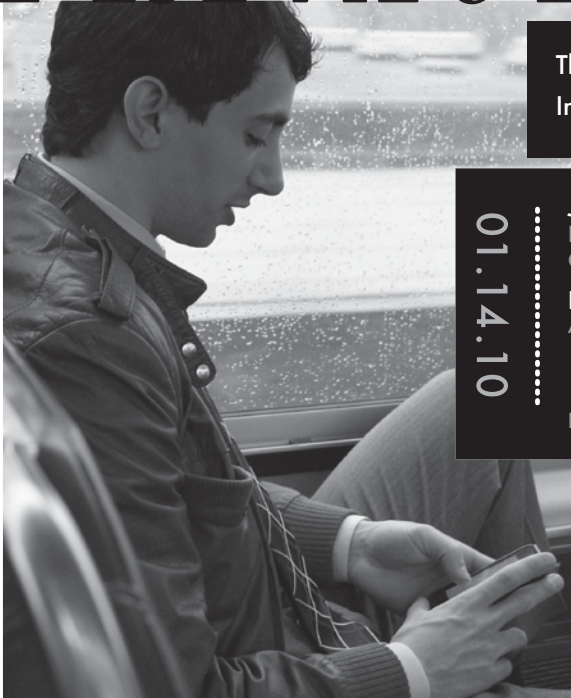


# PRIVACY INVADERS

## PUBLIC SPACE



The Growing Use of Portable Electronic Technology on Intercity Buses, Trains & Planes between 2009 & 2010

01.14.10

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## EXECUTIVE SUMMARY

**Travelers on intercity buses, trains, and planes increasingly are using portable electronic devices** while en route. The use of these devices appears to serve two purposes at once: They enable the passenger to remain in touch with the world outside the vehicle while insulating the passenger from the noise, distractions or just plain boredom normally experienced in the interior. Whether for work or leisure, many travelers engage in intensive digital activities that would have been almost inconceivable a decade ago. In doing so they are profoundly changing the way private individuals inhabit and experience public space.

To clarify the implications of this phenomenon, this study evaluates data from over 19,100 unique passenger observations on intercity trips, primarily in the United States but also on selected Canadian and Western European routes. Among the notable results are:

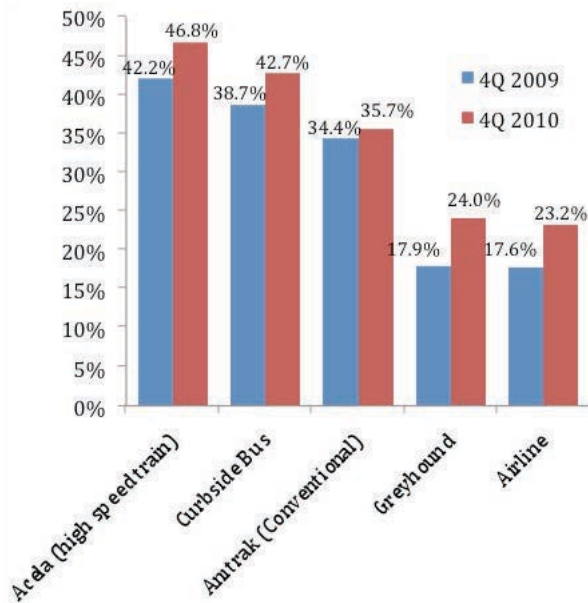
1. Usage of portable electronic devices rose markedly among travelers on all modes of intercity transportation in the United States between the 4th quarters of 2009 and 2010 (Table A).
2. Opportunities for using portable electronic technology continue to give passenger trains and “curbside” bus service an important competitive edge over personal automobiles and air travel.
3. Travelers on all modes are rapidly shifting toward more sophisticated devices, especially those with built-in LCD screens and Internet capability.
4. High-speed trains offer travelers particularly advantageous environments for technology usage, but even conventional trains are congenial to the practice because their generous interior dimensions offer the electronics user more personal space than the interior of a bus or airliner.
5. Use of portable electronic devices is making significant gains on commercial airlines but still lags the rate of the other modes surveyed.
6. As buses and airplanes become more crowded, consumers are less apt to use portable technology, perhaps due to concerns over privacy or lack of adequate personal space needed to manipulate devices.

The dramatic changes under way suggest portable technology appears poised to remain a dynamic and increasingly decisive factor in the exercise of modal choice.

## EXECUTIVE SUMMARY: TABLE A

PROPORTION OF PASSENGERS USING PORTABLE ELECTRONIC DEVICES AT RANDOMLY SELECTED POINTS :  
4TH QUARTER 2009 VS. 4TH QUARTER 2010

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Sharp increases in the use of technology took place across all modes of transportation between the 4th quarters of 2009 and 2010. Technology use on airlines and conventional (Greyhound) buses, however, continues to lag behind. These results are based on more than 19,100 passenger observations throughout the continental United States.



- Passengers wait along the curb for a Megabus departure from Chicago to Detroit. At randomly selected points *en route*, nearly 43% of passengers on "curbside buses" are engaged with portable electronic devices.

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## INTRODUCTION

The rising dependence of travelers on digital technology, spurred by new products, improved Internet access, and emerging tech-friendly amenities and supporting technologies, propelled the use of portable electronic devices to record heights on airplanes, buses, and trains in 2010. Usage of mobile devices among intercity travelers increased sharply on all major modes of travel. Particularly notable increases occurred in “visually oriented activities” involving LCD screens as travelers deployed increasingly sophisticated devices rather than older-generation cell phones and music players.

