

Technological progress is inevitable. Then, the question that ensues is whether it is improving our society for the better. As Marx (1987) inquires, do the advancements in technology correlate to the advancements in humanity or to the heightened sense of self-interest and materialism? One form of technology that has surfaced and quickly gained popularity over the last decade is peer-to-peer service. Peer-to-peer service is a decentralized platform on which two individuals can directly interact with each other to fulfill their needs without any intermediation by a third party. Although research on peer-to-peer services on an individual and social level is scant, companies leveraging such technology have demonstrated positive impacts on users and surrounding communities. Furthermore, they have transformed people's standard of living and have made significant impact in existing industries such as hospitality, travel, and commerce. Thus, in the tightly coupled prospectus, peer-to-peer service model is studied in order to determine its role in society and how meaningful its impacts are.

The technical portion of the project will involve implementing a peer-to-peer marketplace platform where the University of Virginia students can buy and sell used items to other U.Va. students. The STS research portion of the project will involve researching and studying the social and cultural impacts of peer-to-peer services compared to other online business models. Specifically, the prospectus will look into what are the reasons people participate in peer-to-peer services and how do these factors benefit the community as a whole. The overall research motivation of these tightly coupled topics is to study and implement an online business model that not only empowers users, but also promotes integration and cohesion within communities.

### **PEER TO PEER MARKETPLACE FOR UVA STUDENTS**

Every year, an average college student produces 640 pounds of trash ("Curbing," 2015). According to Sloan (2018), at the University of Virginia, a number of students throw away items

that are still usable such as rugs, fans, clothing, and small home goods (Waste Reduction section, para. 1). Although there are a couple different ways students can choose to get rid of unwanted items such as selling or recycling, tons of waste are accumulated on sidewalks and in dumpsters annually. For example, students can sell used furniture, appliances, decorations and other home goods on websites such as Craigslist, eBay, or on the U.Va. Facebook page dedicated for students selling and buying. For textbooks, students can sell them back to the U.Va. Bookstore. However, students neglect all of these options for various reasons. First, the barrier to entry to sell on Craigslist and eBay is too high. Students want to sell to other students in an efficient manner without having to ship it. Additionally, Craigslist does not have a rating system which adds uncertainties to whom they are selling and discomfort about meeting potential buyers. The Facebook group does not have a filter system to categorize their items which makes it disorganized and inefficient. These pain points deter students from using the existing platforms. Thus, with minimized incentives to sell unwanted items, students choose to throw away unwanted items at the end of the school year.

The technical portion of this prospectus will cover user research and implementation of a Peer to Peer(P2P) marketplace platform on which people at U.Va. will be able to buy and sell used items such as textbooks, furniture, decorations, appliances and more to one another. The platform will be closed off only to people within U.Va. This requirement will be implemented by ensuring users have NetBadge authentication when signing up. By developing this exclusive boundary and providing a common factor among our users, the application will enhance the perceived safety and trustworthiness of the platform. The Netbadge Authentication requirement will help relay the sense of community our users are a part of in real life on our platform. This safeguard feature is important because according to Einav, Farronato, and Levin (2016), an

important aspect of building a peer-to-peer marketplace platform is the level of trust for each transaction to ensure positive experience and guard against low quality, misbehavior, and fraud (p. 616). Thus, our platform will promote a positive environment where users can comfortably interact and communicate with others online to satisfy each other's demands.

Currently, when students sell back their textbooks to the U.Va. Bookstore, students get back a small fraction of the initial price they paid for. Then, when the Bookstore resells these books to other students, they increase the prices. In this example, the U.Va. Bookstore acts as the intermediary, connecting buyers and sellers, and determines the price points. The role of the intermediary minimizes the incentives for the buyers and sellers. Ultimately, this process strips away control and power from the buyers and sellers, discouraging them from selling their textbooks. However, one of the benefits of a P2P marketplace platform is eliminating the intermediary who connects consumers and producers ("The Building," 2018). Thus, on our platform, without the intermediary, the buyers and sellers will be able to set up their own price points, maximizing profits and minimizing loss.

