M-Commerce opportunities and revenues models in mass public transportation scheduling

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Executive Summary

Mass transit services have evolved into highly efficient logistic companies with a strong backbone of information systems. The evolution of the industry thus far has been centered in providing a better service at a reasonable cost, but until recently, the focus had not been in giving the user a sense of control over his own time. This business opportunity is a fairly unexploited area of business for which the concept of M-Commerce has a unique appeal.

MobileBus, our proposed business and technological solution, enable the customer to take control of his own time by providing him with accurate and continuously updated information regarding the whereabouts of his bus. We are turning the old notion of waiting for an unknown period of time into a comfortable mean of transportation. By eliminating the uncertainty factor from the mass transit services we make the use of public transportation a more appealing service and may help towards the goal of having more people rely on it and help reduce pollution and improve transit in general.

The idea in principle is simple, all we need to know is the location of the bus at any given time, and the location where the user is expecting it for which we rely on GPS technology on the bus side and a digital mobile phone on the other. The form in which the user receives his notification will depend on whether his phone is a 2G, 2.5G or in the future 3G and use SMS, WAP and Location Sensitive Services respectively to receive and transmit the information.

In financial terms, it is a project that will require a relatively small initial investment and will cover these initial costs within the first four years of operation. The modeling in this specific opportunity is for the city of Pittsburgh, PA, but not limited in anyway to it allowing expansion not only in subscriber base, but also in geographic coverage. The model by which to acquire revenue select will be by providing it as a premium service through the different wireless carriers in the area, at a monthly rate of 3 dollars of which one dollar will go the operator and the rest will be passed on to our company.

MobileBus is the next logical step in the evolution of transportation, in an exciting time when we approach the type of services that the futuristic vision of cities has brought us to expect. Beyond a simple business opportunity it is also an opportunity to improve growing transit and pollution concerns and to help people reclaim their time as their own. It is time for total independence, it is time for **MobileBus.**

About the Service

Today

We want to provide the users of the local port authority a system with an alternative to static bus schedules, and with the power to manage their time more efficiently while using public transportation. The focus initially is on short-distance bus services.

The system will initially provide the users with the ability to select a bus line and choose from the multiple bus stops that the bus line serve. Based on the user input, the current bus position, speed and other stored information, the system will estimate the arrival time for the next two buses corresponding to the particular bus that was picked at the specified stop. A local example would be a user choosing the 61C. The device would then give the user a choice of stops and the option for inbound or outbound. The system would then tell the user when the next bus would arrive at that stop and when the next bus after that would arrive as well.

This system will allow users to make informed decisions about the use of public transportation. Public transportation providers' schedules are affected by daily traffic variations, and these variations impact the users of their services. The system will give the users a countermeasure for unpredictable schedules, and thus make the use of public transportation a more preferable option. From the security and comfort of a protected place, especially in harsh weather conditions, the users can learn when the next bus will arrive at their bus stop.

For passengers the system will:

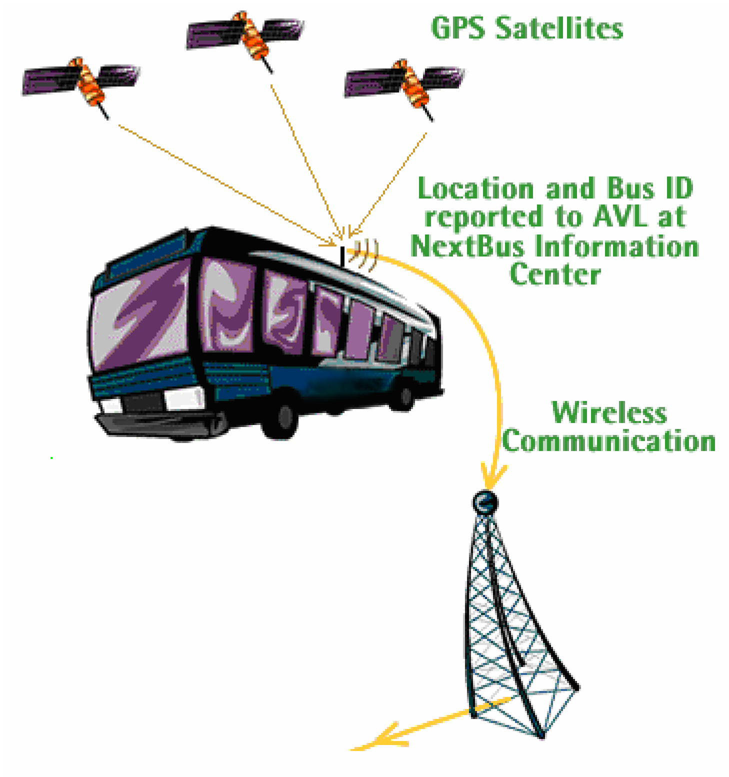
- Reduce the frustration associated with public transit.
- Dramatically lessen exposure to weather and crime.
- Increase the overall reliability of the transit experience.
- Increase personal control over arrival and departure times.
- Alert you when your bus is a certain distance from your home or office.

