Supply-Push or Demand-Pull as driver for Local Access Provisioning? - Initial findings from interviews with market actors

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Abstract
This paper analyzes push-pull initiatives of technological development by studying the concept of Novel Access Provisioning of new wireless Internet access to existing backbone infrastructure. The Novel Access Provisioning project is conducted within the Swedish techno-economic research project with participants from the Royal Institute of Technology (KTH), Stockholm School of Economics (SSE) and the Swedish Telecom Agency (PTS).

This paper reports on the results from a series of interviews during the fall of 2005 with main representatives from within the Telecom Industry and outside in the Nordic market having an interest in the development and use of mobile services. The aim of the paper is to increase the understanding for why some innovations have a rapid rate of adoption while others are deployed more slowly

1 Introduction

It is clear that the industry of mobile telecommunications is undergoing big restructurings both of technical and commercial character. Often these changes start with some kind of technical innovation that progressively gains acceptance and spreads outside the industry where it first was conceptualized. This is a cumbersome process where interests from within the industry and outside influence the reach and range of these developments.

The concept of Novel Access Provisioning (NAP) represents one such innovation being studied within a larger long-term project of techno-economic research in Sweden. *NAP deals with new wireless Internet access to existing backbone infrastructure – the tricky and relatively expensive 'last mile'*. The project focus on service and access provisioning of data services in "local environments". These new forms of access are often cheaper to deploy than access through the mobile phone networks of today – partly because the access technologies are of smaller scale and can be built out in close relation to demand, and partly because emphasis on coordination between different networks (roaming), and quality of service is allowed to differ. Ultimately NAP deals with the convergence of telecom and data services provided wirelessly at the local site.

The provisioning of wireless broadband access emerges as a compelling idea similar to the Internet growth for independent actors both from the telecom industry and from outside it, as a part of their core business or as a supplementary and non-prioritized activity. However the realization of such a scenario depends on a number of demand and supply-based forces conceptualized in this paper as push-pull interests. In addition this idea requires new business models such as local interconnection providers and the restructuring of existing players from the telecom industry and outside like in the case of transportation companies offering wireless access in trains.

Thus, this paper reports on a reality check activity that analyzes the development status of the *NAP concept* and he main forces behind the implementation of wireless broadband access at large scale. The aim of the paper is thus to increase the understanding for why some innovations have a rapid rate of adoption while others are deployed more slowly.

The NAP concept and related market actors are described in chapter 2, the economics of push and pull is summarised in chapter 3. Chapter 4 describes the methodology and chapter 5 include a number of stories on market and network solutions, mostly based on results of interviews. In chapter 6 the empirical data and state of Art observations are analysed from the supply or from the pull perspective. Concluding remarks are summarised in chapter 7.

2 Novel Access Provision

The existing markets for provisioning of wireless access and services are dominated by a few vertically integrated mobile network operators (MNO´s). Although this circumstance minimizes the distortions from a diversity of networks leading to fragmentation, non-compatibility and inconvenience for end-users, it does not promote the development of high data rate wireless services, since the conventional cellular concept does not scale financially well regarding bandwidth. Both investments and operational costs for the radio access increases as a linear function of the amount of capacity deployed per area unit [1] [2].

2.1 Key characteristics

The purpose of the Novel Access Provisioning project (NAP) is to show that these issues can be mitigated by the introduction of new concepts combining novel network solutions with new market structures with higher innovation potential [3] [4]. We believe that there is a potential for both new services in mobile communications as well as new forms of cooperation between service and network providers. Similarly, the Internet development has been driven by small-scale local initiatives in access as well as in service provisioning that has turned out to be very successful.

We have chosen to study small-scale access architectures and adaptation to local demand of heterogeneous traffic density as well as small scale service provisioning for segmented markets as ways to mitigate the above described cost and competition issues. Key aspects are

- Local presence of providers
- Adaptation to local demand
- Public access to private networks
- Local monopoly and “access to users” in own premises
- Re-use of available networks, infrastructure and support staff
- Low cost network deployment and operation
- Re-use of existing customer base, billing relations
- Use of established trust and brand as enabler for new business
- Flexible roaming and interconnection

The NAP concept presupposes the connection of different types of data services such as e-mail, browsing, video streaming, etc. and different wireless technologies both licensed and unlicensed. One consequence of this is the co-existence of different access technologies which are selected depending on specific criteria. One such example is the choice between third generation UMTS systems and WiFi technologies. Much of the selection capability and criteria has therefore to be pushed into the wireless devices.

