Provision of Services Via the Wireless Application Protocol: A Strategic Perspective

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A b s t r a c t

Throughout the 1990s, the technological development and market penetration of mobile phones and other mobile handsets, such as personal digital assistants (PDAs), was very strong. Recently, the convergence of wireless and the Internet has occurred – bringing 'the Internet in your pocket' for which the potential applications are many and various, including shopping, banking, news feeds and e-mail. Under the present technological constraints of low bandwidths and high latency in wireless networks, as well as the low power and small screens of handheld devices, a key standard has emerged for Internet service provision – the Wireless Application Protocol (WAP). WAP provides the means for bringing the Internet and a range of services to the wireless consumer. As such, WAP has created a whole new set of dynamics in the wireless industry driven by this new era of value-added service provision. This paper explores the strategic implications of WAP service provision, drawing on a number of analytical frameworks. The purpose of the paper is to provide a deeper understanding of the forces impacting on the ability of WAP to succeed in Internet service provision. It concludes with a discussion of the future of WAP services and recommendations for practitioners.

Keywords: Wireless Application Protocol, strategy, mobile commerce

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INTRODUCTION

The Internet has proven to be an easy and efficient way of delivering a wide variety of services to millions of 'wired' users; as of July 2001, the estimated number of Internet users stood at 500 million, rising to 1 billion by 2005 (IDC Research 2001). Users can enjoy convenient global access to services via the Web browser; for the supplier, server-based service development via off-the-shelf tools can be very quick and convenient, providing a short time-to-market (724 Solutions 2001).

Throughout the 1990s, another technology that has played an increasingly important role in society is the mobile phone. Again, this is a technology in an age where time is short and the weight attached to convenience is high. From a penetration of only 8% in 1995, more than half of the UK population now own a mobile phone. Similar patterns can also be seen in Japan, the US and many other countries. In some places, such as some parts of Scandinavia and Hong Kong, the saturation of mobile phone ownership is now in excess of 80% (Fernández 2000).

Until very recently the Internet and the mobile phone have appeared largely separate. However, since the mid-1990s, mobile technology providers have been working to bring convergence, enabling the wireless Internet. In 1995, Ericsson initiated a project to develop the Intelligent Terminal Transfer Protocol (ITTP) to provide a standard for value added services in mobile networks. Similarly, in 1996, Unwired Planet launched the Handheld Device Markup Language (HDML) and Handheld Device Transport Protocol (HDTP), which respectively describe content/user interface and transaction protocols for wireless devices. Later, in 1997, Nokia introduced its Short Message Service (SMS) and a language called Tagged Text Markup Language (TTML).

With a multitude of concepts there was substantial risk that the market could become fragmented. Therefore, all the major players agreed upon bringing forth a joint solution. The outcome was the Wireless Application Protocol (WAP) and the industry group involved is called the WAP Forum (www.wapforum.org) – a group with over 200 members dedicated to enabling sophisticated telephony and information services on handheld wireless devices (Logica 2000). Indeed, WAP is now the most widely adopted wireless data protocol in the world among carriers and handset manufacturers (Saha *et al.* 2001).

WAP is a universal standard for bringing Internet-based content and advanced value-added services to wireless devices such as phones and personal digital assistants (PDAs). In order to integrate as seamlessly as possible with the Web, WAP sites are

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hosted on Web servers and use the same transmission protocol as Web sites, that is Hypertext Transport Protocol (HTTP) (3G Lab 2000). The most important difference between Web and WAP sites is the application environment. Whereas a Web site is coded mainly using Hypertext Markup Language (HTML), WAP sites use Wireless Markup Language (WML), based on eXtensible Markup Language (XML). WAP data flows between the Web server and a wireless device in both directions via a gateway that sits between the Internet and mobile networks. A wireless device will send a request for information to a server, and the server will respond by sending packets of data, which are formatted for display on a small screen by a piece of software in the wireless device called a microbrowser (Durlacher 1999).

