

TAP 2 CHANGE
IMPLICATIONS AND FEASIBILITY OF ALL CASHLESS

A Thesis Prospectus
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By:
Jeffrey Rhoads

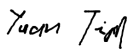
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Rohit Chhatre, Harish Chandrasenkaran, Caden Moses, Cutter Grathwohl

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 

Date: 10/29/20

Approved: 
Yuan Tian, Department of Computer Science

Date: 11/4/20

Approved:
Catherine D. Baritaud, Department of Engineering and Society

Date:

Electronic financial transactions have become an increasingly common part of daily life for the past two decades, whether it be peer-to-peer transfers or purchasing goods online. According a report by Andrew Lipsman from eMarketer, e-commerce was responsible for 14.1% of total global retail sales in 2019, and that share is projected to rise to 22% by 2023 (Lipsman, 2019). Due to the rise in popularity of these services along with credit and debit cards, people are significantly less likely to have cash on them according to a survey conducted by US Bank, and even when they do, they tend to carry less than \$50 ("Digital Payment Platforms Primed to Tople Cash", 2017, para. 5). Utilizing forms of digital currency and e-commerce have several advantages, but they also come with their own set of risks and potential security issues that must be addressed.

One segment of the population that has been left behind by this wave of digital transactions is the homeless population, specifically those that panhandle on the streets for money. The Council of Economic Advisors reported in 2019 that "over half a million people go homeless on a single night in the United States" ("The State of Homelessness in America", 2019, p. 1). Panhandlers largely rely on people carrying cash to receive donations, so not only are they receiving less donations due to people not carrying cash as often, but they also lack the proper resources to participate in e-commerce. The technical project and tightly coupled STS research question seek to provide insight into the ramifications of moving toward a cashless society. Specifically, the STS research aims to analyze the positives, negatives, practicality, and other effects that may result from going cashless fully. The technical side addresses a group of people being hindered by the move to a cashless society, by providing a seamless platform that allows people to give digital donations to the less fortunate. This will offer a new perspective on the rise

and influence of digital transactions, and potentially provide a solution for some of the problems raised by the STS research.

As for the timeline, the majority of the work for the technical project this semester involved defining and researching the challenge space surrounding the project, along with generating a set of requirements and potential solutions. The testing and evaluation of results will occur next semester, likely around March. As for the STS research, the research topic was selected and evaluated to be proposed in this paper this semester, with the full report being completed before the end of next semester.

TAP 2 CHANGE

With the assistance of Computer Science professor Yuan Tian, Computer Science majors Harish Chandrasekaran, Rohit Chhatre, and Jeffrey Rhoads aim to create an application that helps to bridge the technological gap between panhandlers and the rest of the community. Homelessness always has been, and will continue to be, one of the most important issues that our world faces. According to The Council of Economic Advisers, 17 out of every 10,000 people in the U.S. fall under the qualification for being homeless, with a large portion of that population relying on donations from people on the street via panhandling ("The State of Homelessness in America", 2019, p. 9). A decent amount of money exchanges hands through panhandling every day, with a study reporting that panhandlers earn more than \$200 per day (Bose & Hwang, 2002, para. 8). As seen in Figure 1 on page 3, that same study also revealed that around 37.5% of their income was spent on either drugs, alcohol, or tobacco. Clearly, the money that panhandlers receive from donations is not always spent on useful items, especially since 25% of homeless people in America suffer from mental illness or substance abuse (Tarr, 2018, para. 1). Even

though homeless people and panhandlers are not necessarily the same group of people, since homeless people are individuals without a home and panhandlers are individuals asking for money in public, people from both groups suffer from many of the same problems.