2.2 Today's market players, roles and relations

Today's market for mobile services is dominated by MNO´s, which provide both network resources and services. Network planning and Operation & Maintenance (O&M) is usually handled internally, but it can also be outsourced, e.g. to telecom vendors. Own units take care of marketing & sales (M&S), customer care and billing. The users have subscriptions with one MNO and can only access the network of the "own" MNO. Mobile Virtual Network Operators (MVNO´s) provide own services but buy transport and access network resources from other operators (see figure 1). MVNO´s have marketing, customer care and billing resources. Finally, service (and/or content) providers offer services to all users. These services are delivered using the networks of other operators.

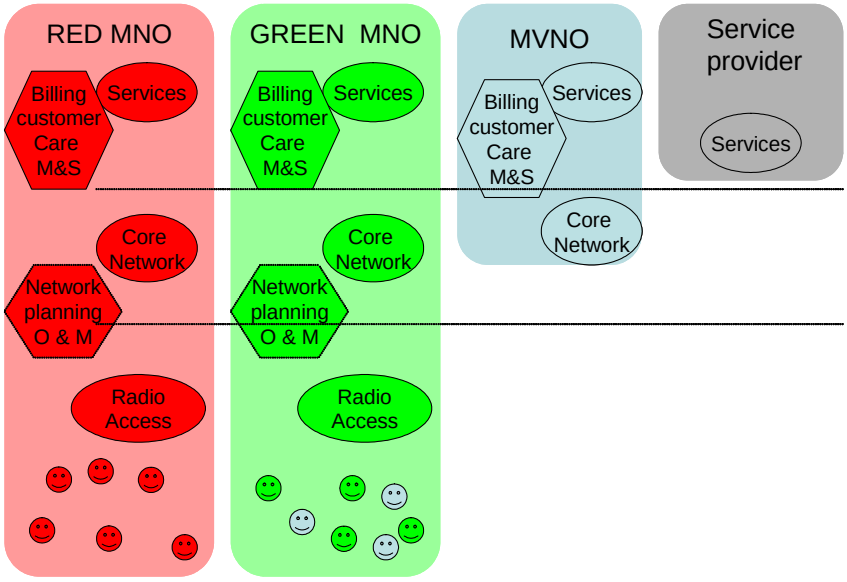

Figure 1 Example with a "small market" with traditional market players; two MNO´s, one MVNO and one service provider. The subscribers of the Red and Green MNO can access the own networks only, the subscribers of the MVNO uses the network of the Green MNO.

2.3 Market players for novel access provisioning

One starting point for novel access provisioning is to identify actors such as private companies, shops, and university campuses etc., whose networks can be re-used for public access. Thus these players become *Local Network Operators* (LNO´s) with the possibility to outsource the local infrastructure to MNOs [5][6]. Additional capabilities that can be offered are local network administration, payment support etc, see figure 2. Large national/global companies (chains of retail, food stores or gas stations) represent another type of NAP market players with a combination of large customer base; a strong brand and a wide spread local presence. These large-scale businesses can re-use also their marketing efforts, customer support and billing units, either in co-operation with MNO´s or as independent operators.

If these types of operators want to be independent from MNO´s a number of other market players are needed such as *access brokers* (handle contacts between users and service providers), *trust managers* (handle trust issues enabling "access of any user to any network") and finally *clearing houses* **[7]** (handle accounting, exchange of charging records and billing).