Developing a user-friendly peer-to-peer marketplace platform requires deep understanding of what makes some succeed and others fail. A research carried out by Dongyu Chen, Fujun Lai, and Zhangxi Lin (2014) illustrates the positive correlation between the level of trust in the buyer's information and the seller's willingness to sell. Furthermore, Lee, Chan, Chong, and Balaji (2018) clarifies that perceived risks, perceived benefits, trust in the platform, and perceived platform qualities all had significance in users' proclivity to participate in the sharing economy. All three of these researches share that trust is a key factor in designing and implementing a peer-to-peer marketplace platform. Ultimately, trust helps lower the barrier to entry, meaning more users will be inclined to go on the platform to sell and buy used items. This

finding reveals that in order to encourage and facilitate interactions among users in the first place, the platform has to provide them with assurance that it is safe and reliable. By enabling students to fill each other's demands on their own terms based on trust, the platform will encourage more peer to peer interactions and exchanges and strengthen the community. Ultimately, our peer-to-peer marketplace platform's mission is to give more power to the individuals within a community and to promote a better integrated society, while providing a better designed solution to the waste problem.

To promote dependability and trustworthiness, our platform will implement a rating system for all users. As illustrated in Figure 1 on page 5, after each transaction, both the buyer and the seller will rate each other, as well as the overall experience. As researched by Ahmadian, Afsharchi, and Meghdadi (2019), the existence of user ratings improves the user reliability. Thus, the rating system will provide a visual and tangible element for users to gauge the reliability of others before proceeding to meet and carry out the transaction. Reducing the perceived risks of the platform will attract more users to participate in our service.

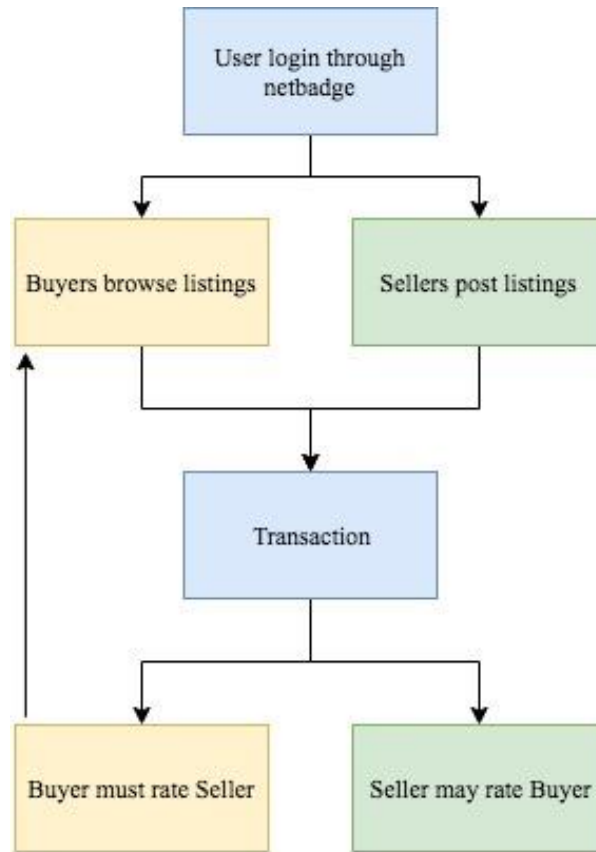


Figure 1: The University Marketplace's Transaction Flow: Highlights the need of a netbadge login to access the system and also the requirement of buyers leaving sellers reviews in order to continue browsing listings (Choi & Workman 2019).

The development of this web application will be worked on in a group of three that consists of Jack Workman, Luis de la Espriella, and myself, all fourth-year computer science students in the School of Engineering and Applied Science at the University of Virginia. The technical portion will be guided and overlooked by Nada Basit, a Computer Science professor at the University of Virginia. As depicted in Figure 2 on page 6, during the fall semester of 2019, research will be carried out to better understand both the users and the system. Having a strong background research on what the users need and look for in such a platform will enhance the usability of the system. Thus, after getting the approval from the Institutional Review Board at the University of Virginia, multiple interviews will be taken place in order to acquire contextual

analysis of the domain and user base. Additionally, in order to implement a user-friendly P2P marketplace platform, the team will research the business model and extract necessary building blocks to develop. After all the research is carried out, multiple different wireframes will be produced to test different designs and then prototypes to validate the designs. During the spring semester of 2020, based on the prototypes, implementation step of the application will be performed. Based on the tested and evaluated prototypes, the platform will be developed using Agile methodology.

