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Location and Product Bundling in the provision of WiFi

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WiFi promises to revolutionise how and where we access the internet. As WiFi networks are rolled out around the globe, access to the internet will no longer be through fixed networks or unsatisfactory mobile phone connections. Instead access will be through low cost wireless networks at speeds of up to 11Mbps. It is hard not to be impressed by the enthusiasm with which WiFi has been embraced. GREEN, ROSENBUSH, CROKETT & HOLMES (2003) assert that WiFi is a disruptive technology akin to telephones in the 1920s and network computers in the 1990s. WiFi is seen as both an opportunity in its own right, as well as an enabler of opportunities for others. Computer manufacturers are hoping that WiFi will increases sales of their laptops, whilst Microsoft feels that WiFi will result in users upgrading their operating systems to Windows XP.

Numerous retailers have also jumped onto the WiFi bandwagon, with perhaps the most prominent of these being Starbucks. Hoteliers, fast food restaurant chains and airport operators have all either launched or announced their intention of launching WiFi networks. A key feature of these companies and their involvement with WiFi is that they control a location whose use they want to further through the provision of WiFi.

Some, such as the SHOSTEK Group (2003a) have, however, questioned the commercial viability of WiFi. They argue that the lack of economies of scale and coverage, debatable quality of service and the heightened price sensitivity of subscribers conspire to squeeze margins, raising the question of whether WiFi service providers will ever make a profit from their investment. Given these doubts, this paper seeks to understand why three companies have sought to provide WiFi.

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WiFi, WLAN & WISP

WiFi stands for Wireless Fidelity, the name of a certification programme run by the Wireless Enhancement Compatibility Alliance and is the popular name for the wireless Ethernet 802.11b standard for WLAN (wireless local area networks). The basic principle of a WLAN resembles that of a cellular network – access points broadcast and receive signals over a short distance from users equipped with a network interface card. In this case, the short distance is up to 100m. The access point is physically connected to the fixed network and acts as an intermediary that relays traffic between the fixed and wireless networks. The concentrated area around an access point where high speed WLAN access is available is commonly referred to as a 'hotspot'. Within this hotspot, 802.11b is capable of delivering 5 to 6 Mb/s of bandwidth. This is, however, less than the nominal bandwidth of 11Mb/s that is associated with 802.11b.

WiFi WLANs operate in license exempt spectrum bands such as 2.4GHz. This means that potentially anyone can build a WLAN as no specific frequency allocation process occurs. However, this lack of licensing is not without its problems. 802.11b supports only three channels in any one location within 100m of one another; with the result that if more than three networks overlap interference will occur. Interference will reduce access speeds and may ultimately prevent access. Moreover, 802.11b is also susceptible to interference from other electronic equipment such as Bluetooth enabled mobile phones and cordless telephones.

Networks can occur on a variety of geographical scales. Personal area networks are the smallest geographically and occur when, for example, individuals use Bluetooth. Geographically larger networks include local area networks (LANs), of which WiFi is an example. LANs are to be found within buildings such as apartment blocks or university dormitories. Metropolitan area networks (MANs) are the next scale up of network and use technologies like xDSL to deliver high-speed data services. Finally, there are also wide area networks (WANs) that connect users across cities, countries and increasingly across continents.

Wireless Internet Services Providers (WISPs) are organisations that provide internet services using WiFi as an access technology. These wireless technologies in turn connect to fixed the technologies that lie at the heart of LANs, MANs and WANs. WISPs can be differentiated by their scale as well as their relationships with the venues where they provide internet access. WISPs can provide internet access in one, a handful or many

locations and may have a co-operative or uncooperative relationship with the venue.

Three illustrations of WiFi provision

Starbucks/T-Mobile

Starbucks' involvement with WiFi dates from early 2001 when a strategic deal with MobileStar, Microsoft, IBM and Compaq was announced providing Starbucks with broadband access in the form of hotspots across the USA (SHOSTEK Group, 2002b: 13). In exchange for exclusivity and all the revenues generated, MobileStar took sole responsibility for the deployment of hotspots in Starbucks' cafes.

The results of this strategic deal were mixed. MobileStar was able to expand its business model – supplying connectivity – into new market: WiFi enabled coffee drinkers. Market research, conducted by Starbucks, indicated that 54% of its customers would pay for in store wireless access and that 91% of customers expressed an interest in in-store connectivity (SAUDERS, 2002). The increased loyalty engendered by WiFi was also highlighted, with customers reporting an increased propensity to visit Starbucks, as well as the value that they placed on the convenience of being able to access the internet, check e-mail etc.

