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## Digital Divide of Perceptions, Usage, and Purchase Items in Japanese E-Payment Adoption

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### ABSTRACT

*The idea of a “digital divide” is a common issue in less developed countries but is also found in developed countries. We surveyed 151 Japanese to examine the effect of digital divide characteristics such as regional variations, age, and gender on the perception and behavior surrounding e-payments.*

*We find that regional difference affects Japanese perceptions, especially ease of use and trust, but not use. Also, older people are more like to use e-payment in terms of weekly frequency and amount of money spent than younger consumers. Japanese males, in general, have higher average scores in ease of use, importance of incentives, and usage than females. Moreover, males are more likely to purchase electronics, books, groceries, and services using e-payments.*

**Keywords:** digital divide, e-payment, age divide, gender divide, regional divide, e-payment in Japan

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## INTRODUCTION

The Internet has certainly impacted daily life worldwide, especially in the business world. With the continuing growth in the popularity of online shopping, e-payment systems have become an important part of the world economy. Data released by the United Nations Conference on Trade and Development (UNCTAD) values the worldwide e-commerce market in 2017 at US\$29 trillion, with the business to consumer (B2C) e-commerce market rising to US\$3.85 trillion (UNCTAD, 2019). China's 440 million online shoppers give it the largest B2C e-commerce market, roughly 40% larger than the market in the US and more than 600% larger than the market in Japan (UNCTAD, 2019). This is not surprising when one realizes that Japanese B2C e-commerce accounted for just 5.79% of overall commercial transactions in 2017 (Ministry of Economy, Trade and Industry, 2018a).

The adoption rate for e-payment systems also varies greatly between countries. Japan is far behind other countries when it comes to cashless payments. With a rate just under 20 percent in 2015, Japan's use of contactless settlements was far lower than South Korea (about 90 percent), China (60 percent), and the United States (45 percent) (Xincheng, 2019). The Japanese government has taken aim at reducing this difference by attempting to increase the use of e-payment systems. The Japanese Ministry of Economy, Trade and Industry (METI) established a study group in 2017 to look at ways to encourage both consumers and businesses to make the switch to e-payments. In April 2018 METI released the "cashless vision," which promotes "the realization of a cashless society" (Ministry of Economy, Trade and Industry, 2018b). Use of e-payment tools such as credit cards and electronic money, which were already targeted to increase to a level of 40 percent of all payment settlements, will now be aiming for a best in the world target rate of 80 percent (Ministry of Economy, Trade and Industry, 2018b). The Japanese government is encouraging use of e-payment systems because they help businesses reduce costs, plus they provide convenience to both Japanese residents and foreign visitors. This convenience becomes more important as Japan prepares to host visitors from around the world for the 2020 Summer Olympic Games and the World Expo in 2025.

Previous research suggests there are several reasons for the low rate of e-payment system usage in Japan. One reason is Japanese customers are satisfied with using cash and want to continue with the cash and bank passbook systems they have trusted for decades (Allan & Kawamoto, 2015). Cash is seen as convenient because it is accepted everywhere, has no associated fees, and transactions are completed immediately (Xincheng, 2019).

Also, because crime rates are low and Japan is considered to be quite safe, there is a lower risk seen in cash use (Humphrey, 2004). Retailers may also be behind the continued low usage of e-payment systems.

According to *The Straits Times* (Sim, 2017), cashless payment is costly to set up and comes with monthly fees to vendors. This increased cost encourages Japanese retailers to avoid the new e-payment systems.

Use of e-payment systems does appear to be increasing in Japan, however. The Japan Consumer Credit Association (2015) reports that credit card use has more than doubled in ten years to become one of the most popular methods of making payment in Japan. However, as previously discussed, the rate of e-payment system adoption is still far behind that of other developed countries.

As the Japanese government attempts to encourage e-payment adoption in advance of hosting upcoming global events, one might wonder if there were specific strategies they should employ to improve the chances of success. Specifically, are there any differences among Japanese in e-payment usage? These differences, often called “digital divides,” might identify groups the government should target to drive the desired increase in adoption. We extend previous research in e-payment adoption to investigate the possible moderating effect of the digital divide factors on e-payment adoption (A. N. Chen et al., 2020).

The rest of this paper is organized as follows. First, we review the literature on e-payments, potential characteristics for a digital divide, and technology adoption. We then describe our methodology and results. We conclude the paper with a discussion of the implications of these results and the research on this topic recommended in the future.

## LITERATURE REVIEW

Electronic payments, or e-payments, refers to a mode of payment which does not involve physical cash or money (Ab Hamid & Cheng, 2013; A. N. Chen et al., 2019; Jeffus et al., 2017) and is conducted through an e-payment system. An e-payment system consists of owners, operators, and members (Hayashi, 2015). According to Hayashi, owners are responsible for setting up and maintaining the system, operators maintain the daily operation of the system, and members provide services to end users. We focus here on the payments themselves rather than the mechanisms and rules that make them happen.