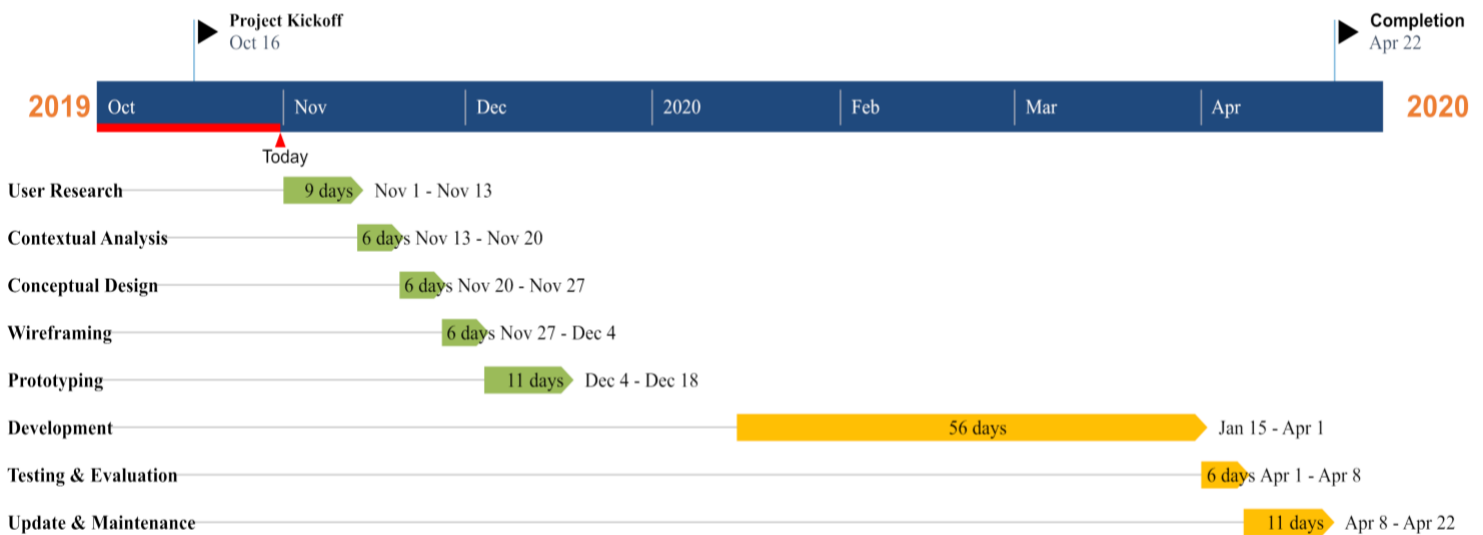


Figure 2: Gantt Chart: Outlined schedule of the project (Choi, 2019)

## **SOCIAL, CULTURAL, AND ENVIRONMENTAL IMPACTS OF PEER TO PEER SERVICES**

The STS portion of the prospectus raises the questions of how can technology be used more than just a tool for profit seeking corporations and what are some of the important driving factors of such technology? With proven success of the peer-to-peer service business model through existing technology companies such as Uber, Airbnb, and Etsy, the prospectus will cover the viability of peer-to-peer service in bringing about positive, meaningful impacts in a society.

Currently, there is a gap in the field of research on peer-to-peer service. A majority of the previous research endeavors study peer-to-peer service on an organizational level. Consequently, the impacts of peer-to-peer service on a social and individual level have been overlooked. Thus, further research into what are the reasons users participate in peer-to-peer services and how do these factors benefit the users and the community as a whole will help understand the role of the technology in society.

