Personal Travel Assistants and En-Route Commerce

David Bernstein
Princeton University
dhb@princeton.edu

Alain Kornhauser
Princeton University
alaink@princeton.edu

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Abstract. Electronic technologies are playing an increasingly important role in travel-related commerce. However, very little attention has been given to how these technologies can be used to facilitate personal *En-Route Commerce*. This paper discusses some of the issues involved in adding en-route commerce capabilities to Personal Travel Assistants (PTAs).

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New Jersey Institute of Technology   Princeton University   Rutgers University

1 Introduction

Electronic commerce is broadly defined as the buying and selling of goods using electronic transaction processing technologies. More narrowly, electronic commerce involves transaction processing technologies that require little or no intervention on the part of the buyer or seller. It includes both business-to-business transactions and business-to-consumer transactions.

Some of the most significant applications of electronic commerce to date have involved personal travel/transportation industries. For example, electronic commerce is playing a significant role in the sale of airline tickets, automobiles, and hotel rooms. In spite of this, very little attention has been given to the ways in which *personal travel assistants* (PTAs) can and should be used for electronic commerce.

Personal travel assistants are *mobile* computers designed to help travelers make better decisions and to make them more easily and efficiently. The most commonly discussed use of PTAs is for *in-vehicle navigation* (or *wayfinding*) but many other applications have been discussed as well. At an airport a PTA could supply you with information about departures and arrivals, the location of airport services (e.g., restaurants, baggage claim areas, ground transportation), the availability of vacant spaces in different parking lots, and much more. On a city street, a PTA could supply you with information about points of interest, bus and subway routes/schedules, the current position and/or anticipated arrival times of buses and trains, the location of pedestrian walkways, and traffic congestion levels. At a commuter rail station a PTA could provide information about schedules, delays, alternative routes, and station services.

The purpose of this paper is to consider ways in which PTAs can be used not just to provide travelers with information but also to conduct *en-route commerce* (i.e., to buy and sell goods and services while traveling that will facilitate the trip). We begin with a discussion of several example of en-route commerce. Then we consider the kinds of transactions that are involved in en-route commerce and compare them to traditional electronic commerce transactions.

2 Examples of En-Route Commerce

Our concern here is with the kinds of transactions that individuals (as opposed to commercial vehicle operators) need and want to make while they are traveling.

First, think about the things you would like a PTA to do for you regardless of how you are traveling (i.e., regardless of whether you are driving, flying etc...). It could obtain information about the pricing and availability of hotel rooms and reserve one for you based on your personal preferences. It could pre-pay for the room if you wanted it to and, if the hotel as equipped, it could even retrieve an electronic key for you (and obviate the need for you to check in). It could also obtain information about restaurants and entertainment and make the appropriate reservations.

Now, think about the things that you would like your PTA to do for you while you are driving. Obviously, it should keep you from getting lost and, if possible, it should monitor traffic conditions to keep you from getting stuck in traffic. But, there are many other things it could do as well. For example, it could monitor your gasoline usage

(or you could tell it that you are low on gasoline) and it could query local gas stations to determine which one has the best prices and/or services and/or location. It could even negotiate a price for you, pre-pay, and obtain a voucher that would enable you to simply drive up, pump, and drive away. If you have special needs (e.g., ethanol or diesel) it could help you with those too. It could also help you find a parking spot. In fact, it could continually query all of the parking facilities near your destination until it found one that was suitable for you (e.g., valet service), reserve a space for you, and pay the bill (either when you enter or when you leave). One can even imagine that some parking lots would auction spots to the highest bidder (as is now popular at many electronic commerce sites) and your PTA could do the bidding for you. Finally, suppose you break down on the road. It could find an appropriate service station, call for a tow truck, and arrange for the tow truck to be paid by your auto club.

When you are traveling by air, bus or train there are also a number of things that your PTA could do for you. Obviously, it could order and pay for your meals and drinks. However, there are a number of less-obvious ways it could help as well. First, it could reserve and pay for a variety of travel aids and sundries. For example, it could reserve DVD movies or video games for your hand-held player at your originating airport or station and even arrange for you to drop them off at your destination. It might even be able to get you the movie or game for a discount if the store at your origin has too many copies and it would like to move some to your destination. It could do the same with your rental car. In addition, as you approach your destination it could contact a "red cap" for you (and even tip him/her) and arrange for a taxi cab or limousine. It could even tell you what the fare should be.[1]

In other words, there are an enormous number of ways that your PTA could make your life easier while you were traveling if it were equipped to conduct en-route commerce. We now consider what is involved in making these kinds of transactions.