For transit managers the system will:

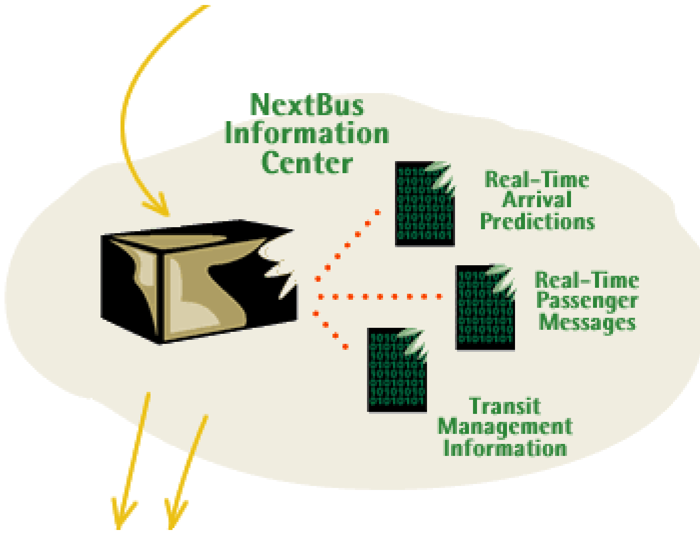
- Increase customer satisfaction by keeping them informed as events occur.
- Increase passenger perception of on-time performance and overall reliability of the system.
- Increase understanding of the system as a whole.
- Provide control over unexpected events in real-time.

How it works

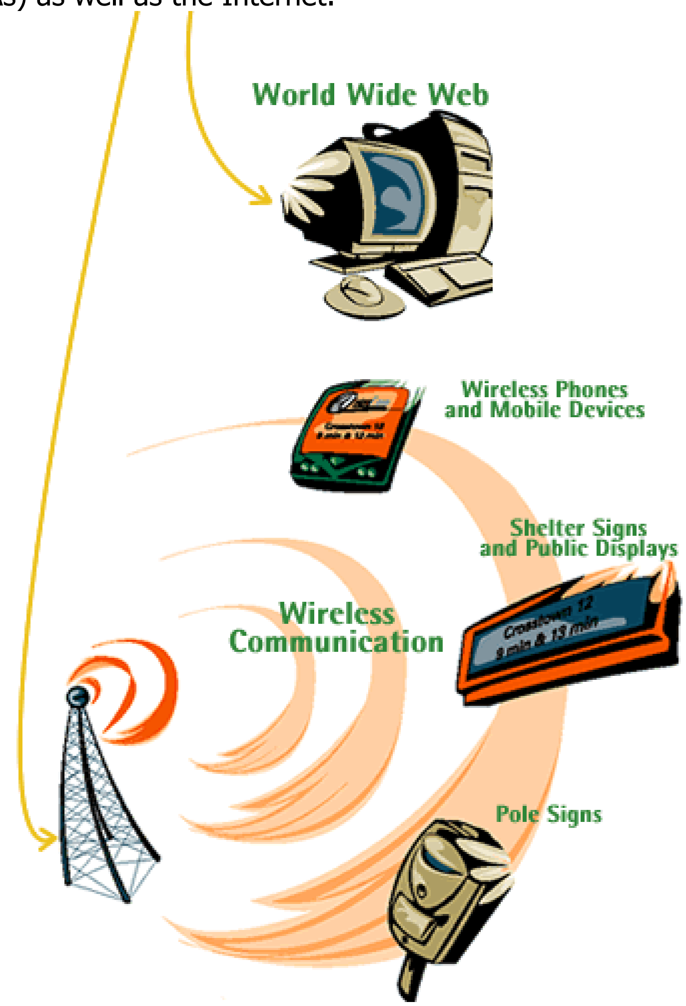
Based on a wireless location tracking system (GPS, wireless device triangulation) the position of all the vehicles are tracked. This information is sent to a central repository, where it will be stored and used to make the predictions.



Taking into account the actual position of the buses, their intended stops, and the typical traffic patterns, the system will estimate vehicle arrival times with a high degree of accuracy. This information is periodically updated.



The predictions are then made available to wireless devices, including signs at bus stops and business, Internet capable cell phones, Palm Pilots, and other Personal Digital Assistants (PDAs) as well as the Internet.



So no matter what the current traffic conditions are anywhere in your bus' (or other public transit system's) route, the user will always has the most current information available.

