

The Brand is the Bundle

Strategies for the Mobile Ecosystem

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Abstract: The current mobile ecosystem is best understood in terms of a monopolistic competition model, characterised by heterogeneous producers providing a range of differentiated products for consumers with heterogeneous preferences. Product differentiation offers producers some market power, ultimately constrained by imperfect substitutes from rivals and the threat of market entry. To achieve their goals, consumers require a mixture of products from the network, handset and application domains. Reduced search and other transaction costs are a demand-side benefit of product bundling. Producers in this market have high fixed costs and low marginal costs. High fixed costs discourage entry, which increases the market power of producers. Low marginal costs and uncorrelated customer preferences across products for individual consumers encourage producers to expand their sales using supply-side bundling. Thus there are strong supply and demand side benefits from product bundling. We argue that producers will compete in terms of differentiated bundles combining network, handset and application features, with branding as the essential strategy for bundle differentiation. Successful business strategies will require direct access to customers and information about their specific preferences. For illustration, we look at the currently apparent strategies of Google, Apple and Nokia. The mobile ecosystem is complex but not unique. Strong parallels can be drawn between the mobile ecosystem and the television ecosystem. Google appears to be following a "free to air" strategy and Apple a "pay TV" strategy in bundle differentiation. Television manufacturers are largely undifferentiated and have little market power: this may be the fate of handset manufacturers and network operators who are comparatively powerless to withstand the evolutionary development of the mobile ecosystem.

Key words: Business ecosystem, platform, monopolistic competition, product bundling, heterogeneous demand, business strategies, mobile telephony, mobile applications, branding, price discrimination.

■ Introduction

General features of monopolistic competition

The current mobile ecosystem is best understood in terms of the monopolistic competition model of interaction amongst consumers and producers ¹. This pattern of interaction is distinct from perfect competition, in which consumers view products as perfect substitutes for each other, and consumers are only differentiated by the utility they place on the products as expressed by their willingness to pay. In markets based upon perfect competition, competitive strategies focus predominantly upon price. Consumers strive to seek out the cheapest provider of a homogeneous product and providers face strong incentives to reduce their costs of producing this good to the lowest possible level.

By contrast, monopolistic competition patterns of interaction emerge where producers supply a range of differentiated products to consumers with varying tastes and preferences for the different product varieties. Heterogeneity of consumers' tastes is essential for monopolistic competition to develop. Products can be differentiated on both tangible or intangible characteristics - what matters is that consumers believe that the products differ on attributes other than price. Potentially, all consumers can be matched to the variant that best suits their individual preferences. Consumers with a strong preference for the characteristics upon which a specific variant is differentiated do not perceive rival (differentiated) products as close substitutes. A degree of market power is thereby conferred upon the producer of each variant, in respect to those consumers who strictly prefer it to its rivals. Producer market power is ultimately constrained by imperfect substitutes produced by rivals and the threat of market entry by a variant that even more closely matches the consumer's preference than the current best. However, the presence of market power does not mean that producers can charge prices above their actual long-run average costs. As long as entry is unrestricted, rents can be competed away by substitution to functionally equivalent variants competing on price, or new variants that better match individual consumer preferences.

¹ The theory of monopolistic competition is credited to CHAMBERLIN (1962) and ROBINSON (1933). A good recent exposition can be found in CARLTON & PERLOFF (2005).

Monopolistic competition predominates in markets for products where fixed and sunk costs are large in proportion to marginal costs and each producer faces a downward-sloping average cost curve over the relevant quantity. Thus it will apply to network, handset and application producers in the mobile ecosystem as they all face the high fixed and sunk costs and low marginal costs inherent in network infrastructure, technology and software development. With monopolistic competition, the optimal number of firms decreases as the quantum of fixed costs rises. The number of firms operating will usually be either higher or lower than the efficient number. If fixed costs are very large and predominantly sunk, only a very small number of firms will participate, and there will likely be fewer firms than optimal as the risks of sunk capital being lost in the event of over-supply are significant. On the other hand, if fixed and sunk costs are low, the risks associated with over-supply are much less, leading to much higher likelihood of entry occurring. If the firms entering do not accurately assess the effect on the residual demand curve of their own and other firms' entry (to the extent that there is partial substitutability between the variants), there will likely be more entry than is efficient. Some firms will have to exit, with the consequence that any sunk capital is lost. Whilst the loss incurred by each firm that exits may be small, if there are many such firms, the quantity lost may be quite large in total (CARLTON & PERLOFF, 2005).