### **THE BENEFITS OF PEER TO PEER SERVICE**

The rise of peer-to-peer service technology has had a profound impact on existing industries such as hospitality, travel, and commerce. Through research into the direction the peer-to-peer service is heading toward in the market, the prospectus will uncover how technological innovation could bring about positive impacts to benefit and empower the people and the society. Such questions and findings can propose a solution as to whether online services can make an offline difference, bringing social cohesion and integration.

Uber and Airbnb, two of the most prominent peer-to-peer service platforms, have been around for nearly a decade and quickly gaining market share in their respective competing fields. These two disruptive companies introduced a completely new way to call for a ride or rent a room, changing the social and cultural norm. For example, a research carried out by Henten and Windekilde (2016) revealed that each 10 percent increase in Airbnb supply led to a 0.35 percent decrease in monthly hotel revenue. This research illustrates the direct correlation between the increased usage of peer-to-peer service and the decreased power and control of intermediaries in the market. Through Airbnb, individuals can rent out their spare bedroom or their entire home with ease. In addition, Airbnb provides travelers an alternate accommodation option.

Consequently, the users of Airbnb, including both the hosts and guests, gain more benefits in the form of empowerment and monetary values from participating in the sharing economy.

Etsy is another peer-to-peer marketplace platform with a mission to keep human connection at the heart of commerce. On Etsy, creatives can sell their unique handcrafted products without requiring an actual brick and mortar. Other users can still buy these items directly from the sellers. Ultimately, this global marketplace empowers sellers, or entrepreneurs, to do what they love and buyers to find what they want. As denoted by Prabhat (2018), services that create new kinds of connections within societies lead to sharing of common virtues. Thus, by connecting the creators and the buyers, Etsy promotes an online community of people with shared values such as creativity, sustainability, and responsibility. Furthermore, as Stanley (2003) asserts, a cohesive community exemplifies shared values (p. 5). Therefore, Etsy not only provides a more efficient and feasible way for creatives to make a living, but also a platform where users can merge together to appreciate and share similar values.

## **TECHNOLOGY LEADS TO ALIENATION**

Despite such findings, the widely held understanding of technology is pessimistic. For example, according to Adibifar (2016), prominent classical sociological theorists such as Karl Marx, George Simmel, Emile Durkheim, and Max Weber shared the view that technology leads to alienation and loss of relations with others (p. 62). Before the rise of technology, people had more face-to-face social interactions, a stronger social bond, and shared the same social norm and values. Durkheim refer to this notion as “collective consciousness.” However, as further noted by MacIver (1950), Durkheim believed that collective consciousness will diminish as



technology advances to eliminate social interactions all in the name of efficiency (p. 84). To illustrate, ATM machines and online stores eradicated human interactions with tellers in banks, clerks in stores, and salespersons in malls. Consequently, anomia, which is a subjective condition that exists in people living in isolated conditions and is pertinent to the deterioration of individuals' sense of attachment to society, caused by rapid social and technological changes will lead to higher rates of depression, isolation, and detachment (Hoge & Bickham & Cantor, 2017).

In America, technology progress has succeeded in providing products and services to fulfill humans' physiological needs, which include food, shelter, health, transportation, and clothing. Individuals can complete more tasks in less time, enhancing the overall efficiency in day to day tasks. Nevertheless, as briefed earlier and illustrated in Figure 3 on page 10, desire for efficiency often leads to eradication of social interactions. Rifkin (1980) denotes how The Machine Age in America stemmed from theologians, mathematicians, and scientists such as Bacon, Descartes, and Newton and their desire for understanding and control of nature (p. 19). In the Machine Age, self-interest sits at the core of all values and Locke and Smith believed that the goal of increasing material well-being emanating from such principle would lead to increased order. Complete order achieved through mathematics, science, and technology would lead to efficiency and harmony. These individuals' beliefs reflect the first three steps in Figure 3. But, the last two steps are disregarded.

