

July 26th, 2020

Dr. Craig Scratchley
School of Engineering Science
Simon Fraser University
V5A 1S6



RE: ENSC 405/440 Project Proposal for **DPL** by **Parcel Solutions Inc.**

Dear Dr. Scratchley,

The attached document, Parcel Solutions' project proposal for DPL, provides a summary of our capstone project. Our goal is to design a cost effective and secure delivery parcel locker to improve the online shopping experience.

The aim of this proposal is to provide a high-level overview of DPL. This will include: initial prototype design, risks and benefits associated with the product; an in-depth market analysis; a list of tentative bill of materials and material costs required to complete the prototype; and lastly, a project timeline to illustrate the expected workflow through Proof-of-Concept and Engineering Prototype phase of DPL.

Parcel Solutions consists of 6 driven and talented senior engineering students ranging in concentrations from Computer Engineering and Electronic Engineering: Arian Vafadar Moghaddam, Boey Leung, Chaoqun Ding, Huron Lee, Linqi Cheng, and Sina Ahmadian Behrouz .

We appreciate your time in reviewing our project proposal for DPL. If you have any questions or concerns regarding our proposal, please do not hesitate to contact our Chief Communication Officer, Sina Ahmadian Behrouz, by phone at (604) 771-1996 or by email at ahmadian@sfu.ca.

Sincerely,

A handwritten signature in black ink, appearing to read "Arian Vafadar Moghaddam".

Arian Vafadar Moghaddam
Chief Executive Officer
Parcel Solutions Inc.

Proposal Document for *DPL*



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Executive Summary

The world of in-store shopping is beginning to diminish as more shoppers are trending towards online shopping. In today's reality of having to deal with COVID-19, very few people are going to shopping centers due to the fear of contracting the illustrious coronavirus. In this unrepresented period of time, Parcel Solutions has been developing DPL.

DPL is a modern parcel locker that combines a website and a parcel locker to improve the online shopping experience. DPL provides a safe and secure locker that courier companies can place customer packages inside. Enabling online shoppers to pick up their packages without ever having to go to a postal office or being stuck at home waiting on their package to arrive. Additionally, DPL eliminates the threat of intruders stealing customer packages from their doorsteps.

This proposal outlines the risks and benefits of DPL from the perspectives of end users of the device, customers of the device, product stakeholders and investors, and from a global perspective.

This document outlines market trends for parcel storage lockers and briefly reviews similar products that are already in the market, such as Amazon lockers by Amazon, 6900RZ Parcel Dropbox by Architectural Mailboxes, and Danny Parcel Guard by Danby Parcel Guard. The strengths and weaknesses of these products and DPL are analyzed in section 3. This analysis and comparison will help evaluate DPL's competitiveness in the market.

Budgetary information for DPL is provided, outlining predictions of costs that will be incurred in designing and manufacturing an Engineering Prototype version of the device. Current funding plans for the project have also been included.

Finally, the Parcel Solutions team, responsible for the design, development and marketing of DPL is introduced. This document is intended to familiarize potential customers, future stakeholders, and investors with Parcel Solutions and DPL.

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Glossary

- **End User:** Any person who uses and interacts with the product
- **Investor:** Individuals/institutions who will ultimately finance the company with an expectation of a future return
- **Stakeholder:** Refers to people or groups who can be influenced by the company, and/or hold the power to influence the company

1. Introduction

DPL is a modern parcel locker that consists of a backend/frontend website and a parcel locker to improve many aspects of online shopping such as efficiency, security and reliability. It is intended to be placed in apartments and residential buildings to improve the world of online shopping.

1.1 Background

A common issue many online shoppers have is efficiency and accessibility to one's package. At the moment, couriers around North America are instructed to leave a note on apartment buildings if the customer is not available to receive their package. The customer is then expected to take the note left at the door by the courier and go pick up their package from the nearest postal service office. This solution is extremely inefficient and inconvenient for many customers. With DPL, online shoppers will no longer need to go to a postal service office to pick up their package. Parcel Solutions will provide online shoppers with a secure and remote method for customers to have their packages delivered.

A major issue that has surfaced across North America in the past several years with the fast rise of online shopping is package theft. Online shoppers around North America have packages delivered to their homes and apartments all the time, however, occasionally they come home from work to pick up their package from their doorsteps just to realize that their package has been stolen. A major issue we Parcel Solutions is targeting is security. DPL by Parcel Solutions will improve package security all around North America and ensure that customers will never have to worry about package theft again.

Currently, there is no product like this on the market, only Amazon offers something with a similar functionality. However, the lockers that Amazon offers aren't widely accessible across North America and are only available to online shoppers that directly order through Amazon. This is where we differentiate ourselves from the competition.

1.2 Scope

This report includes the design, manufacturing and validation for both the Proof-Of-Concept and Engineering Prototype of DPL. This document will give a thorough description of the project overview and planning, finances, market analysis, and an in-depth company overview.

2.Project Overview

This section will identify the system overview, risks and benefits of our product. The development and manufacturing of DPL is justified through a product risk versus benefit analysis. Risks to the product include risks to consumers and device manufacturers, while benefits of the product include the positive social and economic impacts of the device.

2.1 System Overview

DPL incorporates two subsystems that communicate with one another to form the overall system. The first system is the DPL station which consists of the parcel lockers. The second system is the web application and the server module. The section 2.1.1 and its consequent subsections will cover the justification for the use of each component, a technical description and how they integrate into the DPL system.

2.1.1 Product Design

DPL is a modern parcel locker that consists of a backend/frontend website and a locker to improve the online shopping experience. The website will display UI and the frontend; however, the website will be controlled by the underlying server which will have its own components. Other than filling backend needs, the server will control the DBMS, DPL management, and a connection to the courier server for information retrieval. The interactions between the server, DBMS, DPL management and website can be seen in Figure 1.

The parcel locker will consist of its own intuitive software controls along with an easy to use UI. The UI will be presented to the customer and courier in the form of a digital screen. The courier and customer interaction with the parcel locker UI is shown in Figure 1.

