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Problem description

Recent technological developments are changing the ways in which people get things done. With a larger variety of technology-enabled services, it is now possible for people accomplish different tasks without having to get to places. For example, a broader availability of online shopping, as well as the app-based good and service delivery options that are rapidly increasing, may reduce the need for people to get to different places to get the things that they need or to do the tasks that need to be done. In short, new technologies and related services may act as alternatives to traditional modes of transportation.

Recent studies have begun to look into the potential effects of the emerging technologies and services. For example, Zervas et al. (2017) examined impacts of sharing economy services by looking at how Airbnb is affecting the hotel industry. Kathan et al. (2016) pointed to how existing industries and businesses may expect to see economic and environmental effects due to the increase of sharing economy services; and how they may need to consider possible changes in values, processes and customer engagements due to the impacts of sharing economy.

It has been discussed that the related behaviors and experiences – use of various transportation modes including driving, use of online shopping and technology-enabled delivery services, technology experiences, and needs around activities of daily living – may differ across people of different characteristics. For example, Garikapati et al. (2016) discussed how millennials may have different mobility patterns with driving and transportation use due to their technology exposures which are vastly different from older generations. Jones & Kashanchi (2019) discussed, in a report focused on grocery shopping, that while use of online grocery shopping is still relatively rare, demographic differences such as age, gender and family composition may be associated with adoption of related services. However, existing studies have focused mostly on how new technologies and services may be affecting traditional ways in their immediate domains. However, it is likely that, in the future, cross-domain effects may be observed and will need to be better understood.

In this two-part study, adults in the United States were surveyed to better understand their current use of technology or service alternatives to transportation, and how use of such services may be impacting their transportation patterns. In the first study, a large-scale online survey was conducted to understand how people may be using new modes of shopping and service delivery, and what the drivers of their use are. In the second study, a group of people were asked specifically about their transportation needs in association with typical activities they are doing, and how use of various services is impacting their transportation needs and patterns. Taking the possible differences in transportation and service use between people of various characteristics into account, both parts of this study collected information on demographics and mobility needs to allow comparisons.

Study 1: People's use of various services

Methods

A large-scale online survey was conducted with questions on demographics, daily activities and related issues, transportation and mobility challenges, and technology experience. A part of this survey was focused around new services and products that could function as alternatives to traditional ways of living and thus being disruptors to existing modes of transportation. In this section, participants were asked about how they shop for common items such as food and grocery, personal care products, health care products, clothing and accessories, and home care and household products. They were asked if they go to physical stores to buy these things, or if they also shop online on websites and/or smartphone apps, which would reduce or eliminate the need to make the necessary trips. Participants were also asked about their usage of various delivery services for groceries, meal-kits and medications. Demographic variables and reports of transportation-related challenges were used to compare if experiences differed by people with different characteristics and needs.

Responses were collected from 970 adults across the United States. The study sample represented a wide range of ages and demographic characteristics as summarized in Table 1.

Table 1. Study 1: sample profile

Variable	Sample breakdown
Age	Silent generation (born ~1945): 229 (23.6%) Baby boomers (born 1946~1964): 258 (26.6%) Generation X (born 1965~1980): 249 (25.7%) Millennials (1981~1997): 234 (24.1%)
Gender	Male: 475 (49.0%) Female: 495 (51.0%)
Annual household income	Less than $25,000: 99 (10.2%) $25,000~$49,999: 94 (9.7%) $50,000~$74,999: 197 (20.3%) $75,000~$99,999: 200 (20.6%) $100,000~$149,999: 179 (18.5%) $150,000~$199,999: 112 (11.5%) $200,000 or more: 89 (9.2%)
Highest level of education completed	High school or less: 131 (13.5%) Some college: 189 (19.5%) Trade/technical/vocational school or associate's degree: 76 (7.8%) College degree: 295 (30.4%) Some post-graduate work: 41 (4.2%) Post-graduate degree: 238 (24.5%)
Employment	Employed full-time: 364 (37.5%) Employed part-time: 72 (7.4%) Self-employed: 50 (5.2%) Full-time student: 8 (0.8%) Not employed: 44 (4.6%) Retired: 358 (36.9%) Homemaker: 70 (7.2%)