3   En-Route Commerce Transactions

From the examples in the previous section it is easy to see that, as with traditional personal electronic commerce, there are two broad types of personal en-route commerce. One is best described as *information gathering/provision* and the other is perhaps best described as *contractual exchanges*.

Information gathering/provision activities do not involve commitments on the part of either the individual or the vendor. For example, consider a situation in which, while you are driving, your PTA queries nearby hotels to see which ones have vacancies. If you do not want to commit yourself to staying at a particular hotel and they do not want to guarantee that a room will still be available when you arrive then this is just an information gathering/provision activity.

On the other hand, contractual exchange activities do involve commitments on the part of the individual, the vendor, or both. For example, consider a situation in which, while you are driving, your PTA queries nearby gas stations to see which are open and

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[1]En-route commerce could even eliminate the need for fixed taxi fares. Your PTA could check with all of the different cab companies and select the one with the best price. The can companies could then compete. You'd be safe because your PTA would enter into a contract with the cab company that guaranteed the price.

what their prices are. In order to ensure that they stay open you might want to guarantee that you will make a purchase at a specified prices. This, then, would be a contractual exchange.

Information/provision gathering activities are fairly similar whether you are talking about traditional electronic commerce or en-route commerce. Hence, our primary interest is with contractual exchanges. There are two things that make contractual exchanges interesting in the context of en-route commerce. The first is the time-frame involved. In particular, en-route commerce activities are likely to be completed much more quickly than traditional electronic commerce activities. The second is the way in which the transaction is processed, and goods and information flow over time. To see this, we will now consider typical electronic commerce and en-route commerce transactions. For sake of simplicity, throughout the discussion that follows we will ignore the details of the *electronic payment mechanism* and focus exclusively on the overall process. That is, we will assume that the there is a guarantor that ensures that the electronic payment is as good as cash.

3.1 Traditional Electronic Commerce Transactions

The most well-known kind of electronic commerce transaction is illustrated in Figure 3.1. In the first stage of this process the individual travels to the vendor. Then, in the second stage, the individual selects a product and makes an electronic payment. In the final stage of this process, the individual travels back home with the product. Given our assumptions about electronic payment this process is foolproof because the product is paid for and picked up at the same time.
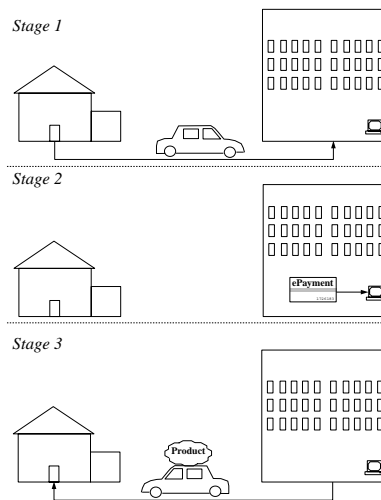

Figure 1: One Type of Electronic Commerce Transaction

The other popular kind of electronic commerce transaction is illustrated in Figure 3.1. In the first stage of this kind of transaction the individual transmits an electronic

order and an electronic payment. Then, in the second and final stage, the vendor ships the product to the individual. Even with our assumptions about electronic payment this process is more complicated then the one illustrated in Figure 3.1 because the individual pays for the product before it is delivered.
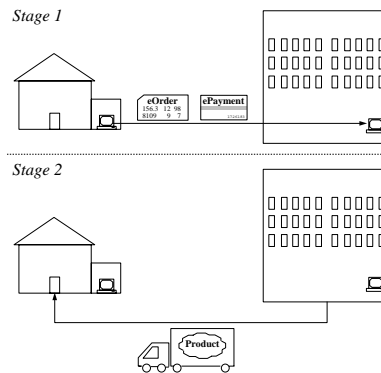

Figure 2: A Second Type of Electronic Commerce Transaction

3.2   En-Route Commerce Transactions

The question now arises of how en-route commerce transactions differ from traditional electronic commerce transactions. To begin, it is important to observe that one can, in fact, conduct an en-route commerce transaction using the process illustrated in Figure 3.1. However, such a transaction is completely uninteresting as it makes no difference whether the individual starts thinking about the process when they are at home or en-route. What is much more important is to consider the process illustrated in Figure 3.1.