The deal also highlighted the unique and significant cost structure of hotspots. Associated with each hotspot are three types of costs: sunk, fixed and operating. A hotspot can cost up to USD 4,000 to install (KOERNER, 2002). To the cost of the installed equipment must be added the cost of a T1 line to each of the hotspots. The cost of each T1 line can vary between USD 400 and USD 900 per month (BEAUMONT & ROBERTS, 2002: 4).

MobileStar agreed to roll out hotspots virtually simultaneously in 550 cafes. Given the aforementioned sunk and fixed costs, it is no surprise that this called for a considerable upfront investment. However, subsequent revenues and customer numbers were modest. Customers typically paid USD 3 for 15 minutes, whilst accesses totalled approximately 20,000 per month (SAUDERS, 2002). The combination of high up front costs and low revenues resulted in MobileStar's bankruptcy in October 2001.

This did not mark the end of Starbucks' involvement with WiFi. Voicestream (later T-Mobile) acquired MobileStar for a reputed USD 1.5 million in late 2001. T-Mobile not only acquired all of MobileStar's assets, but also purchased the right to assume many of its contracts. T-Mobile launched its WiFi service for Starbucks in August 2002. Customers were able to access the hotspots through an initial 24hr free trial, after which subscription charges were incurred. The service plans offered are outlined below.

Table 1: T-Mobile hotspot service subscriptions plans at launch in August 2002

Subscription plan	*Cost (in USD)*	*Cost per minute (in USD)*	*Additional package details*
Pay as you go 15 minutes	2.5	0.16	
Flat rate monthly unlimited local access	29.99	N/A	500 MB data traffic NBED rate for minutes outside of specified local area Additional data transfer at /MB
Flat rate monthly unlimited national access	49.99	N/A	500 MB data traffic Additional data transfer at /MB
Prepaid 120 minute	20	0.16	
Prepaid 300 minute	50	0.16	

Source: *Efimov, 2002*

In order to encourage use of its infrastructure by paying subscribers, T-Mobile prevented subscribers of other WiFi networks from accessing its hotspots. This would seem to suggest that T-Mobile recognised the importance of revenue generation and that it did not want to follow MobileStar in failing to support its business model through insufficient revenues.

Since its launch T-Mobile has made two important changes to its hotspot services. Firstly, T-Mobile has continued to expand the number of hotspots offered. T-Mobile now operates 4321 hotspots across the USA. Secondly, it has changed its subscription plans. Prices have been reduced. For example, the cost of the unlimited national plan has been reduced to USD 29.99 though subscribers need to join for a minimum of one year. Pay as you go plans have also been changed, with the cost of an initial hour falling from USD 10 to USD 6. T-Mobile has also removed the limits on data transfer as well. According to T-Mobile, these changes were motivated by a desire to widen the potential market as well as respond to existing customers who found the subscription plans too complex. Consumption patterns have been affected. T-Mobile saw a fourfold increased in usage (IWATANI, 2003) though the average time online remained static at 45 minutes per user.

Copenhagen airport

Copenhagen airport is one of Europe's largest airports. The airport's involvement with WiFi has been motivated by three desires. Firstly, by a need to offset declining payphone revenues through the development of new services (SØE, 2002). Mobile telephones, which provide the airport with no revenues, have replaced pay phones as the principal mechanism through which travellers communicate.

Secondly, by the need to improve customer satisfaction among a key group of travellers, namely, business travellers. The range and quality of telecommunications services available at the airport will contribute to its overall ranking in airport league tables. Thirdly, checking in for a flight ensures that travellers are at the airport at least one hour before they fly. The time prior to boarding the flight is viewed by many as 'dead time' where the separation of the traveller from their office substantially reduces the amount of work and efficiency with which work is undertaken. WiFi would reduce the amount of 'dead time' through providing a link to the traveller's office.

The airport was not unfamiliar with LANs, as it operated both wired and wireless LANs for its own needs. As a consequence, the commercial offering of WiFi services only required the upgrading of existing hard and software and not a complete installation (SØE, 2002). Not only did this reduce the cost of providing WiFi services, it also reduced the time between taking the decision to offer such services and actually being in a position to do so. The use of existing infrastructures ensured that WiFi installation took two weeks.