	Other: 17 (1.8%)
Marital status	Single, never married: 150 (15.5%) Married or living with a partner: 677 (69.8%) Widowed: 54 (5.6%) Divorced or separated: 89 (9.2%)
Residential environment	Urban: 263 (27.1%) Suburban: 490 (50.5%) Rural: 216 (22.3%)

Results

A part of the questionnaire explored if people are engaged in traditional ways of getting common items through shopping in physical stores, or if they are also utilizing ways that did not require transportation, such as shopping online on websites or smartphone apps. In this part of the survey, participants were asked to indicate their use of various channels for getting the following products: food and grocery, personal care products, health care products, clothing and accessories, and home care and household products. The results are summarized in Table 2.

Participants indicated that they are most likely to buy various products at physical stores, as shown in Table 2. While many utilized websites and smartphone apps, shopping at physical stores, which is the traditional way that would often require transportation, remained the most popular option. Shopping at physical stores was relatively more dominant for food and groceries, while for shopping on websites was chosen by almost half of the sample for clothing and accessories. This indicates that choice of mode and the necessity of transportation may be dependent on the purpose and types of trips to be made.

Table 2 also shows the data by age group, gender and self-reports of need for help with transportation. Across different categories, it was found that younger adults were far more likely to shop online using websites and smartphone apps to shop for food and groceries, personal care items and home care products compared to older adults. Age gaps were smaller for health care products, as well as clothing and accessories, but the trend in which older adults were more likely to go to physical stores held across the different product domains. This suggests that older adults may be needing and utilizing transportation more for getting various things that they may need, whereas younger adults may be increasingly using ways that eliminate the need for transportation.

It was also found that people reporting to need some help with transportation were far less likely to go to physical stores and more likely to shop online, compared to people who said that they do not need any help with transportation. This may point to how people with different needs and challenges may be consciously finding ways around transportation requirements and choosing alternatives to still get things done and get the things that they need.

Another set of questions asked about people’s use of services that are positioned to reduce the frequency of trips necessary for basic items. These questions asked about

grocery delivery, meal-kit delivery and medication delivery services. Participants indicated their use of these services, and the reasons for using the services if they were currently using any of them. As shown in Table 3, it was found that these services were used by the minority of the sample. Grocery delivery and medication delivery were more popular among the sample, with each group being a little over one fifth of the whole sample, and meal-kit delivery was less popular as it was used by just over a tenth of the sample. Among people who currently use these services, the majority were using them to save time, and many were using them to save money. Smaller number of people indicated using them to relieve or ease physical and emotional burden. This indicates that choices around using such services may be centered around efficiency, which may be associated with the decreased needs for making the necessary trips.

Big generational gaps for found for use of grocery and meal-kit delivery services. While these were only used by a tiny fraction of older adults, they were far more popular among younger adults, as shown in Table 3. All three services were more popular among men compared to women. More interestingly, people reporting needing help with transportation were significantly more likely to be using these services, indicating that such services may be effective complements, if not replacements, for fulfilling needs that require transportation, and that they may in fact be viable service alternative to transportation.

Study 2: Service use and its impacts on transportation needs

Methods

A more focused survey was conducted with questions directly around how transportation affects and is affected by various everyday tasks that people engage in. Several sets of questions are asked around this topic, including the following: 1) how people's health limits or interferes with getting around in the community; 2) current access to and use of various transportation alternatives including driving, public transit, ridesharing and others; 3) the degree to which routine activities (e.g., work and study, social interactions, shopping, managing finances, housework, personal care, medication management, eating, meal preparation, caregiving, exercise and entertainment) involve transportation; 4) current and past use of alternative services, and 5) how people's transportation needs have changed as a result of using alternative services.

This survey was also conducted online. A total of 55 adults in the United States answered this survey to date. The basic characteristics of the sample are summarized in Table 4.

