

Trends by Market Segment

Figure 6 presents the demand trends for the U.S. wireless DA market, split out by segment.

FIGURE 6

Total Wireless Directory Assistance Services Market: Total Market Demand by Service (U.S.)
1997-2007

Year	DLDA Volume (Million)	VPDA Volume (Million)	Total Volume (Million)	Total Volume Growth Rate (%)
1997	543.1	---	543.1	---
1998	600.0	---	600.0	10.5
1999	669.5	---	669.5	11.6
2000	752.5	1.3	735.8	12.6
2001	800.7	52.6	853.3	13.2
2002	834.9	136.2	971.1	13.8
2003	824.5	271.7	1096.2	12.9
2004	822.4	410.5	1232.9	12.5
2005	762.4	612.9	1375.3	11.6
2006	713.9	805.8	1519.7	10.5
2007	693.5	978.2	1671.7	10.0

Compound Annual Growth Rate (2000-2007): 12.1%

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Direct listing DA volume is by call and voice portal DA volume by listing access. While this may seem to be an incompatible comparison, revenues accounted for in the report demand this treatment. Direct listing access is charged for by call and is the primary revenue driver. Revenue from wireless minute usage to access the call is secondary. But, the main revenue stream from voice portal access is minute usage. Also, a call to a voice portal may include accessing many different services, including DA. Therefore, the listing access - not calls - was required as a unit for volume. The most important element to understand when interpreting the data in figure 6 is that direct listing DA calls include multiple listing requests approximately 6 percent of the time. Voice portal listing access is always for one listing.

Figure 7 presents a percentage split of wireless DA volume by product type.

FIGURE 7

Total Wireless Directory Assistance Services Market: Percent of Volume by Product Type (U.S.), 2000-2007

Year	Direct Listing DA (%)	Voice Portal DA (%)
2000	99.8	0.2
2001	93.8	6.2
2002	86.0	14.0
2003	75.2	24.8
2004	66.7	33.3
2005	55.4	44.6
2006	47.0	53.0
2007	41.5	58.5

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

In 2000, the wireless DA services market in the U.S. was dominated by direct listing DA, with 99.8 percent of the market. Voice portal use in the wireless market is expected to grow rapidly, however. This will drive voice portal DA volume significantly. By 2003, voice portal DA will account for nearly 25 percent of the market. While voice portal DA listings will continue to be less accurate than direct listing DA, the cost savings to the end user will more than compensate for this deficiency for many consumers. Also, since DA is one service in a bundle offered by voice portals, end users are likely to use voice portal DA habitually. This will be a major change in consumer behavior. Currently, dialing 411 or 555-1212 is a habitual use of DA services in the wireless market. Voice portals will need to break this habitual use to gain DA market share.

Voice Interface Technology Trends

AUTOMATED SPEECH RECOGNITION (ASR)

Automating customer service and other call center functions has been the "killer application" of speech recognition to date. Speech recognition allows automating functions (thought to require agents, and hang-ups and also drastically?) reduces defaults to agents when touch-tone Interactive Voice Response (IVR) systems have speech-enabled alternatives. The payoffs are so clear that some companies reclaim their initial investment in months. In addition to reducing costs, speech recognition can help consolidate call centers by routing calls to appro-

appropriate centers based on customer requests--avoiding the need for a customer to try one toll-free number after another. Some major advantages are:

- Scalable, fault tolerant architecture (resource manager assigns recognition requests to a server farm)
- Natural language and algorithmic techniques such as confidence scoring (so caller does not have to repeat everything, only the piece that was misunderstood)
- Probability assignment to listings within grammar (good for most frequently requested business listings for a particular geographic area)
- Dynamic grammar (which allows the caller to distinguish from eight John Smiths in City, State)
- Noise reduction improvements in wireless environments to prevent false barge-ins and cancel out ambient noise

Other advantages include consistent treatment of customers and adding up-selling features without increasing agent costs.

One of the reasons ASR is making such waves is because people can receive their information quickly and efficiently, regardless of the time of day. Another satisfaction driver for DA was said to be accuracy of listings due to elimination of human error. Dateline aired a story on how "inaccurate" operators were, 34 percent of calls to AT&T "00 Info" resulted in operator error at an annual cost of \$300 million to consumers.

VOICE USER INTERFACE DESIGN

Directory assistance at the neighborhood, city, or national level--either to reach a person, a specific business, or to find a business by category--often results in a wrong listing. Telephone speech recognition can convert this problem into a solution. Directories from tens to millions of names can be handled with the caller simply speaking the name and possible supporting information, such as department or city. Business directories can provide a choice of companies by category. Telephone speech recognition can handle requests for information, such as driving directions, or direct calls by function. The full utilization of the telephony Voice user Interface (VUI) in answering calls results in a corporate voice portal and treats every caller as a potential customer.