The airport funded infrastructure upgrading itself. As a result, no outside WISPs were used. Although this could be viewed as an unusual decision on the part of the airport, several benefits flowed from it. The existing infrastructure and dedicated internet connection could be used, thereby reducing costs. Security concerns would be alleviated, as no outside party had to connect with the airport's existing infrastructure and the airport could dictate the location of the hotspots. Finally, conflicts of interest were also avoided.

This should not be taken, however, to mean that the airport rolled out its WiFi service completely independently of other companies. Aptilo Networks provided a series of inputs – billing, authorisation etc – that enabled the airport to deploy WiFi. Accessing the wireless internet zone at the airport is relatively straightforward. The user requires a WiFi enabled device such as a

laptop and when their browser is activated they are redirected to the wireless internet zone homepage where authorisation and payment occurs. Subscribers to ipass, which offers global roaming services to its members, do not pay and are directly logged on. Those subscribers who are not members of ipass need to pay, through either a credit card or a TDC scratch card. Subscription costs vary from DKK40 for 30minutes to DKK80 for 240minutes. Access from within the SAS lounges is free.

The airport has recognised the importance of roaming between WiFi locations. As a member of ipass, roaming is now possible. It has recently been suggested that roaming agreements with other location controllers, fellow airport operating companies or hotels for instance, are being investigated by the airport.

Telia HomeRun

At the end of 1999 Telia launched its HomeRun service with three hotspots. Since then the number of hotspots has rapidly increased, with 450 operating by early 2004. Significantly, these hotspots have not been indiscriminately sited, but instead are focused where the target market, business travellers, are to be found. Hotspots are to be found in hotels, airports, conference venues etc, namely in venues frequented by business travellers.

Why has HomeRun focused on business travellers? In essence the services provided by HomeRun extends the working day and widens the range of locations where work may occur. As both of these are prized by business travellers who are prepared to pay a premium to enjoy them. By emphasising the quality of service offered, HomeRun has sought to justify its prices, which are higher than those charged by competitors.

The strategy adopted by HomeRun has changed over time. Prices have declined and HomeRun has been bundled with other products offered by Telia. The first of these is illustrated in table 2, which shows that the initial start up fee has been drastically reduced. More recently prices have increased slightly, suggesting that either the market is not as competitive as initially thought or that HomeRun is seeking to position itself as a premium service provider.

Table 2: Subscription costs, Telia HomeRun

Subscription plan	*Price until 30th September 2002*	*Price from 1st October 2002*	
		Non-GSM subscribers	*GSM subscribers*
Flat rate	Initial fee 495 SEK, 2495 SEK/month	1495SEK / month	1395SEK / month
Base monthly contract	495 SEK initial fee, 300 SEK / month & 2.4SEK per min traffic fee	200SEK initial fee, 150SEK / month & 2.4SEK per min traffic fee	200SEK initial fee, 40SEK / month, 2SEK per minute traffic fee
Base 12month contract	N/A	150SEK monthly fee & 2.4SEK per min traffic fee	40SEK / month, 2SEK per minute traffic fee

Source: EFIMOV, 2002

Table 2 also highlights the bundling together of WiFi and mobile services. Through locking together the two services customers are less likely to move to another service provider and the financial incentives may encourage those cellular subscribers who would not otherwise be interested in WiFi to opt for the service.

Discussion

What do the above cases tell us about WiFi deployment? Our starting point here is that the deployment of WiFi networks is not as straightforward as we are often led to believe, with a whole host of factors affecting its economic and operational attractiveness. These in turn lead us to conclude that those presently investing in WiFi networks are unlikely to see a commercial return on their investment.

The first factor limiting the attractiveness of WiFi networks is the lack of economies of scale in their construction. Although the cost of each hotspot is relatively modest, their separateness from one another ensures that each time the full investment of is required. This is not to say that no savings are possible, as some will undoubtedly occur through the repeated installation of hotspots, but that these will be negligible when compared to the overall costs.

A second limiting factor is the number of simultaneous users that each hotspot can support. The evidence to date, albeit often anecdotal, suggests that the number of simultaneous users, each enjoying sufficiently fast access rates, is limited to two or three heavy users. Access speeds are particularly prone to deterioration if one or two of the simultaneous users are

undertaking bandwidth intensive activities such as watching video clips. In other words, a high number of simultaneous users will degrade the quality of service that each experiences as they are sharing the same bandwidth.

The significance of this should not be underestimated. Firstly, it means that if a reasonable level of quality is to be maintained, less revenue will be generated as the maximum number of simultaneous users is lower than would otherwise be the case. Secondly, additional investment is needed if each hotspot were to support more simultaneous users at a reasonable level of service quality.