Not only are panhandlers spending money on unnecessary

items that potentially propagate the cycle of homelessness, but the rise of e-commerce and cashless transactions is part of the reason that people carry less cash. According to a survey conducted by US Bank in 2017, “50 percent of respondents reported carrying cash less than half of the time” (“Digital Payment Platforms Primed to Topple Cash”, 2017, para. 4). Another finding from the same survey was that when people do carry cash, 76% carry less than \$50. Income and age also play a major factor in determining whether people carry cash or utilize cashless options. The Pew Research Center surveyed over 13,000 adults in 2018 and found that “adults with an annual household income of over \$75,000 were more than twice as likely as those making less than \$30,000 to say they do not make any purchases using cash in a typical week” (Dickler, 2019, para. 6). People who are more capable of making donations to the less fortunate are using cash at a decreasing rate, which leads to less cash being donated. As for the age disparity, Experian reported that “more than 1 in 10 millennials use their digital wallet for

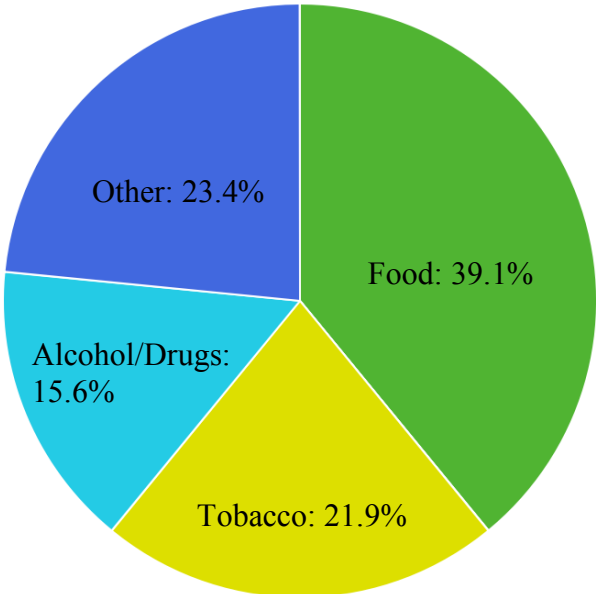


Figure 1: Median Monthly Spending Patterns among Panhandlers in Toronto. Most of their income goes toward food and addictive items (Adapted by Rhoads, J., from data provided by Bose & Hwang, 2002).

every purchase”, although there are other trends that suggest older generations are slowly adopting the move to cashless as well (Dickler, 2019, para. 4). With all this being said, there are also signs that the move to cashless will not necessarily have much of an impact on panhandlers’ income. Two professors, Gwendolyn Dordick and Brendan O’Flaherty, conducted a study of panhandlers in New York City and concluded that most people will continue to carry small amounts of cash, which is exactly what panhandlers need. Dordick and O’Flaherty then go on to claim that panhandlers should try to collect cashless donations because “the transfer of electronic funds could benefit both panhandlers and potential donors if having an app [could] provide some kind of credential [which] would signal to potential donors that this panhandler was not ‘scamming’ them” (Kiger, 2017, para. 8). Even though both professors claim that cash will not entirely disappear from people’s pockets in the near future, they agree that having an online platform would be beneficial for both potential donors along with panhandlers.

The objectives of the team’s technical project are to both streamline the process of donating to panhandlers digitally and ensure that those donations are spent on useful goods and services. This project, called Tap2Change, is centered around the development of an online application that will seek to mirror the process of giving money to panhandlers on the street, but with digital transactions instead of cash. There are existing platforms that allow for peer-to-peer transfers already, such as Venmo, Zelle, and Cashapp, but none of these services replicate both the anonymity and speed of giving someone a few dollars. To satisfy this, cards with unique QR codes will be distributed to panhandlers that can quickly be scanned by potential donors with their smartphone camera. When a donor scans one of the QR codes, they simply enter the dollar amount they wish to give to the person and send it. This process helps to maintain anonymity in that neither the donor nor the beneficiary will know any information about each other, such as

their name or username. Users will obviously need some sort of username and password for creating an account, but that data will never be shared with any other user. For handling the financial transactions, an existing API, like PayPal, will be integrated into the application while limiting the information exchanged between users as noted above. To ensure that these donations are spent on practical things, the current plan is to form partnerships with local businesses that sell those practical goods and only allow the donated money to be spent at these places, though this part is still under consideration by the team. Guaranteeing that the donations are spent in the right place aims to instill confidence in the donor, making them more inclined to donate. The team has also considered the possibility of integrating a log of all the donations a user has made, storing the date and amount of each transaction. In doing this, it may be possible for donors to receive a charitable contribution deduction against their income tax, further incentivizing people to donate.