TEXT TO SPEECH (TTS)

TTS is used for less frequently requested listings. Once information is accessed, it needs to be communicated to the user. One way to do this is via TTS. TTS is increasingly being used to speak e-mail and Web-based text to callers and will play a wider role in the future.

Technology - Market Impact

LOCATOR SERVICES

There exists an almost convergent connection between location-based services and the current wireless carrier 411-directory infrastructure, which already handles more than a billion voice calls each year. Consumers today understand the connection between safety, convenience, and voice. This suggests that wireless directory assistance providers are the best-positioned gateway to location-based services, and consumers expect them to deliver and bill for these applications.

A new technology enables network operators and portals to provide the consumer with value-added location-based services direct to their phones, WAP, and web-enabled devices. At the foundation of the platform is a patent-pending location engine that references content based on street blocks cross streets, addresses, postal codes, telephone area codes, prefix data, and area definitions across North America.

The intention is for carriers and portals to apply their business listings, landmarks, and brand preferences to the location engine to give their content a geographic context. This content can be classified in any way the customer wants and is scalable to take thousands of classifications and millions of business listings. The resulting platform allows users to locate businesses and services in any area or place, such as along a specific street or within a radius of a given location.

Allowing network operators to augment directory assistance into strong revenue centers will entrench them further in the value chain. This new product is an automated assistance function that will allow operators to gain new revenues in delivering location-based services that are relevant to consumers. This service will help consumers save both time and money by having instant access to information on products and services that are relevant to them, anytime and anywhere. With one single call, consumers can research goods and services and make price comparisons. The platform gives the search a geographic context, helping them to locate the store they looked up. The service can put callers through to a retail outlet of choice, without having them look up a number and re-dial.

With the public split on the type of payment plan they would prefer for location-based services, location services providers would likely benefit from offering a variety of pricing plans. Among those interested in location services, 49 percent report a preference for a plan that charged a nominal flat fee (\$1.50) for each use, compared to 46 percent who preferred to pay a single monthly service fee of approximately \$10. Will millions of Americans be saying, "Have your store call my cell phone" within a few years?

Currently, MapQuest supplies driving directions to augment wireless directory assistance. Through Sprint's Wireless Web service, Go2 Systems offers merchant directories that can be accessed using proximity criteria. Geoworks lets Web users sign up for promotions sent

wirelessly by the likes of Starbucks coffee shops and Virgin Megastore music retailers, and ImpulseSale.com has a similar capability. IQorder.com is rolling out a mobile comparison-shopping portal. And voice recognition technologies can connect a patron to a restaurant after guiding her selection.

There is tremendous market potential for wireless location-based services. The number of Americans who use or are interested in location-based services is significantly larger than the percentages associated with wireless Internet access, wireless email, or wireless information services, there is considerable consumer 'traction,' and perceived value for these new services. Revenue models often mentioned for location services include an extra monthly charge, per-transaction fees, premium billing for high-value services such as turn-by-turn driving directions, and advertising revenue to defray expenses. Customers clearly see motor clubs and wireless carriers as the most logical providers of location-based services. When asked which organizations are best suited to offer location-based services, nearly half chose motor clubs, while one-third chose wireless service providers. Fewer than 10 percent chose any other option, including Internet service providers (8 percent), insurance companies (6 percent), or home security companies (5 percent).

VOICE RECOGNITION

Consumers are expressing a clear preference for voice commands, voice recognition, or a live operator from whom to request and receive location-based information. This trend underscores recent market and regulatory demand for "heads-up, hands-off" wireless equipment for both portable and automobile applications. Consumers also indicate that they are interested in both automobile-based and portable options, not an "either/or" solution.

Voice interface is a key to wireless DA and automation is the key to profitability. Wireless users tend to be more comfortable with automated interfaces, particularly if the service is less expensive than live operator services. These factors will make voice interface a major market force in wireless DA.

Pricing Trends

Figure 8 presents the average wireless price per minute for DA access.

Frost & Sullivan used calling patterns specific for DA access, top five market participant's calling plans, and market shares to determine the average price per minute for DA access. This included estimating the use of voice portal and direct listing DA during night and weekend plan time where calling is unlimited or at a high plan amount.