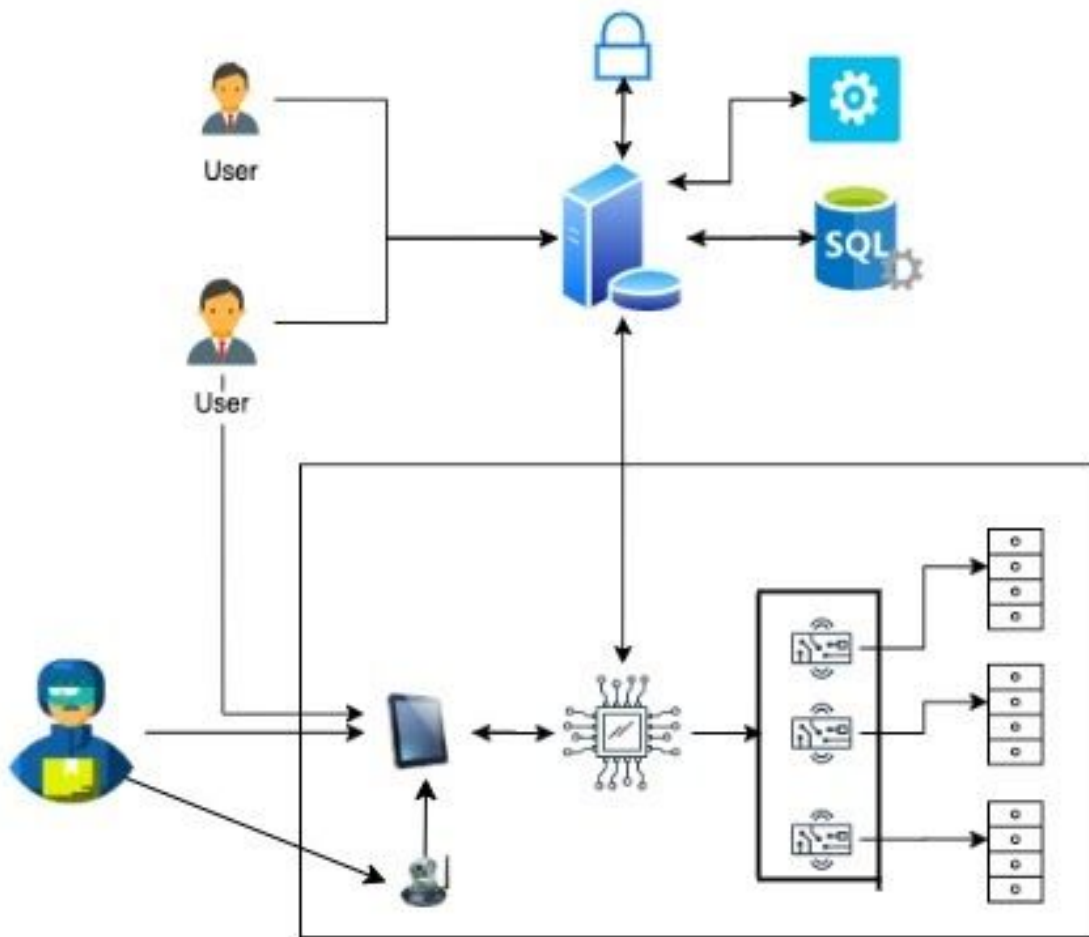


Figure 1: Overview interaction system diagram

2.1.1.1 Website and Server Module

The website component of DPL will consist of a backend server and a DBMS that will coordinate the customer and DPL interactions. The customer will be required to create an account with DPL on our website in order to be able to use the DPL services. The UI and homepage of DPL is shown in Figure 2.

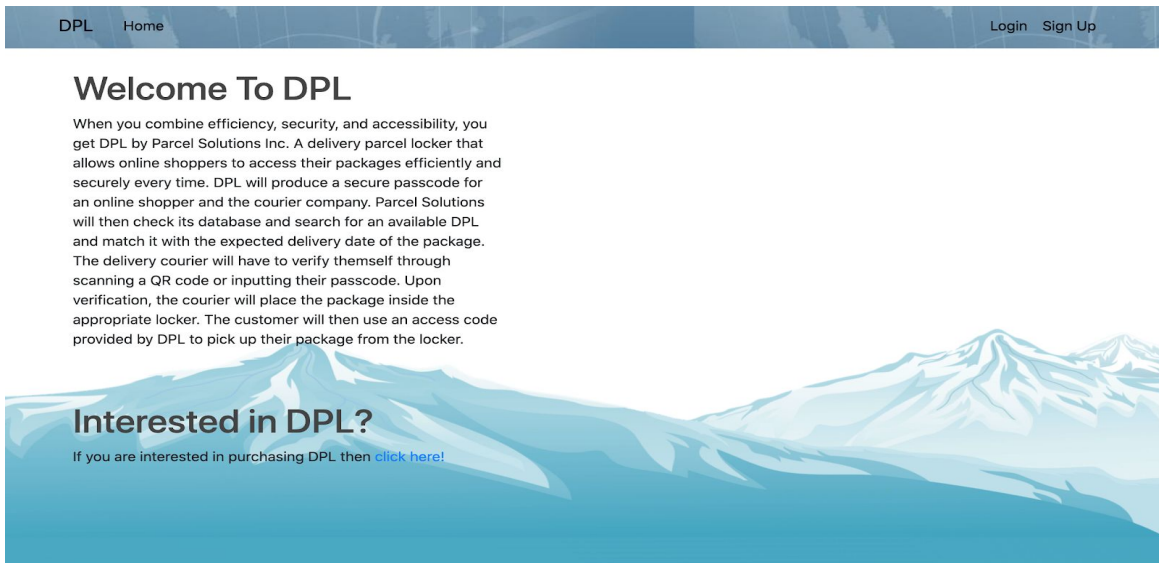


Figure 2: Web Application Home page

The customer will be required to log in onto our website and make a DPL delivery request. The log-in page of our application is shown in Figure 3.

