EDISON

Mobile Software

iRobot

Technology

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The days of earning a return on hardware are numbered. To earn a decent return over the next five to 10 years, companies will need to make a difference to the way users live their digital lives on mobile devices. Fortunes change fast in mobile, and while iOS and Android are on top now, that could rapidly change as they are not without significant weaknesses. Of the challengers, Microsoft and Yahoo! are, by far, the most exciting.

- **Ecosystems will rule.** The smartphone market is still growing but only a few companies seem to be able to make money from it. This is because the emphasis is shifting from hardware towards the entire user experience from hardware performance all the way to the apps and services. The ecosystem is the glue that holds the entire proposition together and it will be responsible for triggering user delight or disgust. It is here fortunes will be won, lost or perhaps recovered.
- **Open spaces.** The notion that the market is saturated or that there is only space for two ecosystems is fundamentally flawed. In theory there could be 20, but Edison sees a more realistic scenario as two to four big and three to four mid-sized ecosystems.
- **Tools of the trade.** Edison Investment Research combines two proprietary methods to assess those addressing the market for mobile devices and services. First, an assessment of services provided to satisfy user demand for online activities (digital life, page 10). This analysis excludes transactions that would be considered e-commerce. Second, an assessment of an ecosystem against three simple rules (the three laws of robotics, page 14) that Edison considers essential to be a successful mobile ecosystem provider.
- **iRobot.** Android and iOS are the runaway leaders but are not without their weaknesses. Of the two, Android looks the most vulnerable and there is scope for substantial market share loss as consumers become more sophisticated and are made aware of decent competing ecosystems at very reasonable prices.
- **Blue squares of death.** Microsoft's Windows Phone scores very well using Edison's methods but it is floundering due to poor execution and user ignorance. There is potential but Microsoft and its partners really need to step it up.
- **Door wide open.** Of the rest, Facebook, Amazon and Twitter have great user numbers but no real ecosystems to speak of. Edison expects heavy investment in this area. Yahoo! and BlackBerry are more advanced in delivering an ecosystem, but only Yahoo! has a good chance of being really successful.

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Executive summary

Large and growing markets are usually where the most profitable companies are to be found, but in smartphones only a few companies are making any money. In fact Apple and Samsung between them make more than 100% of all smartphone industry profits, leaving other handset makers desperately trying to make ends meet. This is the way it has been for many years but the industry is changing as the traditional model of making and selling smartphones is getting much more complicated. This is because the lines between the mobile phone industry, the computing industry and the internet are becoming so blurred that it is almost impossible to tell where one ends and another begins.

Within this widened scope there are more business models available than just selling mobile devices. These are: 1) technology provider like Qualcomm, MediaTek or Ubuntu (via Canonical), 2) handset maker like Samsung, Apple or Nokia, and 3) internet application and service provider like Google, Microsoft or Facebook. Where one has a defensible technological edge, profitability should remain but the outlook for handset makers is very bleak indeed. This is because hardware is becoming more and more of a commodity and the user is increasingly focusing on the user experience when it comes to choosing which device to buy. Outside of providing technology, this means that a company can only make money by charging a premium for hardware on the basis of a great ecosystem (Apple) or by monetising user information gathered when they use one's services (Google). These models are not mutually exclusive and indeed Apple is trying to address all of them (Exhibit 3).

Therefore the main question for anyone looking to be involved as an investor or as a participant is: how do I assess and evaluate who has what it takes to make money in the mobile phone industry over the next five to 10 years? We combine two methods to arrive at a conclusion to this question.

The first is an assessment of digital life. Edison defines digital life as the sum of all activities that a user does in an online split by the amount of time the user spends engaged in each activity (page 10). We assume that the amount of time spent in each activity is analogous to the amount of information that the provider of the activity can collect about that user. Hence it represents the monetisation opportunity when it comes to selling targeted advertising. (This analysis **excludes** transactions that would be considered e-commerce. For example the purchase of goods on Amazon or content from iTunes).