After the smartphone revolution, e-payment systems have expanded to all parts of the globe. Global consulting company Kantar estimates that over half (53%) of the consumers connected to the Internet in the Asia Pacific region use mobile payment via apps, compared to 33% in North America and 35% in Europe (Leopold, n.d.). E-payment use has spread because using it is beneficial for both businesses and consumers.

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E-payment systems bring faster payment, better tracking of transactions as well as transparency, and in turn, reduces lead time, improves cost savings, promote a trusting relationship between buyers and sellers, reduces fraud, and improves transaction clearing times (Ab Hamid & Cheng, 2013; Balaji & Balaji, 2017; Mounika & Kadhivel, 2017). Cashless payment has proven its potential in business and appears poised for increased use in the future.

Adoption is not uniform across the globe, however. We previously discussed the ways in which Japan lags the rest of the developed economies in e-payment use, although there has been an increase in recent years. The increase in e-payment adoption in Japan should not be expected to be uniform either. We expect there would be differences across groups in Japan, as there has been in previous adoption research (A. N. Chen et al., 2020).

There are many potential factors to use as the basis to split Japanese e-payment users into distinct groups. Much previous research considers how age, geographic region, gender, and ethnicity affect the appearance of so-called “digital divides.” Because 98.5% of the population of Japan is comprised of ethnic Japanese (Central Intelligence Agency, 2019), the population is essentially homogeneous along ethnic lines. Therefore, we do not consider ethnicity but do consider age, region, and gender as factors that may influence e-payment adoption.

### ***Digital Divide***

The Organization of Economic Cooperation and Development (Organisation for Economic Co-Operation and Development (OECD), 2001) defines *digital divide* as “the gap between individuals, households, business, and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technology (ICT) and to their use of the internet for a wide variety of activities.” Philip, Cottrill, Farrington, Williams, and Ashmore (2017) argued that socio-economic status (SES) and technological infrastructure are two major types of divides. Three factors were proposed by researchers as important in causing these divides: 1) availability of infrastructure, 2) multi-dimensional factors including SES, skills, geography and education, and 3) other factors including age, gender, race, etc. that interact with the experience of the users (A. N. Chen et al., 2016; A. N. Chen, McGaughey, et al., 2018; Ellis et al., 2021; Helbig et al., 2009; Shirazi et al., 2010; Várallyai et al., 2015) From this research, it is clear that differences in access to technology or in social and cultural status are two major reasons that cause a digital divide.

In Japan, previous research found internet access and use were unevenly distributed (Akiyoshi & Ono, 2008). Akiyoshi, Tsuchiya, and Sano (2013) argued that cultural capital, referring to cognitive resources, i.e., knowledge, tastes, and dispositions involved in the production and reproduction of class distinctions, affect the

adoption and use of broadband technology in Japan. They further identified gender and age, along with other variables as independent variables that affect Japanese use of technology. This research investigates region, age, and gender as three possible contributors to a digital divide in e-payment adoptions.

### ***Region***

Another potential “divide” between groups of technology users that has been mentioned in the literature are differences in usage between rural areas and urban areas (Dijk & Hacker, 2003). This difference appears to be driven by variations in the availability of fast, reliable Internet connections. There are many ways to connect to the Internet, such as digital subscriber line (DSL), cable, or wireless. Regardless of the method of connection, the capacity of the connection can impact the level of use. In the U.S., the FCC recommends consumer speed standards based upon task and number of devices supported, beginning with what they call “Basic” service of 3 to 8 Mbps download speed (*Household Broadband Guide*, 2018). This recommendation follows an increase in what qualifies as broadband from the 2010 standard of 4 Mbps to the new 25 Mbps standard (Morgan, 2015). Therefore, as with other online consumer services, a high speed connection is becoming more necessary to use e-payment systems and larger cities have higher internet diffusion than smaller cities (W. Chen & Wellman, 2004).

Considering the region of Japan in which a user operates is important because not all regions in Japan have broadband connections of equal speeds, and improving the availability of faster connections affects the usage rate of e-payment systems. Arai and Naganuma (2010) found that the three major metropolitan regions of Tokyo (which is in the Kanto region), Osaka (which is in the Kinki region), and Nagoya (which is in the Chubu region) are higher in broadband penetration rate than other regions. As a result, we examine region as one of the major digital divide factors expected to influence e-payment adoption.

### ***Age***

Age is an important contributor for all technology usage behavior (Friemel, 2016). Younger people use the Internet more than older (W. Chen & Wellman, 2004), with a recent study concluding that the probability of Internet use decreases by 1.47% for every year of age increase (Lera López et al., 2009). Young people’s lives at school, at home, at communities, and at work are increasingly mediated by information and communication technologies (Livingstone & Helsper, 2007).

For example, most colleges and universities offer online classes, where an Internet connection is required to complete course-related work.

Seniors currently comprise a small portion of the population of Internet users. However, older people are more likely to use email and use the Internet to search for health information (Jones & Fox, 2009).