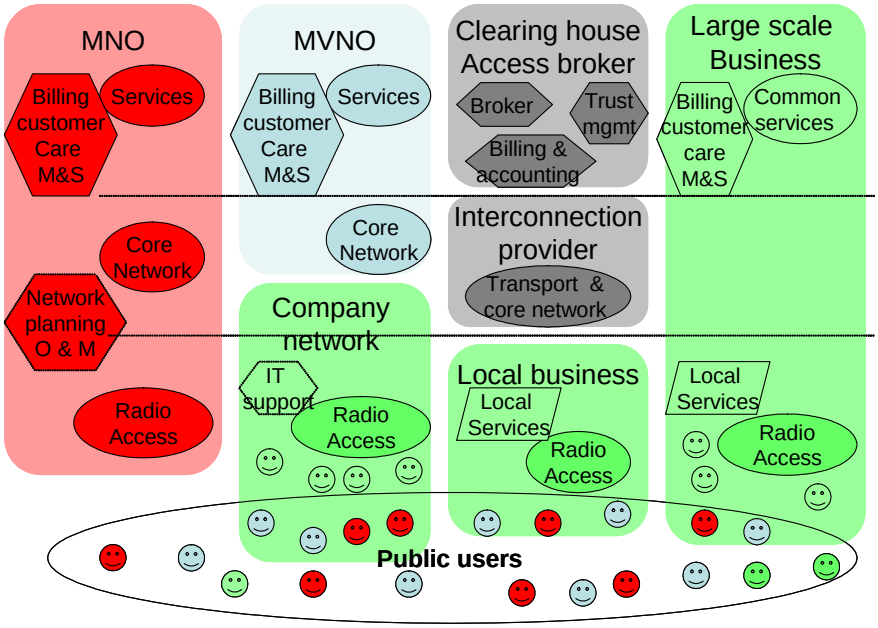

Figure 2. Market situation and market players for Novel Access provisioning; in addition to MNO and MVNO there will be different types of local access providers exist (green) and trusted third parties for interconnection, brokerage, trust management, accounting and billing (grey) (from [3]). *Note that all users can access all networks independently of subscriptions or home network operator*

3 The Economics of Push and Pull

The viability and commercialization of the NAP concept does not depend on its level of conceptual attractiveness. Engineers say that a new idea has been invented when it is proven to work in the laboratory. However the idea becomes an innovation only when it can be replicated reliable on a meaningful scale and at practical costs [8]. A process for the development and implementation of the idea critical for the successful creation of innovations is described in [9].

Often the acceptance gaining process outside the industry where an invention is first conceptualized is most critical for its transformation into an innovation. This process is often characterized as a diffusion process. There are different types of diffusion processes such as chemical diffusion processes, biological processes, encryption diffusion processes, news diffusion, etc. However, this research relates to the diffusion of new technological ideas.

This process can be influenced by a number of different conceptual forces. One such view, widely spread in organizational studies, is presented in [10] that analyses types of driver forces in diffusion models. They distinguish between (a) the 'ecological view' that describes how extra-organizational power dependencies shape the diffusion process and; (b) the 'genealogical view' that focuses on the internal nature of a single innovating organization. This view helps to understand diffusion patterns among similar populations regarding the extent to which conflict and competition (as opposed to consensus and regulation) characterize the behavior of those involved in the diffusion of the innovation process.

Another view is presented as a dichotomy between demand and supply efforts. Both *technology-push* methods, where industry insiders try to envision future applications for a certain technology, and demand-pull motives are present here. Pressure to change evolves

from either organizational needs (demand-pull), technological innovation (supply-push) or both. This distinction between demand-pull and supply-push motives has been elaborated in a number of innovation works such as the stated difference between technology transfer (related to technology-push motives) and technology diffusion (related to demand-pull motives) in [11] or the contrast presented between technology push and competitive pull methods in the Corporation of the 1990s, see [12]

Hagel and Brown [13] define a push-economy (mainly the mass-production economy) as based on a company's anticipating consumer demand and then producing the right resources at the right time and place to meet it. This is for example the case of telecom operators that try to anticipate the demand for future services and then develop these according to the anticipated demand. Although primarily applied to the development of products, push-economies have also been applied successfully to the service industry. On the contrary the pull economy is based on open and flexible production platforms that use networking technologies to orchestrate a broad range of resources.

Although many scholars have argued in favor of one or the other (Schmookler [14], Mowery and Rosenberg [15], Walsh [16], Achilladelis & Antonakis [17]) in this paper we will combine both approaches to analyze the diffusion of the NAP concept. Cases of disregarding such an approach are often illustrative. Napster, a powerful technological solution, has, due to the lack of a clear business model and due to important legal issues, been abandoned. Another well-known example is the VHS and Betamax video systems. A technologically better product was completely massacred by a modest but more customer oriented solution. These are just a couple of illustrative examples among a myriad of others showing the advantages of having a combined perspective when pursuing technology research.

Let us now proceed to analyze how the concept of access provisioning of data services in "local environments", the core idea behind the NAP concept, has diffused recently. But before that some brief comments on the methodology used in the paper.

4 Methodology

4.1 Interviews

The main methodology used in this paper is interviews with potential implementers of the NAP concept. The first step was to look around and try to identify business or technical solutions that were similar to or were believed to support some features of the proposed NAP concept. Interviews were done with more than 30 people in the following types of companies:

- Companies in the telecommunication sector
  - 4 operators of wireless networks
  - 5 urban city networks
  - 2 manufacturers of telecom equipment
- Companies in other sectors
  - 3 facility owners
  - 3 banks
  - one transportation company
  - one university

Operators include GSM, hot spot and fixed wireless access type of operators and for manufacturers we talked to representatives for both wireless and fixed line solutions. The IT department of a university acts as a kind of ISP and provides students with internet access, both at the university but also in the student apartments in co-operation with the facility owner that provides broad band connections in the buildings.