FIGURE 8

Total Wireless Directory Assistance Services Market: Wireless Price Per Minute (U.S.), 1997-2007

Year	Price per Minute	PPM
	(\$)	Growth Rate (%)
1997	0.079	---
1998	0.072	(9.1)
1999	0.065	(9.1)
2000	0.060	(7.4)
2001	0.058	(3.0)
2002	0.056	(5.0)
2003	0.052	(6.0)
2004	0.049	(6.0)
2005	0.046	(6.0)
2006	0.044	(5.0)
2007	0.042	(5.0)
Compound Annual Growth Rate (2000-2007): (4.97)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Declining average price per minute is a significant restraint on the potential revenue growth in the wireless DA market. In 2000, the average price per minute for DA access was 6 cents. This is expected to decline to 4.2 cents by 2007; a compound annual growth rate of negative 4.97 percent.

Competitive Structure

As a result of deregulation, new radio frequency spectrum licenses, privatization, and rapid network expansion by new entrants, the competitive environment among network operators has become intense. Efforts to attract and retain subscribers have resulted in significant price-based competition. Increased competition has, in turn, raised the costs associated with acquiring new subscribers, lowered average revenues per subscriber, and increased the propensity of subscribers to switch from one network operator to another. For these reasons, network operators are looking for new revenue sources in the form of value-added services they can deliver to their wireless subscribers. They are also looking for ways to differentiate their product offerings in an effort to retain customers.

Finally, they are focused upon finding and deploying solutions that enable them to deliver and support their services in a more cost-effective manner.

Historically, the wireless service providers could offer number listing service only. Lately, this trend is beginning to shift as the wireless carriers began offering call completion services. The offering of call completion services will greatly increase the wireless directory assistance revenues as it provides convenience to the mobile customers in the sense that they would not have to first memorize or write the number and then initiate another call while driving. The added flexibility of call completion services will result in the generation of incremental directory assistance revenues for the wireless service providers.

Current offerings include a set of fully automated and operator-assisted information service subsystems that can be implemented independently or in concert with:

- Directory Assistance - provides traditional telephone listing information to callers
- Intercept - redirects callers who dial a changed, disconnected, or unassigned telephone number
- Toll and Assist - an enhanced service which provides billing and other calling assistance
- Automated Call Completion - automatically connects callers to the desired telephone number
- Message Delivery - allows callers to leave a message regardless of the status of the called party's telephone
- Enhanced Information Services - provides Custom DA, Custom Intercept, Operator Assisted Yellow Pages, and other services that capitalize on delivery of highly customized information
- Service Creation Tool Kit - a Graphical User Interface (GUI) enabling quick development and deployment of new, value-added applications

With customized workstation options, operators can enjoy the user-friendly environment and ease with which they can find information. And with options including speech recognition and fax integration, callers realize immediate response to their requests through an effective combination of live and automated operators.

The prize is customer satisfaction. Carriers are not looking to make money on long calls, but satisfied callers will use the service more often, so much so that 30 to 50 percent of calls include an inquiry in addition to a phone number request.

Competition in the provision of operator services and directory assistance in the wireless arena has existed almost since divestiture. Such competition has accelerated in the directory assistance market as a result of the Supreme Court's decision to allow copying of carriers' white pages listings in their entirety.

According to SBC, more than 30 CLECs presently provide their own OS/DA services or resell the services of non-incumbent LECs. In Bell Atlantic's region, only 70 out of 400 interconnection agreements require Bell Atlantic to provide OS/DA as an unbundled network element. Thus, in more than 80 percent of Bell Atlantic's interconnection arrangements, CLECs have chosen to provide OS/DA for themselves or to obtain such service from wholesale providers. Rural ILECs have obtained OS/DA services from outside sources for many years because they find third-party sources to be cost-effective. In addition, Bell Atlantic reports that its wireless affiliate, Bell Atlantic Mobile, relies on a third party OS/DA provider.

CLECs can purchase OS/DA from a number of vendors offering cost-effective nationwide alternatives to those of the ILECs. Even requesting carriers advocating the unbundling of operator and directory assistance services acknowledge that there exists a substantial number of alternative providers of operator and directory assistance services.

For example, AT&T, MCI WorldCom, and Sprint have already established national operator services via toll-free numbers. McLeod USA self-provisions nationwide directory assistance service. Cox and Omnipoint obtain OS/DA service from Teltrust, and WinStar obtains these services from Frontier. Requesting carriers may also obtain OS/DA services and directory listings from numerous wholesale providers, including CenturyTel Telecommunications, Clifton Forge, Consolidated Communications, Excell, Experian's TEC Group, Frontier, HebCom, InfoNXX, Metro One, Quest 411, and Teltrust.

It appears that this increasing availability of competitive DA providers coincides with a decrease in ILEC DA call volumes. This trend, combined with the number of alternative operator services and directory assistance providers outside the ILECs' networks, strongly suggests that requesting carriers are not impaired by lack of access to the ILECs' DA service.