The implementation of WAP has provided both problems and opportunities. Nevertheless, it indicates an important starting point for the growth of the wireless Internet. Whether based on WAP or its successors, the wireless Internet promises to bring significant changes in the ways we live, work and learn. By 2002, data is predicted to account for 20 to 30% of all wireless network traffic, and by 2005, there could be more mobile phones connected to the Internet than PCs, accounting for around 30% of all Internet traffic (Logica 2000).

With the provision of standards such as WAP, mobile telephony offers a potential platform for the penetration of a raft of services such as mobile (m-) commerce. Simply speaking, m-commerce is defined as any transaction with a monetary value – either direct or indirect – that is conducted over a wireless telecommunication network (Barnes 2002). Already this has injected significant growth in forecasts for future revenues in total global e-commerce, predicted to be $6.9 trillion by 2004 (Forrester Research 2000), of which more than $200 billion will be derived from m-commerce (Strategy Analytics 2000).

This paper explores the strategic implications of WAP services. It provides a detailed analysis of the WAP service industry, including the role of customers, suppliers, rivalry, new entrants and substitutes. The main focus for this paper is business-to-consumer m-commerce – currently the fastest-growing sector (Bughin *et al.* 2001). The paper synthesizes and analyses some of the key strategic issues, before rounding off with some conclusions and recommendations.

A STRATEGIC ANALYSIS OF THE PROVISION OF WAP SERVICES

Opportunities for IT-enabled competitive advantage vary widely from one company to another, just as the rules and intensity of competition vary widely from one industry to another. The complexity of the IT management challenge increases considerably when IT penetrates to the heart of a firm's (or industry's) strategy. Thus, in order to understand the impacts of the wireless Internet and WAP we need a comprehensive strategic framework. Porter (1980) provides such as framework, arguing that economic and competitive forces in an industry segment – such as the WAP service industry – is the result of five basic forces: a) positioning of traditional intra-industry rivals; b) threat of new entrants into the industry segment; c) threat of substitute products or services; d) bargaining power of buyers; and, e) bargaining power of suppliers.

This section aims to provide an analysis of the WAP service sector from a strategic viewpoint. The purpose of this analysis is to provide some understanding of the key forces impacting on the ability of WAP services to succeed in provision of mobile Internet services. The results of such an analysis have distinct implications for practitioners. Figure 1 shows Porter's framework, highlighting some of the key elements for each of the five forces. As we can see, there is strength in each of the forces, emphasizing a very strong degree of competition in the provision of WAP services. Let us examine the framework in more detail.

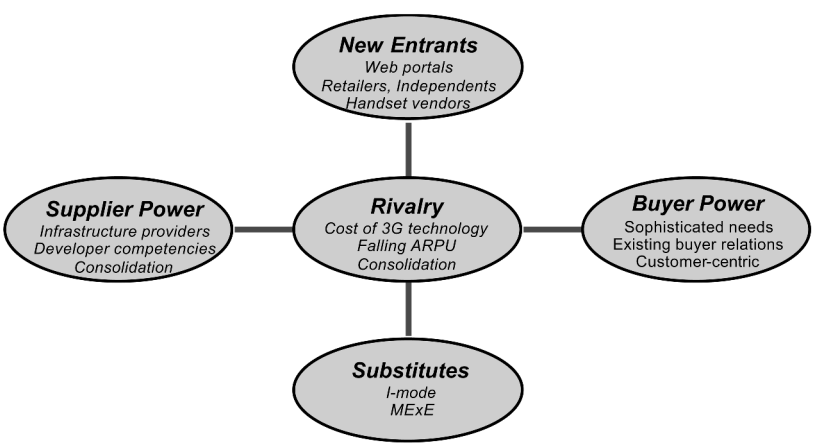

Figure 1. Strategic Analysis of the WAP Service Industry

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Rivalry

The network operators are powerful players in the industry that provides WAP services. Traditionally there has been a reasonably high concentration of players in mobile telecommunications. Recently, rivalry has been exacerbated by developments in service pricing and future service provision. With the implementation of third generation (3G) transmission technologies on the horizon, network operators have been clambering for licenses to provide services. The next generation of technologies promise transmission speeds of up to 2 Megabits per second, opening the door to a raft of high bandwidth services and multimedia. However, the cost of access to such applications – in terms of the frequency licensing arrangements – have not been cheap; in the UK, the cost of 3G License B purchase soared to over £20 billion, and similar figures were seen in other European countries (e.g. Germany). Such costs will inevitably need to be passed on to the consumer.