Future Developments

Proposal

The future proposal of the system will maintain all of the functionality of the system that could be offered today. The main difference will be that this service will be provided using location sensitive content, given the location of both the user and the buses. It's primary market focus will be on medium to large sized cities in which users with WAP enabled devices that will be able to obtain this information.

The revenue model of this service will use location sensitive and context-aware content to provide advertising related to the local area the user is in and the time of day that the service is being accessed. An additional model will be to provide the service bundled to the local provider as an application provider. Other future revenue models are listed as possibilities with the advance of the infrastructure and technology in the U.S.

We would look into a cost reduction by service swapping with the local port authority. We would provide them with location of their buses in exchange for installing our devices in the buses for no fee. More than likely, a fee would probably be able to be charged, as the information gathered would most likely help in the port authority's operational efficiency.

Some considerations that must still be taken into account are how to provide a backward compatible service to users that do not own a WAP enabled device, either by charging for operator assistance or by determining other models that could be developed. The local market should also be examined as a sample market and it should be determined whether deployments in the local area as well as project revenue streams offer a positive net present value.

We also must look into the technical feasibility of the process given the current state of the industry and available technologies, as well as setting realistic timeframes for deployment given the availability of location services provided by wireless providers. In addition to this, the market feasibility must be determined to see if there would be a demand for the service.

Revenue Models

Revenue Model 1

"Subscription Service"

Alternative 1

Concept: This is the most basic revenue model possible. It involves the users subscribing to the service by directly contacting us and paying a predetermined fee for receiving the service.

Pros: This model would simplify the complexity of the transaction, by directly collecting the revenue we will not need to involve any specific system of a third party provider.

Cons: Adding the complexity of extra subscription to providing the service increases the risk of failure to meet revenue expectations. Typical users do not appreciate the extra bills for added services.

Alternative 2
Concept: An alternative to the model is to perform indirect revenue, where the operator provides the billing services and charges a fee for its interaction. This elevates the complexity of the billing since we typically must audit the charges that are made which will require us to adapt to the systems of all operators that provide our services.

Revenue Model 2
"Bundled Service"

Concept: Under the bundling paradigm, we assume that users are interested in not only acquiring our service, but a series of other services provided by other ASP's and operators. Through this model we would obtain standard revenue from the operator, at a flat rate proportional to the number of clients served.

Pros: Increases the probability of acquisition even by clients who would not have otherwise acquired the service. It increases the consumer surplus by offering a reduced price and would provide a more consistent user base.

Cons: Under this model, developing a brand identity will be hard and customers will know the service as provided by the operator but it will not give our company brand recognition.

Revenue Model 3
"Charge advertising fees"

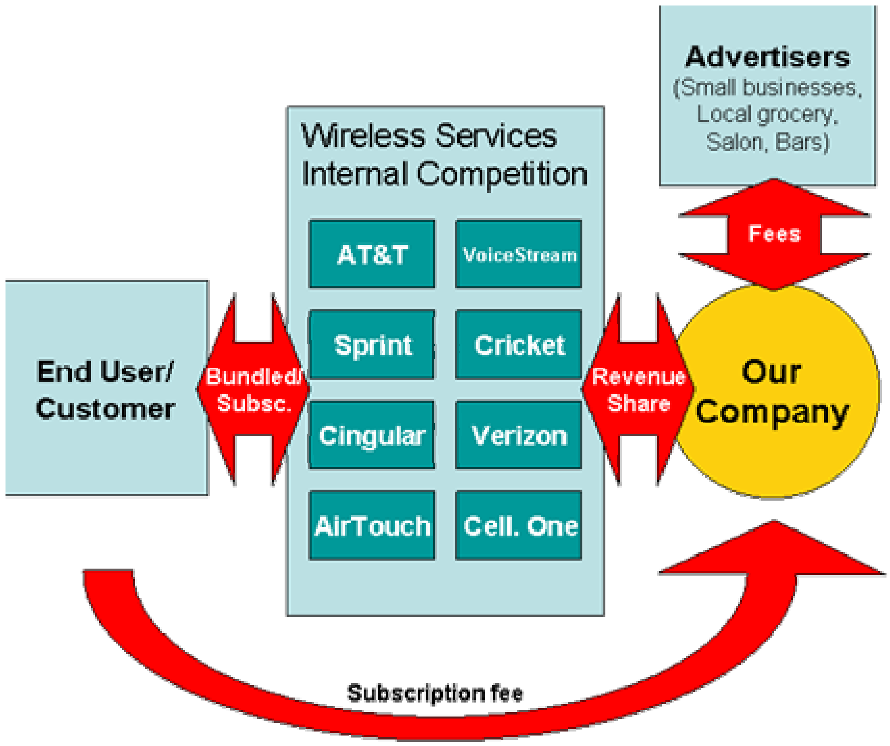
Concept: As a way to reduce the fees we must charge the customer or to make the service free of charge altogether, we could charge local advertisers for location sensitive advertising that can easily hit a highly focused market. In this case we not only have the user's profile, but his or her location. With this information we can leverage the knowledge as a revenue-generating alternative.