According to previous e-payment studies, older people are also found to be more likely to use e-payment systems in Japan (A. N. Chen et al., 2020), in China (Nadler et al., 2019), in Macau (Liu et al., 2021), and in Ivory Coast (A. N. Chen, Nadler, et al., 2018). This difference in the frequency of technology use between the old and young is referred to as the “grey divide” (McMurtrey et al., 2008), a difference seen across countries and cultures (A. N. Chen et al., 2020; A. N. Chen, McGaughey, et al., 2018; Friemel, 2016; Nadler et al., 2019). However, the number of seniors regularly using the Internet continues to increase as the general population ages (Eastman & Iyer, 2004).

Connecting with family and friends is the most important reason seniors use the Internet (Eastman & Iyer, 2004). In Asian countries, some seniors also like to use online shopping because it usually provides home delivery services. Delivery services are beneficial for them because it allows them to overcome any physical limitations they may experience when conducting daily activities. On the other hand, a senior suffering from vision loss will find it difficult to use digital devices. Physical problems can therefore be both a motivation and a deterrent to Internet use among the elderly.

Today’s children and adolescents have constant access to digital devices such as smartphones, tablet computers, and laptops (Valkenburg & Piotrowski, 2017). Today’s seniors, on the other hand, came of age before the Internet and portable electronics were so widely available. They did not have the opportunity to learn these behaviors at an earlier age and are now faced with the prospect of learning a completely new way to communicate and conduct business, perhaps after as much as 50-plus years of experience in a cash business (Xincheng, 2019). As today’s children age while using these digital devices regularly, it can be assumed they will continue their use into adulthood. Over time this will automatically increase not only the number of elderly Internet users but the number of *experienced* elderly Internet users.

Both factors – the contradiction inherent in physical limitations and a lifetime’s worth of habits – illustrate why Internet use by age is not a simple linear function, but more complex.

### ***Gender***

Early adopters of the Internet have been predominantly male (Liff et al., 2004). However, a 2002 report by the U.S. Department of Commerce found the gender digital divide in Internet use had disappeared in the United States between 1997 and 2001 (U.S. Department of Commerce, 2002). The report showed adult females are more likely to use the Internet for communication, while adult males are more likely to use the Internet for information, entertainment, and commerce. Among younger users, males are more likely to use a digital device because they play videogames more than females. On the other hand, young females use a smartphone as a digital device more than males. However, there is no gender difference of usage of smartphones in adults (Jackson et al., 2008).

In addition, there are also racial differences in use in the United States. African American males use online to surf the web, buy something online, and search the Internet for school reports more so than other races in the United States, while Caucasian American males are least likely to search information about diet, fitness, and health. African American females use the Internet to text message and download music more than Caucasian American females (Jackson et al., 2008).

Outside advanced economies, the gender divide exists in different ways in developing countries as a result of what Johnson (2012) refers to as “role definition.” In these societies, the role of women is seen as being centered on the support of the family. This focused definition of women’s roles allows for no use of technology beyond what is necessary to perform a job outside the family, with no allowance for its use by women to further their own interests. Much of the enforcement of these standards is self-imposed, as women avoid technology such as the Internet because it does not fit their internalized standard of what is expected of them (A. N. Chen et al., 2016; A. N. Chen, Nadler, et al., 2018; Johnson, 2012). Uneven distribution of internet usage between genders is significant (Akiyoshi et al., 2013). Akiyoshi and colleagues found that as recently as the late 2000s, gender remained a significant variable in Internet usage. They also found that females were significantly different than males counter parts in six of the twelve areas examined in their study. This research will further examine gender as an independent variable affecting different stages of e-payment attitudes and behaviors in Japan

### ***Perceptions or Attitudes***

The cornerstone of research into user adoption of new technology is the Technology Acceptance Model (TAM). First proposed (Davis, 1986) as an adaptation of the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1969; Fishbein & Ajzen, 1975), TAM has been expanded and modified extensively since. While originally applied in a work setting with stationary technology, TAM has also been extended to mobile payment acceptance (Zmijewska et al., 2004).



Since e-payments are used in both desktop and mobile purchase scenarios we apply constructs from the TAM ecosystem in our study of Japanese consumers' adoption of e-payment systems.

Self-efficacy (Bandura, 1982) is an important part of the background of early TAM development. Seen by Davis (1989) as a precursor to the ease of use construct, self-efficacy has also been examined as a distinct construct in the acceptance literature (e.g. McMurtrey et al., 2011) following the lead of the decomposed theory of planned behavior (Taylor & Todd, 1995). Since self-efficacy embodies a person's belief in their own capabilities to perform a task, higher self-efficacy levels should lead to higher levels of adoption (A. N. Chen, Nadler, et al., 2018; Ming-Yen Teoh et al., 2013).