Together these factors undermine the economic rationale for investing in WiFi networks. The lack of economies of scale increase the cost of building a network of WiFi hotspots, which, in turn, means that subscription charges are higher than would otherwise be the case. Network operators cannot maximise their revenue streams through increasing the number of simultaneous subscribers, because if more than a handful of subscribers access the hotspot simultaneously access speeds decline and quality deteriorates.

If there are limited, if any, financial returns to be made from the operation of WiFi hotspots, why do companies provide such a service? One explanation is to achieve product complementarities. Through the provision of hotspots at its cafes, Starbucks hopes that sales of its core products – coffee and cake – will be increased. As many of its cafes are largely empty during large parts of the working day, the provision of WiFi, which allows users to work whilst being outside their place of work, will generate sales when none would otherwise occur. A second related motive is for Starbucks to differentiate its cafes in an increasingly competitive and crowed marketplace. Starbucks pioneered the introduction of WiFi hotspots, and although other cafe chains have since launched their own WiFi hotspot services, in the minds of many Starbucks cafes are forever associated with WiFi. Thus, there is a marketing advantage to be gained from the provision of WiFi hotspots.

But are these motives shared by T-Mobile? T-Mobile does accrue marketing advantages from its association with Starbucks, and these should not be underestimated. The national scale of hotspot provision by T-Mobile, and the large amount of press attention that its relationship with Starbucks received, helped raise awareness of its brand in the marketplace.

Does T-Mobile share the other motives of Starbucks? No. T-Mobile is motivated by a desire to increase its revenues through the provision of wireless telecommunication services, of which WiFi is just one example. By contrast, Starbucks is motivated by a desire to enhance the attractiveness of its cafes to increase consumption of its core products. The quality of service experienced by users is not as important for Starbucks as it is for T-Mobile. For Starbucks, WiFi is complementary to its core service, whilst for T-Mobile it is a core service. Thus, given the technological limitations of WiFi, Starbucks will favour more simultaneous users than T-Mobile as consumption of coffee will rise. This would, of course, significantly impact the quality of service experienced by users to the detriment of T-Mobile.

There is also a difference between Telia HomeRun's motives and the locations where it has installed hotspots. Many hotels and conference centres have been persuaded to install a hotspot in their premises for fear of losing customers, rather than by a desire to attract new customers. In other words, the installation is part of a defensive strategy that aims to remove the presence of a hotspot as a differentiating factor. What evidence is available supports this conclusion; as many of the locations served have generated little, if any, revenue from their WiFi services.

If the various locations have sought to remove WiFi as a differentiator in their respective markets, then Telia HomeRun has sought to use WiFi to 'lock in' its customers to existing mature services such as GSM. Although WiFi is offered as a standalone product, the pricing regime offered encourages its combination with the mobile services offered by Telia.

Copenhagen airport falls awkwardly between the two other cases. The airport controls a key location and has sought partnerships with other companies to advantageously leverage its control over this location. These partnerships have facilitated the development of the WiFi network across the airport, making the airport more attractive to travellers in the process. It does not, however, rely to the same extent as Starbucks, or the locations in the case of Telia HomeRun, on other companies for the provision of WiFi as it made extensive use of its existing infrastructure. This is not to say that no business relationships exist, but rather than the airport is the dominant partner in the relationships.

Conclusion

In this paper we have identified the different motivations underlying WiFi provision in three different cases. We surmise that these different and diverging motivations are sufficiently strong enough to undermine the partnerships that exists between Starbucks and T-Mobile and Telia HomeRun and its location owners. These partnerships will collapse when it emerges that the underlying aims of the various partners are, in the medium to long term, incompatible. However, in the shorter term, the partnerships make sense as they enable each company to strive towards achieving their strategic objectives.

Copenhagen Airport stands in stark contrast to the other two examples. Its ambitions appear to be more measured than in the other two cases, limited to the provision of WiFi services within a single location. Moreover, its substantial use of its own existing infrastructure ensures that it does not need to align its interests with those of its partners for they are effectively providing inputs to meet its needs. As a result, the tensions that will eventually tear the other partnerships apart are largely missing in the case of Copenhagen airport.

It is therefore suggested here that those companies whose ambitions are limited, who themselves control the location where WiFi services are provided and dominate the necessary business relationships, will be the players who prosper. They may not make a financial return on their investment, but they will remove WiFi as a differentiating factor in the marketplace and attract key customers to use their location in the process.

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