In completing this research and carrying out the project, the team hopes to shed more light on what sort of effects may come from a potential cashless panhandling solution. Some of these effects may include an increase in people willing to donate since they know their money is being spent on useful things, thus in turn also benefiting the panhandlers as well. Another outcome to consider is the panhandler's willingness to use the application since the donations through it could only be spent at certain places. The resources required for this project are mainly server costs to host the application itself and the cost to create the QR code cards. To fund this, the team has already applied for a \$500 grant through the Experiential Learning Fund and applied for the Entrepreneurship Cup. After developing the app and rolling out Tap 2 Change, the team plans to present the methods and technologies utilized along with any research findings that come from creating and testing this solution in a scholarly article.

IMPLICATIONS AND FEASIBILITY OF ALL CASHLESS

For the past several decades, cashless transactions have become increasingly prevalent. Between the invention of the modern payment card back in 1950, and the more recent introduction of digital payment services like Zelle, Venmo, and PayPal, the world has seen an incredible increase in e-commerce. As shown in Figure 2 below, the percent of total global retail sales that e-commerce is responsible for has been gradually increasing each year for the past five years, and is projected to continue at a similar rate for at least the next three years. According to Shopify's business encyclopedia, e-commerce is defined as "the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions" (Shopify, n.d.). This is a relatively broad definition, since it essentially encompasses any transfer of money that is not cash. There are several different forms of e-commerce, including business to consumer, business to business, consumer to consumer, and consumer to business. Figure 2 below mainly demonstrates the influence of business to consumer models of e-commerce, but consumer to consumer models are also being adopted quickly. According to a survey conducted

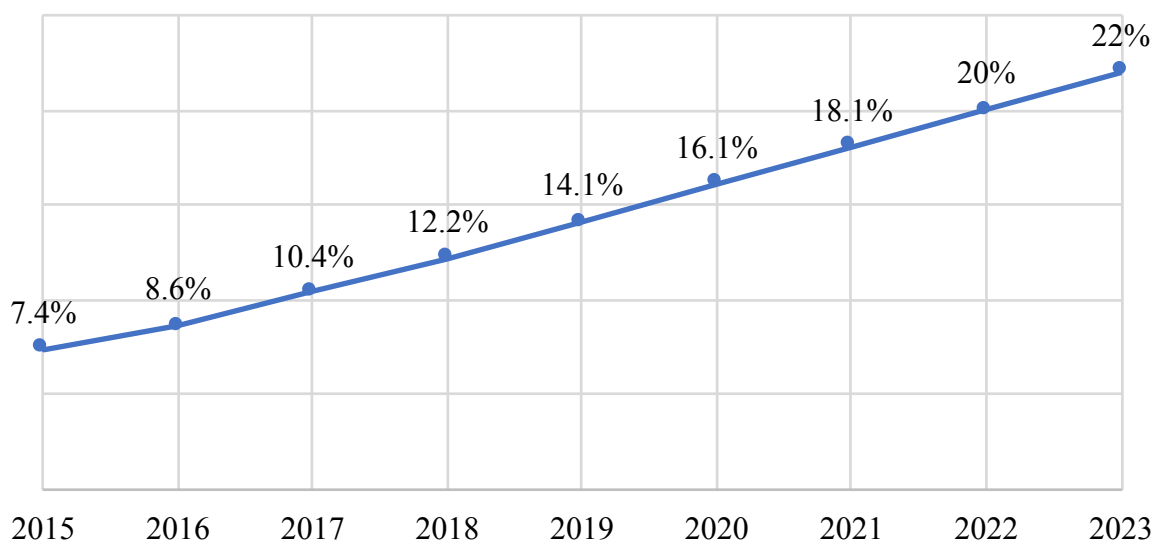


Figure 2: E-commerce Share of Total Global Retail Sales from 2015 to 2023. Each year, e-commerce grows by two percent in its share of total retail sales (Adapted by Rhoads, J., from data provided by Winkler, 2020).