Pros: This model represents an innovation in comparison with existing Internet advertising models, it adds the location advantage that in the general the Internet model does not know. This will enable small local advertisers to benefit from this service.

Cons: The Internet era taught us a lesson on relying on advertisement as a sole source of revenue. Television is another clear example of relying to heavily on advertising. It must always be accompanied by another steady stream of revenues to be feasible. It must also offer the customer a value added proposition such as coupons and discounts for replying or "clicking through" the advertisement.

Optimum Model

An optimum model for streaming revenues will rely on a combination of the generic models shown above, to allow increased revenue and reduced variance. We must also use the growing breadth of services offered in 3G to update our revenue model constantly and be a highly elastic company in our finances.



This model considers a standard unlimited access account that would also provide for alarms and other basic services. It will take advantage of the pushing of the bundled service by the operators, the added revenue from advertisement and the sale of additional services directly to customers who might belong to operators, which do no bundle our service.

Technical Feasibility

Given the development of wireless services today, and the changes we will see in the near future, our service must provide gradual migration that allow us not only to provide services to customers who will have 3G but to the of the vast base of 2G and 2.5G users that will persist.

Current State of Technology

With today's technology, we can only provide a limited set of services, given the limited interactivity of handsets and location knowledge that the operator has. The basic model that could be implemented and is implemented today is the use of SMS to provide alerts at preset times, or as a response to a phone call to a given number. By using caller-id and simple SMS we can provide a rather complete and robust service that provides a minimal interactive and time sensitive service to our clients.

Market Feasibility

The market feasibility of this project is very high. There are already companies such as NextBus (www.nextbus.com) providing primitive versions of what our service will do. The growth in penetration of mobile communications, as well as the drop in prices to access new services will lead to a large potential market. [10]

Our greatest challenge will be branding our service. According to a research paper from INSEAD [9] opportunities in this industry in the future will not lie only on the technology, but in great part on the branding efforts conducted towards the service. If we wish to brand directly to the end-user we must be ready to face a harsh an costly battle for name recognition in the industry.

Deployment Strategy

Given the technological and regulation limitations that bound the business opportunity we will need to do a staged evolution of our business model to adapt to the changes. Our strategy will consist of a three phase roll-out in which timing is critical to the success of our project.

Pittsburgh Port Authority

Key Statistics [5]

Buses	1,000
Average Daily Passengers	258,000
Transit Stops	17,500
Transit Shelters and Stations	350

Phase 1
The first phase of the deployment will be to negotiate a service agreement with the local Port Authority and begin a planning phase for the installation of the devices on the buses. It will also be important to establish what information the Port Authority management wants to be accessible via the Internet site. Once this agreement of information tracking is established the web site can be designed.

It will also require the placement of signs at key bus-stops that provide pertinent information to users, these will be installed in only 1000 of the 17,500 bus stops in the city for purpose of educating our customers.

Phase 2
The second phase of the deployment will be to get the GPS tracking system installed on a select number of buses and routes so that the system can be calibrated and tested to see if it produces accurate results. The web site can then be launched and made accessible to the management of the Port Authority so that they can also view the information as well.

An additional option for phase 2 is to limit the number of buses that you install the GPS system on initially and offer the system as soon as possible to the end consumer at that time. This may be useful to see if the service is viable as far as the number of users, and whether or not it is profitable. After profitability and user response is gauged, the service could be expanded.

Once a high level of accuracy is achieved and the service has been properly marketed and promoted, the GPS system can be deployed as a fully functioning service for a larger line of buses, and then it can be eventually installed on all of the buses.

Phase 3
The third phase of deployment will consist of the service being marketed to the end consumer based on its initial functionality as far as the number of buses and lines that are provided by the service. Advertising and promotion via local news stations, newspapers, and Port Authority promotions of the service will facilitate this marketing. It will also be important for the web site to be promoted, as this will facilitate familiarity with the way the system works.