To understand the implications of these trends, this study explores two issues: i) the changes in technology use among intercity travelers between the 4th quarters of 2009 and 2010, and ii) the apparent implications on the choice of mode made by travelers and how they spend their time *en route*. The results show that the use of portable devices differs sharply among the respective modes and that technological forces appear poised to appreciably affect the dynamics of intercity transportation choice over the next several years.

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A central theme of the report is the discernable advantage that bus and rail operators have over competing modes of travel, most notably air and automobile travel, with respect to the use of technology. Usage of technology on airlines and conventional intercity buses (Greyhound) is growing at a relatively rapid rate, but usage on buses and airplanes tends to fall as on-board conditions become more crowded, suggesting that the relative spaciousness of passenger trains may be provide rail with an increasing advantage as the travel industry recovers from a lengthy recession.

## CONSUMER TECHNOLOGY & THE AMERICAN TRAVELER

The idea of intercity travel as an isolated, undisturbed refuge from the surrounding world persisted in many travel markets well into the 1980s, even as advances in technology quickened the pace of other aspects of everyday life. Although the first commercial cellular phone service was introduced in early 1969 on Metroliner trains between New York and Washington, D.C., this innovation was not followed up with periodic increases in the efficiency or versatility of communication with the off-train world. Almost another generation would grow up before the widespread installation of pay phones (particularly the Airphone) on commercial flights in 1984. Pay telephones soon became widely available on non-Metroliner trains in other busy Amtrak corridors as well.

We summarized several of the most notable milestones reached by transportation companies in supporting on-board technology in last year's report, *Is Portable Electronic Technology Changing How Americans Travel?*, available for download on the Chaddick Institute Web site listed at the front of this report. In brief, this report shows that technological innovation made spectacular advances by the late 1990s. Portable devices gradually became smaller, less expensive, and more sophisticated. Starting with laptop computers and cell phones in the 1990s and followed in the early 2000s by Blackberries, iPhones, notebook computers, compact memory devices, and a wide array of portable entertainment systems, portable electronics have enabled travelers to perform increasingly complex tasks on the road.

Each mode, however, faced notable challenges to creating a truly "tech-friendly" environment for its passengers. Some of the respective setbacks and achievements are summarized on the following page.



- **AMTRAK:** Passenger trains have natural advantages over airliners with respect to technology use. Electronic equipment can be used continuously throughout trips, and the spacious configuration of train coaches is relatively conducive to the use of laptop computers and DVD players. There are no constraints on the use of cell phones, although “dead spots” make coverage inconsistent on some routes, particularly those outside of the busy and densely populated Northeast Corridor.

Amtrak removed pay telephones from most trains by the early 2000s due to the growing prevalence of cell phones, but it succeeded in installing at-seat electrical outlets in many of its corridor trains soon thereafter. Nevertheless, its bid to install wireless Internet has been delayed due to the problems posed by tunnels and the length and capacity of its trains. In April 2010, however, Amtrak successfully completed the installation of free wireless service on its high-speed Acela trains in the Northeast Corridor linking Boston and Washington, D.C., providing complete coverage on a route on which it had previously been only intermittently available. Last year, the carrier hired a private contractor to evaluate the installation of Wi-Fi on its Capitol Corridor in California. For the foreseeable future, wireless will be available only on a small portion of Amtrak’s routes.

- **INTERCITY BUS COMPANIES:** Over the past three years, bus companies, particularly “curbside” operators (i.e., bus lines that do not operate from conventional bus stations and typically focus on express service between large cities), have pushed themselves to the forefront of the wireless Internet movement. Wi-Fi became widely available after BoltBus, a joint venture of Greyhound and Peter Pan Bus Lines, launched services between New York, Boston, Philadelphia, and Washington, D.C. in April 2008. Megabus.com quickly followed, offering wireless Internet service on all its routes. Wi-Fi soon became the accepted standard for curbside operators, so much so that passengers felt slighted when it (or powered outlets) was not available. Greyhound is on the tail end of the trend. In late 2009, the carrier introduced buses with wireless service and power outlets serving the major Northeastern corridors as well as the New York–Montreal route. In December 2010, Greyhound introduced similar service on select medium-distance routes from Chicago.

- **COMMERCIAL AIRLINES:** Passengers traveling by air understand that airplanes are not particularly amenable to the use of some electronic devices. Devices must be deactivated after leaving the gate and remain off for an extended period, leaving travelers on short flights with only a limited amount of time to use them. The design features of commercial airplanes make power outlets generally impractical to install. Due to the “hassle factor” created by crowded conditions and airport security in the post-9/11 environment, many travelers opt to bring only the smallest devices, such as cell phones and iPods, with them. Others use their frequent flyer status to upgrade to business or first class cabins where seating is more spacious.