by McKinsey & Company in 2019, “77% of people used one or more types of mobile payments” during the last year (McKinsey & Company, 2019, p. 4). The same report also broke down mobile payment users by generation, with 91% of millennials, 80% of generation X, and 64% of baby boomers claiming to have made a mobile transaction in the last year (McKinsey & Company, 2019, p. 4). People of all ages are adopting the use of digital transactions, and since the younger generations are the driving force this means e-commerce will only continue to grow. Obviously, e-commerce and digital banking have an extensive list of advantages when compared to using cash, including “reduced costs in accessing and using banking services” along with the convenience of performing bank transactions from anywhere using the internet (Chavan, 2013, p. 22). There are limitations and downsides to e-commerce though, such as requiring significant infrastructure along with security issues that must be considered as society slowly transitions to cashless. An example of this is revealed in a review of the migration plan to the internet carried out by the Society for Worldwide Interbank Financial Telecommunications stating that “full migration [of e-commerce] has not occurred in many developing countries due to the lack of adequate infrastructure, working capital, and required technical expertise” (Chavan, 2013, p. 22). This demonstrates that developing societies are unable to participate in e-commerce at all, limiting them further from the many benefits that it provides. As for security, the rise in online transactions has “occurred with an equal rise in security strikes against electronic payments” (Hassan et al., 2020, p. 7). All online transactions must handle sensitive information regarding the parties involved in the transaction, so the system processing those payments must have enough measures in place to safeguard that data. The objectives of this research are to determine what implications come with a cashless society, and establish what must be in place to mitigate or eliminate any downsides that may arise.

USING ACTOR-NETWORK THEORY TO GO CASHLESS

Two of the most crucial aspects to address in order for an all cashless society to exist are the availability of digital payment options everywhere and securing both consumers’ and business’ data. For an all cashless society to exist successfully, an Actor-Network Theory (ANT) model (Law & Callon, 1988, pp. 284-285), as seen in Figure 3 below, must be in place. By placing the payment service providers in the center of the network, they form the most relationships with the other actants. The one-sided arrows represent interactions or relationships that only benefit the actant on the end with the arrow. Consumers interact with the payment service providers by purchasing goods and services from businesses that offer a payment method compatible with the provider. The consumer also has their personal bank account information stored through the payment service provider, which allows the business to receive money for purchases from banks. Criminals and hackers must be prevented from accessing any information that passes through payment services or banks. Governments can regulate businesses by potentially imposing cashless bans, but they also are in charge of printing money itself. Societies