On the other side of the coin, the mobile market has been squeezed in terms of consumer pricing arrangements. As network operators have sought to increase the volume of mobile telecommunications and to provide differentiated price packages to the customer, profit margins have fallen. Generally speaking, the Average Revenue Per User (ARPU) has declined steadily over the past 10 years and is now an estimated 77% lower than in 1990 (Barnett *et al.* 2000).

The industry response has been a global consolidation as operators try to deal with their high up-front investments for 3G and decreasing ARPU. This consolidation trend, along with control of access and direct ownership of the customer make the operators the most powerful players in WAP services (WireFree-Solutions 2000b). However, legal issues reduce the power of operators to restrict access to content, and a decrease in barriers to entry increases competition from mobile Internet content providers.

All of the other forces in Porter's framework – new entrants, substitutes, buyers and suppliers – further contribute directly to rivalry. These are now explored in turn.

New entrants

The predicted revenues from wireless data services are enormous and have provided an attractive impetus to the entry of new players into the industry supplying WAP services. However, incumbent operators, suffering competitive pressures, have used their control of the network infrastructure to try to lock-in potential value. By presetting subscribers' telephones to make themselves the default Internet access provider and blocking unauthorized services, operators have the opportunity both to charge application providers for access to their subscriber base and to build their own branded services (Barnett *et al.* 2000). Nevertheless, where an industry is driven by consumer choice and varied access to services, such a strategy may not prove to be effective in retaining customers into the longer term.

The key business-to-consumer market makers on the mobile Internet are mobile portals (or m-portals) – revenues of which are predicted to be $42 billion by 2005 (Ovum 2000). In Europe alone, the market is expected to be worth $10 billion by 2005 (Bughin *et al.* 2001). Literally, the word 'portal' means a doorway or gate; mobile portals are high-level information and service aggregators or intermediaries (Chircu and Kauffman 2001) that provide a powerful role in access to the mobile Internet. Their main aim is the provision of a range of content and services tailored to the needs of the customer, including:

- *communication*, e.g. e-mail, voice mail and messaging;
- *personalised content* and *alerts*, e.g. news, sports, weather, stock prices and betting;
- *personal information management* (PIM), e.g. 'filofax' functions; and,
- *location-specific information*, e.g. traffic reports, nearest bank or ATM, film listings, hotels and restaurant bookings.

As such, mobile portals are usually characterized by a much greater degree of customization and personalization than standard Web-based portals in order to suit the habits of the consumer (Durlacher 2000). The mobile portal must be suitably tailored to the user's needs so as to present the right information at the right time on the small-screen WAP device.

The mobile portal market is currently undergoing significant expansion in anticipation of market growth. More than 200 WAP portals have been launched in Europe alone since autumn 1999 (Bughin *et al.* 2001). Players have attempted to build on existing brands, competencies and customer relationships to develop a subscriber base. Key players have been:

- *Mobile operators.* Portals include Genie (BT), Zed (Sonera) and MyDof (Telia).
- *Technology vendors.* For example, Nokia, Ericsson, Palm and Motorola have all developed portal services.
- *Traditional Web portals.* Including offerings from Yahoo!, AOL and Excite.
- *Retail Outlets.* For example, the Mviva portal is 85% owned by Carphone Warehouse.
- *Random new entrants.* Including portal services from banks, e.g. Barclays, and mass-media companies, e.g. the Vizzavi portal is half owned by Vivendi.
- *New independents*, including Iobox, Room33 and Quios.

Given time, one might expect the portal market to consolidate, although the potential role of niche players appears much greater that the traditional Web portal market.