Significantly, the existence of multiple alternative providers of DA service in the marketplace, coupled with evidence of competitors' decreasing reliance on incumbent DA services, demonstrates that requesting carriers' ability to provide the services it seeks to offer does not diminish without access to the incumbent's DA service on an unbundled basis.

The costs associated with self-provisioning DA include:

- The cost of the facility, including employees, real estate, computers
- The cost of transporting traffic to the facilities
- The cost of obtaining the underlying subscriber information contained in DA databases

In some situations, however, depending on the type of DA service a requesting carrier seeks to provide, DA service may be more expensive if it is purchased from third-party providers than it would be if purchased from the incumbent. Although such differences will not materially diminish a requesting carrier's ability to provide local exchange or exchange access service.

In light of the number of alternative providers currently providing DA service and the competitive market that is developing for long distance transport, incumbents do not have any particular advantage in obtaining the facilities needed to create a call center, including employees, real estate, and computers. In addition, unlike many other network elements, such as switching or transport, the ability to provide a nationwide DA service does not require large amounts of sunk and fixed costs in facilities that must be deployed ubiquitously in order to serve a broad customer base. Rather, a requesting carrier can establish one call center or a few regional centers to which it can transport all of the calls on its network and provide DA service nationwide. Moreover, a CLEC or a group of CLECs can achieve economies of scale by aggregating demand for DA services over various regions by processing them through a single call center.

For telecommunications carriers such as the RBOCs, the declining growth rates in wireline local DA is forcing them to look elsewhere for revenue growth. Consequently, the RBOCs are offering wholesale and retail directory assistance to their wireless customers. The higher charges for wireless DA present these service providers with greater margins and hence an attraction to enter the market.

The key factors needed to be successful in the market are:

Market Penetration and Size

The greater the market penetration the greater the share. The greater the share the more effective the competitor can then be. Share is dependent upon brand recognition. Thus a large entrant with a widely-known brand will tend to have a better share.

Operating Efficiency

The ability to provide a national infrastructure of such services as network management, billing, roaming, and customer service pertaining to DA will allow for a lower set of operating costs per customer, and possibly even operating costs on a marginal rather than average basis. This will dramatically change cash flow.

Cost to Acquire Customers

The issue of brand reflects not only the revenue element but also the cost element of acquiring a new customer.

Figure 4 outlines the competitive structure existing within the U.S. wireless directory assistance services market.

DIRECT LISTING DA

Introduction and Definitions

INTRODUCTION

The direct listing DA market has had several major changes in the last five to ten years after decades where the market had very little change. First, the major IXCs introduced national DA services and started to promote them heavily. Second, voice recognition and automated systems have decreased the need for a physical operator for many DA calls and reduced the time per call for those carriers that still provide live operators on every DA call.

The Internet has also impacted the DA market. If a listing was not in a paper directory that may be a year out of date, the only option was to call directory assistance. Now consumers can look the number up on the Internet. Wireless data services will also have an increasing effect on direct listing DA growth.

DEFINITIONS

DA Calls

A DA call consists of one unit of service defined by the service provider, excluding enhanced services. For some DA service providers, this may mean one listing access for a given price. For others, particularly national plans such as AT&T's "oo info" the end user has the option of accessing more than one listing for a given price. This does not mean that all, or most, end users do access multiple listings per call.

Enhanced Services

Enhanced services are defined as any service provided for an additional cost beyond listing access. The most popular enhanced service is call connection. Revenue for call connection, or any enhanced service, is not included in revenues reported in this study.

Key Market Segment Trends

IMPLEMENTATION OF VOICE RECOGNITION TECHNOLOGY TO CUT COSTS

Because of the high volume of calls made to DA every year, the infrastructure and labor costs of providing live operators takes quite a chunk out of a carrier's or DA provider's revenues.

There are so many calls made on DA, and just so much money spent on infrastructure, that every second the phone company saves translates into \$70-\$80 million in savings.

Implementing speech recognition in their DA services allows service providers to offer "multiple flavors" of DA, including call completion and charging a per-minute rate for DA, where a customer could call DA only once and get an infinite amount of numbers, being charged for time rather than having to keep calling the service back for more numbers. The personnel savings is critical for direct listing DA services to compete with voice portal DA and wireless data DA.

USING AUTOMATED SYSTEMS FOR ENHANCED DA SERVICES

Another way in which speech recognition is an attractive option for DA is a low-cost way to offer "enhanced directory services," including movie listings, restaurant, and traffic information or traveling directions. Using live operators for such services currently is cost-prohibitive because DA providers have trouble monitoring and controlling how long operators stay on the phone with those calling in for the service. Enhanced DA with voice recognition is a major trend in the directory assistance market in general, but is critical in the wireless market because of the end-user demand for such services in transient locations.