Ease of use is an original TAM construct (Davis, 1989) with a vast history of supporting research behind it (Ming-Yen Teoh et al., 2013). Ease of use is the perception of how free of effort using a particular technology will be. There is also a large body of research supporting the relationship between ease of use and actual use, although within the context of TAM research this is often seen through the effect upon intention as opposed to actual use (Venkatesh, 2000).

Potential benefits to users can be seen in terms of transaction efficiency. Consumers can incur both fixed costs (setup or preparation costs) and transaction costs (costs that recur in every transaction) (Chou et al., 2004) when they use any payment method. With e-payments, vendors bear much of the burden of both types of costs and pass them along as an essentially invisible part of the cost of items or services purchased. While prepaid cards perform similarly to cash in that they only allow users to spend money on hand, credit cards give users the benefit of spending future money (Ming-Yen Teoh et al., 2013).

Perceptions of the quality of the experience influence user behavior. Quality of the entire experience can be part of that perception, from the quality of the Internet connection (Pikkarainen et al., 2004) through the system quality itself and onward to include the delivery of information content needed by the user. Both the quality of the system and the quality of the information delivered by the system were found to affect the perceived usefulness of e-payment systems (Zhou, 2011). The quality of the Internet connection is out of the scope of control for most e-commerce vendors, so this research will focus on system and information quality.

Trust in a payment system keeps both parties to a transaction engaged. The years of experience with cash-based systems have shown Japanese that the system can be trusted. Japanese e-payment users cannot be expected to adopt these new methods for transaction settlement if they do not trust the online systems. Trust in e-payment systems is defined here as the probability the users of the system believe the transaction will be completed as expected (Pavlou, 2001).

Security for e-payment systems involves four basic requirements: integrity, authentication, fraud prevention, and privacy (Tsiakis & Sthephanides, 2005). Fulfilling these requirements ensures the parties involved are who they say they are, and the data transferred between them is valid. This problem is predominantly technological in nature, but existing research (Abrazhevich, 2004; Flavián & Guinalú, 2006) shows security to be an important factor in the online environment. Incentive is a measure of the importance to a user that a vendor provides some sort of motivation for them to use the e-payment system. It is similar to the rebates, discounts, cash back or rewards offered by credit companies in the United States and other countries. It is closely related to a perception of benefits inherent in using e-payment system. People are more likely to use e-payment systems to pay if they can get direct benefits from the transactions. An incentive is expected to be an important factor to affect users' behavior in using e-payment systems.

### ***Usage and Purchase Items***

In the previous sections, we examined digital divide factors of region, age, and gender affecting technology usage, especially in internet usage. In addition to examining digital divide on perceptions and attitude toward Internet usage, we also examine whether these divides will influence e-payment behavior.

To test this expected influence, we use three different measures of e-payment usage in this study: 1) the frequency of weekly usage, 2) the amount of money spent every month using e-payment systems, and 3) the proportion of monthly expenditures using e-payment systems. Furthermore, we asked survey respondents to indicate via a Likert scale item how likely it is they will purchase products and services in ten categories. These categories are electronics, books, travel, entertainment, clothes, dining, groceries, services, pay bills, plus a miscellaneous others category. The three digital divide factors (age, gender, and region) were then used to examine any effects on e-payment behavior and items purchased.

## **METHODOLOGY**

Most of the survey items for this research were adapted from the instrument validated and used by Wendy Ming-Yen Teoh and her colleagues (2013).

That study was deemed to be an appropriate starting point because it was also conducted in an Asian country (Malaysia) and provided coverage for most constructs in our planned study. In addition to the items in that study, we added variables to gather data specific to our demographics of interest (i.e., age, region, and gender), perceptions toward e-payment, the incentive item, and self-reported variables on usage and the types of items purchased during e-payment use.

The finalized survey instrument was translated from English to Japanese by Japanese students fluent in both languages. The translations were then reviewed by an instructor who teaches Japanese at the university. A pilot study with 10 Japanese students was also conducted to assure the accuracy of the translation.

The survey was conducted online using the Qualtrics tool (*Qualtrics*, 2017) from April 2017 to September 2017. Two female Japanese students distributed links to the survey via social media, connecting the survey to Japanese users from age 15 to 35 years old. About 240 Japanese responded, but several responses contained missing values and were not included in our analysis. Our remaining sample consisted of 151 Japanese residing in Japan. Statistical analysis was conducted using SPSS software (*IBM SPSS Statistics for Windows*, 2017).

## RESULTS

An overview of the general sample demographics is shown in Table 1 below. The characteristics of sample subjects were skewed in two of the main categories: gender and age. Females outnumbered males by an almost 3 to 1 margin in the sample. Likewise, respondents in the 19 to 30 age group comprised just over three quarters of the sample. Most subjects were currently employed at least part time and the sample was balanced between students and non-students.