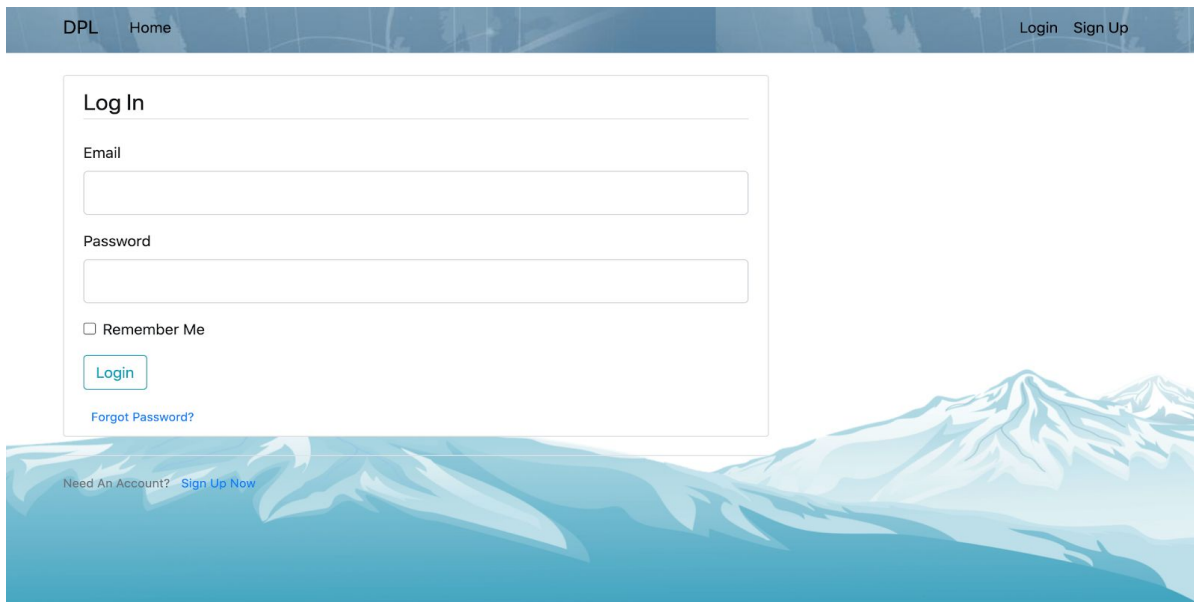


Figure 3: Web Application log-in page

DPL will generate a set of instructions for the courier company to access the DPL lockers. Once the customer receives their tracking number, they will be required to input the tracking number into the DPL website. This allows DPL to check the database and match the delivery date of the

package with an empty locker. Once the package tracking number has been put into the database, DPL will generate an access code for the customer to access the parcel locker. The tracking number and customer information will be stored in the database for future reference.

2.1.1.2 Parcel Locker Module

The parcel locker will consist of its own intuitive software controls and a digital touch screen to present the UI. The courier and the customer will interact with the DPL lockers through the digital touch screen. The DPL Station unit is shown in Figure 4.

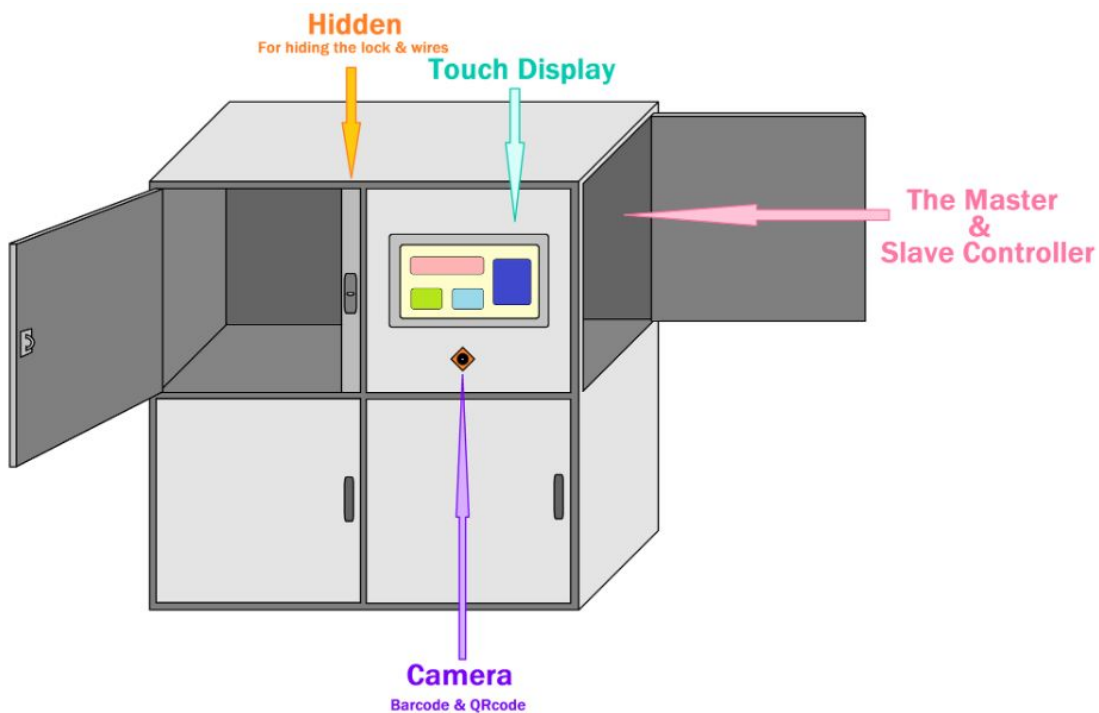


Figure 4: Proposed DPL Station Prototype

The courier company will have specific instructions given to them by DPL to access the parcel lockers and place the customer package inside. The instructions provided by DPL will include two options for the courier to access the parcel lockers. The courier can either scan the barcode of the package, or alternatively, the courier can enter the provided passcode by DPL. The customer will use an access code provided by DPL to pick up their package from the parcel locker. Once the customer has picked up their package, DPL will update their database and the locker availability

2.2 Risks

The risks of DPL are negligible from an end user's perspective and low for a customer's perspective.

DPL is equipped with a system recovery mechanism, in which all lockers will be externally accessible for DPL owners to recover customer packages in the event that the parcel locker unit ceases to function. Therefore, even if the system fails, end users will still be able to recover their delivered packages.