Revenue Forecast

Figure 9 presents the call revenue forecast for the U.S. direct listing wireless DA services market.

FIGURE 9

Wireless Direct Listing Directory Assistance Market: DA Call Revenue Forecasts (U.S.), 1997-2007

Year	Revenues (\$ Million)	Revenue Growth Rate (%)
1997	359.1	---
1998	390.0	8.6
1999	428.2	9.7
2000	474.1	10.7
2001	496.9	4.8
2002	510.3	2.7
2003	496.9	(2.6)
2004	488.8	(1.6)
2005	447.2	(8.5)
2006	412.9	(7.6)
2007	395.9	(4.1)
Compound Annual Growth Rate (2000-2007): (2.54)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Wireless voice services are the fastest growing sector in the voice telephony industry. Wireless direct listing DA services have benefited from this, resulting in an average growth rate over the last several years which is much higher than wireline DA. In the base year (2000), the market grew at a healthy 10.7 percent, to \$474 million. Growth rates will begin to slip in 2001, as voice portal DA use and wireless data DA begin to substitute for direct listing call volume.

Frost & Sullivan still expects growth in the direct listing wireless DA market until 2003 due to habitual use and low voice portal penetration rates. The market segment revenues are estimated to peak in 2002 at just over \$500 million. At that point the market revenue growth will turn negative. The revenue for the last year of the forecast (2007) is expected to be reduced by over \$100 from the high in 2002.

Figure 10 presents the total revenue forecast for the U.S. direct listing wireless DA services market.

FIGURE 10

Wireless Direct Listing Directory Assistance Market: Total Revenues (U.S.) 1997-2007

Year	DLDA Revenues (\$ Million)	Min Revenues (\$ Million)	Total Revenues (\$ Million)	Total Revenue Growth Rate (%)
1997	359.1	56.1	415.2	---
1998	390.0	54.7	444.7	7.1
1999	428.2	53.9	482.1	8.4
2000	474.1	54.4	528.5	9.6
2001	496.7	54.5	551.4	4.3
2002	510.3	52.4	562.7	2.1
2003	496.9	47.2	544.1	(3.3)
2004	488.7	42.9	531.7	(2.3)
2005	447.2	36.3	483.5	(9.1)
2006	412.9	31.3	444.2	(8.1)
2007	395.9	28.9	424.8	(4.4)

Compound Annual Growth Rate (2000-2007): (3.07)

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

The purpose of figure 10 is to present the total market revenue generated from wireless direct listing services. While the revenue for minutes of usage may not be realized by the same services provider as the provider of the DA service, the total is an important aggregate going forward in the market.

While the revenue from minutes of use are secondary to the DA revenue stream for providing listings, the trend from wireless data and voice portals toward "free" DA information may require a more balanced view of revenue generation in the market. This may mean that some revenue is allocated from the wireless carrier to the DA service provider based on a service contract. The DA services would be used to market the carrier's services. In an increasingly competitive market that is demanding profitability, the carriers may be willing to do some revenue sharing to attract subscribers to existing services rather than depending on future revenue streams from "the next big thing" (i.e. 3G).

Demand Trends and Forecast

Figure 11 presents the wireless direct listing DA unit forecast. The unit for wireless direct listing DA for this study is calls, not listings accessed. One call may include multiple DA listing hits (see "definitions" for further explanation).

FIGURE 11

Wireless Direct Listing Directory Assistance Market: DA Unit Forecasts (U.S.), 1997-2007

Year	Calls (Million)	Revenue Growth Rate (%)
1997	543.1	---
1998	600.0	10.5
1999	669.5	11.6
2000	752.5	12.4
2001	800.7	6.4
2002	834.9	4.3
2003	824.5	(1.2)
2004	822.4	(0.3)
2005	762.4	(7.3)
2006	713.9	(6.4)
2007	693.5	(2.9)
Compound Annual Growth Rate (2000-2007): (1.16)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

In the base year, the number of wireless DA direct listing calls was just over 750 million. This represents a 12.4 percent increase from the previous year. This growth rate is expected to decrease over the forecast period due to service substitution from wireless data and voice portal DA services. However, the habitual use of 411 and 555-1212 to access DA services will continue to be an important factor in sustaining market volume.

The compound annual growth rate for the forecast period (2000-2007) is expected to be a negative 1.16 percent. This is a result of a relative balance between the substitution of direct listing DA by alternative wireless DA sources and the growth rate in wireless use in the U.S. combined with market familiarity with direct listing DA as a legacy from wireline use.