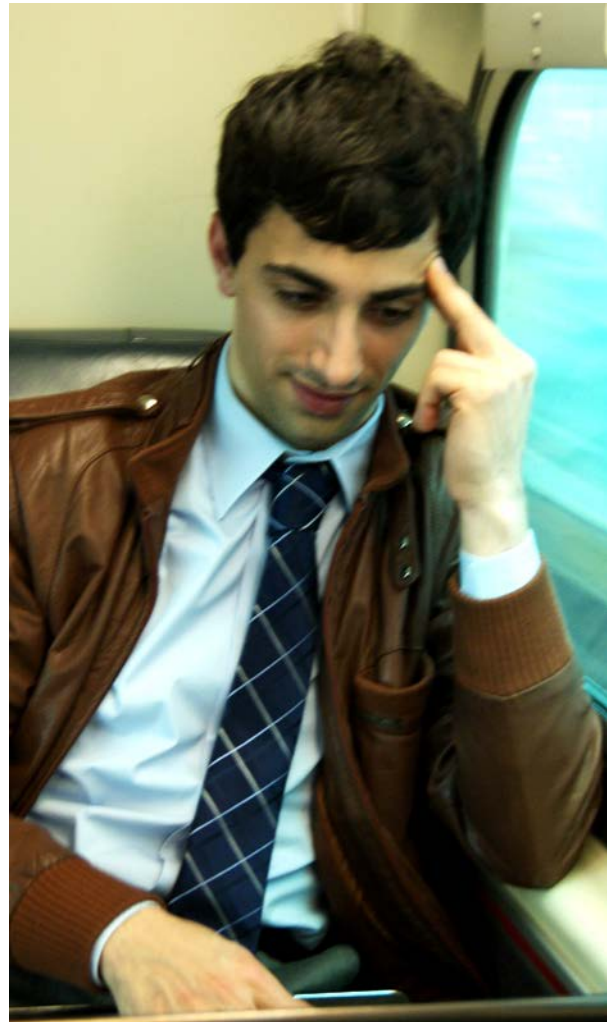
Another problem facing airline passengers is the lack of wireless Internet and cell-phone connectivity. Although the push to provide wireless Internet on commercial flights gathered momentum in 2004, it was not until 2008 that Wi-Fi became standard on an appreciable share of domestic flights. Nevertheless, it often still carries a considerable price. Among major domestic carriers, only Airtran offers free wireless on a permanent basis (other airlines occasionally make Wi-Fi free during special promotions, as Delta Airlines did during the 2010 Christmas season). The number of paid customers, however, has reportedly been disappointing (Wall Street Journal, August 27, 2009).

## THE DEPAUL PORTABLE TECHNOLOGY PROJECT

**THE CHADDICK INSTITUTE** began systematically collecting data on commercial flights and intercity trains and buses in September 2009. Since launching the Project, we have collected over 19,100 unique passenger observations (i.e., observations in which no passenger is counted more than once on a given trip) on 235 departures. (When repeat observations of passengers on a trip are included, the sample has grown to 25,400). We are aware of no other data set of this kind.

When collecting data, field researchers move about on board as fare-paying passengers and collect data through a strict research protocol involving observations of passengers. Team members pass through the aisles of railcars, buses, and airplanes and enter coded data about passenger activity, typically between 20 minutes and an hour after departure. During both the 4th quarters of 2010, the team collected bus and rail data in 13 states plus the District of Columbia as well as on numerous flights. Earlier in 2010, as noted in Appendix B, we collected data on the French TGV and Spanish AVE high-speed trains and VIA Rail Canada trips on the Windsor – Quebec Corridor.

**Researchers measure the use of two basic features of electronic devices:** (1) those using audio features of devices, such as cell phones, CD players, or other devices that can be used with earphones, speakers, or headsets, and (2) those using visual or audiovisual features, such as laptop computers, Blackberries and other smart phones, DVD players, and iPods (essentially, any traveler looking at a screen for the purpose of engaging in an activity more substantial than placing a phone call or changing a music selection fell into this category). These activities typically involve the observation of images or information on LCD screens.



○ Andrew Pizzano (above) collecting data on the Metra.



**TABLE 1**

**PASSENGERS OBSERVATIONS MADE BY MODE OF TRANSPORT :  
FOURTH QUARTER 2009 & 2010**

Mode	Departures Surveyed		Unique Passengers Observed	
	2009	2010	2009	2010
Commuter train	14	20	1,381	1,449
Curbside bus - BoltBus, Megabus	19	26	697	792
Conventional bus - Greyhound	10	16	251	408
Commercial flights	10	26	652	2,078
Train - Conventional Amtrak	26	36	3,486	3,460
Train - Amtrak Acela	6	6	868	767
<b>Total U.S. Observations</b>	<b>85</b>	<b>130</b>	<b>7,535</b>	<b>8,944</b>
Cumulative observations, both years	-- 215 --		-- 16,479 --	
Cumulative, including European and Canadian trains	-- 235 --		-- 19,126 --	

**AS NOTED IN TABLE 1**, the 2010 data collection effort involved 8,944 unique passenger observations. The effort included 36 conventional Amtrak runs, six Acela runs, and 20 commuter trains (see appendix for a list of states and corridors in the sample). Data also were collected on 42 bus trips—26 curbside bus departures and 16 Greyhound departures. Flight data were collected on 26 departures involving 19 airports and seven airlines in the continental United States. The commuter train data, however, are limited to metropolitan Chicago and thus are only tangentially discussed in this report. The 2009 sample encompassed a slightly smaller number of observations. (See Appendix A for further details).

