline Engine (V12)	Ferrari 550 Maranello	11.7 mpg	0.12 km/MJ	121.7 g/km	4.7 sec
Gasoline Engine (V8)	Chevrolet Corvette	25.0 mpg	0.25 km/MJ	57.0 g/km	4.8 sec
Gasoline Engine (VTEC 4-cyl)	Honda Civic VX	51.0 mpg	0.52 km/MJ	27.9 g/km	9.4 sec
Diesel Engine (4-cyl)	VW Jetta Diesel	50.0 mpg	0.48 km/MJ	41.5 g/km	11.0 sec
Natural Gas Engine (4-cyl)	Honda CNG	35.0 mpg	0.32 km/MJ	45.0 g/km	12.0 sec
Hybrid (3-cyl Gas/Electric)	Honda Insight	63.0 mpg	0.64 km/MJ	31.2 g/km	12.3 sec
Hydrogen Fuel Cell	Honda FCX	64 mi/kg	0.35 km/MJ	41.1 g/km	15.8 sec

As shown in Table 1, the electric energy technology easily dominates over all of its existing alternatives in terms of gas mileage, well-to-wheel efficiency, CO_2 emissions, and acceleration. Additionally, the daily cost of using electric energy is way below that of using gasoline, yet it is better than other sources of energy in terms of the environment. All the previously mentioned factors make this source of energy a strong one to be used for powering the vehicles of MacIN.

Air Pressure Energy

One of the most fascinating and new energy sources is the air pressure source of energy. This technology was developed by a French company called MDI. The idea is to use compressed air stored in the car to control the pistons in the engine, thus moving the car [4]. The product which they built was called the Airpod. Basically this is a mini car similar to the golf carts that could be used in the cities of Europe [5]. This car can be refilled with air from either stations meant for that purpose in approximately 3 minutes, or even from home by a normal air compressor, which would take about 4 hours. This process is relatively cheap, versus the price of existing fuel technology, at a cost of around half a dollar per 100 km [6]. Along with its cheap refilling cost, it also has one of the lowest impacts on the environment compared to other sources of energy since it only uses air as its source of power.

Figure 2: The Airpod

Solar Power Energy

Solar power energy is also another new field of renewable energy that is currently still under development. The way that it works is simply by having a solar panel to absorb the sunlight which will be converted through the panel into enough energy to power a car. Moreover, any extra energy produced will be stored in batteries and used later on in the absence of sunlight. Unfortunately, the solar power energy is not well developed yet for use on cars in the present time, since existing solar power cells do not provide enough energy to power a full vehicle [7]. However, this technology is still considered for the design of the MacIN vehicles for two reasons. Firstly, the car which will be used for the MacIN Car-Train will not be like the transit bus that is used by the public, but rather a small and a light car of maximum one or two drivers. Therefore not as much energy will be needed to power it. Also, the usage of this car will not be as heavy as that of other transit busses. Another reason is that this could be used only as a supplement for the main source of energy used to run the car.

Proposed Design

The transit system will help the students reduce their travel time between classes by having two main products to serve its purposes: the MacIN Bike, and the MacIN Car-Train.

The first product is called the MacIN Bike. The idea behind this product is to have the front half as a normal bike with one wheel, and a seat attached to the back of it where the students will be seated (Figure 3). The driver of the MacIN Bike will drive it through a pulley system and a pedal. The MacIN Bike will be 2 meters in length and 1.5 meters in width. This will allow a total of one driver and two students with their belongings at the back at a total weight of about 500 pounds. The original design (Appendix A) had a luggage space at the back which would carry passengers' belongings, which may include laptops, bags, roller blades, skateboards, etc. This feature makes it easier for the students as they do not have to carry the weights and travel across the campus. However this was changed in the new design and the space was left in between the driver and the student to ensure the safety of the student's equipments. The original MacIN Bike was also supposed to have a hood that can expand and shrink as needed so it can prevent the passengers from rain, snow and high ultraviolet rays in summer. However this was also a major change in the product as the whole MacIN Bike is now covered with the hard materials of polypropylene and polyethylene, which are meant prevent both the passenger and the driver from all possible weather hazards and to insure they are safe and comfortable.