Figure 12 presents the wireless minute usage to access direct listing DA services. Wireless minutes used to access direct listing DA are expected to decline starting in 2003. The primary reason for decline is substitution by voice portal and wireless DA services. In 2002, wireless direct listing volume should approach 1 billion, declining to 693 million by 2007.

FIGURE 12

Wireless Direct Listing Directory Assistance Market: Minute Usage (U.S.) 1997-2007

Year	Volume (Million)	Growth Rate (%)
1997	712.2	---
1998	763.8	7.3
1999	827.5	8.3
2000	903.0	9.1
2001	932.0	3.2
2002	942.6	1.1
2003	903.0	(4.2)
2004	873.7	(3.2)
2005	785.7	(10.1)
2006	713.9	(9.1)
2007	693.5	(2.9)

Compound Annual Growth Rate (2000-2007): (3.70)%

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Price Trends

Figure 13 presents the pricing trends for the direct listing wireless DA services market.

In 2000, the average price per call for wireless direct listing DA services (excluding cost of minutes used) was 63 cents. The market is highly fragmented on the supply side due to regional price caps imposed by various states and the different pricing plans for national DA services. The result is a wide price range in the market from \$0.25 to \$1.75.

Because of price competition from alternative wireless DA sources, Frost & Sullivan expects a gradual decline in direct listing wireless DA services. Increasing use of IVR will lower the costs to the carriers and call centers and allow for lower retail price points while maintaining a reasonable profit margin.

FIGURE 13

Wireless Direct Listing Directory Assistance Market: DA Service Price Forecasts (U.S.),
1997-2007

Year	Price per Call (\$)	Growth Rate (%)
1997	0.661	---
1998	0.650	(1.7)
1999	0.639	(1.6)
2000	0.630	(1.5)
2001	0.621	(1.5)
2002	0.611	(1.5)
2003	0.603	(1.4)
2004	0.594	(1.4)
2005	0.587	(1.3)
2006	0.578	(1.4)
2007	0.571	(1.3)
Compound Annual Growth Rate (2000-2007): (1.4)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

VOICE PORTAL DA

Introduction and Definitions

INTRODUCTION

Voice portal use is expected to increase dramatically over the next five years. Currently, several web portals have instituted voice portal companions. The most prominent is Yahoo! voice portal services. The key with this integration is that voice services are fully integrated with the web based services. This makes customer set-up and marketing much easier than stand-alone voice portal models.

One key service voice portals need to be successful is directory assistance.

DEFINITIONS

Listing Access

Voice portals have many services that can be accessed. For the purposes of this report, Frost & Sullivan has estimated the time an average end user would need to access a listing. Also, the time for accessing a second listing was estimated and a weighted average of the frequency of second DA listings was averaged with all voice portal DA accesses.

For one listing accessed it was assumed that the subscriber was calling in specifically to access the DA services of the voice portal and not accessing the DA services from another service in the voice portal.

Key Market Trends

CONTINUED IMPROVEMENT IN AUTOMATIC SPEECH RECOGNITION (ASR) WILL IMPROVE VOICE PORTAL DA ATTRACTIVENESS TO END USERS

Voice Portal Directory Assistance consists of some very unique requirements--namely the ability to handle extremely large vocabularies, data that is constantly changing, names that sound the same, names originating from foreign origins, callers having different accents, and people having exactly the same names. All these characteristics make the challenge of speech enabling directory assistance services extremely difficult and together create inimitable problems, which can not be solved by traditional speech-recognition technologies.

The deployable solution requires a combination of powerful directory search technology, caller conversation management, and robust speech-recognition capabilities. Direct Listing DA systems use store-and-forward recorded messages backed up by actual agents who listen to the request and send the listing name on to a DA operator once one is available. This is a far cry from the technology that companies such as Nuance are working on, which actually will recognize what the caller is saying and will eliminate the need for a front-end agent.

Applications such as speech-enabled directory assistance represent the progressive sophistication of services being developed and deployed for the rapidly expanding wireless market. Automatic Speech Recognition (ASR) in a Directory Assistance Service stretches the capabilities of the technology to the very end, and most probably beyond its present limits. Once one realizes how large the number of different surnames in a country-wide database is, and once one thinks of the many different ways in which especially business listings can be pronounced, it is evident that complete automation of the voice-only version of the service will probably never be possible. Even human operators occasionally fail to find a number.

NATIONAL CALLING PLANS ENABLE VOICE PORTAL DA

With a regional plan, a call to a voice portal would include long distance charges. This would force voice portal companies to have a local access number for each region or a toll free national number. With the current capital restraints in the market, the cost of either option would be prohibitive. But national wireless calling plans eliminate this problem. Because a wireless call costs the end user the same if they are calling across town or across the country, one centrally located access number can service the entire country effectively.