**Table 1. Sample demographics.**

	Frequency	Percent		Frequency	Percent
<b>Gender</b>			<b>Working status</b>		
Male	43	28.5	Full-time	22	14.6
Female	108	71.5	Part-time	71	47.0
Total	151	100	Non-working	58	38.4
			Total	151	100
<b>Age</b> *(mean = 23.76, s = 6.49)			<b>Student status</b>		
17-18	18	11.9	Full-time student	79	52.3
19-30	116	76.8	Non-student	72	47.7
31-39	10	6.6	Total	151	100
40-58	6	4.0			
Missing	1	1.0			
Total	151	100			

\*The data was collected as integer values and summarized with these categorical ranges.

**Figure 1. Regions of Japan.**



**Table 2. Regional demographics.**

Region	Frequency	Percent
Hokkaido and Tohoku	9	6.0%
Kanto	51	33.8%
Tokyo	16	10.6%
Chubu	35	23.2%
Kinki	15	9.9%
Chugoku, Shikoku, and Kyushu	10	6.6%
Currently outside Japan	15	9.9%
<b>Total</b>	<b>151</b>	<b>100%</b>
Classification (of those in Japan)		
Urban (Regions 2, 3, and 5)	82	60.3%
Rural (Regions 1, 4, and 6)	54	39.7%
<b>Total</b>	<b>136</b>	<b>100%</b>

The regions of Japan were defined in this study as shown in Figure 1, with respondents from each region summarized in Table 2. Kanto, Tokyo, and Kinki (regions 2, 3, and 5) contain the largest, most densely populated cities in Japan.

The remaining regions – Chugoku, Shikoku, Kyushu, Chubu, Tohoku, and Hokkaido – are less densely populated in relative terms. With these differences in mind, we use the general classifications of “urban” and “rural” to refer to the first and second regional groupings respectively.

The region of the study subject was determined from the IP address used for the survey response. An IP address search engine was used to locate the subject on a map of Japan. These locations were then coded for the region in which they appeared. More than half of the respondents were from our “urban” regions (60.3%) and 39.7% were from the “rural” areas. Fifteen of the respondents (9.9%) were not physically in Japan at the time of survey completion so they were excluded from the regional analysis.

The reliability of the attitudinal constructs used in this study was tested using the Cronbach’s alpha statistic. Results are shown below in Table 3. The original attitudinal constructs used in the survey are benefit, self-efficacy, ease of use, perceived quality, trust, and security. All constructs exhibited Cronbach’s alpha values exceeding the generally accepted cut-off value of 0.7, with the exception of the security construct. As a result, the security construct was removed from the model for the remaining analysis.

The values in Table 3 are shown in descending order by construct mean value, allowing for an easy comparison of the mean levels of response values for each. Benefit and self-efficacy, with mean values over 4 (out of 5), were clearly the items receiving the highest response values from respondents. This is an indication that our respondents saw a benefit to using e-payment systems while also being confident in their abilities to use them. In comparison, trust received the lowest overall responses (mean = 2.72) of the latent constructs. This suggests that trust may not an important concern for Japanese e-payment users.

**Table 3. Construct reliability**

Construct	# of items	Cronbach’s $\alpha$	Mean	S.D.
Benefit	3	0.772	4.11	0.90
Self-Efficacy	7	0.849	4.05	0.79
Ease of Use	3	0.862	3.86	0.88
Perceived Quality	4	0.871	3.30	0.85
Trust	4	0.774	2.72	0.82
Incentive	1	N.A.	2.11	0.82

Subjects were also surveyed as to the importance of incentives in their decision to use e-payment systems. Although fewer than ten percent of subjects said incentives were extremely important, four out of five subjects felt incentives offered to them were at least slightly important in driving their decision to use these systems. Since it is a single question using a Likert scale, only the mean and standard deviation values are presented in the construct reliability table below.

Three aspects of e-payment system use were collected and are summarized in Table 4 below. Subjects indicated the number of times per week they used an e-payment system. With just under eighty percent of respondents using e-payment systems at least once per week, the mean weekly usage frequency across all subjects was 1.53. Average monthly expenditure was also reported by those subjects using e-payment systems. More than half of users (56.9%) spent under 20,000 yen (or about US\$200 at the time of the survey) per month. That amount represented around 20 percent of monthly expenditures for the average respondent. Just over five percent of respondents claimed to spend 40,000 yen (about US\$390) or more per month via e-payments.

**Table 4. E-payment usage.**

	Frequency	Percent		Frequency	Percent
<b>Usage per week * (mean = 1.53, s = 1.77)</b>			<b>Monthly Expenditure</b>		
0	32	21.9	0	32	21.2
1-2	94	62.2	1-9	30	19.9
3-5	18	11.9	10-19	27	17.9
6-10	6	4.0	20-29	18	11.9
Total	151	100	30-39	13	8.6
			40-49	9	6.0
<b>Monthly Expenditure (Japanese Yen**)</b>			50-59	8	5.3
0	32	21.2	60-69	5	3.3
1 - 10,000	68	45.0	70-79	4	2.6
10,001 - 20,000	18	11.9	80-89	4	2.6
20,001 - 40,000	25	16.6	90-100	2	1.3
40,001 - 80,000	5	3.3	Total	151	100
80,001 - 120,000	1	0.7			
120,001 - 240,000	2	1.3			
≥ 240,001	0	0.0			
Total	151	100			

\*The data was collected as integer values and summarized with these categorical ranges.