Industries characterised by monopolistic competition tend to exhibit fierce competition at the margins, as each firm endeavours to inform consumers of its specific characteristics in order to attract those consumers for whom it is the best match and persuade consumers with less firm preferences (i.e. more elastic demand) that its variant best matches their individual tastes. The intensity of competition is likely to be greater the more elastic the consumer demands and the less consumers know about the product (so the less likely it is that their preferences have been well-formed).

Specific features of telecommunications and information industries

Producers of telecommunications and information products typically need to make large fixed investments in order to be able to offer any product at all. Furthermore, most of the fixed costs are sunk, as they pertain to unrecoverable installation costs (networks), research and development and design (handsets and application software). However, once the required infrastructure is in place (or the content or technology has been developed) the marginal cost of provision is small (and very close to zero in the case of

software applications). These characteristics lead inevitably to the downward-sloping average cost curves and other features characteristic of monopolistically competitive markets. Pricing needs to be set in such a way that the costs of the fixed investment are covered over time (or at least enough is recouped to fund the next generation of technology before the current one becomes obsolete).

Low marginal costs combined with a degree of market power makes pricing strategies such as price discrimination and bundling very attractive. In addition to market power, price discrimination (charging different prices to consumers for the same product or service) requires that the provider has sufficient information available to separate consumers into different groups on the basis of their different demand elasticities and has some ability to prevent resale between the two groups (CARLTON & PERLOFF, 2005). Mobile network operators are able to separate consumers on the basis of billing information (business consumers are generally more price-inelastic than residential consumers) and calling patterns (those making fewer or shorter calls are likely more price-sensitive). Resale can be prevented by selling services on account to a named consumer who remains liable for all charges incurred regardless of who makes the call.

Bundling

Bundling two or more products together also relies upon differences in consumer valuations of the goods concerned, but unlike price discrimination, does not necessitate the producer knowing exactly how each consumer values each product in the bundle². Assume two products are offered for sale separately for price x , or together in a bundle for $x+y$ ($y < x$). If at least one product in the bundle is valued by the consumer above x (say, $x+s$), the consumer receives surplus s above the price paid for the good alone. This surplus can be used to offset the welfare derived from the purchase of the second product. The consumer may not value the second product sufficiently to purchase it at x , (say it is valued at $x-z$). However, the consumer will purchase the bundle as long as $x-y > z-s$. The producer will sell more of the less-valued product in a bundle than if the goods were sold separately. Moreover, the producer does not need to know which product each consumer values above the single product price. A consumer valuing

² The economics of bundling is credited to STIGLER (1963) and ADAMS & YELLEN (1976). See BAKOS & BRYNJOLFSSON (1999) for a literature review.

product 1 more highly will use the surplus on that product to offset the purchase of product 2, just as a consumer valuing product 2 more highly will use the surplus on it to offset the purchase of product 1. Consumer welfare is unambiguously increased relative to the case of single price selling. As long as the costs of production of both products are less than the bundled price, the strategy also results in increased profits.

Bundling is most profitable for producers when customer valuations of the two goods are negatively correlated and the goods are offered *via* mixed bundling (i.e. each can be bought separately or the two can be purchased as a bundle depending upon consumer valuations). However, if consumer valuations are positively correlated (both goods valued highly or both lowly), bundling will result in lost profits from the sale of the second good at a discounted price when the consumer would have been prepared to pay the full price. Bundling can still be a profitable strategy even when customer valuations of individual goods are highly correlated, but not to the same underlying variables (BAKOS & BRYNJOLFSSON, 1999). In general it is necessary to increase the number of goods in the bundle under these circumstances.

Discounting handsets to mobile telephony account customers is a classic example of bundling. For most consumers, the ability to make calls (i.e. the account) is the more highly-valued service (indeed, calls cannot be made without an account being purchased). A new handset with enhanced features can be purchased at a stand-alone price. However, unless the enhanced features are especially highly valued, the consumer will probably find the existing handset sufficient for the primary, highly-valued uses (calling and SMS), so will not purchase a new handset. However, handset upgrading can be induced amongst low handset valuers by bundling handsets and accounts. The same customers will purchase the handset when offered in this manner as they are utilising surplus from the highly valued service (calling) to offset the lower valuation of the handset. Finnish evidence confirms this rationale. When regulations prevented network operators from bundling handsets with accounts, Finland had a very old handset stock in use. However, when the regulations were removed, the average age of handsets in use reduced dramatically (TALLBERG *et al.*, 2007).