SUITE OF SERVICES THAT VOICE PORTALS HAVE ATTRACTS END USERS

DA offerings are just one of many voice-driven services in a voice portal that charges a flat-access fee (Qwest and Lycos both charge \$4.95 for their voice portal services using speech recognition.) Voice portal services are relatively straightforward to deploy and offer many opportunities to carve out a singular niche in the market. Every service provider wants to be the next Yahoo! or America Online, and voice offers service providers an incredible opportunity to expand their user base and differentiate themselves from their competition. At the same time, existing portal and Web site operators have huge databases and can support telephone applications with minimal investment. And the business models that drive the success of the Web "advertising driven, rather than fee driven" can be adapted easily to Internet access via the telephone.

COST OF VOICE PLATFORM IS DECREASING

ASR is making dramatic advances, powered in large measure by huge increases in processing power. Text-to-speech (TTS) technology has also improved. The adoption of a standard voice-scripting language, such as voice extensible markup language (VXML), can be expected to fuel voice portal services, just as hypertext markup language (HTML) fueled development of the Internet.

The cost of creating a speech-based portal platform continues to decline. Increasing densities and decreasing costs on the voice processing and network interface hardware that form a central part of a voice portal system allow service providers to serve more users at less cost.

THE INTERNET HAD RAISED CONSUMER DEMAND FOR BUNDLED INFORMATION SOURCES

Finally, the Internet has raised public expectations, with people growing used to having information at their fingertips when they want it. Once people get accustomed to immediate news, weather reports, movie listings, or stock quotes over the Internet, the transition to the phone makes perfect sense.

Revenue Forecast

Figure 14 presents the revenue forecast for the wireless voice portal DA market segment. Revenue for this market segment are from minute usage only. Due to variations in revenue models in the market and the need to compare voice portal DA to direct listing DA in the wireless industry, other revenue streams are not included.

FIGURE 14

Wireless Voice Portal Directory Assistance Market: Revenue Forecasts (U.S.) 2000-2007

Year	Revenues (Million)	Revenue Growth Rate (%)
1997	---	---
1998	---	---
1999	---	---
2000	0.2	---
2001	7.7	3776.6
2002	18.2	136.1
2003	34.1	87.5
2004	46.4	36.1
2005	65.1	40.3
2006	77.7	19.5
2007	89.6	15.3

Compound Annual Growth Rate (2001-2007): 50.53%

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Voice portal DA services are in their infancy. The \$200,000 revenue in the base year (2000) reflects this fact. Some of the major voice portal services did not have a substantial DA service. There are several factors that will increase voice portal DA revenue over the forecast period, which is illustrated in the mini case study below.

MINI CASE STUDY: YAHOO! VOICE

Yahoo! Voice is an example of a voice portal that is adding DA services in 2001. Management is looking at voice portals and mobile data as two ways to increase revenue and build "community" brand loyalty among its customer base. Yahoo! Voice's factors for success

closely mirror the factors that all companies in this space would need to execute to be successful. These include:

- Yahoo! will be adding many of the portal services available on its web portal over the next two years to increase number of hits per user per month.
- Because Yahoo! Voice charges \$4.95 per month for voice portal service, management at Yahoo! may recognize the voice portal as a way to diversify their revenue stream away from advertising.
- Yahoo! can leverage its web portal presence to capture voice portal users.

Look for other web portals to leverage their band to market voice portal services. The advertising revenue model that has been acceptable for the last six years will probably give way to a charge per month similar to Yahoo!

Voice portal DA is expected to cause a fundamental shift in the wireless DA services market. As voice portals add services to draw consumers to the voice site, DA services will be a core service. Also, as consumers begin to habitually use voice portal services, the habitual use of 411 or 555-1212 DA services will decrease. Finally, voice portal service will have the greatest impact on wireless telephony use, where the vast majority of DA accesses are from locations where data or print DA services are unavailable or inconvenient (e.g. in an automobile).

Demand Trends and Forecast

Figure 15 presents the minute volume forecast for the voice portal DA services market.

In the base year (2000) the number listings accessed through voice portals was 1.3 million. This is expected to increase dramatically in 2001, growing nearly 4,000 percent to 52.6 million listing accessed. Much of this increase will come from major web portals activating their voice portal services or adding DA services to the voice portal.

Growth in voice portal DA access is expected to grow to over 600 million listings accessed in 2005 and almost one billion listings accessed in 2007. Most of this growth will come at the expense of direct listing DA services.