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Substitutes

WAP adoption by consumers is both patchy and limited. As of July 2001, the use of WAP phones has been disappointingly low; just 6% of Finnish and US mobile phone users access the Internet using their phones, compared with only 10% in the UK and 16% in Germany (eMarketer 2001). Predictions are much better for some parts of the Asia-Pacific region (Dataquest 2000). In Japan, the success of WAP services has been greatest, with 6 million subscribers to the EZWeb WAP service in July 2001 (Mobile Media Japan 2001).

In most countries, the expectations of consumers have not been met and WAP has been considerably oversold. Part of the problem is the limitation of the technology and the non-subtractive nature of services; WAP is not a replacement for the wired Internet and involves an important trade-off between richness and reach in providing data services (Wurster and Evans 2000). Furthermore, while proponents argue that WAP is scalable and extensible enough to endure (Leavitt 2000), many see WAP as a stop-gap until 3G phones. In particular, critics point to the primitive nature of WAP, which is too closely aligned to the current generation of mobile phones, and the possible control of material by cellular operating companies, which will stifle creativity (Goodman 2000). Key problems include security (Korpela 1999), the high cost (until networks become packet-switched and the pricing model changes) and limited infrastructure (from networks and devices) (Barnes *et al.* 2001).

In addition to WAP, much attention is now being drawn to the HTML-based i-mode standard in Japan. The growth and success of i-mode provides considerable food for thought for WAP proponents. Launched in February 1999, i-mode has a subscriber growth rate of nearly 1 million per month, standing at 24 million in June 2001 (Mobile Media Japan 2001). This is nearly four times more than the competing WAP service, EZWeb. NTT DoCoMo, the owners of the i-mode brand and service, are now planning to 'export' this model to the US and Europe. Through a strategy of partnering, NTT DoCoMo hopes to emulate its earlier success (Associated Press 2001; Business Week 2001). Analysts put this success down to a number of reasons including technological investment, market dominance, vertical integration in technology development and the low penetration of expensive wired Internet (Funk 2000; Kramer and Simpson 1999; WireFree-Solutions 2000a).

Clearly, the development of i-mode is very different to WAP. In some senses the Japanese i-mode example is unique and perhaps unlikely to be emulated in the US (Diercks and Skedd 2000) and elsewhere. However, there appear to be some lessons that can be gleaned. i-mode is very definitely a brand and stands for key concepts like simplicity, functionality and meeting consumer needs (WireFree-Solutions 2000a). In this respect, WAP has some way to go to catch up with i-mode; WAP is a bundle of technologies and protocols, which on its own does not deliver value to the end-user.

Another possible alternative to WAP are standards based on Java – a 'write once, run anywhere' programming language – to provide a full application execution environment. These include Java 2 Micro Edition (J2ME) (Newsbytes 2001) and the Mobile Station Application Execution Environment (MExE) (Durlacher 1999). These standards are primarily aimed at the next generation of powerful smartphones. MExE, for example, incorporates some advanced features to provide intelligent customer menus, voice recognition and softkeys, as well as to facilitate intelligent network services.

Customers

Although the network operators still dominate the wireless market as a key intermediary, the signs are that this situation will change very quickly and may – to some extent – mirror the business model of Internet Service Providers (ISPs) in the traditional Internet market (Mobilocity 2000). The key driver here is service provision; the operators, in order to increase their ARPU, have to provide services that increase the customer's willingness to pay. Whereas there are currently very few services linked to cellular telephone companies (cellcos), estimates suggest that by 2004, around 75% of wireless revenues will be from the provision of services, including those based on WAP (KPMG 2000).

The convergence of mobile telecommunications and the Internet leads to more personalization and customer empowerment (Arthur D. Little 2000; Barnett *et al.* 2000). Although segmentation is important, e.g. focusing on specific market segments with designated products or specific high quality products for various segments, there is a strong recognition that one size does not fit all on the wireless Internet (Arthur D. Little 2000). After all, a customer who is not fully satisfied with a WAP service can move to another service provider immediately. Three key features enable the personalization of wireless Internet: the 'always at hand' nature of the mobile phone; the unique identifying nature of the phone; and, the ability to detect a user's location (Barnett *et al.* 2000). Using 'intelligent' personalization tools, such information can be used to enhance the richness of the user's service experience, anticipating customer needs.