Indeed, two-part tariffs as utilised on mobile markets are a complex combination of both price discrimination and bundling. On one level, a mobile telephone account is a bundle of a connection and usage. Some individuals value connection highly (in effect the option to make and receive

calls when required), but make few calls because each is valued lowly. Others value calling highly. Multiple call plans with different combinations of fixed fee and usage charges (often in 'buckets' of minutes or megabytes) enable consumers to self-select the bundle that gives them the most surplus given individual valuations and usage patterns. Some consumers are also extremely price-sensitive with respect to connection (demand is elastic), but value calling very highly (demand is inelastic). They can be separated by selling accounts with no fixed monthly component at all - the classic 'prepay' accounts. These consumers do not value connection highly enough to pay for a monthly account at any positive price (perhaps because they lack the certainty of being able to make a regular monthly commitment to pay). The very high per-call charges these consumers pay (substantially above cost) is a form of price discrimination that is facilitated by bundling to the point where all of the costs of both services are combined entirely within the price paid for (and value of) calls (HAUSMAN & SIDAK, 2004). If the bundle was not valued above the price of the calls, these consumers would eschew mobile services entirely. That they purchase pre-pay but not post-pay accounts confirms their valuations of each component.

The bundling of goods with zero or low marginal costs can create significant economies of scope (BAKOS & BRYNJOLFSSON, 1999). This result holds even in the absence of technological economies in production, distribution or consumption - all of which can be found in the mobile ecosystem. The benefits of bundling grow as the number of goods in the bundle increases - offering profit advantages to firms that can create or coordinate larger bundles than their rivals (BAKOS & BRYNJOLFSSON, 2000). The benefit is greatest when the cost of the additional feature is essentially zero (PARKER & VAN ALSTYNE, 2005). This characteristic is evidenced in telecommunications and information industries principally in respect of the very low marginal costs of reproduction of software. Differentiation of handset features is increasingly evidenced in the bundling of low-cost applications based principally upon software. It makes very little difference to the cost of the handset whether these features are included or excluded. Their inclusion widens the appeal of the handset to all consumers who value one of the features (without the handset producer knowing *ex ante* which specific features will attract which consumers). Nonetheless, handsets are still 'versioned' to enable some form of price discrimination to be practised - high-featured bundles sold at high prices for those with high valuations of the features, and low-featured bundles sold to the price-conscious consumers who place a low value on the extra features. Similar characteristics pertain to software sold separately as applications. Indeed,

software is often sold in 'versioned' forms (e.g. 'student', 'professional') that contain essentially identical bundles of code, but with switches set to prevent access to some features in the bundle.

Bundling is also an effective strategy for deterring entry from specialist competitors who cannot provide all elements of the bundle (NALEBUFF, 2004). By offering only a pure bundle of products 1 and 2, a monopolist can earn more profits than by offering 1 and 2 separately and simultaneously deter entry from firms offering only 1 or 2. This strategy remains optimal post-entry. This effect can outweigh the price-discrimination advantages of bundling, and is strongest when customer valuations of the elements of the bundle are positively correlated.

Other features

Markets with low marginal costs where producers have market power also tend to 'tippy', in the sense that a producer with a small advantage in market share has a large advantage in profits. Applying that profit advantage back into product improvement can create a virtuous cycle resulting in market dominance. Markets with strong network effects can also be tippy (SHY, 2001). These features are evidenced in operating systems markets, which are typified by a single dominant firm.

High fixed costs discourage entry, which increases the market power of producers. This characteristic is evidenced in the very small number of network operators in most markets. Whilst virtual network operators have emerged as a consequence of regulatory provisions to increase competition, they are still reliant upon a very small number of physical networks to provide their services. There is little evidence that virtual operators grow to the point of investing in their own networks as per the 'ladder of investment' model (CAVE, 2006). Rather, as network technology features (coverage, quality) provide the main source of product differentiation in the mobile market, and hence define the customer groups who will value the differentiated features most, the main purpose of virtual operators appears to be to provide price competition and hence competitive discipline to the network operator from which they purchase their services. Indeed, their low-cost entry model would suggest that, *via* the monopolistic competition model, there will be over-many entering as a consequence of their low fixed costs, many will exit, and therefore it would be unwise for them to invest any capital

at all as long as they can lease access from network operators at (potentially) regulated rates (HAUSMAN & SIDAK, 2005).

SHAPIRO & VARIAN (1999) describe the importance of technical standards to support interoperability in information industries. Standards are used (or ignored) on a strategic basis by producers, who choose to support interoperability with their rivals' products on a product-by-product basis. As a general rule, multi-homing (supporting connectivity to multiple standards) can be an effective way of undermining the market power of rivals with related products, whereas single-homing (or locking out rivals) can be an effective tactic for increasing a producer's own market power.