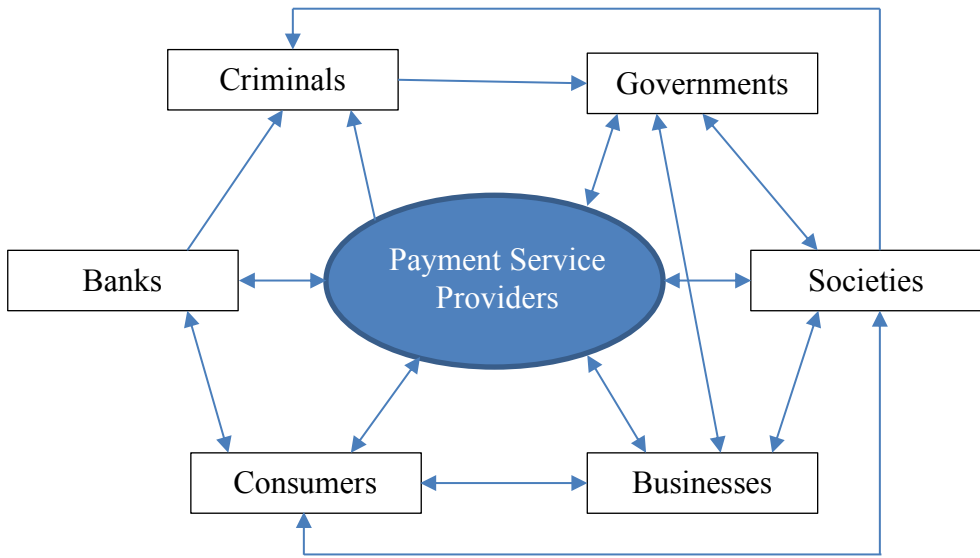


Figure 3: Cashless Society ANT Model. Payment service providers are responsible for having high availability, as well as security against threats, due to the many relationships it has (Rhoads, 2020).

express concerns over security and infrastructure required by the payment service, which the governments or the payment service provider could satisfy. As depicted in Figure 3 above, many different actants stand to benefit from a cashless society because “electronic payments often only cost from one-third to one-half as much as a paper-based transaction, [therefore,] considerable social benefits can be realized by promoting the use of electronic [payments]” (Humphrey et al., 2001, p. 231).

Consumers and payment service providers are the most influential actants when it comes to moving toward a cashless society, since consumers are the ones who choose what form of payment they will use. Payment service providers must provide a secure, reliable, and accessible platform that instills confidence in consumers that their service is better than using cash. The STS research project will be presented in a scholarly article detailing the feasibility, effects, and requirements of becoming a cashless society. In pairing this research with the technical project, the ideal outcome is to provide a solution to one of the potential problems of living in a cashless world. Ideally, the technical project will integrate into society and allow people to still give money to the less fortunate, even if they do not carry cash.

WORKS CITED

- Bose, R., & Hwang, S. W. (2002). Income and spending patterns among panhandlers. *CMAJ: Canadian Medical Association Journal*, 167(5), 477–479.
- Chavan, J. (2013). Internet Banking- Benefits and Challenges in an Emerging Economy. *International Journal of Research in Business Management*, 1(1), 8.
- Dickler, J. (2019, January 15). *More Americans say they don't carry cash*. CNBC.
<https://www.cnbc.com/2019/01/15/more-americans-say-they-dont-carry-cash.html>
- Digital payment platforms primed to topple cash*. (2017, August 16).
<https://www.usbank.com/newsroom/news/digital-payment-platforms-primed-to-topple-cash.html>
- Hassan, A., Shukur, Z., Hasan, M. K., & Al-Khaleefa, A. S. (2020). A Review on Electronic Payments Security. *Symmetry-Basel*, 12(8).
- Humphrey, D. B., Kim, M., & Vale, B. (2001). Realizing the Gains from Electronic Payments: Costs, Pricing, and Payment Choice. *Journal of Money, Credit and Banking*, 33(2), 216–234. <https://doi.org/10.2307/2673882>
- Kiger, P. (2017, March 10). *How Will Panhandlers Fare as Our Economy Goes Cashless?* HowStuffWorks. <https://money.howstuffworks.com/cashless-economy-affect-panhandlers.htm>
- Law, J., & Callon, M. (1988). Engineering and sociology in a military aircraft project: a network analysis of technological change. *Social Problems*, 35(3), 284–297.
<https://doi.org/10.2307/800623>
- Lipsman, A. (2019, June 27). *Global Ecommerce 2019*. EMarketer.
<https://www.emarketer.com/content/global-ecommerce-2019>

McKinsey & Company. (2019). *Are convenience and rewards leading to a digital flashpoint?*
(Insights from McKinsey's 2019 Digital Payments Survey).

Shopify. (n.d.). *Ecommerce Definition—What is Ecommerce*. Shopify. Retrieved October 20,
2020, from <https://www.shopify.com/encyclopedia/what-is-ecommerce>

Tarr, P. (2018, November 19). *Homelessness and Mental Illness: A Challenge to Our Society*.
Brain & Behavior Research Foundation.
<https://www.bbrfoundation.org/blog/homelessness-and-mental-illness-challenge-our-society>

The State of Homelessness in America. (2019). The Council of Economic Advisers.