The interviews were 1-2 hours and annotations were made and discussed between both researchers from KTH and SSE present at them. The interviews were conducted as discussions around 2 main aspects

- Do you believe that the market for future access and service provisioning will be "fragmented" with a large number of actors?
- Do you see business opportunities for yourself?

To non-telecom companies, banks and facility owners, we also asked

- How do you use and how do you benefit from telecommunication services today?

4.2 Structure used for analysis

For the analysis of the market for network provisioning we have structured the market actors into four different groups:

- Traditional operators of mobile and/or fixed line networks operators that have a direct and established relation with the end-user based on long term subscriptions.
- Local network providers (LNP´s) with temporary customer relations, e.g. on trains, railway stations, airports or restaurants. The local network is used to offer any customer public internet access as an "added value".
- Local network providers with long term customer relations e.g. facility owners or power companies. The network is deployed in order to offer "own" customer with an established billing relation internet access in the own premises, i.e. no public access.
- Novel solution providers (NSPs) offering network solutions, which are non traditional in some sense, to LNP´s. The NSP may also offer the LNP to deploy and operate the network solution. The end user has a business relation with the LNP.

5 How to enter a market or how to strengthen your position

There are several ways of making sense of an emerging market for access provisioning. One way would be based on the **access technologies** deployed. One predominant radio technology used today, WiFi, is based on the IEEE 802.11b protocol operating in the unlicensed spectrum band. Other access technologies like WiMax (802.16a) and UMTS/TDD are on their way up. Combinations of access technologies also start to emerge e.g. mobile terminals with WiFi and cellular interfaces, combined 2G/3G /WiFi "surf cards" for laptops.
A second way to look at the **customers and usage** and see what kind of access that there is a demand for. Business customers accessing their corporate intranet through a radio device would be B2B, consumers accessing Internet in order to buy things, make bank transfers or email would be B2C, and finally individuals that organize communication in-between each other would be P2P.
A third way is to approach the **supply side** and map and assess the market actors that have found incentives to provide access today and tomorrow. All three perspectives are possible to use for the solutions and actors under study. In an early phase of the NAP project we identified that many of the characteristics of the envisaged Novel Access Provisioning concepts already had started to emerge. The major part of the interviews has been conducted with companies employing these "new concepts".

5.1 Liberating the Internet from the stationary PC - by actors outside the telecom sector

Up to now the dominating usage of the Internet has been from stationary computers at home or at work. Some of the initiatives for internet access on the move (at least semi-stationary usage) are introduced by actors from outside the traditional telecom sector and also from outside the data communication sector.

One example is transport companies, a LNP with temporary customer relations, where Internet access at railway stations and in trains (a moving hot spot) has started to emerge. The connectivity for the internet access in trains is provided by a combination of 2G, 3G and satellite systems, also involving several cellular operators. The technical solution (with a high degree of novelty) is provided by a systems integrator (a NSP). The access at the trains can be free (included in the ticket) or require a special fee. From a UK train operator it is reported that the number of passengers in business class has increased after the introduction of "free" Internet access. In Sweden no plans exist at the moment to allow users with subscriptions with a telecom operator to be billed through the operator. In Sweden the facility owner of the railway stations, another LNP with temporary customer relation, uses a third party NSP to deploy and operate the networks whereas the train operator is responsible for the "train network". It is interesting to note that it currently is no "roaming" possibility for WiFi users between the networks in the train and at the railway stations. A project manager at a Swedish railroad operator says that is currently no plans to provide a bundled offer to the end-users.

A new form of access provisioning is identified from outside the telecom sector where "site owners" (e.g. fast food restaurants, airports and hotels) cooperate with an access operator. In this case the operator also provides the technical solution, hence acting as a NSP, and the site owners provide "site space" and "customers". A representative for the access provider says "we have been chosen mainly due to the fact that we offer solutions with open access…" The same person also foresees a large potential with this kind of cooperation with "an increased coverage in a broader range of site categories and an increased flexibility in differentiation of services due to cost and performance", i.e. not only for business users. This will be even more obvious when new WLAN enabled devices is starting to enter the market.