Expected industry structure in the mobile ecosystem

Under these circumstances we can expect to see the emergence of a dominant firm for each product or key bundles of products. The dominant firm will be constrained by a competitive fringe of niche players who provide more specialised products to niche consumers. These niche players may, of course, be the dominant firm supplying a product in a nearby market.

■ The mobile ecosystem

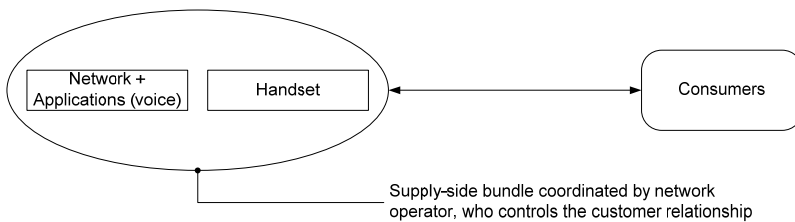
A categorization of products

For our purposes we categorise products in the mobile ecosystem as residing in the handset, network and application domains. The handset domain encompasses features requiring specific functionality in the handset, for example a camera or music player. The important features in the network domain are connectivity, geographic coverage, connection quality, reliability, bandwidth and latency. The application domain includes products such as voice, email, SMS, mapping, web browsing, searching, music, video and social networking. Each application product will have specific underlying requirements which need to be met by a combination of handset, mobile network, content and back-end server resources. An 'application' product is a wider concept than software running on the handset. It also includes products that are primarily content, e.g. a pay-per-track music store.

Evolutionary trends

The original mobile ecosystem can be considered as covering only two of these domains, as the only application provided (voice) was inextricably bound with the network. The network operator controlled the relationship with the customers, so managed the information and therefore any ability to engage in price discrimination. Whilst there were technological differences in network characteristics, market power emerged principally from the economics associated with high fixed costs. Whilst consumers might have had preferences for specific handset features, network operators could ultimately determine which handsets could be used on their networks. Network operators utilised their market power to engage in both price discrimination and supply side bundling - handsets plus network access - as sales strategies to increase their own market share. These relationships are depicted in Figure 1.

Figure 1 - Early mobile ecosystem



At the present time we observe convergence occurring in the network domain as competing network operators increasingly standardise on common network technologies (for example, in Australia and New Zealand, where historically both GSM and CDMA networks have operated, the CDMA operators have moved away from this technology in favour of standardisation with their competitors). Differentiation is occurring in the handset domain as new operating systems are developed for these devices and features from other portable electronic devices are added to the bundle. The application domain is characterised by a very high degree of differentiation, albeit based upon common standards for computer operating systems, browser functionality and internet addressing.

Producers who operate solely in the network domain face three essential problems. The first is that any technical differentiation in new network

technologies are being undone by multi-homing handsets³. Consumers prefer - and have demanded and received *via* regulatory processes - the ability to roam across different networks. Smart software now enables them to select the optimal network for specific uses. The second is emerging applications that do all their communication over the IP layer⁴ - removing the ability of the network provider to price discriminate based on the application type and hence customer valuations for different applications, as has occurred in the past. The third is that the technical parameters on which they compete are fast approaching the point where there is little if any benefit to the consumer from further improvement. For example, once round-trip latency falls below approximately 20ms, further improvements are unnoticeable to the user. Similarly there are virtually no consumer benefits to additional bandwidth once the point where a video can be downloaded faster than it can be played back⁵. Current levels of mobile network technology already approach these thresholds, though that technology remains to be widely deployed.

Producers operating solely in the handset domain (e.g. Nokia) also face difficulties. They are operating in a bounded ecosystem in which they do not control the ongoing relationships with the majority of their customers, relative to the network operators who have very frequent interactions and hence the ability to gather information on customer preferences. This inhibits their ability to control price discrimination and bundling. It is noted that it has been the network operators who bundle the handset with network connectivity, and not the handset manufacturers who bundle network connectivity with the handset. The second problem is that the proliferation of product variants that has been an essential part of their strategy to date has become a major hindrance to their ability to attract and implement third-party applications. A third-party developer for the iPhone needs to test their application on a maximum of three iPhone models, whereas a developer for Nokia's Symbian-based phones might potentially need to test on hundreds of

³ For example, the iPhone 3G S supports ten wireless communication protocols/frequency bands, and six email protocols.