FIGURE 15

Voice Portal Directory Assistance Market: Volume Forecasts (U.S.), 2000-2007

Year	Listings Accessed (Million)	Growth Rate (%)
2000	1.3	---
2001	52.6	3886.2
2002	136.2	158.9
2003	271.7	99.4
2004	410.5	51.1
2005	612.9	49.3
2006	805.8	31.5
2007	978.2	21.4
Compound Annual Growth Rate (2001-2007): 62.8%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Figure 16 presents the average minutes of use per voice portal DA listing access.

In the base year, the average real time to access a voice portal DA listing was approximately 2 minutes. But, since most wireless service providers round up to the next minute - to execute the call and end is higher charged minute incomplete. Essentially, about half of the accesses take between 1 and 2 minutes and are charged as 2 minutes of use. The other half of the accesses take between 2 and 3 minutes and are charged at 3 minutes. The average for 2000 is, therefore, the average of 2 and 3 minutes or 2.5.

Frost and Sullivan expects the average time for voice portal DA listing access to decline slightly over the forecast period. The reasons for this is increased sophistication and accuracy in voice recognition. This will eliminate some need to repeat voice requests or speak back verification of many commands.

FIGURE 16

Wireless Voice Portal Directory Assistance Market: Average Minutes of Use Per Listing Access (U.S.) 2000-2007

Year	Time Per Call (Minutes)	Growth Rate (%)
2000	2.5	---
2001	2.5	---
2002	2.4	(4.0)
2003	2.4	---
2004	2.3	(4.2)
2005	2.3	---
2006	2.2	(4.4)
2007	2.2	---
Compound Annual Growth Rate (2000-2007): (1.81)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Figure 17 presents the minutes of use for the U.S. voice portal DA services market. This chart is simply a representation of the previous two multiplied together. In 2000, the voice portal DA market used 3.3 million minutes of wireless use. This is expected to increase to over 2 billion by 2007, representing a major use of wireless voice minutes in the U.S. Combined with minute usage for other voice portal services, voice portals are going to be a major driver in the wireless voice market.

FIGURE 17

Wireless Voice Portal Directory Assistance Market: Minutes of Use (U.S.) 2000-2007

Year	Minute Use (Million)	Growth Rate (%)
2000	3.3	---
2001	131.5	3884.8
2002	326.9	148.6
2003	652.1	99.5
2004	944.2	44.8
2005	1409.7	49.3
2006	1772.8	25.8
2007	2152.0	21.4

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Price Trends

Figure 18 presents the wireless price per minute for U.S. DA. Since the only revenue reported from this study for the voice portal DA market is generated by minutes of wireless use, only the average price per minute forecast is relevant for this market segment.

FIGURE 18

Total Wireless Directory Assistance Services Market: Wireless Price Per Minute (U.S.), 1997-2007

Year	Price per Minute (\$)	PPM Growth Rate (%)
1997	0.079	---
1998	0.072	(9.1)
1999	0.065	(9.1)
2000	0.060	(7.4)
2001	0.058	(3.0)
2002	0.056	(5.0)
2003	0.052	(6.0)
2004	0.049	(6.0)
2005	0.046	(6.0)
2006	0.044	(5.0)
2007	0.042	(5.0)
Compound Annual Growth Rate (2000-2007): (4.97)%		

Note: All figures are rounded; the base year is 2000. Source: Frost & Sullivan

Wireless pricing plans have been declining in price over the last several years. In 2001, expect some slowdown in price decreases as the market consolidates its position somewhat. Prices should have a relatively steady downward trend throughout the forecast with some bottoming out toward the end of the forecast period.

STRATEGIC RECOMMENDATIONS

Strategy Analysis

The wireless industry is undergoing tremendous growth and change as demand and technology develops simultaneously. Given this, voice is really where we see service revenues.

Because people are willing to pay a premium for voice services. If you lose a packet, or lose e-mail, that's one thing - it can be resent, you may not notice it, or if you're connection is slow you're kind of used to it and it'll get faster, or it may be just a glitch - but you notice problems with voice. So premium voice service will always have a premium paid for it. When those voice services start being produced that's when we are going to see the revenues really ramp up.

Since WAP's inception, the promise of presenting information specific to the wireless user's current or destination location has been in the model. Furthermore, directions and navigation have figured prominently in every survey of wireless users' preferences. The implications are huge for both content and advertising.

Hands-free input of directory information at 60 mph sounds a whole lot safer than the "silent touchtone" that is text input. We are arriving at the long-awaited intersection of speech recognition, directory assistance, and wireless. In addition, new networks are being constructed which are able to exploit the cost advantages of the Internet, (which arise from the way data is transmitted in packets rather than along dedicated circuits) without the congestion and quality drawbacks.

These ("Internet Protocol" or "IP") networks will be able to carry voice in addition to data, with quality comparable to the PSTN, this promises lower costs than the circuit-switched architecture of traditional telephone networks.