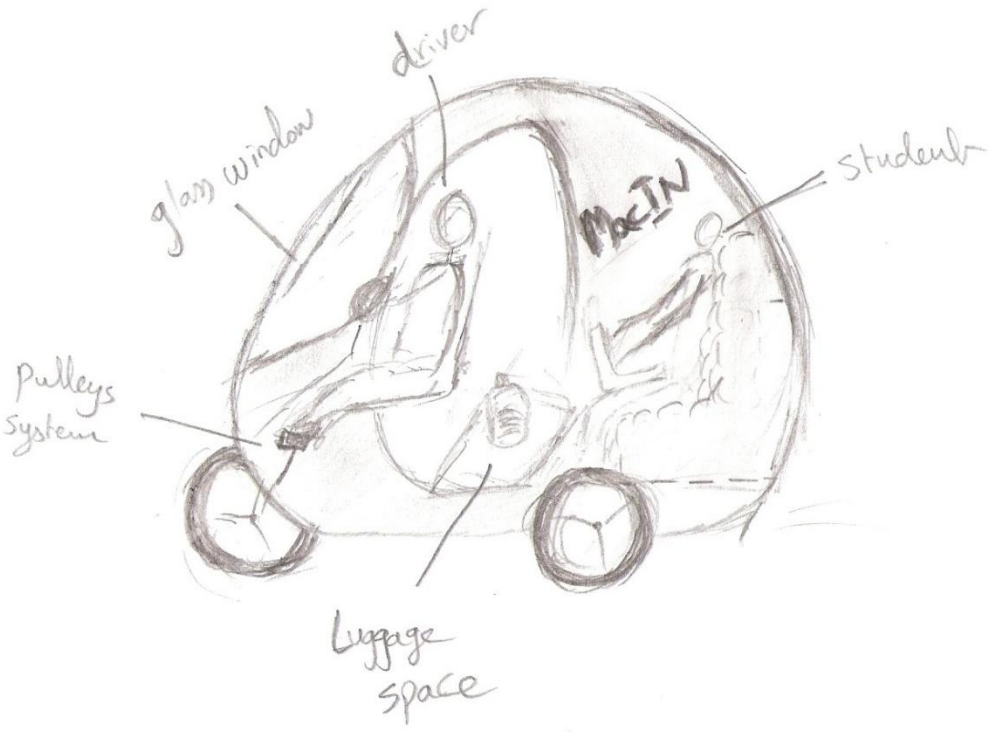

Figure 3: The MacIN Bike

On the other hand, the second product is called the MacIN Car-Train. Although the idea behind this product is different from that of the MacIN Bike, they both still serve the same purpose. The MacIN Car-Train is simply a small car which pulls one or two carts attached to its back. Thus only the first car will be driveable and will have a motor to power it while the rest of the carts will only have wheels (Figure 4). The idea is simply the same as a normal train except it will be using the concepts of a vehicle (wheels) so it can be driven on asphalt roads rather than a railway. The first car will be roughly around 2 to 2.5 meters in length and 1.5 meter in width. As for the carts they will be a little bigger at a length of 3 meters and a width of 2 meters. This will have a weight of 2000 pounds plus the weight of the carts to be pulled by the car. The motor and the battery in the first car are designed to be at the back of the car. Also, a solar panel will be

added to the top roof of the car to allow a maximum absorption of sunlight and to provide energy to the MacIN Car-Train.

Although a similar product already exists for tours in some cities around the world, the product used was not fuel efficient, not environmentally friendly, and makes a loud noise, which could be a hazard to people around it. The MacIN Car-Train will avoid all of the previously mentioned problems by using one of the renewable technologies researched to power the motor instead of fuel. This will solve the environment issue by reducing the pollution emitted by the car on the system (Table 1), and also solve the loud motor sound problem as all of the mentioned technologies are well known for their motor sound to be quieter than those using fuel.

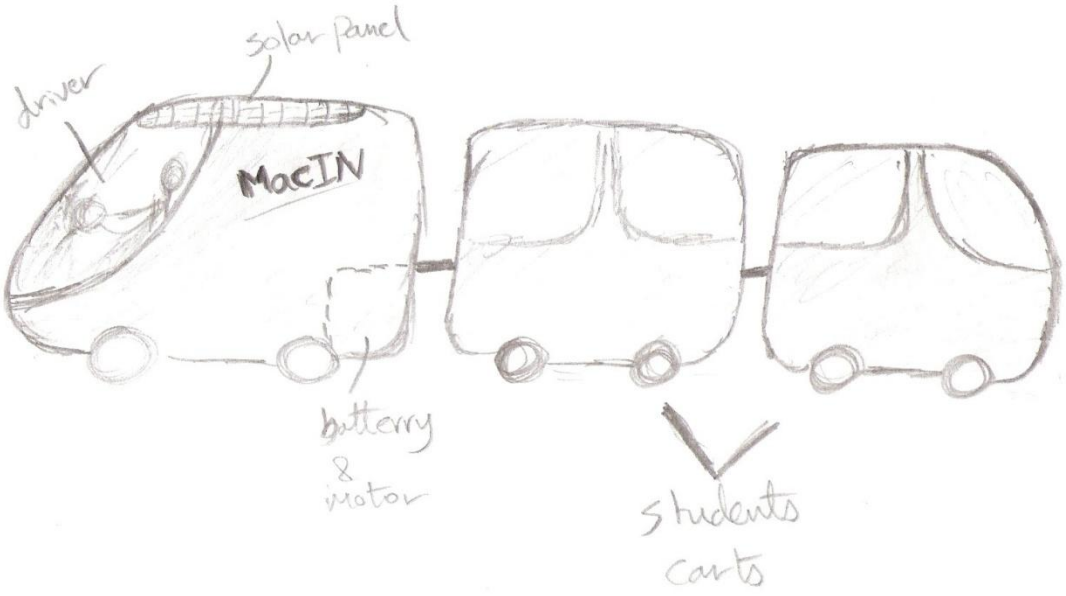

Figure 4: The MacIN Car-Train

Due to the stress placed on environmental awareness, a normal bike can be used as a template for the front section of the MacIN Bike. For the construction of the seats and luggage

space, polypropylene and polyethylene can be used as the materials for both vehicles. Polypropylene and polyethylene both have low density. Polypropylene has a better overall tensile strength than polyethylene. On the other hand, polyethylene is very stable and can withstand temperatures as low as -70°C. By combining both materials to build the back sections of the MacIN Bike, its longevity is extended. For the MacIN Car-Train, the leading section will resemble a normal car, and the following sections will be made of strong, lightweight materials such as steel plating.