⁴ E.g. Google Voice and Skype. The technology to do voice over IP also exists in current iPhone models and is useable over WiFi connections, presumably the only reason it has not been enabled over cellular data connections is because of Apple's contractual relationship with mobile network operators.

⁵ The only obvious exceptions to these cases are (1) where an application is poorly written, thus requiring multiple round-trips where one would suffice, and (2) where the consumer wishes to download a large file for offline use. We can expect that selection pressure from consumers will in time weed out (1), and the improving geographic coverage of mobile networks over time will reduce the number of situations where (2) is valuable.

models. Google's Android platform can be expected to suffer from similar problems as with Symbian over time, because of the incentives for handset manufacturers to differentiate their Android-based handset offerings.

The consumer is part of the ecosystem

Ultimately it is the application that is of interest to consumers. The 'killer application' of the early mobile ecosystem was voice connectivity. This required both a handset and a network connection, and was sold typically in that bundle.

Customers have turned out to be very heterogeneous in their use of mobile phones (VERKASALO & HAMMAINEN, 2007). There are strong distinctions between heavy SMS users, heavy voice users, those who value their phone for incoming connectivity and those who value them for outgoing connectivity. Some frequently upgrade their handsets to obtain the latest features whereas others buy a cheap handset and use it until technical failure or obsolescence forces them to upgrade. This heterogeneity has only increased with the emergence of new applications. For example, email is an essential application for some users (witness the emergence of the Blackberry), but of little utility to many others.

While voice (and its related social connectivity partner SMS) are still highly valued by consumers today (ODLYZKO, 2009), there is no single 'killer application' of the current mobile ecosystem. The new 'killer application' is instead, we suggest, a 'killer bundle' that takes advantage of the extreme heterogeneity of consumers' preferences and valuations of the services supported by the ecosystem. Firms with a direct relationship with their customers are able to collect information about their relative preferences and thus are best positioned to take advantage of the heterogeneity in customer demand.

Bundling as a strategy

There are strong supply- and demand-side benefits from product bundling in the mobile ecosystem. To achieve their goals, consumers require a mixture of products from the network, handset and application domains. Reduced search and other transaction costs are a demand-side benefit of product bundling. The provision of a more consistent user interface across

multiple applications reduces consumer learning and support costs. There are also substantial practical benefits for a consumer from a single device that can provide functions previously found in separate devices, e.g. a phone, camera, music player, GPS and video camera. In an environment where technical compatibility between and across products and applications is a risk for the consumer, a bundle provides an implicit guarantee of interoperability between elements of the bundle. Low marginal costs and negatively correlated demand preferences across products for individual consumers encourage producers to maximize their profits using supply-side bundling. Information goods are inherently copy-able (or 'infinitely expandible' - QUAH, 2003). An effective strategy to reduce unauthorised copying is to bundle (or indeed 'tie' in a 'pure bundle') information goods with a physical good (e.g. Microsoft sells the majority of its copies of Windows pre-loaded on a PC). The ticket can be 'clipped' for an information good distributed this way whereas if supplied *via* other means (e.g. over the internet) the ability to enforce payment is substantially reduced (or may be extremely costly to undertake). In the mobile ecosystem a producer can also add value by including in their bundle free content from other producers, including competitors (PARKER & VAN ALSTYNE, 2005). For example, Apples bundle Google Maps and Gmail connectivity with the iPhone.

Bundling can also be used as a strategy to develop demand for new products for which consumers are yet to develop their own valuations. The inclusion of an 'unknown' product in a bundle encourages consumers to try it out at low risk - specifically, any consumer surplus remaining from the purchase of the other products in the bundle will offset the low value placed on an unknown risky product, meaning more will be sold in a bundle than when sold separately.

Branding as a strategy

Some key attributes of products in the mobile ecosystem are highly technical, and expensive for consumers to evaluate, including compatibility, security and the protection of privacy. Customers also fear the stranding of their assets due to technological obsolescence. Under such conditions brand reputation is a very important signal that products will be supported by an entity that has made a commitment (*via* its spending upon branding) to remain in the market and adhere to the values and principles that the brand embodies over an extended period.