The fee for short-term usage at the restaurant could be paid separately or be included in the offered meal. For usage at airports or at hotels, one time subscriptions area available for a fee ranging typically from 5 Euros per hour to 20 Euros for 24 hours. In some hotels the WiFi usage is for free, "we don't charge for hot water", but still you need a temporary subscription for secure access. One feature with the abovementioned cooperation between site owners and the access provider is that many billing solutions can co-exist. Hence, traditional MNO´s can also benefit from this business model and make use of the customer base and billing relations.

5.2 Liberating the Internet from the stationary PC – wireless city initiatives

Some examples of a trend towards open wireless access for everyone in large areas of cities can be identified. In this case we don't mean isolated hot spots but larger areas, hot zones. One type of initiative is several wireless city projects that were initiated a couple of years ago and driven by local organizations, e.g. in Austin[18] . Facility owners, shops etc could contribute to the wireless access and the local organization provided "some" support and also equipment, mainly in the deployment phase. The access was for free, no revenue streams could be observed and no operating party could be clearly identified.
A number of initiatives for larger metropolitan wireless network [19][20] have been reported. In many cases, London, Philadelphia, San Francisco, Portland and Taipei (Taiwan), the local authorities had initiated the plans for such networks being a utility for the citizens. In other cases, Google in Mountain View, private companies are taking the initiative

Another example is the FON "movement" where anyone with WiFi access points allows other "Foneros" to use the access [21]. The usage is cheap or free but still economic incentives and revenue streams are part of the business model. Currently FON is operating in Spain and in the US and has announced its presence in Sweden. Although FON has got a lot of attention recently a similar concept, SparkNet [22], was initiated in Finland in 2003. SparkNet is exploiting existing network resources and instead of building their own WiFi network, the cooperation members are building pieces of public WiFi network that has the same services everywhere

How do these examples relate to the proposed NAP concepts? Many characteristics of NAP can be identified, e.g. local presence, public access, re-use of infrastructure. So, what responses from different market actors can be identified from the interviews? Do local actors (in Sweden) consider "wireless city" aspects and do they identify business opportunities?

The answer is in most cases NO and the motivations differ depending on the type of market actor. One type is the **broad band urban networks** provided by local companies, in all our cases part of or related to the local power company, that offer open access to households and facility owners (LNP with long term relations). The possibility to use "wireless extensions" to the fixed broad band networks in order to provide open access "everywhere in the city" has not been considered. During the interviews we got more or less the same kind of answers "The ideas are very interesting but it is up to the individual customer to use wireless access point". The possibilities for open access, with public access everywhere within a city and also within a region, i.e. interconnection between different city networks (The FON approach at a higher level), had NOT been identified as an option. Another type of market actor that could play an important role in wireless cities using NAP concepts is **a facility owner**. On one hand they have a large interest to provide broadband connection to the customers, but on the other hand there is no or low interest to provide wireless access within the buildings. In some case decisions were made NOT to use wireless access. One reason is the ongoing discussion on radiation from cellular systems, a lot of people are afraid and hence one company had as

company policy not allow any 3G sites within the own facilities. The same would apply for WiFi systems. Another reason is that the added values for end-users were considered as low "our customers already have internet access", the facility owner as a provider of local services focus more on other kinds of added value related to facility management, reception services etc. In addition, if such a wireless service would be introduced it should be based on mature technology and proven to be very reliable since "system failures and problem causes a lot of bad will for us".

5.3 Liberating the Internet from the stationary PC - by the traditional telecom actors

The examples above target semi-stationary use of Internet access. Although traditional operators also offers WiFi access, in fact in most European countries the largest WiFi networks are operated by incumbents, it is interesting to note the response to competing hot spot networks; wireless broad band using cellular systems. Both incumbents and Greenfield operators offer 3G "surf-cards" for laptops, in some cases with competitive flat rate subscriptions. As mentioned above combined 3G/WiFi cards and subscriptions are also available. The efforts by the manufacturers to introduce "super 3G" (HSDPA) is along the same way, wide area provisioning of high speed data services.

Brief discussion with telecom vendors indicate that there currently is a low degree of interest in R&D activities targeting NAP type of solutions, both for markets like Western Europe and for emerging markets. In developed countries NAP concepts could be used to increase the deployed capacity in areas where demand is high. In the latter case NAP concepts could be used for the cost-efficient rollout of the "first mobile network" done by cellular operators in co-operation with power companies, railways and bus companies. However, it should be noted that telecom vendors do support WiFi solutions "as such", both by providing access solutions (e.g. to some of the hot spot networks mentioned above) and by developing and supporting standardization of interworking between cellular and WiFi systems. NAP type of solutions are also considered and analysed in research projects in the pre-competitive phase, e.g. in the EU integrated project Ambient Networks. Here multi-radio multi-operator network architectures are developed that works across administrative boundaries.