For customers, there are two potential risks in exposure to COVID-19 and DPL's server crashing. For the case of COVID-19, Parcel Solutions will require the apartment manager to clean the parcel locker unit daily and ask customers to use gloves. For the case of the DPL server crashing, our developers have implemented a log collections system and a backup server to be used temporarily until the main server is back online. The logs will be used by our team to resolve the server issue and recover the server to its original state immediately.

For the engineering team tasked with constructing DPL, DPL is a relatively safe product to manufacture as it does not involve the use of any toxic materials or processes. Additionally, ABCNC Industries will be tasked with building the parcel locker unit to ensure that it is completed professionally. However, the engineering team will be assembling and wiring the components together, where potential electric shocks or injuries may be sustained.

2.3 Benefits

The risks stated above are offset by the various benefits provided to end users, customers, and shareholders of DPL. In a risks versus benefits analysis, the benefits justify the manufacturing and use of the product despite the risks, and predict positive product adoption by the marketplace.

DPL provides a great convenience for customers. Without a parcel locker, customer packages will be delivered to the apartments' front office or the nearest post office. This forces customers to pick up their packages in a short period of time due to the fact that the building office staff or post office staff must be present to retrieve the package. Often, these staff work only on weekdays during 9am-5pm. This is quite useless for online shoppers as the majority are usually at work during that time. Furthermore, there may be a long queue at the building office or post office, and may result in customers having to wait 5-10 minutes or even more to pick-up their package. With DPL, customers can retrieve their package by simply entering a one time PIN code or QR code that they received via SMS message and the parcel lock door will be opened for pickup. Customers can access their package at any time that is convenient for them and will no longer have to spend crucial minutes waiting in line.

As mentioned above, without a parcel locker, packages are delivered directly to office staff. Those staff then have to log each package, notify each recipient that their package has arrived, and secure the package. This will increase the cost for the process of parcel delivery. With DPL, front office staff or the package delivery driver can enter packages in individual lockers. These lockers can then be accessed by the residents at their convenience. DPL can decrease the manpower cost and increase the efficiency of the parcel delivery process.

Security is one of the benefits of DPL. Commonly, packages that are delivered to customers' doors are stolen from their doorstep. DPL ensures the security of the parcel as well as that of the property. With DPL, it limits public access to the package by having packages go directly from carrier to locker.

Shareholders who invest in DPL benefit from the rising trend of parcel lockers. The market demand for parcel lockers is increasing drastically. Parcel lockers provide data and reports on a number of key performance indicators to evaluate performance as well as the need for additional parcel locker stations. The reports will also show the parcel locker station's occupancy, pickup times, turnover, parcel size and more. Shareholders can use the reports as indicators for making investment decisions.

3. Market

The descriptive market analysis on parcel locker business in the e-Commerce business world and a comparison between DPL and competitors will be provided.

3.1 Market Analysis

Last mile delivery is the major challenge for e-Commerce businesses. Inefficiencies risen from, delayed delivery times, and return of the parcels due to unavailability of the customers are the major problems hampering the growth of e-Commerce business worldwide. Therefore, a smart parcel locker is one of such solutions. These automated parcel delivery terminals are available 24/7 and strategically located at easily accessible locations like schools, metro stations, and residential complexes.

According to Pitney Bowes's annual Parcel Shipping Index[1], parcel volume rose by 17% to 74.4 billion parcels in 2019, up from 63.6 billion in 2016. They are expected to surpass the 100 billion mark by the end of 2020. It illustrated that the rising demand of e-Commerce had significantly increased year by year especially in the current COVID-19 pandemic. As more and more cities are going under lockdowns, customers prefer ordering essentials online. That makes

smart parcel lockers a viable option as it helps avoid person-to-person contact and create contactless delivery.

The smart parcel locker is considered a solution to drive the rising trend of the e-commerce market in coming years due to minimizing the cost of delivery. According to the market research from Transparency Market Research [2], the total cost of global e-Commerce goods delivery excluding sorting and pickup to more than 70 billion euros, with China, Germany and the United States accounting for more than 40% of the market. Smart parcel lockers are expected to greatly reduce this cost of e-Commerce businesses. They can reduce the labor costs associated with buying online, picking up in store service (BOPIS) and saving on last mile shopping costs.

The objective of our product is not only to streamline the order pickup process but also to provide an effective way to improve convenience for customers. There is a large market to be targeted. We are providing them a central collection point which is more secure, convenient, and efficient.

3.2 Competition

This section will outline some of the similar products that are in the market today. The following products discussed in this section will be the Parcel Drop Box, Danby Parcel Guard, and the Amazon Hub Locker.

3.2.1 Architectural Mailboxes 6900RZ Elephantrunk Parcel Drop Box



Figure 5: 6900RZ Elephantrunk Parcel Drop Box [3]

As shown in Figure 5, the Architectural Mailboxes 6900RZ Elephantrunk Parcel Drop Box is a solution that provides a personal mailbox to collect the parcel. Their idea is to set up a parcel box in front of the house and the courier will put the package in it. On Amazon, 262 customers have rated this product based on its functionality. 56% of them rated 5 stars on this product. Most of them are satisfied with the size and material used on the product. However, compared with DPL, 6900RZ Elephantrunk Parcel Drop Box has a lot of drawbacks. Firstly, it is quite expensive as it costs \$398.63 CAD. Secondly, it does not have an App which means customers will not be notified by any message or email. They would need to check the mailbox manually. Lastly, the mailbox has an issue with the capacity size. One Customer left a comment stating that the mailbox is too small, mentioning that it is suited for small packages. Therefore, if the package does not fit into the mailbox, the customer would have to pick it up from the nearest post office.

3.2.2 Danby Parcel Guard



Figure 6: Danby Parcel Guard box [4]

Danby Parcel Guard box is a smart parcel mailbox for customers. Customers do not need to worry about the porch package theft or weather damaged box. Users will use a mobile application that links with their package and provides the user with the location of their package. Users will receive notification once their package has arrived. The parcel mailbox is loaded with modern features, like tamper alarm and motion sensor security camera to secure the parcel. The idea of the Danby Parcel Guard is similar to that of 6900RZ Elephantrunk Parcel Drop Box. The main similarity between the two is that both provide personal drop boxes to users to collect

their parcel. There are several advantages that make Danby Parcel Guard stand out from other similar products. It consists of a number of high security functions. The parcel mailbox cannot be opened unless the user unlocks the mailbox using their smart device. The main disadvantage of the Danby Parcel box and 6900Z Elephantrunk Parcel Drop Box is that it can only be used by one person at a time. Thus, both parcel boxes are more suitable for people living in houses instead of apartment buildings. Alternatively, DPL provides a set of lockers that allow more users to interact with the system at one time, and is more suitable for apartment residents.