Financial Projections and Operational Costs

Future revenue expectations are still somewhat vague, the constant delays in the development of regulation to enable location sensitive services. Revenue expectations will be subject on our ability to provide newer and more complex forms of the service in a simpler and almost effortless format. Here presented are Cash Flow figures for the first stage of deployment considering a one city deployment in the Greater Pittsburgh Area:

Financial Projections

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	240,000	960,000	1,920,000	2,400,000	2,880,000
Operating Costs	994,920	1,035,080	1,081,960	1,115,400	1,148,840
Gross Profit	-754,920	-75,080	838,040	1,284,600	1,731,160
Assets	1,170,000	1,170,000	1,170,000	1,170,000	1,170,000
Debt	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000

Annual Operating Cost Breakdown

Utilities	4,800	4,800	4,800	4,800	4,800
Phone	1,800	1,800	1,800	1,800	1,800
Office Expense	3,600	3,600	3,600	3,600	3,600
Manager	260,000	260,000	260,000	260,000	260,000
Rent	30,000	30,000	30,000	30,000	30,000
Equipment leases	12,000	12,000	12,000	12,000	12,000
Taxes	3,120	12,480	24,960	31,200	37,440
Insurance	2,400	9,600	19,200	24,000	28,800
Advertising	100,000	120,000	140,000	160,000	180,000
Telecom (GPRS)	576,000	576,000	576,000	576,000	576,000
Miscellaneous	1,200	4,800	9,600	12,000	14,400
TOTAL	**994,920**	**1,035,080**	**1,081,960**	**1,115,400**	**1,148,840**

Technical Costs

The primary components of the GPS tracking system are [1]:

1. a GPS receiver, with power and a data connection.
2. a communication device, such as a cell phone, wireless device, radio or satellite transmitter. (Sometimes items 1 & 2 are integrated into a single device)
3. a communication service for the device.
4. an on-line tracking service or centralized tracking software.

GPS Receiver

There are a number of GPS receiver (some of them also include other services like two way messaging, etc) commercially available. Some work with geostationary systems around the world. Some products are dual-mode, switching between terrestrial data and satellite networks depending on availability and/or cost. Other units work only with the designated satellite system. None of the terminals is interoperable among different satellite systems. Because the manufacturers of the different devices offer data services, software must be compatible with the software in use by the customer. One doesn't simply buy an off-the-shelf data unit, plug it in and drive off. The unit has to fit within the information infrastructure of the corporate customer, and so strictly speaking, it is not possible to do a straight comparison of products and services. Prices of course vary depending on the number of units purchased, service desired, region etc. but it can be estimated that for the type of service required for bus tracking the device cost will be between $ 600 and $ 1200. [2] For Pittsburgh PAT fleet (1000 buses [5]) this adds to less than $1,200,000. The assumed cost for the whole Pittsburgh PAT fleet would be $900,000.

Communication Device

For the purposes of bus tracking the best alternative would be to look for GPS receivers that have an integrated communication device. Many of the options commercially available [2] [3] already provide this integration and were considered when estimating the price.

Communication Service

The cost associated with the communication services used to transfer the position of the buses, unlike the GPS receiver and communication devices cost, are recurrent costs that our company will incur on monthly basis. To estimate this cost, we used the service provided by VoiceStream, as it is the only Packet-Switched wireless network for the US for which we found available data.

The estimated monthly cost of communication traffic for a buses fleet like the one find in Pittsburgh is $ 48,000 – for position update every minute -.

The following model was created to estimate this cost:

Position update rate (minutes)	1		
Bus daily running time (hrs)	16		
Bus daily updates	960		
Message size (bytes)	1000	1	KB
Daily traffic (bytes)	960000		
Bus monthly running time (days)	25		
Monthly traffic	24000000	**24**	**MB**

VoiceStream traffic cost ($/MB) [4]	4
Estimated wholesale price ($/MB)	2
Estimated monthly traffic cost for 1 bus ($)	48
Pittsburgh PAT fleet (# of buses) [5]	1000
Fleet traffic Cost ($/month)	**48000**

Software Development

The last component of the tracking system is the software that provides the services to the users, either through their phones or the web. The cost associated with this component has a large initial cost and a smaller ongoing cost for maintenance.

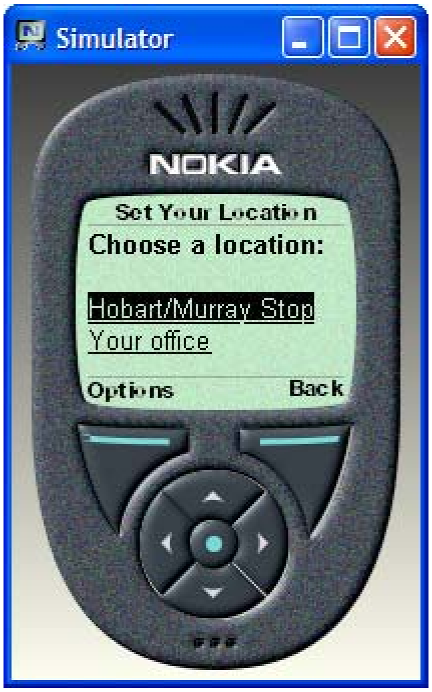
Initial Development		
DB development	(developers/month)	2
Position information transmission	(men/month)	3
Application development for XML generation	(men/month)	3
XSLT development for HTML/WML generation	(men/month)	1
Integration	(men/month)	1
Testing	(men/month)	2
Total		12
Men cost (hr)		75
Men/month cost - 160 hr/month ($)		12000
Initial Development cost		144000
Web server licence -Websphere ($) [6]		755
DBMS licence ($/year/processor) [7]		300
Server/Hardware [8]		316

