

## **Technology and the Future of Tolling**

Many of us would probably project the future for tolling as robust. Certainly, tolling has become a last resort for politicians to avoid transportation tax increases and to close funding gaps and maintain our respective countries' global competitiveness. Policymakers realize how crucial it is to have transportation infrastructure second to none and tolling carries the very attractive characteristic of being voluntary because there is the option of taking another, probably slower, route. All of these reasons highlight why tolling has experienced a renaissance as a transportation funding mechanism.

However, the case can be made that the revival of tolling is equally the result of the revolution of electronic toll collection, ETC. Would so many toll road/pricing proposals have occurred without ETC? Obviously, ETC increases the throughput of tolling facilities and some would argue it also reduces transaction processing costs. It is unlikely that politicians would be promoting a widespread increase in the use of tolling if all the new tolling customers (read that "voters") were required to stop to pay the toll. Imagine the backups that would occur on most major urban systems without ETC. Would we be considering HOT lanes without ETC, or variable pricing or congestion charging? The fact that tolling generates a recurring and growing revenue stream is powerful but insufficient without a superior means of collecting the revenue efficiently.

So to consider the future of tolling requires that we consider the future of tolling technology as well as financing structure. Advances in technology may be so profound that the issue of collection becomes moot, removing the remnant of objection to the use of tolling. Acceptance of tolling as a funding mechanism would no doubt be much easier to sell if the issue of collection is taken out of the debate.

### **What causes technological innovation?**

What is it that causes someone to develop a new technology? Is it the stuff of raw invention? Is it fundamental to a basic science or is technological innovation more about the use of an existing technology? It may not be the technology at all but rather the frame of reference that persists. For example, the Internet was developed so that universities could communicate more fully and carry out their military research agenda. Consider the many and varied uses that the Internet serves. It has morphed to create economic, social and political change on a wide ranging scale. Major businesses have been created. The Internet is a major match maker. Politicians use the Internet to reach their constituencies and carry out campaign fund raising. This single technological creation has become much more than what was originally intended. A strong case can be made for the concept that invention is more a result of a revelation about the application of the tool than the tool itself and that frequently it is a "eureka moment". The next era of ETC innovation may develop when we begin to consider electronic toll collection in the light of all users of the system not just the commuter or repeat user.

### **The infrequent traveler**

When toll industry officials gather to consider ETC issues, the discussion invariably turns to the question of market penetration which is the percentage of revenue or transactions that are handled by electronic means rather than by cash. Penetration rates of 60-70% are common on mature ETC systems. This percentage however, does not mean that 60-70% of the individual customers of the toll road buy a transponder and set up an account. Recent studies at a major toll operation in the U.S. indicate that 2% of the individual users generate 30% of the revenue and 11% of the users generate 67% of the toll revenue. Therefore to go from 67% ETC market penetration to 100% means that the toll operator has to deal with the remaining 89% of the customers that travel the toll road in a year's time. Hypothetically, if 500,000 transponders were required to attain a 67% market penetration rate, then another 4,545,454 ( $500,000/.11$ ) transponders would have to be issued to reach 100% ETC penetration. Further, some of those infrequent customers simply do not want to obtain a transponder to handle the three or four trips they might take on the system over the year.

To convert this remaining 89% of the customers of a toll system requires new tools and techniques that cater to the infrequent traveler. Prepaid video tolling techniques are just beginning to be tested but they appear to offer a significant opportunity to accommodate the infrequent traveler. If pre-registration in some form is not chosen by the infrequent traveler, billing processes and ultimately violation processes must be applied to ensure collection. The business rules and pricing of these various techniques affect customer choices. To the extent that such techniques can address the remaining 30% ETC market penetration (made up of the remaining 89% of the users) all-electronic-toll-collection, AETC can be attained. AETC removes

the traditional collection costs of labor, buildings, plazas, utilities, armored cars and other costs from the balance sheet. The result is a higher net revenue operation and one that offers even greater convenience to the entire customer base.

### **A new perspective on electronic toll collection**

Like many readers of this magazine, I can remember the early days of ETC. When I first became aware of ETC technology, I traveled with staff and several policymakers and reviewed ETC operations in the US. Comments were made about the risks involved in such a scheme and the potential for not collecting all the funds. We debated various technological approaches and concluded that ETC could be risky. Without toll gates we might lose revenue and if we used toll gates, the primary objective of greater throughput might be lost. Such considerations are troubling to public agencies that are easily criticized for the loss of any revenue whether by the press or by an auditor.

Now 15 years later, the collective perspective has changed considerably. As business rules have been defined, legislation passed and new applications of technology applied, ETC has become common to most toll operations worldwide. New loop technology, lasers, video camera equipment and digitizing equipment and software have been deployed. Toll operators speak of customer service centers, violations processing and billing systems. Policymakers now consider congestion pricing schemes, HOT lanes, and other pricing methods. Pricing has become the word of choice to the policymaker because it is about more than raising revenue to build more roads; it is about affecting choice through economic incentives. Demand management effects are increasingly important policy considerations. Environmentalist, transit advocates and road builders find they have agenda in common. Would this have been the case but for ETC?

### **Future paths for tolling technology**

Over the last decade we have witnessed the construction of several new toll facilities around the world that are AETC from the outset. Recently, several toll agencies have begun to consider converting existing facilities to AETC. Pre-registered non transponder accounts are being tested, day passes are being implemented and billing systems are more focused towards converting potential violators into billing customers. The result will be electronic collection systems but without transponders. Most likely the toll rate will be increased slightly to offset processing costs. These accounts contain far less data than most classical ETC accounts and are more temporary in nature as desired by infrequent users.

Technologies other than RFID are also beginning to be applied, further altering our concept of ETC. SMS messaging on cell phones is beginning to be applied to make it convenient for infrequent customers who use a cell phone to set up a temporary account for toll collection through video tolling. In this case, the toll account is established through the cell phone account. The collection and management of the toll account is in effect outsourced from the toll operator to the cell phone company. Such a system has recently been implemented in Turkey.

Another concept that is in the planning stages in South Africa is that of using RFID not only for toll collection but also to register the vehicle. While the RFID tag will be low cost and required in addition to the ETC tag, it will possess minimal functionality and contain information on the vehicle registration only. The tag is permanently affixed to the vehicle during the registration process and all properly registered vehicles will be required to have such a tag. The result is a capability that mirrors vehicle license plate recognition technology and ensures that the vehicle is quickly and efficiently identified, speeding access to registration information. Electronic vehicle registration will likely prove to be a powerful asset for those who prefer not to obtain a transponder for ETC.

### **A morphing ETC concept**

AETC is a laudable goal for toll operators and could make toll road operations much more efficient by providing a higher net revenue solution. It is now being considered not only for new projects but for the conversion of existing ones. This increased efficiency should shorten the time required for a toll road to pay operations, maintenance and debt service. A shortened time frame for "profitability" will make more toll road proposals feasible and advance the development of pricing as a transportation policy solution.

Reward does not come without risk and just as we were able to absorb the risks and criticisms of RFID based ETC in the 90's, we will be able to do the same for AETC. We will accomplish AETC by offering a range of ways in which toll road customers can become electronic customers without having to fit into an established ETC process. We will offer more options but to do so we must modify our concept of what Electronic Toll Collection is.