3.2.3 Amazon Hub Locker



Figure 7: Amazon Hub Locker [5]

The Amazon Hub Locker is considered the main competitor of DPL over the other mentioned products. The idea and setup of Amazon Hub Locker is similar to DPL. Both the Amazon Locker and DPL offer automation from end-to-end; customers can click and collect. It is also designed to be installed in multi-tenant dwellings so that residents can receive bulky packages and provide customers with flexible pick-up times. However, there are two major advantages of DPL compared to the Amazon locker. Firstly, DPL's targeted customer audience is different from Amazon's. The Amazon Hub Locker is specifically designated to serve the customers on Amazon. Conversely, DPL is available to any parcel courier company. Customers can make purchases from any website and request to use DPL services. This removes the limitations that

Amazon has on their Amazon Hub Lockers. Essentially, the targeted audience of DPL is larger than the Amazon Hub Lockers. Additionally, another advantage of DPL is its location. The Amazon Hub Locker is located in public areas such as train stations, convenience stores, and shopping centers. Alternatively, DPL is located in residential areas such as apartment buildings. This allows customers to pick up their packages without having to leave their apartment buildings.

3.3 Research Rationale

The research rationale is based on the sale analysis on Amazon, the satisfaction of the customers from Parcel Locker, and Parcel locker stations overview.

3.3.1 Sale Analysis on Amazon

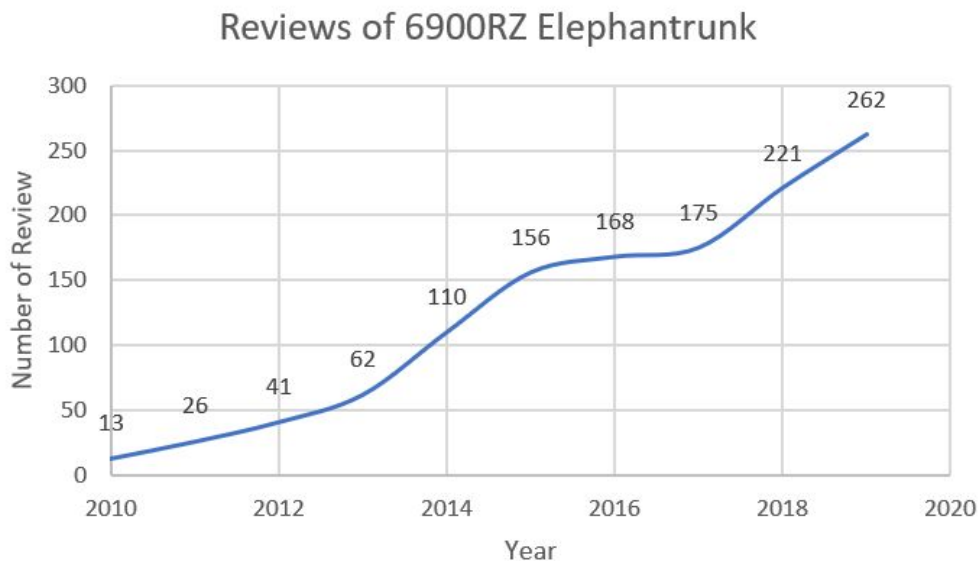


Figure 8: Reviews of 6900RZ Elephantrunk from Amazon [6]

By looking at the number of reviews of the most popular parcel locker, 6900RZ Elephantrunk from Amazon, it can be seen that the reviews increased gradually from 13 in 2010 to 262 in 2019. It demonstrated that the demand for smart parcel lockers is increasing. It is noteworthy that the number of reviews has a strong growth rate in the last three years (2017-2019). There is no doubt that the smart parcel locker has become a trend for the past three years with large growth of sales. We believe that our proposed product, DPL, will have tremendous potential to compete in the market.

3.3.2 Satisfaction of the customers from Parcel Locker

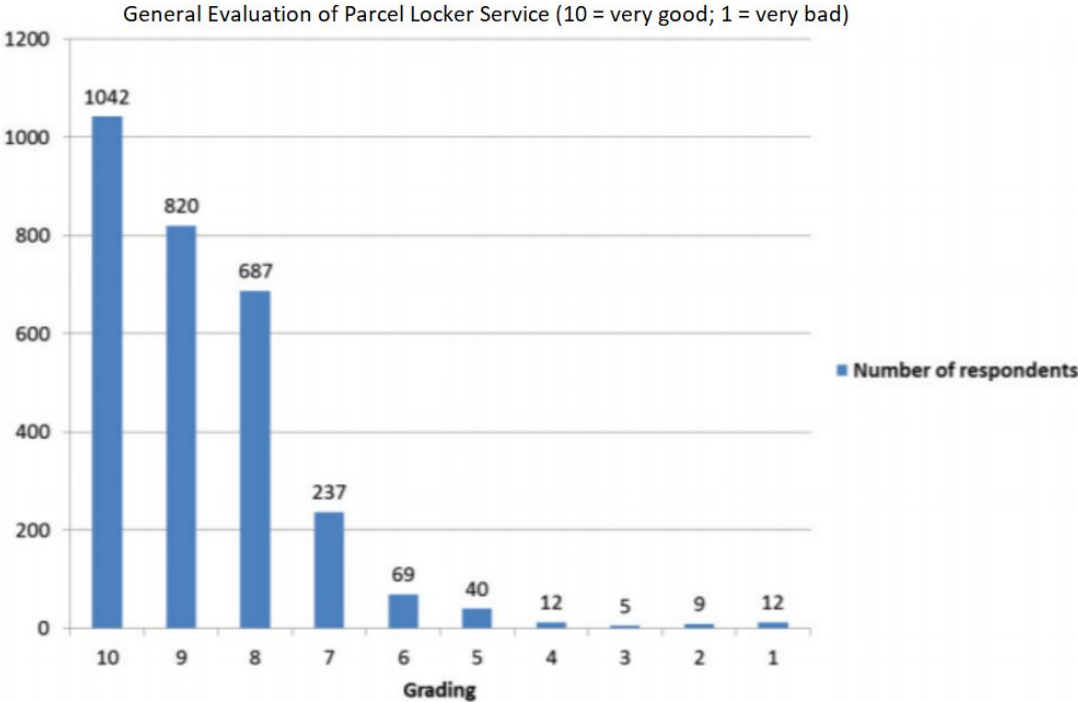


Figure 9: General Evaluation of Parcel Locker Service [7]