The MacIN Transit system will run only inside McMaster University. Furthermore, Table 2 shows the difference in time that it takes to travel across McMaster University's campus with and without the MacIN transit system. The following information was obtained through experiments done by the project designers. For more information on calculations and measurements please refer to Appendix B.

Table 2: A Travel time comparison between MacIN and walking

Building To Building	Distance (m)	Average Travel time (min)		
		Walking	MacIN	
			Bike	Car-Train
TSH – ABB	800	8.8	3.33	1.92
ETB – TSH	770	8.5	3.21	1.85
ITB – KTH	780	8.6	3.25	1.87
MDCL – HH	380	4.2	1.58	0.91
JHE – TSH	580	6.4	2.42	1.39
ITB – Gym/Stadium	960	10.6	4.00	2.30

As shown in Table 2, the timings difference between walking and using the MacIN transit system over the same distance is relatively high. This shows the significance of this system and its positive effect on the students' daily lives.

To see if this type of system is capable to use inside the university, the main stakeholders were interviewed to get an idea of what they think and also to allow a room for any improvements on the design. This was extremely important since they are the main focus of the project as well as they will have to use the MacIN transit system everyday so they will have a better understanding when this system is implemented to use.

According to the stakeholder interviews (Appendix C), the following problems were encountered in the design of the transport system:

1) As there will be a number of these vehicles, some students thought that the MacIN Car-Train and the MacIN Bike will take up space.
2) Students thought that the modern look of the vehicles might ruin the old fashioned look of the university, and thus the overall picture might look weird.
3) Most students said that they are not willing to pay more than 25 cents per ride.
4) Students were also concerned if the transit system will save and protect them from bad weather.

These problems that arise from the interviews created constraints, which help to adjust the system as follows:

- The MacIN Bike and the MacIN Car-Train should look attractive and should not be bulky.
- The MacIN vehicles should match and flow with the old fashioned look of the university.
- Ticket price should be below or at 25 cents per ride
- The vehicles should be completely covered to provide shelter for the students from bad weather.

In order to resolve the above stated problems, a solution had to be found to each of the problem, keeping the constraints in mind.

1) Both products will be made smaller but will still be wide enough to allow enough students to be accommodated with their belongings.
2) The colours and the materials used to build the vehicles will match the overall theme and look of the university. For example, the colours of the vehicles will be dark red and grey which are the official theme colours of McMaster University.
3) The cost of the ticket per ride has to be 25 cents or below, keeping in mind that the university also has to make some profit.
4) The original design of the vehicles, (Appendix A), were changed by making sure they are completely covered. This ensures maximum safety and protection from bad weather for the driver, the students, and their belongings (Figures 3 and 4).

Objectives

With the use of the MacIN transit system, the main objective of the project is to cut down on transit time between classes. However, from the objective tree (Figure 5), it is easy to see that each stakeholder will significantly benefit from the MacIN transit system. The stakeholders involved are the university students, visitors, and McMaster University itself.