AMONG THE KEY FINDINGS FROM OUR ANALYSIS OF THE 2010 DATA ARE THE FOLLOWING:

# KEY FINDINGS

**FINDING 1: USAGE OF PORTABLE ELECTRONIC DEVICES ROSE MARKEDLY AMONG TRAVELERS ON ALL MODES OF TRANSPORTATION BETWEEN THE 4TH QUARTERS OF 2009 AND 2010.**

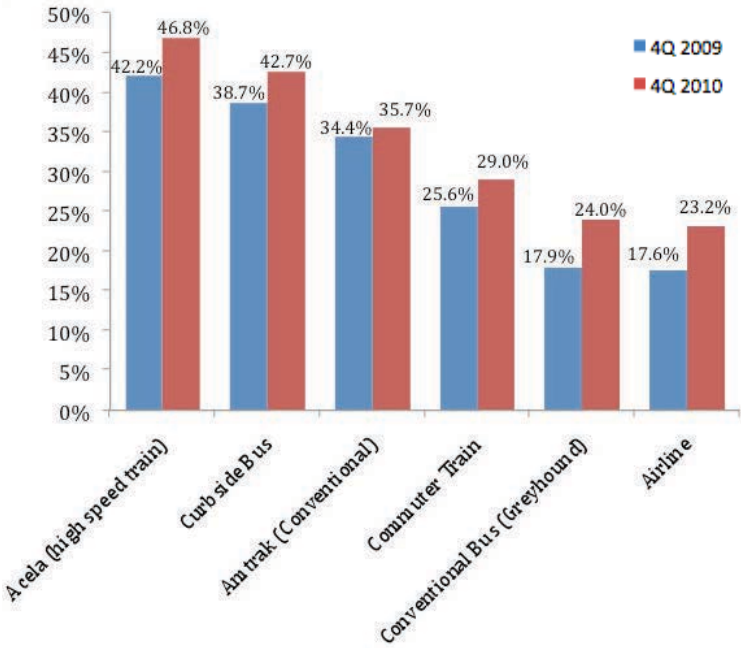
The trend toward higher usage differs between modes of travel, but exceeds three percentage points on all modes except conventional Amtrak trains, in which it rose 1.3 percentage points. The percentage of passengers using technology at randomly selected points ranged from 46.8% on high-speed Acela trains to 23.2% on commercial flights, up from 42.2% and 17.6% last year, respectively.

In absolute terms (i.e., on the basis of the percentage-point change), high-speed trains and curbside buses saw significantly larger increases than the other modes. Nonetheless, the highest proportional gains (excluding commuter trains), were observed on conventional buses (all of which were operated by Greyhound) and commercial flights, each of which grew by more than 25%, albeit from a relatively small base. (Note that our sample of airline flights in 2009 was limited to just 10 flights, necessitating caution in year-over-year flight comparisons).

On Acela and curbside bus trips, it has become common for more than half of the passengers to be engaged with portable technology at a randomly selected point in time—a rarity on airlines and conventional buses. The number of passengers using technology at some point on the trip is much higher. By contrast, none of the airline or conventional bus departures with more than a dozen passengers had usage rates exceeding 40 percent. An increasing number of passengers appear to be traveling in a state oblivious to the noise, commotion, and other passengers around them. Electronic devices allow them to, in effect, bring their home offices entertainment systems and social connections with them, turning what previously had been experienced as public space into an extension of private space. Although further study will be needed to verify and explicate this development, we suspect it is a major factor in the increasing popularity of Amtrak and curbside bus travel among tech-savvy and tech-dependent young people.

**FIGURE 1**

**PROPORTION OF PASSENGERS USING PORTABLE ELECTRONIC DEVICES AT RANDOMLY SELECTED POINTS : 4TH QUARTER 2009 VS. 4TH QUARTER 2010**



**FINDING 2: TRAVELERS ON ALL MODES ARE RAPIDLY SHIFTING TOWARD MORE SOPHISTICATED DEVICES, ESPECIALLY THOSE WITH BUILT-IN LCD SCREENS THAT ALLOW THEM TO UNDERTAKE “VISUALLY ORIENTED” ACTIVITIES RATHER THAN MERELY AUDIO ACTIVITIES SUCH AS PHONE CALLS AND LISTENING TO MUSIC.**

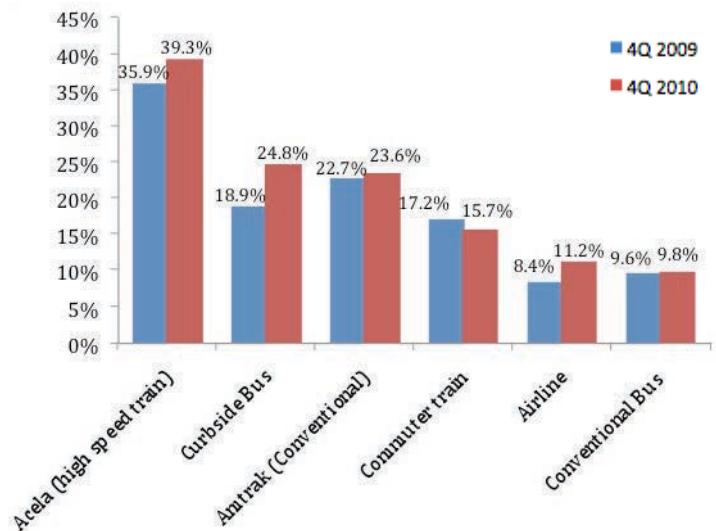
Passengers are increasingly engaged in visually oriented activities involving LCD screens rather than activities that have a strictly audio function. As shown on Figure 2, “visual activities” rose in particularly sharp fashion between 2009 and 2010. Although such increases were universal across all modes of transportation except commuter rail, they were greatest in absolute (percentage-point) terms on Acela and curbside-bus departures. Activities that involve strictly audio functions (such as talking on cell phones or using digital music players) actually fell by 1.90% on curbside buses, while on conventional trains, the prevalence of audio-only activities was essentially flat. Clearly, a veritable tidal wave of new and sophisticated devices is marginalizing devices used solely for one purpose, such as the basic cell phone.