\*\*1USD = 103JPY at the time of the survey.

The most frequently purchased items for young Japanese are travel and entertainment, each with a mean response value of 2.75. Clothes (2.52) is the only other item with responses closer to “sometimes” rather than “rarely.” The items purchased responses (see Table 5) coupled with the usage frequencies from Table 4 support the assertion that Japan is still a largely cash-based economy.

**Table 5. Items purchased with e-payment systems**

Item	Mean	S.D.
Travel	2.75	1.51
Entertainment	2.75	1.40
Clothes	2.52	1.40
Pay Bills	2.45	1.50
Books	2.39	1.29
Services	2.14	1.23
Groceries	2.12	1.24
Dining	2.04	1.28
Electronics	2.03	1.26
Others	1.99	1.15

Values: 1=Never, 2=Rarely, 3=Sometimes, 4=Frequently, 5=Very Frequently

The possible effects of region, age, and gender were first tested using standard ANOVA tools in SPSS (*IBM SPSS Statistics for Windows, 2017*) plus an additional test. The Duncan’s Multiple Range Test (MRT) (Duncan, 1955) is a post hoc comparison test between means conducted on the results obtained from a previous ANOVA analysis. In this instance, the test is calculated as part of the SPSS suite of ANOVA analysis features (*One-Way ANOVA Post Hoc Tests, n.d.*). It is used to identify significant differences between multiple group means. It is interpreted by assigning the comparison variables to groups with non-significant differences between the values in question. Values in the same Duncan group exhibit non-significant differences. Only significant and near significant results are shown in the tables that follow to limit the size of the tables.

***Effect of Region***

The results of possible regional effects are summarized in Table 6 below. For the attitudinal constructs, Ease of Use ( $p = 0.022$ ) was significant and exhibited two Duncan groupings. Most regions are found in the same grouping, but Tokyo and Chubu were significantly different. This result suggests rural people (i.e., those in Chubu and/or Tohoku region) are more likely to rate the importance of ease of use with a higher score. Therefore, ease of use appears to be more important for rural Japanese.

**Table 6. Effect of region (N=136)**

Constructs	Region	Mean	F-value	p-value	Duncan Grouping	
					1	2
<b>Attitudinal Constructs</b>						
Ease of Use	3	3.46	2.723	0.022	*	
	2	3.65			*	*
	5	4.00			*	*
	6	4.07			*	*
	1	4.15				*
	4	4.31				*
Trust	3	2.44	2.259	0.052	*	
	2	2.55			*	*
	4	2.75			*	*
	6	2.78			*	*
	5	2.99			*	*
	1	3.11				*
<b>Purchase Items</b>						
Services	1	1.78	2.330	0.046	*	
	5	1.83			*	
	2	1.88			*	
	6	2.30			*	
	3	2.63			*	
	4	2.73			*	
Regions: 1=Hokkaido & Tohoku, 2=Kanto, 3=Tokyo, 4=Chubu, 5=Kinki, 6=Chugoku, Shikoku, & Kyushu						

Trust was nearly significant in the ANOVA test, as there were two groups resulting from the Duncan's MRT (and a p-value of 0.052). As shown in Table 6, residents in Tokyo have the lowest trust scores. Those who reside in Hokkaido and Tohoku, the northern rural areas, are more likely to have higher scores for trust.



This result may indicate urban/rural or north/south differences among Japanese regarding trust as it affects e-payment adoption. Further study is needed to investigate this possibility.

The only significant relationship for items purchased in terms of the regional divide is services ( $p = 0.046$ ). All regions are grouped together in the Duncan MRT. No specific pattern could be identified regarding rural urban differences in purchase service in Japan.

**Table 7. Effect of age (N=151)**

	Age Group	Mean Response	F-value	p-value	Duncan Grouping	
					1	2
<b>Attitudinal constructs</b>						
Benefit	17-18	3.67	2.780	0.043	*	
	19-30	4.15			*	*
	40-58	4.44				*
	31-39	4.47				*
Incentives	31-39	1.78	2.875	0.038	*	
	19-30	2.00			*	
	40-58	2.13			*	*
	17-18	2.70				*
<b>Purchase items</b>						
Travel	17-18	1.61	4.918	0.003	*	
	19-30	2.84				*
	40-58	3.17				*
	31-39	3.50				*
Pay bills	17-18	1.44	5.873	0.001	*	
	40-58	1.67			*	
	19-30	2.55			*	*
	31-39	3.60				*
<b>Usage</b>						
Weekly Frequency	17-18	0.89	4.653	0.004	*	
	19-30	1.47			*	
	31-39	1.90			*	
	40-58	3.83				*

### *Effect of Age*

The results related to the possible effect of age on the usage of e-payment systems are summarized in Table 7. The only significant attitudinal construct was benefit ( $p = 0.043$ ), with a p-value just below 0.05. Travel ( $p = 0.003$ ) and paying bills ( $p = 0.001$ ) were highly significant purchase items, with incentives to customers ( $p = 0.038$ ) completing the list of significant results for the effect of age. Each of these significant factors displayed at least two Duncan groupings as expected.