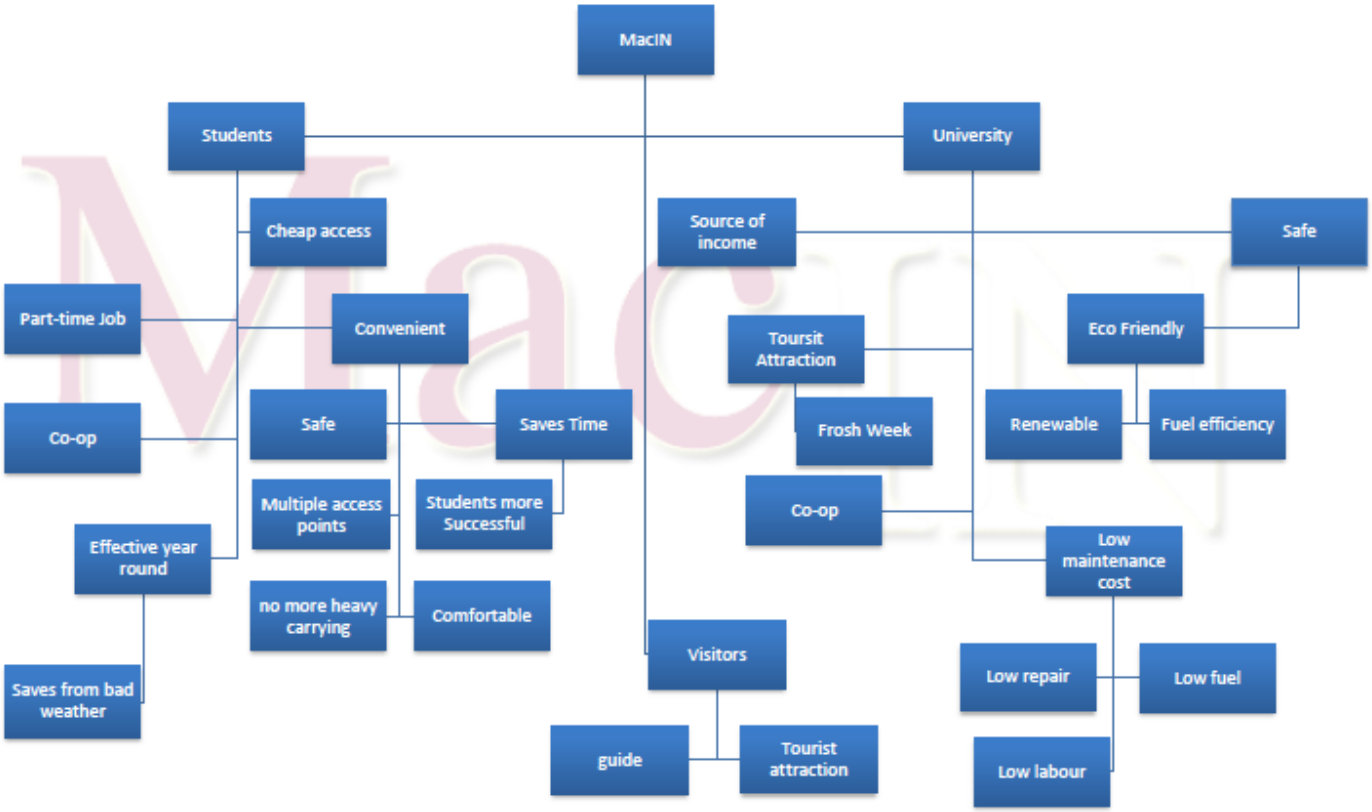

Figure 5: Objective Tree of MacIN

For the students, the most beneficial aspect is the convenience it will offer. By reducing the time spent travelling between classes it will alleviate the stress caused by arriving to class late. In addition to the reduced stress, MacIN will offer students shelter from bad weather, as well as providing a more comfortable alternative to carrying their supplies across the entire campus. Each building will be treated as an access point for the usage of the system, providing students with the easiest, most direct, and fastest route to their destination.

Discussion

The purpose of the design is to reduce the time spent in transit by all pedestrians at the University. Currently walking is fine for shorter trips, but can be inconvenient for larger distances, especially in poor weather. Some students may choose to bike; however, this is also not a viable option in winter as, besides the obvious reasoning of the cold, their chains can become corroded from the snow, or the salt used to melt it. Therefore the MacIN's transit system is a solution to both problems, offering students a much faster, safer, and more comfortable way to get between classes.

Based on information gathered from students and faculty at McMaster, cost was determined to be the most important factor in whether or not people would actually use the system. Balancing cost with effectiveness was the most challenging aspect of the project, and the final design chosen were both the MacIN Bike, and the MacIN Car-Train, as it was apparently the most efficient way to get around campus as well as the cheapest. In addition to helping students get to class, the system will also provide a source of income for McMaster, as well as its students. Ideally it would be student-run, providing potential jobs for students as well as a CO-OP opportunity for engineering students as the system is implemented.