The growth of B2C e-Commerce market results in the increase of importance of last mile deliveries in the city area. Due to commerce’s generic specificity, parcel lockers became a popular solution as the efficient last mile delivery system. Customers prefer parcel lockers over traditional delivery. According to market research conducted by Maritime University shown in figure 9 [7], 95% of parcel locker users are highly satisfied with the service. The average grade given by the whole population falls between 8.7 and 8.9 in the scale ranging from 1 to 10, where 10 is the maximum grade. The research also stated that the parcel locker users definitely prefer this service and declared that the parcel locker service is better than traditional delivery because they need not wait endlessly for delivery personnel to come with their package.

3.3.3 Parcel locker stations overview

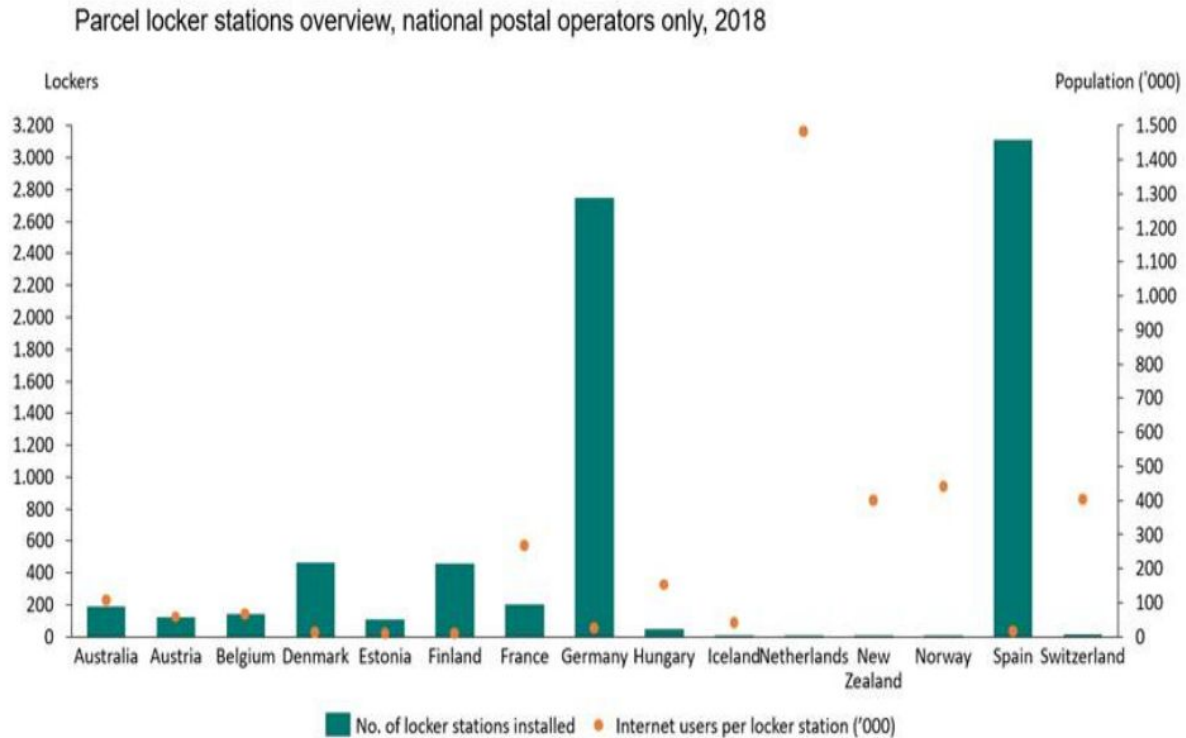


Figure 10: Parcel Locker station overview, national postal operators only [8]

The popularity of parcel lockers is rapidly growing nowadays and leads to shortage in supply in certain countries. Figure 10 bar chart of parcel locker station overview from national postal operators in 2018 [8] indicated that the number of parcel locker stations in some countries such as Netherlands and Norway are extremely undersupplied. Over 1.5 million and 4 hundred thousand internet users shared one locker station. It demonstrates that these countries have a high demand on parcel lockers, but the national postal operators did not offer it. As such, DPL would have great potential and opportunities to collaborate with these national post offices.

4. Company Overview

Parcel Solution Inc. was formed on May 10th, 2020. Parcel Solutions is a team built of engineers focused simplifying the process of package deliveries by providing a safe and efficient alternative to traditional methods of receiving packages. Delivery Parcel Lockers (DPL) is the team's flagship product. The team aims to deliver a fully functional Engineering Prototype by the end of December 2020.

4.1 Meet the Team



Candice Ding - Chief Development Officer

Candice Ding is a 5th-year Computer Engineering student in SFU. She is passionate about learning new knowledge and meeting new challenges. She spent her spare time learning some new skills and put those skills into the implementation process of her personal projects. She has completed two terms of her Co-op with one of them in a phone repair store in Canada as a technician and another one as a database administrator in a store in China. The skills she gained from her Co-op jobs have also been applied during the implementation of the DPL project.



Huron Lee - Chief Market Officer

Huron Lee is the 5th-year student pursuing an Electronic Engineering degree at Simon Fraser University. He has completed 8 months of Co-op as an IT technician in Hong Kong, providing system support and software troubleshooting. His experience in PCB debugging and programming as a PCB developer from his previous Co-op became an important asset for Parcel Solutions Inc. He believes the experience and knowledge that he gained from his previous Co-op will bring insights to this project.