Where there is a significant effect of age on the attitudinal constructs and e-payment usage, the 31 to 39-year-old age group stands out. They see the highest benefit of using e-payment systems while also showing the highest inclination to make travel purchases and pay bills online. They also appear to respond more to incentives offered for the use of e-payment systems while falling in the middle of the range of usage frequency and monthly expenditure. The youngest groups tend to be the lowest in all categories.

**Table 8. Effect of gender (N=151)**

	Mean Values		F-value	Sig.
	Male	Female		
<b>Attitudinal constructs</b>				
Ease of Use	4.11	3.81	3.648	0.058
Incentives	2.33	2.03	4.132	0.044
<b>Purchase items</b>				
Electronics	2.58	1.80	12.516	0.001
Books	2.84	2.21	7.630	0.006
Groceries	2.53	1.95	6.997	0.009
Services	2.56	1.97	7.238	0.008
<b>Usage</b>				
Weekly frequency	2.14	1.29	7.446	0.007

### *Effect of Gender*

The final set of results from the ANOVA test of a possible gender effect is shown in Table 8. There are significant differences between males and females shown in many areas. Ease of use shows a difference in mean values between genders and is nearly significant ( $p = 0.058$ ). The incentives offered by vendors to use e-payment systems appear to be more important for males than for females ( $p = 0.044$ ).

Several of the items purchased with e-payments (electronics, books, groceries, and services) showed a strongly significant gender effect as well.

Males also appear to use e-payments more than females in terms of weekly frequency (2.14 to 1.29). In all relationships shown, males use e-payment systems more than females.

## DISCUSSION

We used a survey of 151 Japanese to investigate their e-payment use and some of the factors that might exhibit an influence on that use. The sample included subjects from different regions of Japan who use e-payment systems to a varying degree for a variety of purchase behaviors. There are a number of factors in our results that should be of interest to anyone attempting to encourage increased levels of e-payment adoption in the future.

Roughly 85% of respondents use e-payments two or fewer times per week for an average monthly expenditure equivalent to less than US\$200. We also found that about 20 percent of their monthly expenditures were via e-payment. In a country with a reputation for being technologically advanced, this seems relatively low. It suggests that there are issues to address to meet the government's goal of increasing the use of e-payments. The key to reaching that goal is to identify likely areas where behavior might be influenced.

Incentives, while not the most important factor in the adoption decision were at least slightly important for about 4 out of 5 respondents. Even with the relatively low average response of users when asked about incentives, it is a well-known, easy to implement strategy and both providers and governments are already pursuing it. The Japanese government will be giving reward points worth as much as 5 percent of purchase amounts to consumers using e-payments at smaller retailers later this year (Xincheng, 2019). Japanese e-payment provider PayPay introduced a rewards program in February of 2019 that ran through the end of May in a bid to increase their market share (Xincheng, 2019).

Incentives can also be extended to vendors to help them overcome their inertia caused by the historical use of cash transactions. That is the approach taken at the end of 2018 in Sumida Ward, located in central Tokyo and popular with tourists. Setup charges were waived by PayPay for around 300 shops in the area during a trial period intended to make it easy for them to try the service (Xincheng, 2019). Whether these trial vendors retain the e-payment provider's services will ultimately determine the success or failure of the efforts.

The highest mean values for the attitudinal constructs were for benefit (4.11) and self-efficacy (4.05).

These high response values suggest Japanese people think e-payment systems are beneficial to them, and they are confident in their ability to use them. The bottom two mean responses are for perceived quality (3.30) and trust (2.72).

It could be considered that because in Japan, there is a high level of e-payment systems, Japanese people do not be careful of using the systems, and so perceived quality is not important to them at all. The lowest mean was trust. Because Japan is ranked as the ninth safest country in the world (Martin, 2018), it might be that Japanese do not specifically think about trust.

Regarding purchasing items via e-payment systems, we found that young Japanese are more likely to purchase travel and entertainment than other items. The next items in terms of frequency were found to be clothes and pay bills. It is possible this could be due to the larger proportion of females in our sample. Similarly, electronics was found to be lower still, which may be due to the smaller proportion of males. Further study is needed to determine if the difference in items purchased is influenced by gender.

#### ***Effect of region, age, and gender***

The region, age, and gender of respondent e-payment users appeared to affect use, albeit unevenly. In general, the youngest subjects had the lowest response values for the construct of benefit of the e-payment system across our survey. The reason may be that the youngest group does not have enough income to purchase and thus cannot perceive e-payment to be beneficial to them. This would suggest it would be beneficial to focus on changing the payment habits of younger consumers to drive the overall adoption rate. Statistical significance can be found for ease of use and trust among different regions. Urban Japanese are more likely to have lower mean scores in ease of use. People residing in the North, Hokkaido and Tohoku, are more likely to have a higher score in trust, with people living in urban areas tending to place less importance on trust.