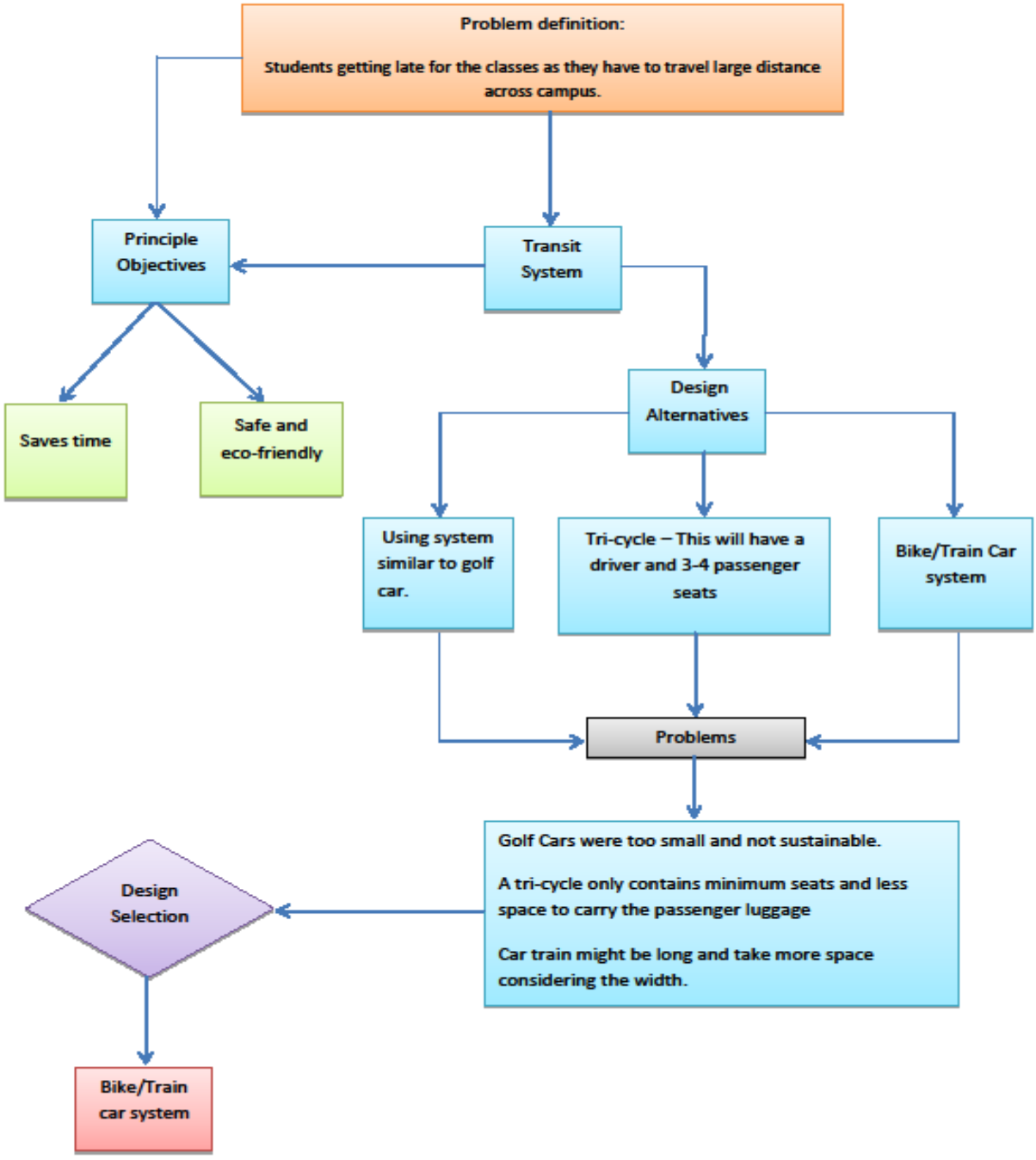

Figure 6: Flow chart of the design process

As depicted in the flowchart (Figure 6), there were 3 possible alternatives which were taken into consideration. As a solution to the problem that the project tried to solve, it was decided that the system using the MacIN Bike and the MacIN Car-Train system will be implemented. The benefits of this proposed solution are described as follows.

Firstly, as for the student, the main benefit is being convenient to them by removing their stress of going late to class by traveling faster between buildings in a safer, more comfortable, and cheap way. Some of the other benefits which the students will receive from this transit system include shelter from the bad weather; and no more lifting their heavy weights of bags and laptops while walking a long distance. Inside the university, each building will be an access point where students can easily board the system across the campus. In the meantime, this system, if approved by the university, could be both a CO-OP and an on campus part-time job for the students. This will help the university students from the different faculties to have an amazing and a once in life time experience and also join in writing history as this idea would be the first of its kind.

Secondly, visitors are another main stakeholders in this project. The reason is that a big university like McMaster always gets visited by different people all year round. Another fact to keep in mind that McMaster visitors are not all from Canada, but also from all around the world. Therefore a guide is needed to be always available for those visitors to guide them to the different buildings on campus and also provide a tour to them. This system could turn into a tourist attraction and increase the university's reputation.

Lastly, the university itself is also another stakeholder which will benefit a lot from the MacIN transit system. Depending on the total cost of the system, theoretically speaking this

could be another source of income for the university. Even if not, charging a price for the ticket per ride will at least cover the maintenance cost and the salary for the driver for the whole system. The University's reputation and fame will also be positively and heavily affected by this system. If approved by the university, this might be the first and the only one in the world to be done inside campus. It will attract people from different ages to see and learn about McMaster the "green" university and its leadership in supporting the environment, as well as working hard to increase its students' productivity by creating an amazing positive experience for them.

Design Evaluation

Life Cycle Assessment:

Table 3: Life cycle Assessment for the MacIN Transit System

MacIN	Environmental Stressor					
Life Stage	Materials Choice	Energy Use	Solid Residues	Liquid Residues	Gaseous Residues	Total
Pre-manufacture	3	2	3	2	2	12
Product Manufacture	3	2	3	4	4	15
Product Delivery	3	2	4	2	2	12
Product Use	4	3	4	4	4	19
Refurbishment, Recycling, Disposal	4	2	4	4	4	18
Total	16/20	11/20	18/20	16/20	16/20	76/100

Matrix Discussions:

Table 4: Pre-manufacturing for the MacIN Transit System

Pre-manufacturing	MacIN
Materials Choice – 1,1	The polypropylene and polyethylene are common materials. They are relatively cheap and easy to get. However, they are non-renewable resources. In addition, the used bike and normal storage battery car are easy to build.
Energy Use – 1,2	To get polypropylene and polyethylene need little energy to reach specific pressure and temperature. And to build the MacIN Car-Train and the MacIN Bike need relatively high energy.
Solid Residues – 1,3	Some solid will release for building the MacIN Car-Train and the MacIN Bike, and very little solid materials will be released for getting polypropylene and polyethylene.
Liquid Residues – 1,4	Very little liquid residue produced from the MacIN Car-Train and the MacIN Bike. Nevertheless, much more liquid residues produced from the plastic (The polypropylene and polyethylene).