Presently, the dominant business model for WAP service provision involves mobile operators aggregating content and services from third-party partners and providing these services directly to their subscribers. This situation is shown in Figure 2, where mobile (m-) businesses and portals are obliged to reach customers through proprietary networks. However, as the diffusion of WAP accelerates and consumers begin demanding services independent of the wireless carrier, a model similar to that of ISPs is likely to emerge (as indicated in Figure 3). Under this model,

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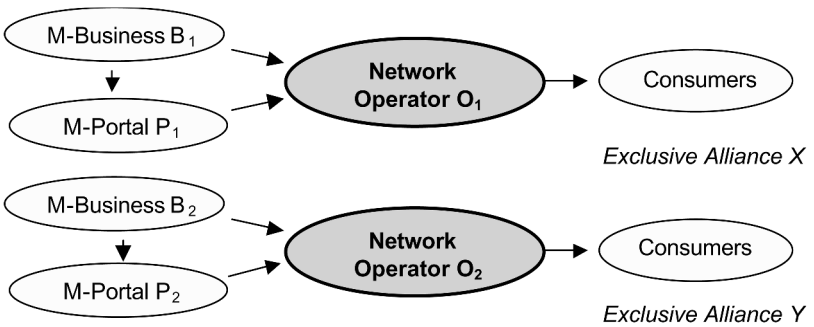

Figure 2. The Closed-operator Model (Adapted from Mobilocity 2000)

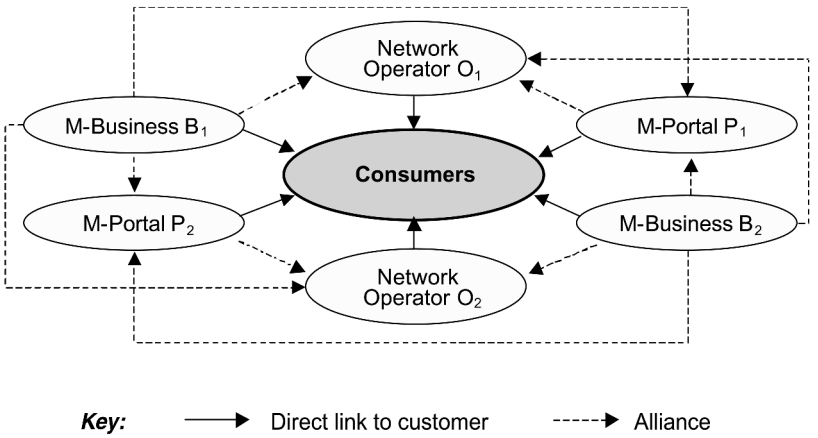

Figure 3. The Customer-centric Model (Adapted from Mobilocity 2000)

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wireless service subscribers will have access to any mobile site, and the open-access system will spur companies' development of their m-commerce presence (Mobilocity 2000). However, new entrants will be severely challenged by incumbents that have built strong customer relationships. Unlike the Web – where customers traditionally maintain multiple accounts – companies in the WAP service industry will be highly dependent on network operators and first movers that control billing relationships. In this sense, the customer-centric model will not prevent companies from creating partnership consortiums to provide the entire range of value-added services to consumers (Barnett *et al.* 2000).

Suppliers

Suppliers of hand-held mobile devices are one key group that have a strong grip on the WAP service industry. In the smartphone market, as in the PDA market, the brand and model are the most important part of the purchase decision; the service provider or network provider is less important (Peter D. Hart 2000). A stable oligopoly of four smartphone suppliers set prices to sell what they can produce; there is no omnipotent force pressuring prices, and little evidence that low cost strategies win market share (Kramer and Simpson 1999). Players such as Nokia have proven that barriers to entry in the handset market are substantial, with the cost of branding, production capacity and research and development deflecting considerable competition and making high margins sustainable. The next wave of consolidation in the wireless industry will probably involve handset vendors strengthening their position prior to the new wave of sophisticated wireless services (Kramer and Simpson 1999). Simple strategies of 'safety in numbers' will not address the deep impacts of deploying next-generation networks and services; access to leading-edge competencies in software and services is likely to be more important than being the largest supplier of a given element of the network.