Lynch Cheng - Chief Operator Officer

As a 5th-year Electronic Engineering student, Lynch has a passion for developing and contributing to useful solutions to the problems. His Co-op experience improved his abilities in checking logic and solving various problems. Meanwhile, he has experience in inner website design, PCB manufacturing and repairing in China. He also implemented the fixing

problem of PCBs at ALGO company in Canada. Currently, Lynch works as a hardware developer at Parcel Solutions Inc, helping figure out the problems in the circuit and assemble the mailboxes.



Sina Ahmadian - Chief Communications Officer

Sina is a fourth year Computer Engineering student. He has experience with embedded systems. Doing an internship as a Firmware Engineer at Intel, has allowed for interest in embedded systems and database management.



Boey Leung - Chief Quality Officer

Boey Leung is a 5th-year undergraduate Electronic Engineering student at Simon Fraser University. In her Co-op experiences she was a tester who investigated and designed specific repairs for damaged components of circuit boards and has experience in JAVA script coding for programming the PCB. Furthermore, she was responsible for debugging issues and marketing research when she worked as an Engineering Assistant in Hong Kong.



Arian Vafadar - Chief Executive Officer

Arian Vafadar is a 5th year undergraduate Computer Engineering Student at Simon Fraser University. In his first internship he worked at Sierra Wireless as a Software Test Engineer where he gained a keen eye for bugs and exceptional skills at debugging and was exposed to highly useful networking and security protocols. Arian is always welcoming new projects and challenges as he is passionate about using skills he learned throughout his technical career and coursework.

5. Project Planning

The projects have been divided into 2 major checkpoints, these being proof of concept prototype and final engineering prototype. The proof of concept will contain aspects of different hardware and firmware within the DPL station. Final product will optimize the firmware code residing in the DPL system, develop the web-application and servers and manufacture the box.

5.1 Gantt Chart and Timeline

Gantt chart is useful for planning and scheduling tasks for projects. These tasks are assigned by each member in Parcel Solution Inc. by integrating and consolidating every member’s different opinions on the product. Therefore, all members of Parcel Solution Inc. have been complying with the tasks in the Gantt chart shown below in order to manage the time, dependencies between tasks and the resources needed.

The Gantt Chart will be divided into two stages: preparation and implementation. The tasks in the preparation stage are mainly focused on researching and the hardware programming. The tasks in the implementation stage are providing more iteration of the design of DPL. UI design, hardware design and final testing are the most important tasks during the implementation stage.

The diamond icons represent major milestones of the project. At the same time, the bars represent the tasks required to complete the milestone.

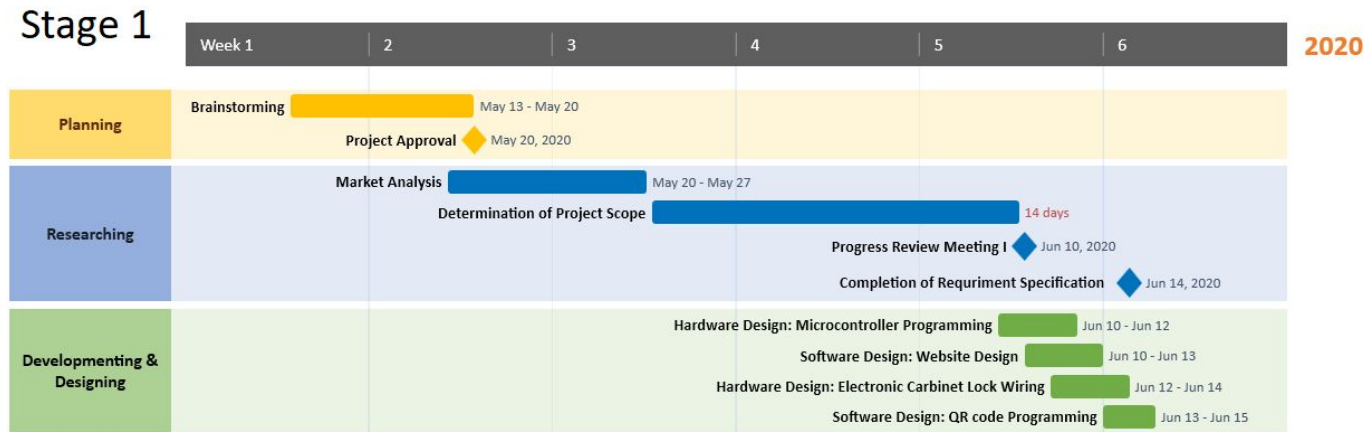


Figure 11: Stage 1 (Preparation Stage)

Stage 2

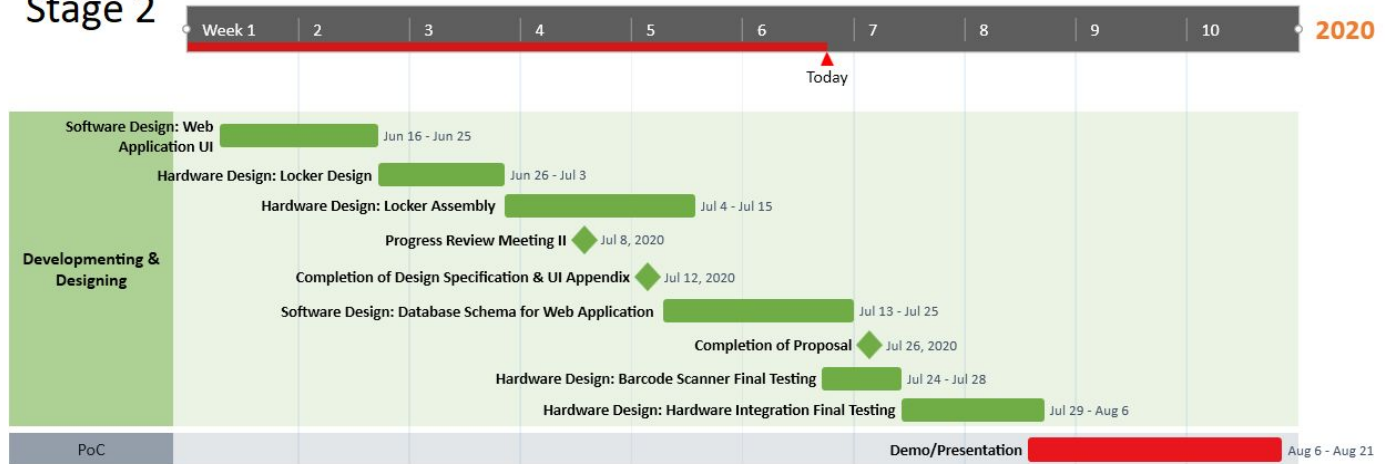


Figure 12: Stage 2 (Implementation Stage)