Table 5: Product manufacture for the MacIN Transit System

Product Manufacture	MacIN
Materials Choice –1,1	The MacIN Bike and The MacIN Car-Train both are produced in the factories. However, partially they are made up with used materials, such as a used bike; it will be less harmful for the environment.

Energy Use – 1,2	All factories use electricity and it will not release significant harm to the environment.
Solid Residues – 1,3	Some solid residues will leave because some parts of bikes are less useful for the product.
Liquid Residues – 1,4	Very little liquid residues will leave.
Gaseous Residues -1,5	Very little gaseous residues will leave.

Table 6: Product Delivery for the MacIN Transit System

Product Delivery	MacIN
Materials Choice –1,1	The transport trucks or The Car-Trains themselves will be used to deliver to McMaster university.
Energy Use – 1,2	The transport trucks use gasoline and the Car-Train themselves use the energy from storage battery and solar panels.
Solid Residues – 1,3	Very little solid residues will leave during the transportation.
Liquid Residues – 1,4	Gasoline is harmful for the environment.
Gaseous Residues -1,5	Some harmful gases will be exhausted from transport trucks such as CO2, CO, and SO2.

Table 7: Product use of the MacIN Transit System

Product Use	MacIN
All (4,1) (4.3) (4.4) (4,5)	No solid, liquid, or gaseous residues will leave.
Energy Use – 1,2	Clean and renewable energy will be used such as electricity and solar energy.

Table 8: Refurbishment, Recycling, and Disposal of the MacIN Transit System

Refurbishment, Recycling, Disposal	MacIN
Materials Choice –1,1	All materials are recyclable or disposable
Energy Use – 1,2	To recycle the MacIN Bike and the MacIN Car-Train need the transport trucks to replace them into the recyclable places.
Solid Residues – 1,3	Very little solid residues will leave, because most materials are recyclable.
Liquid Residues – 1,4	All materials leave no liquid residues.
Gaseous Residues -1,5	All materials leave no gaseous residues.

From the Life Cycle Assessment tables, its obtained that the MacIN Bike and the MacIN Car-Train are established for providing students a faster way of travelling across campus with a minimal impact on the environment. As such, the vehicles should be used across the entire campus for a minimum period of one to two years.

Resources extraction:

The MacIN Car-Train will be powered by a combination of solar and electric energy. The storage battery and solar panels can work together so that even when not in use, solar energy is not being wasted.

A normal bike or car can be used for a long time; however, due to the high frequency of use, the MacIN Bike and the MacIN Car-Train should be maintained as often as possible. For example, the storage battery should be replaced when it is not functioning at maximum efficiency, and the solar panels should be maintained in working condition to provide the maximum longevity age for them along with the least damages.

Conclusion

After viewing and studying all of the previously mentioned factors about the project, many decisions were made about the project to eliminate other options and to have the final and the best possible product. The proposed design is both beneficial to all stakeholders involved and represents an eco-friendly solution. MacIN is assertive that the requirements of all the stakeholders will be fulfilled and is certain about the positive changes it makes by using the MacIN Transit System.

Firstly, it was decided that the project will proceed as planned to have two vehicles in the transit system: the MacIN Bike, and the MacIN Car-Train.

Secondly, the technology used for this project will be electric energy by the usage of batteries as the main source of energy along with solar power panel as a supporter. Although the air pressure energy might be more efficient and useful for this project, it was eliminated because of it being relatively new, thus not commonly used and not easily available to build the vehicles.

Thirdly, from the information gathered from the interviewees, the price ticket was decided to be equal to or below 25 cents per ride. Since most students agreed that this price will not add a heavy load of money on their shoulders along with their other expenses they already have to deal with.

Recommendations

The major goal of this project has been to lower the time it takes students to travel inside McMaster University. Thus the next step in this project is to conduct an exhaustive test

to confirm that the goal will be met. This will be done by taking the project to the stage of actual implementation, as in moving on from researching and writing reports to actually starting to build the project. To do so many steps have to be taken in order to insure a successful final product. Those steps will be as follows.

Firstly, furthermore research will be done for the designs to turn this from just a rough idea into a reality. This will be done by more research on the type of batteries, motors, wheels, and solar panels that will best fit with the designs. The next stage is to get and obtain the real life dimensions of every detail in the vehicles and combine them all together to come up with a final product design that can be built.

Secondly, the designs of both vehicles of the system will be entered and built on computer through the use of a software design program, like Autodesk or MapleSim, to ensure that they will work. The designs will be entered to scale and tested through the programs as how they would run and function, and also what to except. This will allow an easy and relatively cheap way of testing the products and fixing any arising problems in the designs before physically building it.

Thirdly, after the design being built successfully on software, a scaled prototype will be built and tested for a set amount of time on the campus of McMaster University. This amount of time will be set to be over one to two months depending on the results of the testing. During that time very detailed observations will be taken on how both designs are working, how students are interacting with it, and how the overall project is coming out. This will ensure the product is working according to theory and will also allow enough opportunity to fix any surprising mistakes that might pop out on the surface.