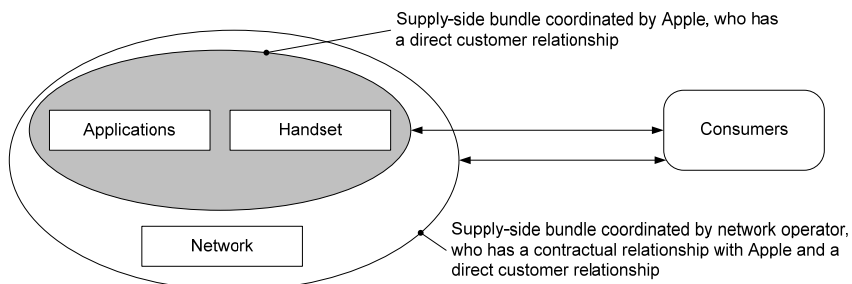
Entry strategies

Apple entered the mobile ecosystem *via* their dominant position in portable music. iTunes allowed reliable sales of high-quality music with clearly defined and allocated property rights, which had clear advantages to music producers and some advantages for consumers. The iPhone was essentially an iPod Touch with a cellular connection, adding voice, SMS and cellular data roaming to the previously sold bundle. Apple's initial entry strategy allowed exclusive bundling of their iPhones with specific network providers (AT&T in the US). This situation is depicted in Figure 2.

This strategy enabled Apple to lever their market power over customers who valued the iPod/iPhone features and the Apple brand strongly but did not have strong preferences for network features to become customers of the exclusive network. As long as the network selected as the exclusive partner was already well differentiated in the characteristics that differentiated the Apple brand (high quality, clear property rights, reliability), Apple could maximise its ability to sell handsets (*via* network-operator controlled bundles) to customers who valued the network highly but the specific iPhone features less so, to purchase more iPhones than they would have done if they were sold separately.

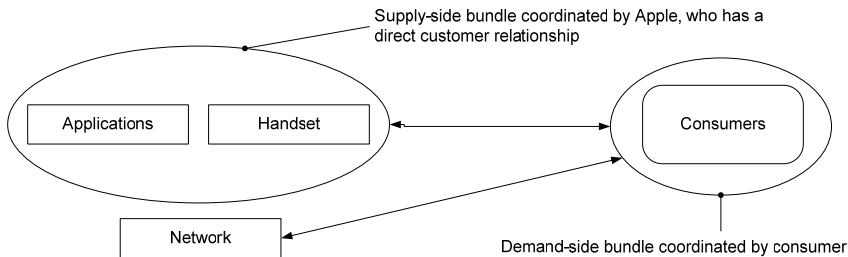
The new customers could then try the new features and specifically the applications such as iTunes about which they may previously have had limited knowledge, and thereby develop (or discover latent) preferences for these features to the extent that they would develop an ongoing preference for the Apple brand over other handset (and indeed, other internet-access appliance) brands.

Figure 2 - Apple's entry strategy into the mobile ecosystem (exclusive network provider)



However, having maximised its reach across customers who were initially differentiated across handset and network preferences, Apple's more recent strategy is to decouple their products from network providers. This situation is depicted in Figure 3.

Figure 3 - Apple's evolving strategy ^(*)



(*) Note that 'applications' include those supplied directly by Apple and third-party applications vetted by Apple.

This strategy is possible because customer preferences for the iPhone features and the applications it supports are sufficiently strong across both markets now for the Apple brand differentiation to confer the necessary market power to proceed alone. This is supported by the fact that Apple, by selling services *via* its own controlled sites, can both manage the quality of services provided and begin building its own relationship with the customers it has attracted. As these services are charged for ⁶, they will be purchased by those who value those characteristics sufficiently highly to pay a positive price (compared to the equivalent services offered by 'free' sites that do not charge and do not therefore guarantee quality or even legal title to materials acquired).

Google entered *via* their dominant position in internet search and other database-backed applications. Making the Android operating system open-source gives a cost advantage to those handset manufacturers who adopt it. Google bundles in other database-backed applications (e.g. location-aware search, maps, Latitude) and adds the Google brand to the handset.

⁶ The Apple AppStore also hosts free third-party apps. As these are subject to the same vetting and quality-control process that applies to paid apps, they offer the same benefits to consumers.

Google can selectively provide features in the Android bundle that are not made freely available on other handset platforms. There is, however, an inherent danger in this strategy. A major gap in functionality of a key application for a different platform (e.g. Google Maps on the iPhone) might encourage the platform owner to seek a second supplier for that element of their bundle (e.g. Microsoft's Virtual Earth), to the detriment of Google who would lose the associated advertising revenue.

Google's strategy is inherently more flexible than Apple's. Independent handset manufacturers who produce Android-based phones may choose to sell them independently (Figure 4) or bundle them with network providers (Figure 5). The relationship between Google and the end customer may remain anonymous.