5.4 Mobile phone as fixed phone or fixed phone as mobile phone

Two different approaches have been identified and studied will be described; however they target the same basic customer needs and potential benefits: one phone, one phone book and one subscription. The first example of "on person – one phone" concepts is a GSM operator that focuses on what is called "total enterprise telephony service". Fixed and mobile phones and the company PBX are replaced by a cellular solution with indoor base stations.

The other case is UMA (Unlicensed Mobile Access) that is a standard for extension of GSM/GPRS mobile[23]. It is achieved by tunnelling GSM/GPRS protocols through a broadband IP network and an unlicensed radio link in the customer's premises. The standard can be seen as an extension of traditional mobile operators access into WiFi networks owned and operated by customers. British Telecom introduced the UMA based service "BT fusion" 2005, Telia in Denmark have reported customer trails and newspapers report that Telenor Sweden (former Vodafone Sweden) plans to introduce it. However, the UMA solutions provides only access for the owner of the private network, no public users can access the system. The interviews indicate that the potential for cost savings at capacity expansions using "public UMA" as an alternative to build out of cellular sites had not been identified or considered. The main driver for introduction of UMA seems to be to establish a closer relation with existing customers.

6 Analysis

The description of the cases above can be analysed and divided according to the push-pull framework developed in section 3 above.

Examples with Demand - Pull

Internet access onboard trains

The railway industry faces sharp competition from low fare airlines. In general long distance land-transportation companies are part of a competitive environment due to the flight industry. Transportation companies offer “reliable, safe and productive travel opportunities to its customers” and complementing the value offering with Internet access may fit well within the idea of productive travel opportunities. Furthermore, provisioning Internet access may increase the attractiveness of the travel service offered. In this particular example the pressure to change evolves from an organizational need. Internet access provision could be a way to differentiate and increase customer satisfaction. Therefore this example shows clear signs of demand-pull motives for the provisioning of NAP-based services. An outsider, in this case the transportation company, takes the initiative and together with a novel solution provider (NSP) puts together a solution from different telecom suppliers offering 3 G, satellite and WLAN connectivity in combination.

Internet onboard trains is developed on the requirements of a single innovating organization which makes it a bottom up service based on competition according to the genealogical view. Even more interesting is the fact that the facility owner of the railway stations uses a different solution to operate the networks. Thus users cannot roam as explained above. This shows how conflict and competition between railway operators and railway stations difficult the spread of broadband access for traveller on the move.

Deployment of broad band networks in homes and offices

The last 10 years the number of broadband connections to homes and offices in Sweden has increased substantially. The interviews with facility owners and operators of the urban broadband networks have shown strong characteristics of demand-pull. It has been seen as most essential to provide the citizens or the tenants with broadband connections both for cable TV and for Internet access.

It is interesting to note the story that many urban network providers are telling about the start-up of the company. In the middle of the 1990s, the interest to get broadband connections started to grow in many Swedish towns and the existing providers were asked to deploy networks in these areas. As the stories are told the existing providers were quite reluctant to meet this emerging demand, maybe we could call this an example of “anti-pull”. The result were that new market players, often supported by the local authorities and/or as part of the local power company, were founded in order to satisfy this demand, hence this is an example of demand-pull.

It has also be observed that one reason for the success of the city networks is that they often supports open access where all providers can offer services to end-users. This is in contrast with some facility owners and providers where end-users are “locked in” and only can use services from specific service providers.

Examples of supply-push

Internet access using 3G or super-3G

Stationary Internet access using cellular systems is currently in most cases not a feasible solution due to bad cost-capacity performance. The already mentioned solution "surf-cards" for laptops is a useful and competitive solution for truly "mobile users" where a wide area capability is required; no strong threat is clearly visible. However, the major part of what we usually call "mobile" usage is semi-stationary and hence has to compete with solutions providing access in wireless cities, hot spots or surf zones.

The surf-card has the characteristics of technology-push, it is a specific technical solution targeted to a specific usage profile, the truly mobile user of Internet access, but offered to a much wider range of users, which all can choose alternative less expensive options. The surf-card is an extension of both the existing product portfolio and the way to make business, the operator – subscriber model. The solution has the strength that is also makes use of an existing asset and competitive advantage, the use of licensed spectrum. In summary, this is an example of supply-push combining both technical and commercial push aspects.