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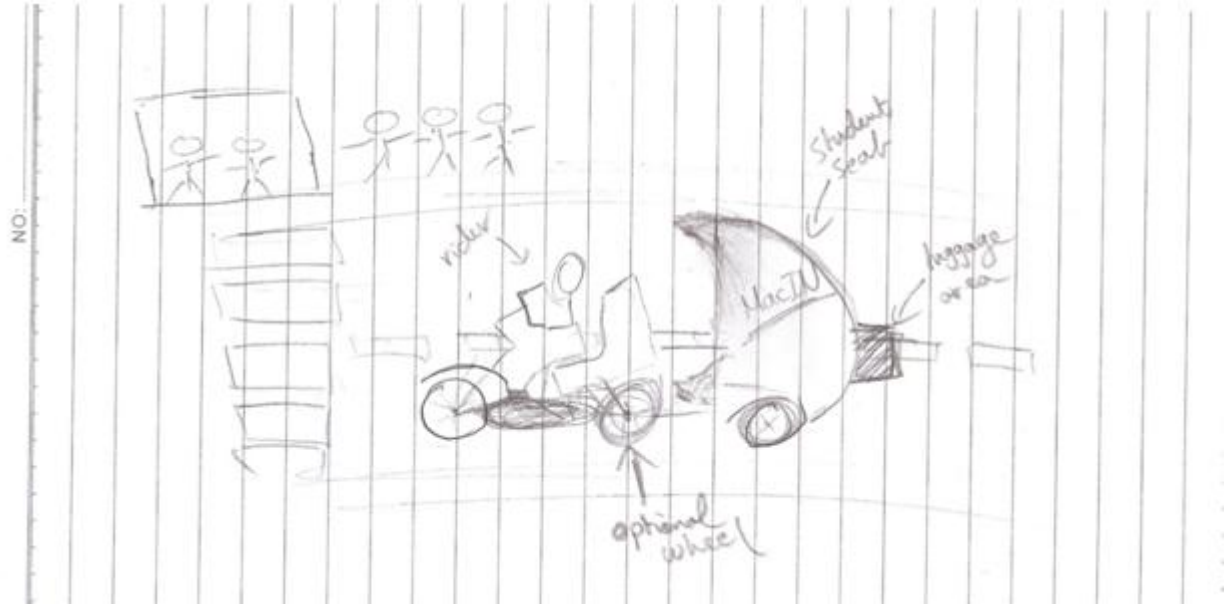
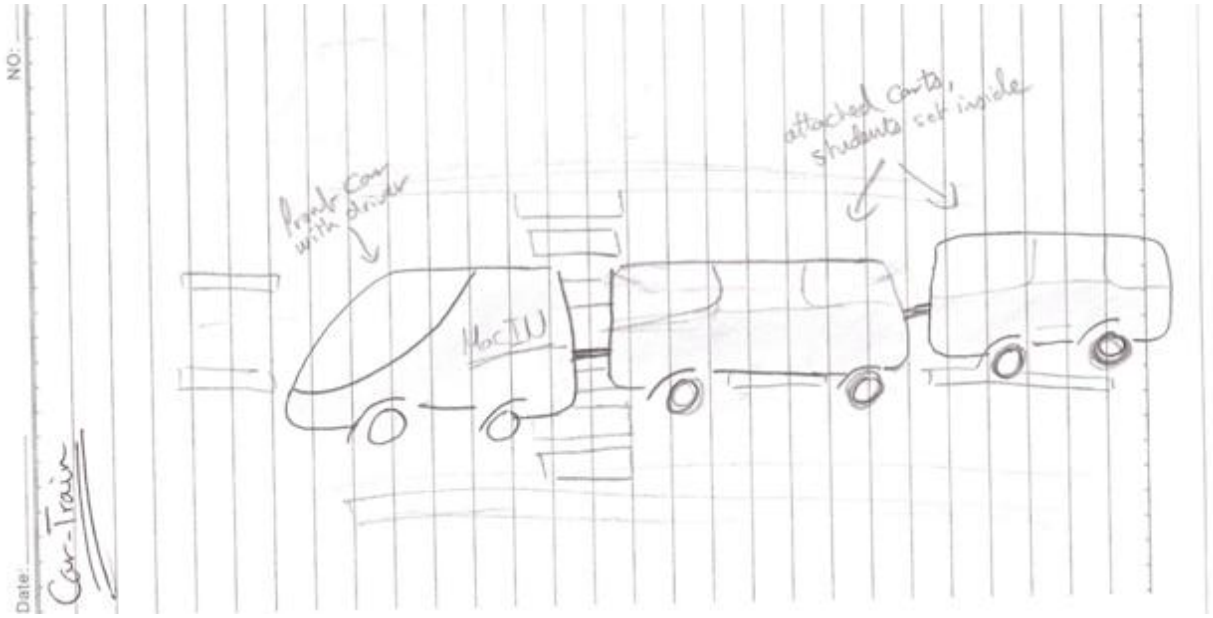
Appendix A: (Design Sketches)