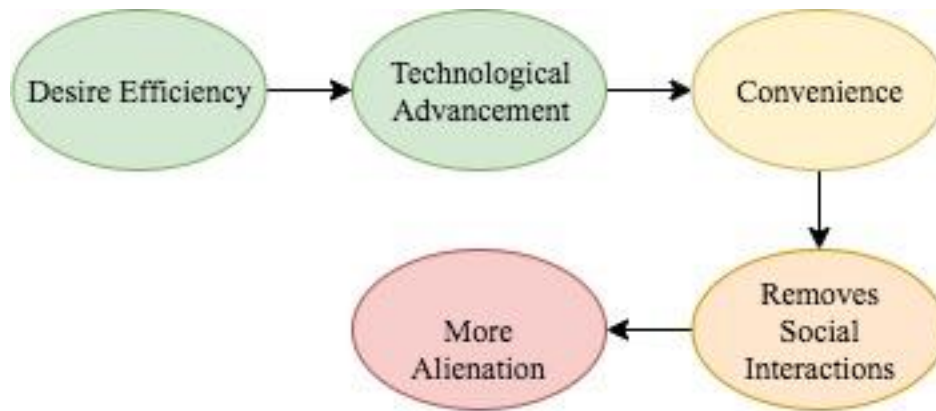


Figure 3: Technological Progress and Alienation: A desire for higher efficiency leads to a drive for technological advancement and while it is typically associated with improved efficiency and convenience, many times it leads to the removal of social interactions and more alienation (Choi & Workman, 2019)

To further illustrate these implications of technological progress, humans can order a roll of paper towel and have it delivered to their front door in less than two days, have restaurant food delivered in less than an hour, and watch high definition movies without leaving the comfort of their own homes. In all of these situations, tasks, including entertainment, have been maximized in convenience and efficiency. However, the enabling technology strips away the social elements that were previously required. Consequently, the society is left disintegrated and individuals alienated. To quote Rifkin (1980), “by separating and then eliminating all of the qualities of life from the quantities of which they are a part, the architects of the machine paradigm [are] left with a cold, inert universe made up entirely of dead matter (p. 22).” However, this assertion does not conclude that all technology is evil. The responsibility of ensuring greater humanity lies in the architects of the machine age, or the engineers. As believed by Benjamin Franklin, focusing on the goal of using technology as instruments for carrying out a comprehensive transformation of society can benefit all, not just private corporations (Marx, 1987). Technological progress can lead to efficiency that can transform the society. But, in order

to bring about meaningful changes, the attention needs to be shifted from maximizing convenience to liberation and empowerment. Thus, studying technological models that can positively impact the users and society will raise awareness for responsible implementation of technology. Peer-to-peer services have demonstrated stimulating meaningful connections and changes. Consequently, in the subsequent section, the prospectus will delve into what are the reasons people participate in peer-to-peer services and how do these factors benefit the users and the community as a whole.

### **WHY DO PEOPLE PARTICIPATE IN PEER-TO-PEER SERVICES?**

What is interesting about peer-to-peer services is that, as asserted by Hawlitschek, Teubner, and Gimpel (2018), consumers are motivated to participate for multiple, diverse sets of reasons: financial benefits, trust in other users, social experience, sense of belonging, modern lifestyle, and ecological sustainability. This finding reveals that the users of the system are not driven by pure self-interest, contradicting Locke's and Smith's theory of the Machine Age. Moreover, the users are interested in the wide reaching social and environmental impacts. For example, MamaBake is a peer-to-peer service that enables mothers of Australia to get together regularly to form a group, big batch cook, and share the meals. As researched and delineated by Rowe (2017), MamaBake promotes social cohesion by bringing the users together with the goal of reducing the workload while increasing social support within the community. Furthermore, MamaBake demonstrates the use of technology, peer-to-peer service, as a tool to drive social and cultural goals, rather than as a primary means to generate revenues and profits. Consequently, discerning the underlying motifs can help to discern the relationships among peer-to-peer services, users, and the society.