The differing intensity of visually oriented digital activities also reaffirms a finding in last year’s report: For intercity travelers the spacious environments on board trains (which include tray tables and generally electric outlets as well) are particularly amenable for passengers eager to work on laptop or notebook computers. The seat pitch and width also afford passengers greater privacy and ability to maneuver. The ratio of video to audio activities on high-speed Acela (5: 1) and conventional Amtrak trains (2:1) exceeded that of all other modes by a comfortable margin. On curbside buses, the ratio was only about 1.4 to 1.

The tight seating configurations of airplanes are particularly unsupportive of visually oriented activities, especially, as we note later in this report, when passenger loads are high. Nonetheless, some of the differences on Figure 2 can be explained by the types of passengers that different modes attract rather than the on-board conditions. The preponderance of business travelers on Acela trains, for example, is likely responsible for much of the high usage, although the interactive effects between the spaciousness of the seating and the mix of travelers on board are no doubt significant as well. Regardless, the consistency of the results across time periods, corridors of travel, and time of day suggest that on-board environment plays a significant role.

**FIGURE 2**

**PROPORTION OF PASSENGERS PERFORMING “VISUAL” (LCD) ACTIVITIES ON ELECTRONIC DEVICES AT RANDOMLY SELECTED POINTS : 4TH QUARTER 2009 VS. 4TH QUARTER 2010**



**FINDING 3: OPPORTUNITIES FOR USING PORTABLE ELECTRONIC TECHNOLOGY CONTINUES TO GIVE PASSENGER TRAINS AND “CURBSIDE” BUS SERVICE AN IMPORTANT COMPETITIVE EDGE OVER PERSONAL AUTOMOBILES AND AIR TRAVEL.**

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The newly collected data reaffirm a point made in last year’s Chaddick report: Portable technology is responsible for at least some of the rising popularity of rail and bus travel. In both 2009 and 2010, ridership growth on these modes exceeded that of commercial airlines. As our 2010 Update on Intercity Bus Service report (available for download at [las.depaul.edu/chaddick](http://las.depaul.edu/chaddick)) issued in December 2010 shows, the amount of curbside bus service, measured by the number of daily departures, grew by 23.9% in 2010. Ridership on Megabus reportedly is up more than 40% on routes it served both in 2009 and 2010. Amtrak, meanwhile, saw its passenger base expand by 5.6% in 2010, with some individual corridor routes reporting double-digit increases, compared to the previous year. Air travel grew by only about 5% in 2010 (2010 Update, p. 6).

Although the ability to use technology may be just one of many factors responsible for the rates of growth of curbside bus travel, a survey we administered to 200 passengers boarding BoltBus and Megabus coaches in New York and Chicago suggest that the influence of a tech-friendly environment is not to be discounted. This survey, administered in late 2010, revealed that more than half of passengers intended to surf the Internet ( 51.6%) or make a phone call (76.6%) when traveling. More than ninety percent (91.8%) anticipate using an electronic device during their trip. More than a third (37.0%) considered the availability of Wi-Fi an important consideration when traveling on a curbside bus.

**FINDING 4: PORTABLE ELECTRONIC DEVICE USE MADE SIGNIFICANT GAINS ON COMMERCIAL AIRLINES IN 2010. AT THE SAME TIME, THE USE OF TECHNOLOGY ON FLIGHTS STILL LAGS BEHIND THAT OF OTHER MODES, PARTIALLY DUE TO RESTRICTIONS ON THE USE OF DEVICES AT THE BEGINNING OF FLIGHTS AND THE TIGHT SEATING CONFIGURATIONS.**

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The use of technology on airplanes rose appreciably between 2009 and 2010. It is noteworthy, however, that technology use remains less than half that of Acela and only 60% that of curbside buses. When one takes into account that all devices must be turned off, sometimes up to 25 minutes before and after departing the gate, the effective usage rate (rates factoring in the time in which devices must be off) is even less. After making this adjustment, the effective use of devices is likely only about 18 - 20%, a rate even lower than Greyhound. Due to seat configuration and other factors, air travel is the only mode where audio activities remain more common than visual activities, with listening to music through an earphone or headset being the most common activity.

Technology use on commercial flights nonetheless appears poised to grow. Not only is free Wi-Fi becoming more prevalent, but technology is gradually becoming more “air traveler friendly”. Network computers (in effect, miniature sized laptops), long-life batteries, and portable DVD players were found to be particularly pervasive.

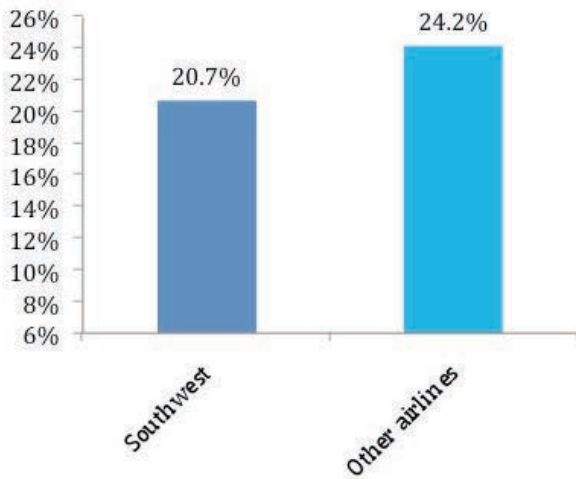
Our 2010 data set includes 10 Southwest Airlines flights and 16 flights operated by carriers that provide passengers with a reserved seat. Our sample allows for a simple approximation of the extent to which technology usage rates varies between different types of carriers in the same mode. Although there is significant sampling error in this estimate, we believe Southwest’s tendency to attract a broader demographic and socioeconomic mix of passengers than other carriers, its continued use of open seating, and the lack of available Wi-Fi, explains at least some of the difference. Usage on Southwest averaged 20.7%, while those on other airlines averaged 24.2 percent. Nevertheless, more exhaustive data collection is clearly needed to better understand the differences.