Figure 4 - Google's entry strategy (with unbundled handsets)

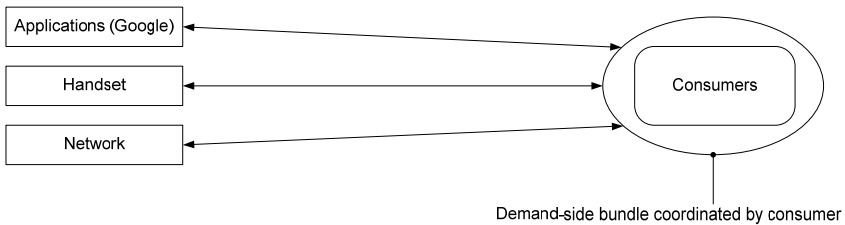
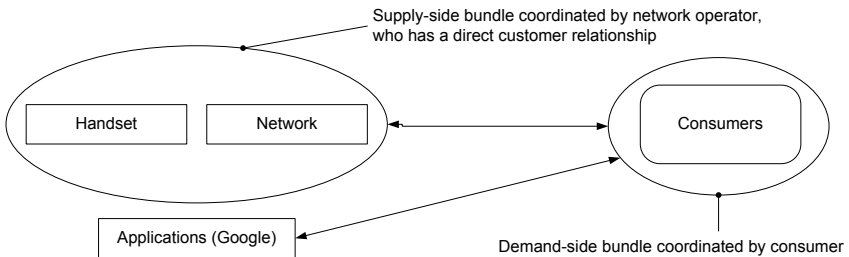


Figure 5 - Google's entry strategy (with bundled handsets)



Amazon is building its own mobile ecosystem based on content (books, newspapers and magazines), a proprietary platform (the Kindle) and a proprietary mobile network. From there is a small step to expand into telephony and the other services offered by the mobile ecosystem.

Games consoles might provide another entry point into the mobile ecosystem. The Sony PSP is an obvious candidate that could easily become a telephony-enabled mobile gaming platform. Skype could also leverage their voice-over-IP technology and existing customer database to enter the

ecosystem with a cellular-data only phone, though the emergence of Google Voice may have forestalled that market opening.

Google entered the mobile ecosystem *via* applications, subsequently adding a handset. Apple in contrast started with a handset then added applications. While the mode of entry may differ, the end point is the same: global ecosystem players will be those in control of applications, and able to offer consumers a bundle of application, handset and network products.

■ Competition *via* bundles

We can expect that producers will compete in terms of differentiated bundles combining network, handset and application features, with branding as the essential strategy for bundle differentiation.

BRESNAHAN & GREENSTEIN (1999) describe competition in the computer industry in terms of competition between platforms. PARKER & VAN ALSTYNE (2005) identify personal computers and game consoles as two-sided platforms competing for game players on the basis of preferences for quality over a small range of applications (game consoles) and the wide range of applications available (personal computers), linking this back to the pricing strategies used by each to differentiate both customers purchasing the devices and the application developers creating content. We suggest that these features come together in the mobile ecosystem in the form of a competition between bundles that draw upon the differences in customer preferences across the range of features in handsets, networks and applications.

Table 1 contrasts selected attributes of the Apple and Google bundles ⁷. Apple's model is funded by application consumers, whereas Google's is funded by advertisers.

It is highly possible that both bundles can coexist over time, just as game consoles continue to co-exist with personal computers, based upon consumer self-selection into the bundle that offers the greatest welfare for that particular consumer. Indeed, we predict that the outcome of Google

⁷ Clearly other producers and bundles currently exist in this ecosystem, however these two have taken reasonably polarised positions and we can contrast them without loss of generality.

Android / Apple iPhone competition will be a bifurcated market based upon the differentiations in Table 1. It remains to be seen which will be the key attributes that define customer loyalty.

Table 1 - Selected attributes of the Apple and Google bundles

	<i>Apple/iPhone</i>	<i>Google/Android</i>
<i>Brand values</i>	High quality	Universality
	Clean property rights	Free - take what you get
	Trustworthy	Open access -
	Takes responsibility	get the good and the bad
	Mediated	Peer-to-peer
<i>Third party access</i>	Consistent	Less consistent, at some cost of usability
	Highly useable	
<i>Third party access</i>	Regulated and quality controlled	Unrestricted
<i>Target consumer attributes</i>	Specialists	Generalists
	Dislike of advertising	Open to advertising
	Time poor	Time rich
	Price inelastic	Price elastic
<i>Customer relationship</i>	Direct	Anonymous
<i>Core content</i>	Paid music and videos	Search and mapping
<i>Payment</i>	Cash	Eyeballs (viewing advertising)

If a single producer was to become dominant, it would be the one with the bundle that was cheap enough, or their single-homed applications were valuable enough, and there was a sufficiently large weight of preference amongst consumers generally for those features, to capture the entire middle ground of the market. Other producers would be left to serve niche markets. Nonetheless, both the dominant firm and the niche producers would continue to exist serving their own consumer base.