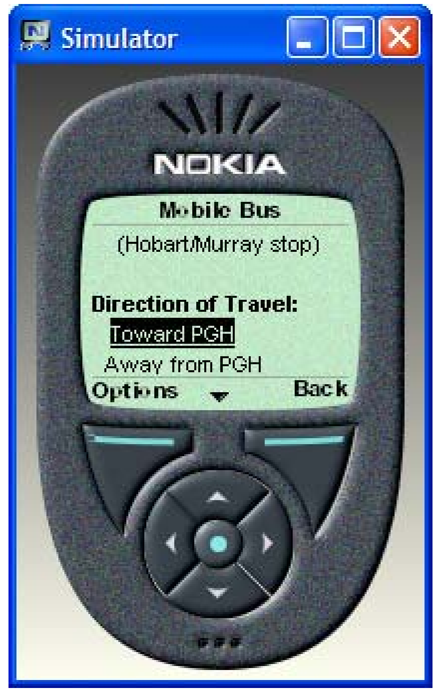
Risks and Contingencies

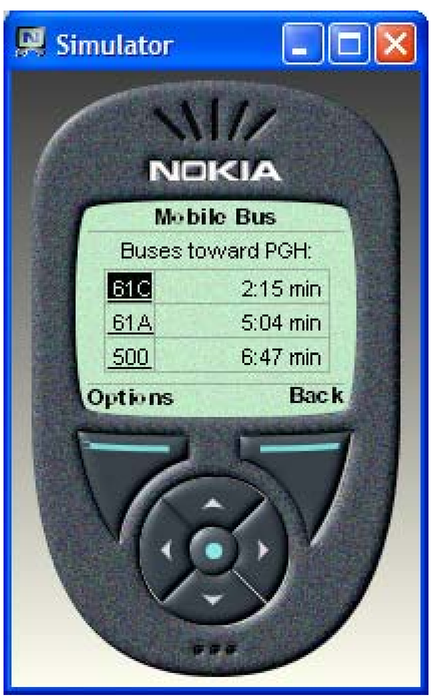
- Legal issues related to patents held by NextBus might represent a threat of entry for our service.
- Our services, as well as the speed at which we can roll them out depend highly on the roll out speed of the independent operators.
- We might not manage to attract enough advertising revenue to make it a viable model.
- The complexity of collecting revenue from very small businesses for advertisement may represent a challenge in volume.
- We might face intensive competition from existing providers such as NextBus and may not be able to push our service.
- We might be unable to develop a strong brand identity, which would strongly sever our growth.

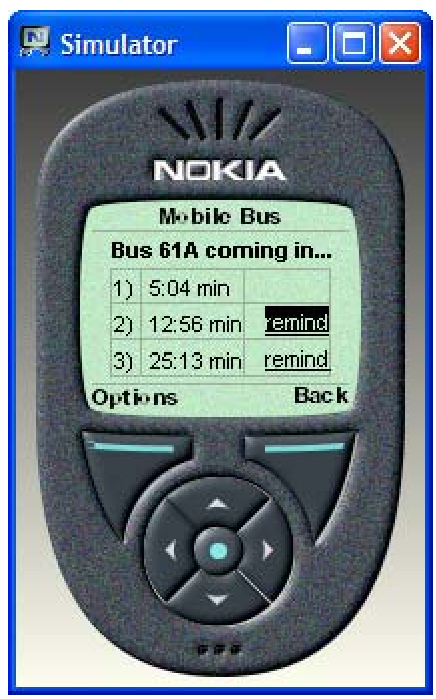
Appendix A

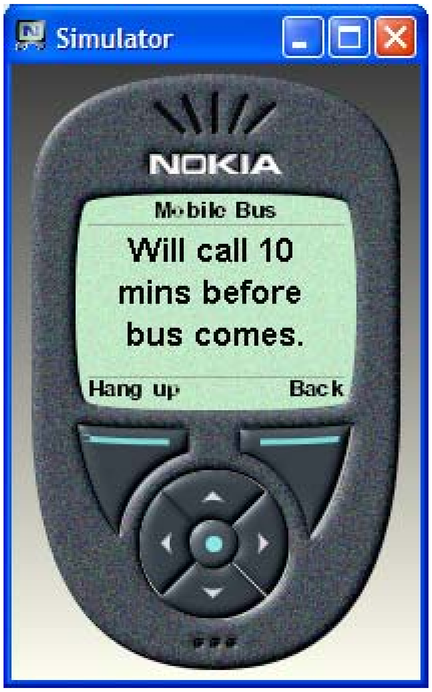
(System Screenshots)