**FINDING 5: HIGH-SPEED TRAINS OFFER TRAVELERS PARTICULARLY ADVANTAGEOUS ENVIRONMENTS FOR THE USE OF PORTABLE TECHNOLOGY. ON THE ACELA EXPRESS, IT IS ROUTINE FOR MORE THAN HALF OF THE PASSENGERS TO ENGAGE IN TECHNOLOGY USE AT ANY GIVEN POINT IN TIME. WE OBSERVED SIMILAR USAGE ON TGV TRAINS.**

**FIGURE 3**

USES OF PORTABLE ELECTRONIC DEVICES ON COMMERCIAL FLIGHTS RANDOMLY SELECTED POINTS SOUTHWEST AIRLINES VS. OTHER AIRLINES : 2010



More than any other mode, high-speed trains provide a supportive environment for travelers using multiple electronic devices, such as cell phones and laptop computers, simultaneously. It is also common to find passengers working in groups while using technology, in some cases using portable wireless routers.

In 2009 and 2010, our research team surveyed 24 high-speed trains in the United States and Europe. On the six Acela trips we observed in 2010, usage rates were 46.8%, with the highest-use trip being more than 56%. By way of comparison, on six French TGV trips we observed in March 2010, usage rates averaged 44.0%.

Part of the reason for such high usage rates on trains is the dimensions of the seating. Acela trains have a coach-seat pitch of 42 inches, compared to about 30 inches for the typical domestic airline. Moreover, Acela passengers have the benefit of free Wi-Fi and power outlets at every seat. On the Acela trips we surveyed, nearly 40% of passengers were engaged in visual-oriented technologies, more than four times the number on airline trips (Figure 2).

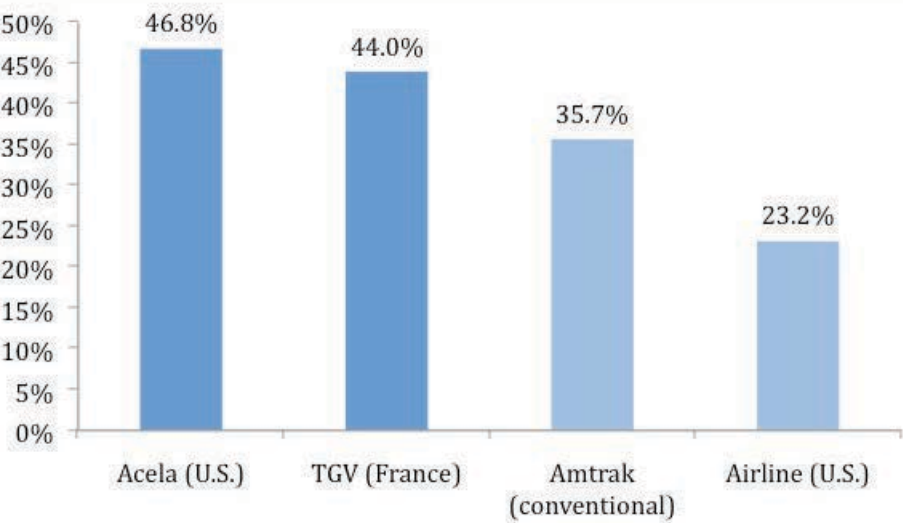
Our data suggest that notable differences in technology usage also occur on conventional trains in different parts of North America, although again, we caution that breaking out the data in this way substantially increases the level of sampling error. Usage was higher on Northern California trains (at 41.6%) than on those in the Northeast (38%) and Midwest (36.0%) or in Eastern Canada's Quebec – Windsor corridor (25.5%). (See Appendix A for a summary of the size of our samples in these regions).

These differences may well reflect the differing rates of technological adoption taking place across North America. Commuter trains in the San Francisco Bay Area were among the first to introduce free Wi-Fi, for example, thereby acclimating travelers to technology use, and a large segment of the ridership on these trains represents persons employed in the digital-technology industry. In comparison, few Canadian, Midwest and Northeast systems offer such amenities.



**FIGURE 4**

USE OF PORTABLE ELECTRONIC DEVICES ON HIGH SPEED RAIL SYSTEMS COMPARED TO AIRLINES AND CONVENTIONAL AM-TRAK: % USING TECHNOLOGY AT RANDOMLY SELECTED POINTS : 2010

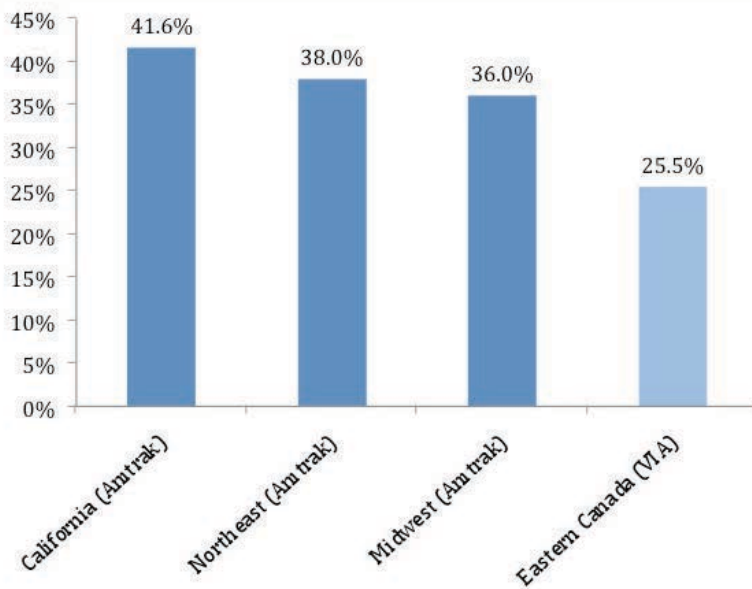


○ Andrew Pizzano (left) and Steven Field (right), part of the Chaddick Institute's data collection and analysis team, await their next departure at Grand Central Terminal in New York.