Wireless city initiatives

The mentioned cases in section 5.2 are all examples of supply - push but of different types with different key drivers for deployment. Technically it is not a solution providing access "everywhere", but a common feature for all cases are coverage "at many places", a mesh of hot spots and hot zones. The demand cannot be clearly identified; hence these cases have a low degree of demand-pull.

At the Austin Mobility Roundtable 2004 one type of push that we can call "ideological push" could be identified among "wireless city projects". It is represented by the local organisations and a kind of "movement" supporting free wireless access for anyone and this can be achieved by more or less voluntary contributions of equipment and labour.

Another type of push, although not crystal clear, but anyway visible is provided by local authorities that claim that wireless access is a public utility like roads, electricity and water supply. We could call this push characterised by "we should have" motivations.

Finally, the FON initiative represents a combination of technology and commercial push. Technical solutions for access technology (WiFi), public access and accounting are combined with a business and revenue sharing model. However, you shouldn't be confused by the combination of commercial drivers and movement characteristics, large companies like Skype, eBay and Google have shown large interest in FON.

UMA and use of mobile phones at home

UMA can be used by Fixed Network Operators (FNO´s) to enter the mobile voice market or it can be used by MNO´s to enter (or strengthen the position at) the market of fixed telephony. UMA as used so far is an example of technology-push, where the need of the organisation to be active at the market and provide means for closer relationship with the customers are the main drivers for introduction of the new technology.

The customer benefits that can result; one person – one phone number - one phone book and lowered cost could all be achieved by other means, e.g. different pricing depending on

location. This later solution has existed a number of years where MNOs offer enterprises reduced price per voice minute when the employees are at the office and/or when internal calls are made.

At the same time the organisation is not aware of or willing to adopt the technology internally as a way to reduce deployment and operational costs, hence this could be viewed as an example characterised by low degree of “internal technology-pull”.

Examples with both Push and Pull

Public Internet access provided by access provider cooperating with site owners

Internet access in hot spots based on WiFi technology has existed for many years. So what is new with the concept access provider cooperating with site owners?
Most markets in Europe have one dominant national WiFi operator and a handful of small alternative WLAN operators where most of the WLAN access networks have been built with focus on the business traveller segment. Both dominant and alternative WLAN operators are generally using a traditional vertical telecom business model, i.e. trying to control both access network, the core network and the service and application platforms.

With this open business model a number of opportunities are created for most players in the value chain. The NSP type of access provider is responsible for network deployment and operation and can focus on issues like dimensioning of network coverage and capacity, assurance of quality and availability. The Site Owner can be an active part and bundle the access offer component into their core business offer ensuring access for all users and visitors. This is efficiently and reliably achieved by an agreement with one partner (the access provider) and using one infrastructure. New opportunities can be identified by revenue sharing and contribution to local marketing and sales. Traditional operators also can benefit from this business model and can focus on offering and bundling of services and applications, customer support and accounting and billing.

In this example the “site owners “have demand-pull motives whereas the NSP type of access provider acts from a supply-push perspective. For traditional MNOs it opens up a possibility to extend the service bundle to existing customers. In addition the MNO could act as an independent third party offering accounting and billing services. This is quite a different scenario for MNO´s compared to the situation where own WiFi networks could be seen as a threat that may cannibalise on the cellular “core” business.

WLAN enabled devices and new user segments

In the case described above we can also identify another form of technology-push and demand-pull. Most user devices (including cellular phones) will have WLAN radio interfaces and this will quickly change the existing arena and open up for new user segments in addition to the “travelling business man”. Youngsters playing games over the Internet is one example that would require usage that is for free or very cheap. The technology push motives would be most obvious for hand set manufacturers.

7 Conclusions

Using the push and pull approach some interesting observations can be made from the interviews shoeing how different types of market actors behave.

- *Traditional operators* mainly have a technology focus (push) when new solutions are introduced being a continuation or extension of current offers to the customers. Use of mobile phones at home (UMA) and cellular solutions for semi-stationary Internet access (surf card in laptop) are examples where other solutions are possible most likely preferred by users. The surf card would be a competitive solution for mobile users with a really wide areas usage profile, but would be considered expensive and slow compared with semi-stationary hot spot solutions. Use of UMA type of solutions for public access and/or low cost deployment is not considered.

- Facility owners and power companies providing fixed broadband connections can be seen as *local network providers with long-term customer relations.* On one hand a strong pull has characterised the broadband deployment, but on the other hand opportunities to deploy wireless access has not been considered.