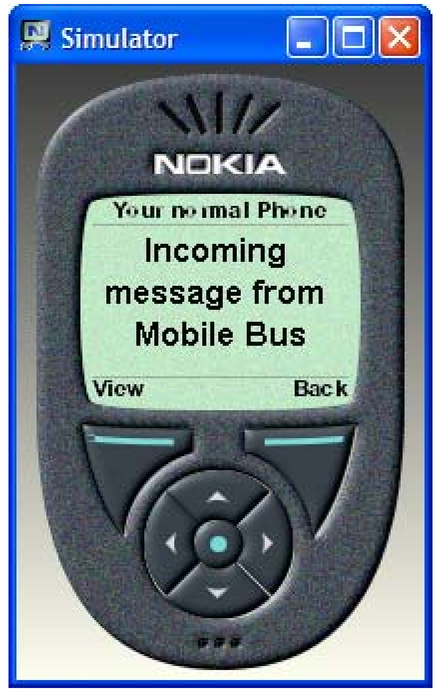


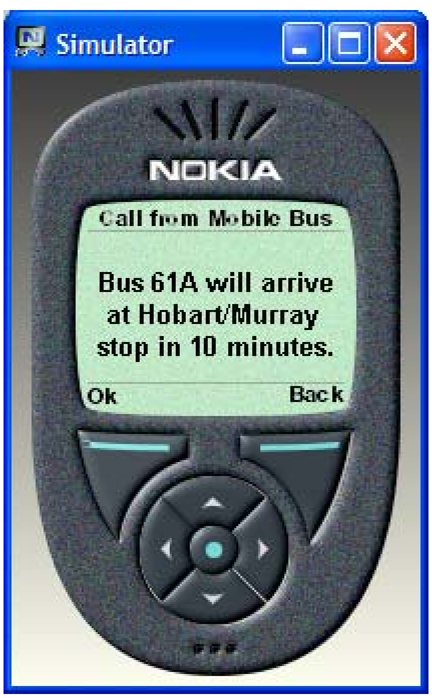


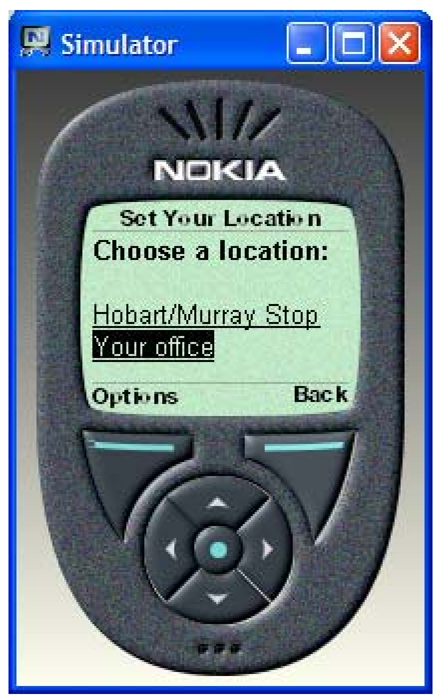


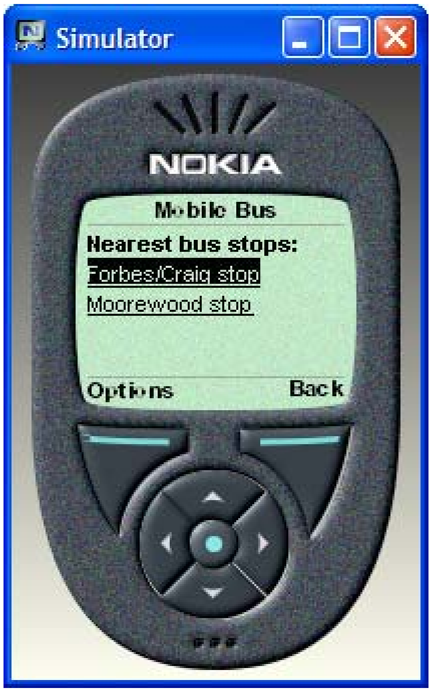


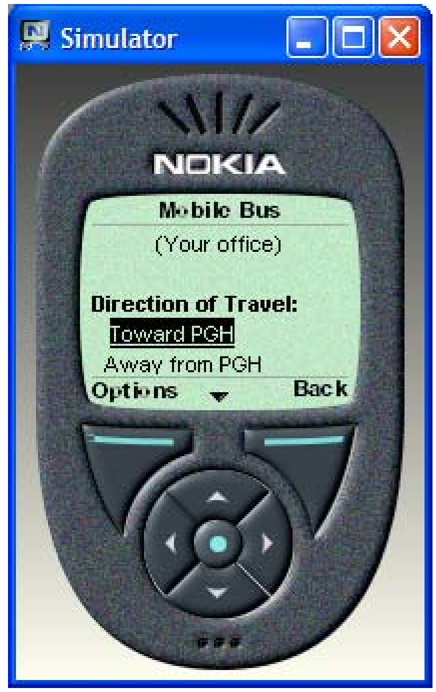

Simulator
NOKIA
Mobile Bus
Will call 10 mins before bus comes.
Hang up
Back

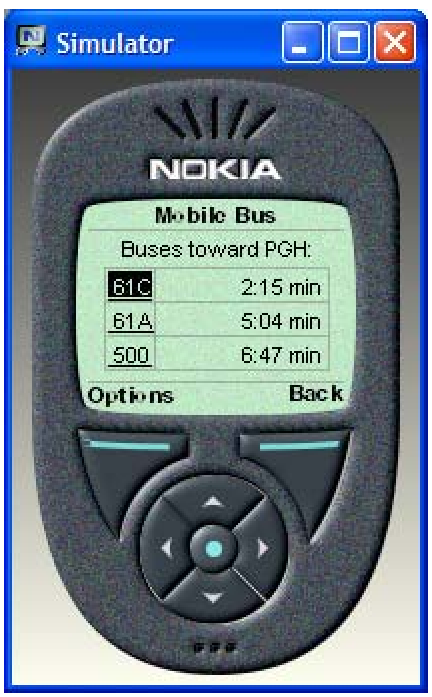

Simulator
NOKIA
Your normal Phone
Incoming message from Mobile Bus
View
Back

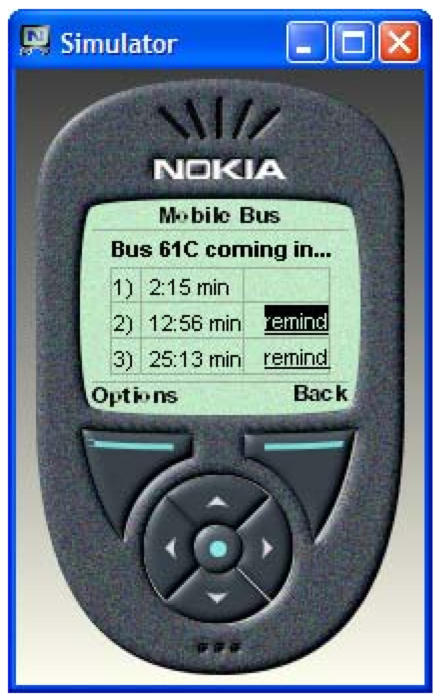

Simulator
NOKIA
Call from Mobile Bus
Bus 61A will arrive at Hobart/Murray stop in 10 minutes.
Ok
Back


Simulator
NOKIA
Set Your Location
Choose a location:
Hobart/Murray Stop
Your office
Options
Back


Simulator
NOKIA
Mobile Bus
Nearest bus stops:
Forbes/Craig stop
Moorewood stop
Options
Back


Simulator
NOKIA
Mobile Bus
(Your office)
Direction of Travel:
Toward PGH
Away from PGH
Options
Back


Simulator
NOKIA
Mobile Bus
Buses toward PGH:
61C 2:15 min
61A 5:04 min
500 6:47 min
Options
Back


Simulator
NOKIA
Mobile Bus
Bus 61C coming in...
1) 2:15 min
2) 12:56 min remind
3) 25:13 min remind
Options
Back

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[4] VoiceStream, http://www.voicestream.com/products/services/istream/rateplan.asp

[5] Pittsburgh Port Authority, http://www.portauthority.org/grow/stats.asp

[6] IBM, http://www-3.ibm.com/software/info1/websphere/index.jsp?tab=highlights

[7] Oracle, https://oraclestore.oracle.com/OA_HTML/ibeCCtpSctDspRte.jsp?section=10166

[8] Dell, http://www.dell.com/us/en/esg/topics/segtopic_servers_server_main.htm

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[10] NextBus Information Systems, www.nextbus.com, Accessed on: February 8th, 2002.

[11] Mobile Commerce: Technologies, Services and Business Models, Norman Sadeh, Wiley, 2002

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