**FINDING 6: AS BUSES AND AIRPLANES BECOME MORE CROWDED, CONSUMERS ARE LESS APT TO USE PORTABLE TECHNOLOGY, PERHAPS DUE TO CONCERNS OVER PRIVACY OR LACK OF ADEQUATE SPACE IN WHICH TO MANIPULATE THE CONTROLS.**

**FIGURE 5**

USE OF PORTABLE ELECTRONIC DEVICES IN VARIOUS REGIONS OF NORTH AMERICA CONVENTIONAL AMTRAK AND VIA RAIL CANADA TRAINS :  
 % USING TECHNOLOGY AT RANDOMLY SELECTED POINTS : 2010



Our data provide compelling evidence that crowding tends to deter usage of portable electronics. Virtually all curbside bus departures sampled involved double-deck equipment with a capacity between 78 and 81 seats. On the six departures in which passenger loads exceeded 40, thus exposing passengers to at least a nominal degree of crowding, we found usage rates averaged 34.66%. On the 17 departures with lighter loads, usage rates averaged 49.51%. (The difference is statistically significant at a .05 level). These results confirm comments that using electronics becomes more cumbersome in high-density bus environments largely due to concerns over privacy and a desire not to disrupt neighboring passengers.

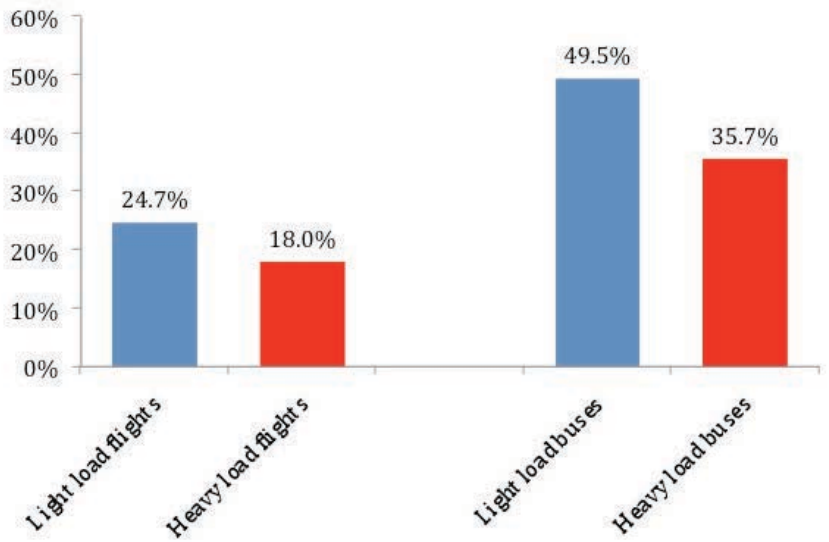
Our data do not allow us to test this hypothesis for airlines with the same degree of statistical confidence. The 11 observations we made on Southwest Airlines flights, however, suggest that crowding likely has an appreciable effect. Southwest exclusively uses Boeing 737 models, making the capacity of each plane relatively constant. Ninety-six percent of Southwest's fleet, its 737-300 and 737-700 models, have 137 seats, while the remaining 4% of its fleet has 122 seats). The five departures with 80 or less passengers had usage rates of 24.66%, while the six with higher loads had usage rates averaging 17.95% (Figure 6).

There is an alternative explanation for this difference, such as the possibility that departures with heavy loads are more likely to be populated by passengers traveling in groups. Those in groups, in all probability, are more likely to pass the time with face-to-face conversation than passengers traveling alone, thereby reducing reliance on portable technology. However, it seems unlikely that this particular factor would explain more than a small share of the gap on regularly scheduled departures, although on charter buses one might expect this effect to be quite large.



**FIGURE 6**

**EFFECTS OF CROWDING ON USE OF PORTABLE ELECTRONIC DEVICES ON SOUTHWEST AIRLINES FLIGHT AND CURBSIDE BUSES: % USING TECHNOLOGY AT RANDOMLY SELECTED POINTS**



○ Eric Roach, a young professional working in metropolitan Chicago, uses a portable device on a Metra train leaving a downtown terminal.



## TECHNOLOGICAL FORCES RESHAPING TRAVEL

The data presented above provide little reason to expect the rate of growth of portable technology use to subside anytime soon. Nevertheless, it is important to examine how technology use might change over the next several years. Several recent advances in portable technology suggest that travelers may soon have even more incentive and ways to remain digitally connected. Five of these developments may be worthy of particular attention and are summarized below.

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**1. BARCODE SCANNING.** Barcode scanning, an established technology, is rapidly being adopted on mobile technology platforms available to intercity travelers. Smart phone users who have downloaded and installed apps or software packages can scan two-dimension barcodes into their portable devices using the camera feature. Software reads the barcode, interprets the information, connects the user with related websites, coupons for merchandise, and other types of information about a product or service. By strategically placing barcodes in magazines and on signage in airports and bus and train stations, this technology allows vendors and others to actively engage travelers instead of relying upon passive technologies, such as traditional print advertising. The global leader in this technology, ScanBuy, reports that usage of its Scan Life software increased by 700% between 2009 and 2010.