Table 2. Study 1: current modes of shopping

		Total		Age								Gender				Needing help with transportation			
				1945 or before		1946~1964		1965~1980		1981~1997		Male		Female		Some help needed		No help needed	
Food and grocery	Physical store	862	88.9%	218	95.2%	249	96.5%	200	80.3%	195	83.3%	407	85.7%	455	91.9%	206	76.0%	656	93.8%
	Website	149	15.4%	29	12.7%	27	10.5%	45	18.1%	48	20.5%	74	15.6%	75	15.2%	64	23.6%	85	12.2%
	Smartphone app	95	9.8%	4	1.7%	6	2.3%	40	16.1%	45	19.2%	58	12.2%	37	7.5%	52	19.2%	43	6.2%
Personal care products	Physical store	785	80.9%	216	94.3%	242	93.8%	170	68.3%	157	67.1%	351	73.9%	434	87.7%	160	59.0%	625	89.4%
					19.2%	55	21.3%	100	40.2%	103			32.8%	146			42.4%	187	
					1.7%	10	3.9%	33	13.3%	39			9.5%	41			14.8%	46	
Health care products	Physical store	787	81.1%	213	93.0%	235	91.1%	179	71.9%	160	68.4%	351	73.9%	436	88.1%	167	61.6%	620	88.7%
	Website	245	25.3%	57	24.9%	53	20.5%	65	26.1%	70	29.9%	125	26.3%	120	24.2%	79	29.2%	166	23.7%
	Smartphone app	117	12.1%	5	2.2%	13	5.0%	36	14.5%	63	26.9%	79	16.6%	38	7.7%	61	22.5%	56	8.0%
Clothing and accessories	Physical store	748	77.1%	189	82.5%	224	86.8%	170	68.3%	165	70.5%	338	71.2%	410	82.8%	158	58.3%	590	84.4%
					40.6%	113	43.8%	119	47.8%	111			41.7%	238			43.9%	317	
					2.6%	15	5.8%	42	16.9%	50			12.6%	53			17.7%	65	
Home care and household products	Physical store	795	82.0%	210	91.7%	238	92.2%	179	71.9%	168	71.8%	358	75.4%	437	88.3%	168	62.0%	627	89.7%
	Website	298	30.7%	61	26.6%	66	25.6%	84	33.7%	87	37.2%	153	32.2%	145	29.3%	97	35.8%	201	28.8%
	Smartphone app	97	10.0%	2	0.9%	9	3.5%	35	14.1%	51	21.8%	57	12.0%	40	8.1%	52	19.2%	45	6.4%

Table 3. Study 1: current use of service alternatives

		Total		Age								Gender				Needing help with transportation			
				1945 or before		1946~1964		1965~1980		1981~1997		Male		Female		Some help needed		No help needed	
Grocery delivery	Yes - currently using	206	21.2%	15	6.6%	24	9.3%	78	31.3%	89	38.0%	138	29.1%	68	13.7%	128	47.2%	78	11.2%
	Save time	149	72.3%	7	46.7%	16	66.7%	57	73.1%	69	77.5%	104	75.4%	45	66.2%	88	68.8%	61	78.2%
	Save money	84	40.8%	6	40.0%	7	29.2%	27	34.6%	44	49.4%	64	46.4%	20	29.4%	55	43.0%	29	37.2%
	Ease physical burden	65	31.6%	9	60.0%	6	25.0%	25	32.1%	25	28.1%	43	31.2%	22	32.4%	45	35.2%	20	25.6%
	Ease emotional burden	19	9.2%	1	6.7%	1	4.2%	4	5.1%	13	14.6%	14	10.1%	5	7.4%	12	9.4%	7	9.0%
Meal-kit delivery	Yes - currently using	106	10.9%	4	1.7%	5	1.9%	49	19.7%	48	20.5%	85	17.9%	21	4.2%	86	31.7%	20	2.9%
	Save time	72	67.9%	2	50.0%	4	80.0%	34	69.4%	32	66.7%	60	70.6%	12	57.1%	57	66.3%	15	75.0%
	Save money	45	42.5%	1	25.0%	1	20.0%	16	32.7%	27	56.3%	40	47.1%	5	23.8%	36	41.9%	9	45.0%
	Ease physical burden	27	25.5%	1	25.0%	0	0.0%	9	18.4%	17	35.4%	26	30.6%	1	4.8%	24	27.9%	3	15.0%
	Ease emotional burden	25	23.6%	1	25.0%	0	0.0%	11	22.4%	13	27.1%	20	23.5%	5	23.8%	21	24.4%	4	20.0%
Medication delivery	Yes - currently using	219	22.6%	55	24.0%	39	15.1%	72	28.9%	53	22.6%	150	31.6%	69	13.9%	122	45.0%	97	13.9%
	Save time	120	54.8%	33	60.0%	19	48.7%	35	48.6%	33	62.3%	88	58.7%	32	46.4%	64	52.5%	56	57.7%
	Save money	109	49.8%	28	50.9%	24	61.5%	31	43.1%	26	49.1%	78	52.0%	31	44.9%	55	45.1%	54	55.7%
	Ease physical burden	50	22.8%	8	14.5%	7	17.9%	15	20.8%	20	37.7%	37	24.7%	13	18.8%	40	32.8%	10	10.3%
	Ease emotional burden	30	13.7%	3	5.5%	2	5.1%	13	18.1%	12	22.6%	21	14.0%	9	13.0%	21	17.2%	9	9.3%