■ Parallels with the TV market

There are strong parallels between the mobile ecosystem and the television market. Televisions multi-home (they can receive content from multiple broadcasters). Programme producers produce bundles of branded content (called channels) and we also observe further bundling of channels.

The television manufacturing industry itself is barely monopolistically competitive. There is some evidence of brand preference but ultimately little to distinguish the offerings of one manufacturer from another over time.

These manufacturers can be expected to earn little more than zero economic profit.

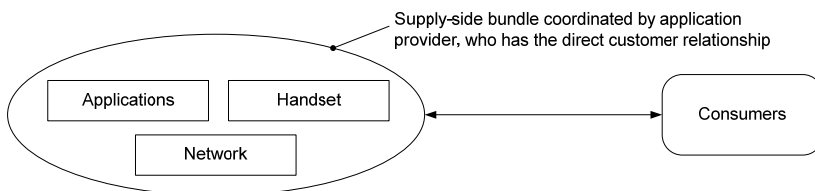
Two major business models have evolved for content: free to air programming paid for by advertising (think Google) and the pay TV model with direct payment for services (think Apple). Interestingly the free-to-air model preceded the pay TV model, though the two models appear to co-exist in a stable configuration at the present time.

■ Strategic weaknesses

Geographically-based telecommunications networks are already subject to intrusive regulation in most developed countries. Typically regulators reduce the ability of networks to use the obvious economic tools to increase their economic profits: bundling, price discrimination, restricting access to competitors and consumers lock-in.

In the longer term, it is difficult to see how geographically-discrete networks subject to regulatory scrutiny will be able to wield sufficient market power to control the bundle (for example, Apple's exclusive network deals would likely be considered anticompetitive by industry-specific regulators in some countries). The major strategic weakness facing network operators is the bargaining power available to the global ecosystem players. For example, Apple could build its own networks (like Amazon) or become a virtual mobile operator, playing one operator off against another for discounted access for "its" customers to telecommunications networks (see Figure 6).

Figure 6 - Possible future strategy for Apple or Amazon



Network operators have little chance of becoming effective global ecosystem players, as they are subject to different regulatory environments in each country in which they operate (HOWELL, 2006).

Specialist handset manufacturers may find themselves in a similar position to television manufacturers over time, finding it very hard to differentiate themselves on attributes other than price.

A potential weakness for Google is that there is very little customer lock-in in their model. Advertisers can be expected to spend on any platform that enables consumers to be reached.

Price-inelastic consumers are those most valuable to advertisers. If Google's bundles are not attractive to those consumers, advertisers may defect. Customers attracted to free content and services may desert Google if better free services appear.

Another danger is that the unfiltered mobile ecosystem quickly evolves to contain too much junk. 'Junk' in this sense is anything that has negative value for the consumer (e.g. advertisements, pornography, or low-quality applications and content). Improvements in search technology can only do so much without enough reliable information about individual consumers to effectively segment them. Whether Google's largely anonymous customer base is willing to forego that level of privacy remains to be seen.

Apple's model allows the collection of a substantial amount of information about each iPhone consumer. Apple requires signup for iTunes account with customer credit card information before allowing any apps (including free apps) to be downloaded to an iPhone. Apple has a full record of every app installed and upgraded, along with every music track and video purchased from iTunes for each consumer. This is extremely detailed information from a marketing perspective; however privacy concerns may limit the extent to which Apple can exploit this information for marketing purposes.

Apple has shown that it can drive prices down aggressively (D'AVENI, 2007) and capture a broad consumer market with their iPod product line. It remains to be seen whether they can achieve the same result with the iPhone.

■ Conclusion

The monopolistic competition model offers a good explanation of current firm behaviour in the mobile ecosystem and a basis for the prediction of future developments. We believe that heterogeneous consumer demand

means that successful producers will compete in bundles that include products from the handset, network and application domains. These bundles will be differentiated by strong branding that reflects the values of the producers.

To fully capitalise on these strategies requires information sufficient to manage the customer relationship. Apple is in a strong position to gain this information *via* a direct relationship with their customers, in comparison with Google's more anonymous customer relations.

Network operators and handset manufacturers are not in a strong position to offer comprehensive bundles. Their market power in the mobile ecosystem can be expected to diminish over time.

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