Mobile network operators – such as Mannesmann, Telia and Vodaphone – are an important part of the transport process. Notwithstanding, these players are now leveraging their infrastructure advantages in transport to enable movement along the value chain towards mobile services, delivery support and market making. Typically, these operators control the billing relationships and SIM (Subscriber Identification Module) cards on WAP phones and are ideally positioned to become mobile Internet service providers (MISPs) or portals, thereby establishing a transport pipeline for content services (Durlacher 1999).

Apart from the infrastructure suppliers who are driving technological progress, a host of other suppliers are

important – such as those who handle financial transactions, software application developers, content packagers and content providers. The simple value chain that is mostly controlled by the network operator and heavily influenced by handset vendors is being transformed into a complex value network where alliances play a key role. In this new digital economy, consumer online services demand that diverse inputs must be combined to create and deliver value. No single industry alone has what it takes to establish the m-commerce economy (Barnes 2002).

DISCUSSION AND ANALYSIS

The WAP service industry – itself barely two years old in the UK – is in a state of flux. Driven by this new platform of value-added services, rivalry has begun to develop. Pressured by falling revenues, operators are seeking to build on important relationships with mobile customers – such as billing – to extend their portfolio of offerings. However, the demands for services from customers are unlikely to be met from a sole company; with the opening of WAP channels to the customer, partnership is one key trend in an area where pressure is mounting from players entering the market either directly or from adjacent competencies. In other parts of the value chain, the power of suppliers – such as handset vendors – is also distorting the market.

Figure 4 provides a simple framework for visualizing some of the key strategies in the WAP service industry. In particular, this shows how strategies are likely to change over time, driven by the increasing trend towards an open, customer-centric industry model and full service provision. The matrix has two axes: market focus and channel access. In the framework, market focus can either be broad, as the WAP service provider aims to be a portal, or niche, as the WAP service provider aims to target a specific segment. In terms of channel access, this can either be closed, where control falls to the network operator as an intermediary, or open, where access to the customer is direct and partnerships are likely to play a role in the provision of a range of services.

In the early days of WAP – from late 1999 to early 2001 – services were content-focused, as indicated by the leftmost cells on the grid; the provision of WAP services is based more on a supplier 'push' than a customer 'pull'. Typically, the network operator has played the role of content enabler, providing a range of selected content services to its subscribers. It is the controlling faction in exclusive alliances. Such players include BT, Vodaphone and Sonera. Other companies – content providers – supply focused, niche-oriented digital content to the network operator portal. Examples include Kizoom, the travel information provider, and BBC News Online, via its WAP news site.

As the WAP service market becomes more open, the user is likely to become the key focus; in this new era, WAP services become demand-led by the ever-sophisticated needs of the consumer. As channels to the consumer become more accessible, other players will enter the increasingly lucrative portal market, attempting to gain a share of increasing service revenues. In a market driven by personalization and consumer choice, alliances provide an important way to give the full range of consumer-demanded services. Participants in such alliances – service enablers – are an integral part of service offerings. Those who provide the 'front-end' of these offerings – service providers – are far less dominant than in the closed-channel era. Nonetheless, network operators are still likely to be central players in the early stages of open-channel access