As mentioned by Marx (1987), new technology should further consider the meaning and implications of technological progress to better understand its necessity in context. More specifically, how should the engineer shape the design of technology to respond to the needs, wishes, and goals of other social groups. The use and impacts of peer-to-peer services can best be illustrated through the adaptation of Carlson’s Social Construction model. Figure 4 below demonstrates the social construction of technology regarding what are some of the factors the engineer must consider to

satisfy the concerns and needs of the environment, society, government, and people. First, from an environmental stand point, the engineer must realize the goals of reducing waste by reusing or sharing. Socially and culturally, the engineer must keep in mind that the peer-to-peer service should aim

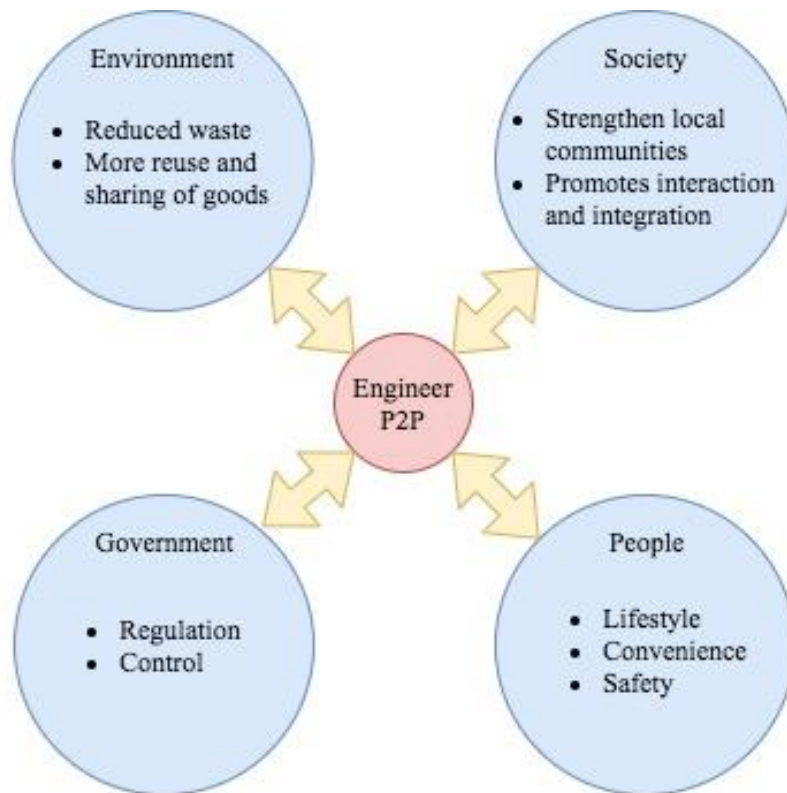


Figure 4: Peer to peer marketplace SCOT model: The Engineer in the center of the social construction must balance the interests of each group involved (Choi & Workman, 2019).

to improve the society by strengthening local communities. This challenge is closely related to the goal of empowering users and facilitating positive interactions. Then, enhancing the usability of the service can lead to social cohesion, for which the engineer must implement functional and

nonfunctional requirements to satisfy user's needs. As delineated, the design and implementation of a successful peer-to-peer service requires consideration of relevant entities.

To conclude, meaningful technological progress requires solid understanding of underlying goals in the context of benefiting all entities involved and users' motivation for participation. Peer-to-peer services have the potential to be leveraged as a tool to empower users and bring social integration and cohesion. However, there is still a gap in the field of research on the topic. Thus, the tightly coupled prospectus plans to implement a peer-to-peer marketplace platform while researching the social, cultural, and environmental aspects of the technological model. This will help better understand how this technology fits into our society.

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**TECHNICAL PROJECT**  
**Peer to Peer Marketplace for UVa Students**

**STS PROJECT**  
**Social and Cultural Impacts of Peer to Peer Service**

A Thesis Prospectus  
In STS 4500  
Presented to  
The Faculty of the  
School of Engineering and Applied Science  
University of Virginia  
In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Computer Science

By  
Johnny Choi

October 31, 2019

Technical Project Team Members  
Luis De La Espriella  
Jack Workman

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Signed: Johnny Choi Date: 10-31-19

Approved: Catherine D. Baritaud Date: Dec. 5, 2019  
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