Obviously, en-route commerce cannot use this second transaction process directly because it would involve the vendor trying to deliver to a moving target. Instead, the individual must come to the vendor and this changes the nature of the transaction process. In traditional electronic commerce, each individual can be identified by their fixed location (i.e., their address). With en-route commerce transactions this is no longer possible.

The most direct way to overcome this problem is using the process illustrated in Figure 3.2. The central difference between this process and the one illustrated in Figure 3.1 is that the individual's PTA must be issued and *electronic voucher* after the electronic payment is received that can be used for identification purposes. Thus, in the first stage of this process the PTA transmits an electronic order and an electronic payment to the vendor just as the home computer did in Figure 3.1. However, things change in the second stage. In particular, in the second stage the vendor transmits an electronic voucher back to the PTA (in lieu of being able to ship the actual product). Then, in the final stage of the process, the individual arrives at the vendor, uses the PTA to transmit the electronic voucher back to the vendor, and is given the product.
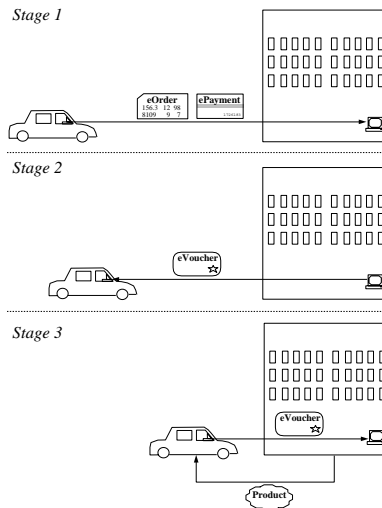
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Figure 3: One Type of En-Route Commerce Transaction

It turns out that there is another way to conduct en-route commerce transactions. One can think of the above process as one in which the vendor does not trust the individual and, hence, insists that electronic payment be received at the same time that the electronic order is received. One can also imagine a situation in which the individual does not trust the vendor and, hence, insists on some kind of guarantee. Returning to the gas station example, imagine that your PTA is given information about gasoline prices but when you arrive at the station the prices have changed. To avoid this, you might insist that the gasoline station provide you with an *electronic quote* guaranteeing the advertised price even though you are unwilling to pre-pay.

This second type of en-route commerce transaction process is illustrated in Figure 3.2. In the first stage of this process the PTA transmits an electronic order to the vendor. Then, in the second stage, the vendor transmits an electronic quote (i.e., a guaranteed price) back to the PTA. In the third and final stage, the individual arrives at the vendor, uses the PTA to transmit the electronic quote and electronic payment to the vendor, and is given the product.

It is important to note that in this second process payment need not be made electronically. That is, after the PTA supplies the vendor with the electronic quote the actual payment can be made in cash.

It is also important to note that the PTA might not deal directly with the local vendor originally but might instead deal with some central office. These kinds of transactions are illustrated in Figures 3.2 and 3.2 (ignoring the way in which the transaction is processed over time).
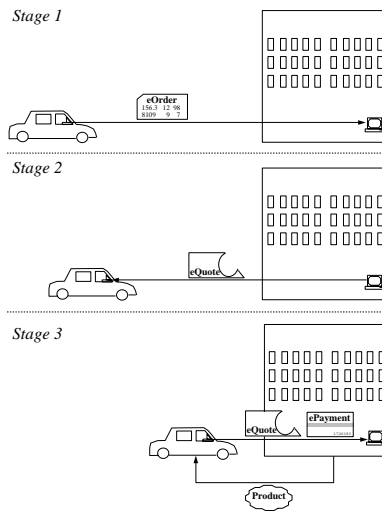
Figure 4: A Second Type of En-Route Commerce Transaction
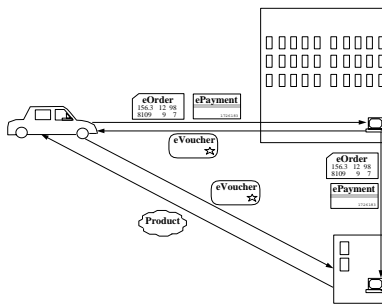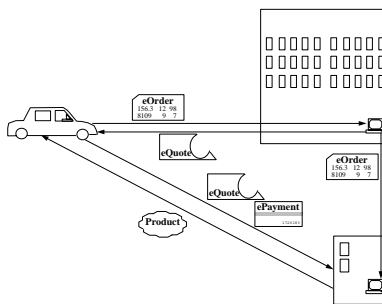

Figure 5: One Way to use a Central Office

Figure 6: A Second Way to use a Central Office