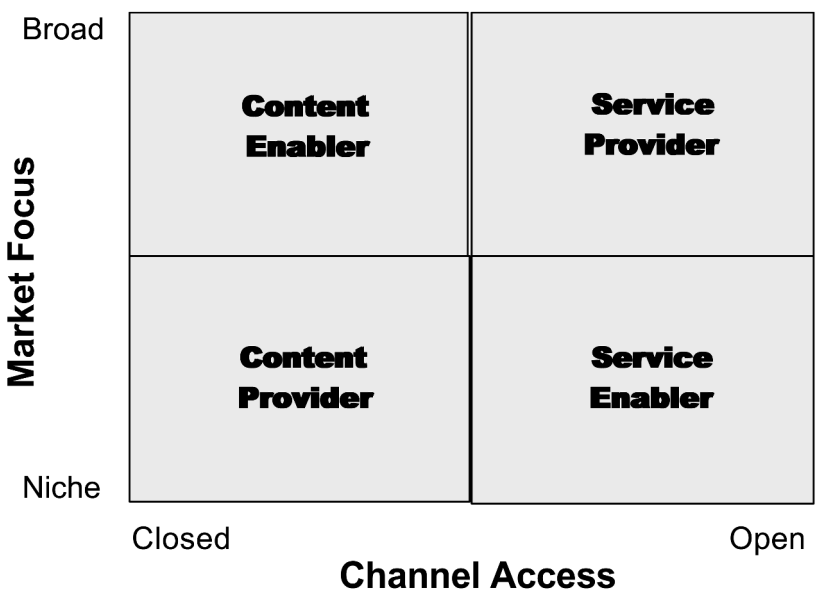

Figure 4. Strategic Framework for WAP Service Provision

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due their knowledge of the customer and pre-existing relationships – particularly via billing.

CONCLUSIONS

In spite of some misgivings, the wireless Internet is now firmly on the map, aided by the platform provided by WAP. The WAP standard provides the first steps in a path towards mobile Internet, taking stock of the current limitations of wireless networks and mobile devices. As Porter's framework has demonstrated, WAP creates an interesting and powerful set of dynamics for the industry of mobile Internet service provision, with competition and collaboration coming from a variety of avenues. Mergers and acquisitions have been rife as players in wireless, IT and media industries have attempted to position themselves, under the increasing threat of competition. As well as the transformation of incumbents, the lure of service revenues and the drive to serve the customer brings many new players from adjacent and even unrelated markets. In order to understand some of the strategic implications of WAP for such companies, this paper has provided an original matrix framework to chart some of the key market strategies.

The above analysis provides some important implications for practitioners. The provision of WAP services, although currently dominated by key players such as operators and infrastructure providers, must become more open and inclusive in the future in order to succeed in core markets such as the US and Europe. As early apathy to WAP services has shown, successful offerings must be demand-led rather than supply-driven; the penetration of WAP services has so far been limited, and initial high expectations of the wireless Internet have not converged with the reality. Successful WAP offerings are likely to be those combining content, infrastructure and services in a seamless way, attempting to be relevant and personal to the mobile phone user. The core consumer market for mobile Internet services is likely to be users under the age of 35, whose trade-off between reach and richness has proved most favourable (Wurster and Evans 2000). In Japan, a massive 72% of mobile phone users access the Internet via their phones, largely on the i-mode platform (eMarketer 2001). Although market conditions are very different in the US and Europe, i-mode does provide some important lessons, including the importance of a trusted, branded, holistic package of services, and substantial investment in and leveraging of superior technological infrastructure, such as networks and handsets. Such ideas provide significant food for thought for industry players involved in WAP service provision.

Whether WAP continues to thrive into the medium-term is uncertain. The implementation of the next generation of transmission technologies will enable a new breed of high bandwidth mobile networking that will stretch the abilities of WAP. Also, mobile devices are becoming more powerful – combining the capabilities of a mobile phone and small computer into a PDA. Whether WAP is extensible enough to cope with the possibility of rich multimedia and 'always-on' connection remains to be seen. WAP will always exist as a technology alternative, but the strengths of other application protocols such as Java-based MExE and HTML-based i-mode provide attractive replacements. Such replacements are built for a world where complex interactivity is paramount. Notwithstanding, in the absence of more advanced infrastructure WAP provides the de facto standard for the wireless Internet; WAP will most likely endure into the short term, spearheading initial attempts at wireless data services for business-to-consumer markets.

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