Table 4. Study 2: sample profile

Variable	Sample breakdown
Age	Silent generation (born ~1945): 6 (10.9%) Baby boomers (born 1946~1964): 22 (40.0%) Generation X (born 1965~1980): 13 (23.6%) Millennials (1981~1997): 13 (23.6%) No answer: 1 (1.8%)
Gender	Male: 24 (43.6%) Female: 30 (54.5%) Prefer not to disclose: 1 (1.8%)
Annual household income	Less than $25,000: 3 (5.5%) $25,000~$49,999: 10 (18.2%) $50,000~$74,999: 12 (21.8%) $75,000~$99,999: 8 (14.5%) $100,000~$149,999: 6 (10.9%) $150,000~$199,999: 5 (9.1%) $200,000 or more: 2 (3.6%) Prefer not to answer: 9 (16.3%)
Highest level of education completed	High school or less: 9 (16.3%) Some college: 9 (16.3%) Trade/technical/vocational school or associate's degree: 9 (16.3%) College degree: 17 (30.9%) Post-graduate degree: 11 (20.0%)
Employment	Employed full-time: 24 (43.6%) Employed part-time: 7 (12.7%) Not employed: 1 (1.8%) Retired: 19 (34.5%) Homemaker: 4 (7.3%) Other: 1 (1.8%)
Marital status	Single, never married: 10 (18.2%) Married or living with a partner: 32 (58.2%) Widowed: 2 (3.6%) Divorced or separated: 11 (20.0%)

Results

The sample largely consisted of current drivers, with 54 people currently having a valid driver's license. A total of 50 people stating that they currently drive a personal vehicle to get around, with 45 of them choosing driving as their primary mode of transportation. The vast majority (n=51) also indicated that they depend on their ability to drive to move to and from their current residence. Also, most of the sample (n=53) said that they currently have a personal vehicle at home that they have access to.

Participants also indicated limited use of other modes of transportation. A little less than half (n=25) people said that their family, friend or caregiver drives them at least some of the time, and three people said that they carpool. A smaller number of people identified walking (n=18) and biking (n=4) as modes that they are currently using to get around. Some people also indicated using other alternatives. Twelve people said that they use ridesharing services such as Lyft or Uber, and fewer people reported using various means of public transit services, including bus, trolley, subway or commuter rail.

While only few people indicated using transportation modes other than driving, those that currently use various alternative methods generally agreed that using them caused them to drive less. Among people who use ridesharing (n=12), 5 people said that they are driving less as a result of using ridesharing, while 5 reported experiencing no change and 2 did not answer. Among four people using public transit, 3 said that they were driving less as a result of using public transit, and only 1 person said that they didn't experience any change in driving.

Building on to some of the questions asked in Study 1, this survey also included questions around delivery services that may reduce or eliminate transportation needs, including medication delivery, online non-grocery shopping, online grocery shopping, meal-kit delivery, and food/restaurant delivery. In this survey, participants using these services were directly asked to rate if and how their transportation needs have changed as a result of using these services.