The MacIN Bike



The MacIN Car-Train



Appendix B: (Measurements)

With the use of the speed equation: $S = \Delta d/\Delta t$

Using the metric tool in Google Earth:

- From TSH to ABB is 0.80 km
- From TSH to ETB is 0.77 km
- From ITB to KTH is 0.78 km
- From MDCL to HH is 0.38 km
- From JHE to TSH is 0.58 km
- From ITB to Gym/Stadium is 0.96 km

Average university student walking speed [8]: 1.51 m/sec = 90.6m/min

Calculated average speed of bike: Distance from ITB to Gym is (0.96 km)
Time is (4min)
Thus Speed is: (0.96 km)/(4min) = 240 m/min

Based on driving experience, average speed of the Car-Train to be: 25 km/h = 417 m/min

Appendix C: (Interviews)

Interviewees:

a: McMaster TA
b: McMaster 3rd year Engineering student
c: McMaster 2nd year Linguistics student

1. **Are you having trouble in terms of travelling on campus? (Time, Distance, weather, lost, etc)**
   a. Yes, sometimes during winter and if it rains.
   b. No.
   c. The only trouble I encounter when travelling on campus is the weather. I always have to consider the weather in order to know what time to catch the bus in order to make it on time for class.

2. **How would you like it if there would be a transit system (e.g. the GO-Transit) on campus?**
   a. It would be really cool and helpful at the same time.
   b. I would love it if it did not cost me anything.
   c. Personally, I would not like this proposal because it will cost more as well as make the students lazier. Also, the McMaster campus is not a huge campus, compared to UofT for example, so there might be no need for it.

3. **Introducing MacIN ...**

4. **What you think? First impression?**
   a. I liked the idea of using an inside university transport system. It will help me a lot and it will save my time to get to the classes. That's great!!
   b. Where does the money come from? Students are poor.
   c. It is pretty cool. It is a smart idea in terms of getting to class on time considering weather conditions.

5. **What are your main concerns about this? (Pros, Cons, etc ...)**
   a. Pros- saves time for students and prevents them from rain if they forget their umbrellas.
      Cons- After being implemented a lot of these bikes will be on the campus going from one place to another, so I think that might create problem to the people who are walking in terms of spacing.
   b. I prefer this to biking on campus because it is more relaxing and luxuries.

c. The amount of money that will be added to our tuition in order to pay this off. As well as how the modern look will ruin the look of McMaster (old fashioned). I feel like we should start slow, by having a 'tester' to see if it will actually benefit the students.

6. **Would you use it?**
   a. Yes I definitely will.
   b. Depending on cost and speed, if it cost me more than 25 cents per ride then probably not. I will keep using my bike, it is free.
   c. I would probably use it when running late to class, or if the weather is really bad.

7. **If charging, how much are you willing to pay to use it?**
   a. None, I want a free ride.
   b. Maximum 25 cents per ride.
   c. I feel like since we will be paying extra in our tuition to pay off the expenses for this proposal, it should be reasonable to be able to use it for free.

8. **Who do you think should pay to use it?**
   a. I think university should pay for it even if they are using it or not using it.
   b. Depending on your business model. Do you want to make money of it? Then probably everyone. Do you want to increase university expenditure? Then make it free for students, but I think demand will be too high if it was free so the price will settle on keeping the system running.
   c. I think when tourists come to visit McMaster; there should be a group fee to pay for it. I don't think students should be paying for using it.

9. **How do you think this is going to change our university? (More fame, less, etc ...)**
   a. I believe that it might make the university famous as other university don't have a transport system.
   b. To be honest it will be hilarious at the beginning, and if it succeeds others will adopt it. However if it flops other will make fun of the university.
   c. It will definitely change the look of the university by making it more modern. It will also spark conversation and interest between other universities, since it's a technological development.

10. **Would you work/volunteer on it?**
    a. Yes, I would be the driver if I actually get an enough pay and if I am not busy. I might work for 1-2 days per week.

b. Perhaps depending on school load and pay.
c. I would probably work for it. Just to make some extra money, wouldn't hurt.

11. What improvements would you add-on to this project/idea?

a. I would suggest you to remove the train car from the system and just make it a bike which will work on fuel or battery. Because I think that will make it a bit short and long enough to accommodate passengers'.
b. A proper feasibility study consideration of tourist attraction areas like Niagrafalls might yield higher ROI.
c. Personally, starting off slow to see how it works, then expanding from there is how I would take on this proposal. We could even add on air-condition and heaters for a more comfortable travel (even though it's a short distance).

12. Who do you think would use this the most?

a. Students, TA's, professors, kids etc.
b. Lazy people like me. And rich people unlike me.
c. I think students will be using it the most, just because everyone would like to be on class on time. Professors will also be using it a lot.

13. Any further comments you want to add?

a. No.
b. It is all about the price for me being a student. If it is efficient in both price and time then I will use it. If not then I will not use it.
c. It's a great project to take on. One thing to consider is how it would ruin the flow of McMaster University by making it more clustered. So that's one thing that should be considered.