There are age and gender differences when it comes to the importance of incentives. The middle age group of those between 19 and 39, are more likely to view incentives as important than the younger group (17-18) and older group (40-58). Females appear to be the least likely to be swayed by incentives. The key to reaching this group may be in the incentives themselves. Instead of concluding that females don't respond to incentives, the correct conclusion might be that the correct incentives are not being offered to attract female users. Offered incentives can be designed to appeal to different age groups and genders.

Usage rates also vary significantly by both age and gender. By both frequency and amount, males use e-payments twice as often as females.

This result is consistent with many studies that find males are more likely to engage in using new technology or e-payment (Hernández Blanca et al., 2011;

Ho, Bruce Chien-Ta & Oh, Kok-Boon, 2009; Hsieh et al., 2013). In this study, males use e-payment more frequently, spend more money monthly via e-payment, and have a higher proportion of their spending transacted via e-payment system. This suggests it is easier to promote e-payment among Japanese males relative to females. However, there is a much bigger payoff for increasing the e-payment usage rates of females.

Normally, younger people are more likely to adopt new technology (Morris et al., 2005; Morris & Venkatesh, 2000; Sharit & Czaja, 1994). Somewhat surprisingly, it is the older users in our sample that lead in use, with a significant increase in frequency and amount over their younger counterparts. One reason could be that older people have higher income and thus spend more money in general, including using e-payment systems. Also, Japan is a country with a relatively large amount of older people who may prefer home delivery service, which favors remote payment as opposed to buying products in a face-to-face transaction. More study is needed to determine what is behind the tendency of older Japanese to use e-payment systems.

The items purchased exhibit varying differences due to region, age, and gender. Age has a significant impact on travel purchases and paying bills. Region is important when considering dining and services purchases. The 31-39 age group is more likely to purchase travel and pay bills via e-payment than other age groups. Males are more likely to use e-payment in the purchase of electronics, books, groceries, and services.

## LIMITATIONS AND FUTURE RESEARCH

While our results showed promise, there are limitations to this research.

Most limitations surround the characteristics of the sample subject pool used.

The sample of Japanese e-payment users available to us was strongly skewed in favor of females. This is related to the method used to recruit subjects. The survey link was distributed by female students to people with which they had at least a passing familiarity. That females would outnumber males by a 2.5 to 1 ratio is not surprising. However, even with this discrepancy we found a strong gender effect, with males scoring significantly higher in several categories.

Our sample also skewed very young, most likely for the same subject recruitment reasons as the gender discrepancy. This may have had a negative impact on results. Younger people are earlier in their careers and expected to have less income and accumulated wealth than their older colleagues. With less money to spend, our results might be naturally skewed in favor of older users. This may be especially pronounced when dealing with the purchase of items in more expensive categories

like travel. However, the purchase of items like groceries should be less affected by this aspect of the data since people of all ages need to buy groceries.

The determination of which region a user was in was determined from IP addresses from which subjects completed the survey instrument.

This could introduce discrepancies to the data if a respondent were completing the survey from a temporary location in one region rather than their primary location in another. More granular location data for the determination of a respondent's regional location would help alleviate this potential issue.

Other possible courses of action beyond adjustments to the subject pool are also suggested for future investigation. A full twenty percent of respondents said incentives offered by vendors were not an important factor in their decision to use e-payment systems. Future research to determine their reasons for e-payment use could provide an additional set of factors to be considered in the effort to increase use overall. It is also possible these twenty percent were the lowest level users of e-payments, and these same factors could identify ways they could be encouraged to increase their use.

## CONCLUSION

In spite of its overall embracing of technology, Japan remains a very cash-oriented society. The digital payment tools found in the rest of the world are available in Japan, but the Japanese generally choose not to use them. This research studied digital divides in region, age, and gender regarding e-payment attitudes and behaviors among the Japanese that contribute to the low e-payment use rates. We found effects attributable to these divides, especially in the context of the use incentives provided or the items purchased by the consumer.

The general conclusion is that for this culturally homogeneous and highly developed economy, regional divides are relatively low influencers of attitudes and behaviors related to e-payment. There is a difference in use between users in rural and urban areas, but it is smaller than other differences found. Age and gender, however, are still found to predict a larger gap among Japanese in e-payment adoption. For example, younger females are the lowest users of e-payment systems among Japanese surveyed, but they are also placed the highest importance on incentives.

Government, vendors, and further research can use these results as a basis to promote e-payment systems as Japan prepares for the upcoming Olympic Games. Since the overall goal of the Japanese government is to encourage e-payment use, a possible strategy is to focus on types of transactions that would attract younger consumers. By engaging with younger users, the chance of creating lifelong e-payment users is increased.

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