- Companies from outside the telecom sector with high degree of local presence and local monopoly on the use of the own "sites", e.g. train operators, hotels, fast food restaurants are called *Local network providers with temporary customer relations*. To deploy local networks and offer any customer public internet access as an "added value" is a good example of demand-pull. This seems to be very powerful when combined with supply-push of Novel Solution Providers.

- *Novel solution providers (NSPs)* that offer some kind of non-traditional network solutions and optionally deployment and network operation to LNP´s is an example of supply-push.

The open business model where site owners (with basic customer relation), and the network operator (a NSP) cooperate, will create a number of opportunities to other market players too. Service providers and MNO´s can offer added value services and the latter can also provide AAA and payment services.

When it comes to the NAP concepts one conclusion is that traditional operators and local network providers with long-term customer relations tend to NOT consider opportunities for expansion into new market segments or for cost savings with re-use of infrastructure, public access to private networks or flexible roaming solutions.

However, local network providers with short-term customer relations, show many of the main characteristics typical for the proposed NAP concepts.

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8 References

[1] Zander, J, “On the cost structure of Future Wireless networks”, *IEEE VTC97*, Phoenix, AZ, May 1997

[2] Markendahl J, Zander J, “Low Cost Broadband Wireless Access – Key Research Problems & Business Scenarios”, *ISART04*, Boulder, March04.

[3] Markendahl J, Mäkitalo Ö, Werding J, “Company asset analysis of candidates for novel access provisioning”, *Proc. RVK 2005, (Swedish conference on Radio Science).*

[4] Johansson K, Markendahl J, Zetterberg P, “Relaying access points and related business models”; *Austin Mobility Round Table*, Austin, TX, March2004

[5] K. Johansson, J. Lind, M. Berg, J. Hultell, N. Kviselius, J. Markendahl, and M. Prytz, ”Integrating User Deployed Local Access Points in a Mobile Operator’s Network” *Proc WWRF#12*, Nov 2004.

[6] M. Berg, J. Markendahl, “A concept for public access to privately operated cooperating local access points”, *Proc. VTC Spring 2005*,

[7] CN.Chuah et al, "QoS Provisioning using a clearing House architecture", *Proc IWQoS*, June 2000

[8] Senge, Peter M. 1999 "The fifth discipline: the art and practice of the learning organization" London: Random House

[9] Van de Ven, A. H., Angle, H. L. and Poole, M. S. (2000). "Research on the management of innovation". Ballinger Publisher. Cambridge, Mass.

[10] Baskerville, R. and Pries-Heje, J. (2001). "A multiple-theory analysis of a diffusion of information technology use", Information Systems Journal, Vol.11 pp.181-212.

[11] Lien, L. (1995). "Towards a management model for the transfer of technology", in: Kautz, K., Pries-Heje, J., Larsen, T. J. and Sørgaard, P. (eds.), Diffusion and Adoption of Information Technology, Conference Notebook from the first IFIP 8.6 Working Conference. Leangkollen, Norway, Norwegian Computing Center, Report No. 900 pp. 153-166.

[12] Scott Morton, M. S. and Thurow, L. C. (1991). "The corporation of the 1990s: information technology and organizational transformation". Oxford University Press. New YorkFidler, Roger F. (1997) "Mediamorphosis: understanding new media" Thousand Oaks, Calif., Pine Forge Press

[13] John Hagel and John Seely Brown “From push to pull: Emerging models for Resource Mobilization” The McKinsey Quarterly, 3Q 2005

[14] Schmookler, J., 1976. Innovation and Economic Growth. Harvard Univ. Press, Cambridge, MA.

[15] Mowery, D., Rosenberg, N., 1979. The influence of market demand upon innovation: a critical review of some recent empirical studies. Research Policy 8, 102–153.

[16] Walsh, V., 1984. Invention and innovation in the chemical industry: demand-pull or discovery-push? Research Policy 13, 211–234.

[17] Achilladelis, B. and Antonakis, N. 2001 “The dynamics of technological innovation: the case of the pharmaceutical industry” Research Policy 30 2001 535–588

[18] http://www.austinwirelesscity.org/

[19] www.muniwireless.com

[20] From The Economist print edition (Economist.com) Mar 9th 2006 “Wi-Pie in the sky?”

[21] www.fon.com

[22] http://www.sparknet.fi/en/index.html

[23] Unlicensed Mobile Access (UMA) technology, *http://www.umatechnology.org*

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