As shown in Table 5, it was found that the majority of people using these services experienced changes in their transportation needs. That is, people who use of these services generally indicated that their transportation needs have decrease as a result of using these services. The strongest impact was seen among people who use food/restaurant delivery service (e.g., Grubhub, DoorDash, UberEats, Postmates, etc.), where 15 of 16 current users reported experiencing lower transportation needs due to using the service. Similar effects were observed across various service categories asked in the survey, indicating that using new technology-enabled services for on-demand delivery may be effective alternatives to making the necessary trips.

Table 5. Study 2: impact of service use on transportation needs

	I do not do this or use this	Not lower/ the same	Lower transportation needs due to using service			
			Total	A little lower	Somewhat lower	Much lower
Prescription medication delivery	42	5	8	5	1	2
Online shopping (not groceries)	17	18	20	10	6	4
Order groceries online and pick up at store	40	4	11	5	3	3
Online grocery shopping and delivery	44	4	7	1	2	4
Meal-kit delivery	51	1	3	1	0	2
Food delivery	39	1	15	10	2	3

As also shown in Table 5, it was found that online shopping was used by the majority of the sample. This subgroup of participants was further asked if they saw any changes in their frequency of shopping in physical stores as a result of shopping online. While the slight majority indicated that the frequency of shopping in physical stores has stayed about the same (60.5%), a sizable portion (36.8%) indicated that they were going to physical stores less often as a result of shopping online. This provides additional

evidence that technology-enabled services may be decreasing people's needs around transportation.

In addition to shopping and other retail experiences where transportation may be necessary, participants were also asked to indicate how much they felt transportation was required for the variety of routine activities that they do. Answers to these questions are summarized in Table 6.

Table 6. Study 2: transportation needs associated with routine activities

	No transportation needed	Transportation needed				Not applicable
		Total	A little	Some	A great deal	
Working	4	32	3	8	21	19
Studying or doing schoolwork	12	5	4	1	0	36
Engaging in social interactions	3	48	11	25	12	4
Shopping	3	52	8	26	18	0
Managing finances	25	22	14	6	2	8
Housework / home management	21	26	18	8	0	8
Personal care	12	35	20	11	4	7
Taking or managing medications	15	29	21	5	3	11
Cooking and meal preparation	17	32	13	14	5	6
Eating	15	38	17	18	3	1
Exercise or other physical activities	21	28	13	10	5	6
Entertainment and leisure activities	8	46	17	19	10	1
Taking care of someone else	15	22	6	11	5	18

As shown in Table 6, the majority of participants doing the given activities reported needing transportation for the respective tasks. Managing finances was the only exception, with slightly more people reporting no transportation needs with the task. While Table 6 shows that tasks like shopping, eating and cooking or meal preparation likely require transportation for many people, this study has found that such needs may be decreased or eliminated by new technology-enabled services that are becoming increasingly available and widely adopted, especially among younger generations and people with mobility or transportation needs. While data have not been collected, similar effects can be expected in association with other activities as well. As technology-enabled services and modes of engagement become available across domains, people may be increasingly able to effectively get things done without making the necessary trips, and transportation needs may see additional changes in the near future.

Conclusion and recommendations

This study examined how people of various characteristics are navigating routine tasks in association with changing needs around mobility and transportation. From the two-part study with online surveys, we found that age and mobility needs may be associated

with differences in use of shopping-related services, and that new technology-enabled retail and delivery services are impacting people's transportation needs. It was also observed that, outside of shopping and meal preparation, a large number of various daily tasks also involve transportation for people. Results suggest that emerging services may in fact be viable alternatives to transportation in that they may reduce or even eliminate the need for someone to drive or otherwise get somewhere to get things done, and that the impacts may differ across tasks as well as across consumer segments.

Future research and practice will need to consider how new technologies and related services may be impacting people's behaviors across domains, and how current experiences may be driving possible changes. While the second study did a deeper investigation around the transportation impacts of new services, the sample largely consisted of people who primarily drive to get to places. Future study can include a larger and a more diverse sample, with representations of various mobility needs and current transportation experiences. Also, while this study focused on shopping and meal preparation as key tasks, further research spanning various activities of daily living will generate more generalizable insights around the cross-domain impacts on transportation needs and patterns.

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