5.2 Counter Plan for Covid-19

Life as we know it has significantly changed since the COVID-19 outbreak that began in Wuhan, China. COVID-19 is an infectious disease that spreads through droplets of saliva or discharge of the nose [9]. It poses a large threat to people of all ages, specifically, older people and those with underlying health conditions [9]. COVID-19 was declared a global pandemic by the World Health Organization on March 11, 2020, and infection rates are still increasing around the world at an exponential rate.

In light of the current situation, Parcel Solutions is committed to maintaining our social responsibilities to protect those vulnerable to COVID-19 by practicing social distancing. Parcel Solutions will continue to progress through development and testing of DPL Engineering Prototype by working remotely as much as possible. The majority of our weekly team meetings will continue to take place in the form of conference calls via Zoom. Project tasks will be evenly distributed among all team members, and designated team members shall be “on-call” to provide support to those physically working on a task. However, if an in-person meeting is required, the team is capable of meeting as some restrictions have been lifted in B.C. In the event that a in-person meeting does occur, precautionary measures will be taken such as wearing gloves while working with shared components or equipment, thoroughly sanitizing components before commencing individual work, washing hands regularly and ensuring all members are wearing a mask.

6. Finances

The components associated with DPL require a higher level of accuracy than a regular mailbox to provide benefits to customers. Therefore, the systems used in building DPL call for increased investment to ensure reliability and quality of the product. Section 6.1 below provides an in-depth overview on the costs arising from building the parcel locker unit. Many of our competitors discussed in section 3.2 obtained funding from government subsidies, investors or competition prizes. This demonstrates that DPL is an appealing product to the market and industry, which increases our options for external funding. See section 6.2 for more in-depth details on engineering awards considered for DPL.

6.1 Costs

The tables below outline our estimated costs for both the proof-of-concept prototype as well as the final functional prototype. For the proof-of-concept prototype, Parcel Solutions will be designing the DPL station using Wood. For the final functional prototype, Parcel solutions will be using aluminum sheets to build the DPL station. Parts used in the functionally prototype that are from the proof of concept prototype are not included in the price as they do not need to be repurchased.

Component	Cost per Unit (\$)	Quantity	Subtotal (\$)
Raspberry Pi 4B kit	\$151.19	1	\$151.19
Lock Controller	\$3.33	6	\$20
Electronic Lock	\$2.00	4	\$12.00
Raspberry Pi Camera	\$16.99	1	\$16.99
RS485 to RS232 converter	\$0.83	6	\$4.00
USB to RS485 converter	\$1.33	6	\$8.00
XF extension wire x 4 (for locks-slave controller)	\$0.37	5	\$2.00
DC power supply	\$1.11	5	\$6.68
RS232 extension for RP	\$2.83	6	\$17.00
DSC6656 Electric Magnetic Lock	\$2.92	5	\$17.5

Electric-Salon 4 DPDT Signal Relay	\$5.37	5	\$32.19
Box wood	\$14.93	5	\$89.60
Narrow Hinges Fixed Pin	\$2.67	5	\$13.35
Total Cost	\$205.87	60	\$390.50

Table 1: Proof of Concept Prototype Estimated Cost

Component	Cost per Unit (\$)	Quantity	Subtotal (\$)
SUPPLY ALUMINUM 12 GA	\$220.00	1	\$220.00
SUPPY AL TUPE 1” X 1”	\$40.00	3	\$120.00
HINGE	\$20.00	4	\$80.00
CUTTING SIZE ALUMINUM	\$200.00	1	\$200.00
FABRICATION	\$200.00	1	\$200.00
Total Cost	\$880	10	\$940.00

Table 2: Functional Prototype Estimated Cost

6.2 Funding

Several sources of funding are available to engineering students who are currently in the process of completing their capstone project. Two sources of funding that will be pursued by Parcel Solutions are listed below:

1. Weighton Engineering Development Fund, administered by Dr. Andrew Rawicz, is typically awarded to capstone groups that have projects focused on benefiting society. Parcel Solutions considers DPL a potential candidate for this award. As mentioned before, one of DPL’s main objectives is to reduce the number of package thefts that occur across North America every year. The team is working on applying for this award in Fall 2020.
2. The Engineering Science Student Endowment Fund (ESSEF) is administered by SFU’s Engineering Science Student Society. Parcel Solutions considers DPL to fit in category C (class) for this reward -- projects that originated from an Engineering Science class. The team will apply to this award in Fall 2020.

Lastly, if all funding opportunities become unavailable, each member of our team has agreed to contribute \$200 to the material costs. This provides us with a total amount of \$1200 for this project, which we deem to be sufficient to complete the prototype after careful planning and considerations.

7. Conclusion

This document has outlined DPL as a whole, providing a background on the need for this device and a brief introduction of the suggested implementation. Additionally, it covered the different business aspects of DPL and familiarized potential customers, stakeholders, and investors with Parcel Solutions and DPL. It evaluates the risks and benefits of DPL from multiple different perspectives, such as, end users, investors, shareholders and global perspective. The current market trends and competitors of DPL have been analyzed, and evidently show the position of DPL within the delivery solutions hierarchy.

Furthermore, we outlined the cost analysis and cost breakdown for developing and manufacturing each DPL station. We also covered the different streams of funding that our team will be applying for in the fall, and the maximum amount each member is willing to contribute. We, as the developers of DPL, will work together to combine our expertise and aim to create a smart delivery solution towards a more efficient and safer alternative of package delivery.

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