**2. MOBILE APPS.** Mobile apps have long been a mainstay of smart phones, but their use for marketing purposes to travelers is still in a relatively embryonic state. A variety of new apps, however, give users instant information about the nearest location of a preferred retail outlet, transit stop, fast-food restaurant, and other locations geographically relevant for travelers. One such app, Special Agents, advertises to travelers about bargains specifically offered in the immediate vicinity. For intercity travelers, the mobile app makes traveling with a sophisticated device even more attractive than before by reducing search costs and informing the user of discounts and bargains.

**3. 4G NETWORKS.** “4G” refers to the fourth generation of wireless service, which promises connection and download speeds similar to direct internet connections. At present, much of the advertised 4G differs little from 3G, but the standard of service is advancing rapidly. As “true 4G” becomes more pervasive, users will be able to stream movies or play games without the burden of painfully slow download speeds. As it

becomes available to more consumers, Wi-Fi will likely cease to be seen as a major marketing asset for providers of rail and bus services and will instead become an expected amenity for many intercity travelers.

**4. GROWTH OF PRE-PAID PLANS.** Most consumers in the United States have traditionally paid for wireless and cell-phone service using “post-paid” plans, meaning they enter extended contracts and pay for the service on credit, typically on a monthly cycle. However, the growing pervasiveness of pre-paid plans affords new demographic segments with access to sophisticated internet-on-the-go service. Although pre-paid plans have been dominant in Asia and Europe for years, they have only recently become popular in the United States. This shift is generating a great deal of innovation in device technology and infrastructure investment while allowing travelers of limited financial means to have the benefits of service previously available only to more affluent and business travelers.

**5. CLOUD COMPUTING AND PORTABLE WIRELESS ROUTERS.** Although “aircards” allow users to connect to the Internet almost anywhere from a portable computer, they remain relatively expensive and impractical for many users. To avoid the cost, many travelers tether their smart phone to a laptop computer, but still experience slow data transmission. In response, portable wireless routers are becoming increasingly popular, particularly among business travelers. These mobile units, when tethered to a smart phone, create a superior Wi-Fi signal that can support multiple devices and offers quicker data-transfer rates. A related technology, cloud computing, allows users to “borrow” IT resources from an off-site server, typically for a rental fee. For example, instead of buying and installing Microsoft Office on a laptop, users can gain access to the software remotely whenever they need to use it, making the tool increasingly popular for business travelers. As devices with limited storage space, such as netbooks and tablets, become more commonplace, the use of online storage and cloud computing should increase.



## CONCLUSION

**Passengers are increasingly using electronic technology to transform public space into private space** where they are insulated from noise, commotion, and other passengers. On account of the growing prevalence and diminished cost of portable electronic technology, the perceived cost of time spent traveling, particularly on airplanes, buses and trains appears to be falling.

As a greater share of communication is handled through text messages and e-mails as well as through social-interaction sites such as Facebook, it appears likely that many travelers place a premium on the ability to stay constantly connected through portable devices. Moreover, the rapid expansion of 3G and 4G wireless networks makes travel on buses and trains more attractive relative to that of private automobiles and airplanes.

The spectacular advances in technology made over the past several years is arguably increasing the opportunity cost of being behind the wheel of an automobile, while bolstering the relative attractiveness of what might be described as a “transit oriented lifestyle.” Impending changes in technology, meanwhile, promise to bring many more changes to the American travel scene.



## APPENDIX A

### Overview of Data Collection

As noted in Table 1, our U.S. survey for 2010 involved observations of 8,944 distinct passengers on 130 different transportation departures to and from major cities. Data collection was undertaken in 13 states as well as the District of Columbia. Rail passengers were observed on trains in California, Connecticut, Delaware, Illinois, Indiana, Massachusetts, Michigan, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, and Wisconsin. Bus-passenger data were collected in each of these states plus Ohio but not in Virginia. Station stops were made in each of these states except for the trip through Rhode Island, through which the bus passed without a stop. Note also that our base-year California numbers were collected during the first two months of 2010.

Flight data were collected on 26 departures involving 14 states plus the District of Columbia. Our 2009 bus and rail data involved the same states as in 2010 except California, which was not included in our bus data for that year. For a complete list of routes surveyed, please e-mail [chaddick@depaul.edu](mailto:chaddick@depaul.edu) or see the appendix of our 2009 report, *Is Portable Technology Changing How Americans Travel?*, which includes a full list of routes surveyed in 2009.

The regional comparisons on Table 2 are subject to a higher degree of sampling error due to the limited number of trains sampled. Our samples are based on the following: Northeast, 1,624 passengers on 14 trains, Midwest, 2,154 passengers on 21 departures, TGV, 1,168 passengers on seven trains, California, 351 passengers on seven departures, VIA Rail Canada, 589 passengers on seven trains.

## APPENDIX B

### Data on European High-Speed Trains

The data in Figure 4 are based on six Acela and six TGV trips. We observed even higher usage on Spanish AVE trips (averaging 65% in the four observations we conducted) but do not show these results in Figure 4 since figures include usage of built-in entertainment systems, which are not relevant to this analysis (See *Railway Gazette International*, [need month of this issue here—FKP] 2010). Note that the European observations were made in March 2010, more than six months prior to the Acela observations. We also sampled one Eurostar train in France. The average usage rates for all seven French high-speed trains sampled (Eurostar and TGV combined) is 40.0 percent.

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