The second is what we refer to as "the three laws of robotics". These are: 1) an ecosystem must provide easy and fun access to the user's digital life, 2) an ecosystem must be simple and quick to set up, and 3) an ecosystem must capture traffic on its own servers. The first two are self-explanatory but the third is crucial if one wants to earn revenues from offering digital life (page 10). If a company is not a handset maker and fares badly against this law, the chances are that it will fail to make both headway and profits in the mobile phone economy.

It is on this basis that we have assessed the outlook for all of the major ecosystem layers and contenders and drawn the following conclusions:

Apple's digital life offering is poor. Despite a huge presence in hardware, Apple's offering of services to consumers is patchy and we think of dubious quality (page 16). Leaving aside iTunes, Apple's efforts in this space such as MobileMe, iCloud, Apple Maps and so on are not a patch on competing services. Furthermore Apple has no real presence in gaming or social networking, which together make up 56% of digital life (page 10). Hence, we conclude that Apple is a superb medium for the creation and distribution of third-party content. That is all well and good but if hardware and user interface commoditise, what has Apple got with which to differentiate its offering? This is the biggest long-term risk that Apple runs and why we think that this will be the biggest area of investment for Apple. Apple's long term outlook depends on this.

Android looks very vulnerable. Google's inference that there are nearly a billion users is misleading. There are a nearly a billion Android devices out there but Edison Investment Research calculates that only around a third of them actually provide a decent Google Digital Life experience (Exhibit 14). The Google digital life experience is best in class (a great service for almost every activity), but the way it is delivered is substandard. Android fares very badly on laws 1 and 2 (page 22) as the experience is inconsistent, difficult to use and application quality is poor. This combined with the fact that traffic generation on handsets with the same price as iPhone still meaningfully lags iOS (page 23) indicates that user loyalty is low. We think that users are ready to try something different as long as it is meaningfully better and comes at the same price.

Windows Mobile has great potential but is suffering from poor execution. Windows Phone scores well on the three laws and has great coverage of digital life with high-quality services. Despite these great scores, the devices are selling in paltry volumes and there is little consumer interest in the offering. The reason for this is that consumers seem to have no clue about what is on offer as Microsoft and its partners have done a very poor job to date in terms of marketing Windows Phone 8 and educating the user base. The opportunity for Windows Phone is to attack the Android user base below the price point of the iPhone.

Facebook, Amazon and Twitter have great user numbers but are a long way adrift of the leaders. These services have hundreds of millions of users each, and the potential to become ecosystems in their own right, but it is still early days. None of them have an ecosystem with the kind of depth of iOS or Windows Phone and their coverage of Digital Life is focused on only one or two segments. For these companies to be real contenders in the delivery of internet services in mobile this must meaningfully change. Amazon is addressing this through the sale of hardware and its own user experience on Kindle, while Facebook is trying to expand its reach beyond social networking with a user experience called Home on Android devices. Twitter has yet to make what could be considered as a move in this direction and consequently appears the most challenged of the three. This is a requirement for long-term growth but dominating one segment across all ecosystems (page 41) is a viable, if somewhat smaller opportunity.

Yahoo! and BlackBerry are viable contenders. Yahoo! has over 120m users and with the acquisition of Tumblr Yahoo! adds social networking and micro blogging to its list of digital life services. Yahoo! now has most of the assets it needs to create a rich and immersive ecosystem but does management have the depth to execute that strategy effectively? History and the share price say it does not. BlackBerry is down but not out. However, its move to allow BlackBerry Messenger to be available on platforms other than BlackBerry is fraught with risk. This is because it has willingly given away a popular and exclusive asset meaning that the devices now need to stand on their own two feet to survive. BlackBerry has no real presence in digital life, meaning that its handsets must make money for it to survive. That being said, the user experience on BB10 is fairly good once one has become used to its idiosyncratic commands.

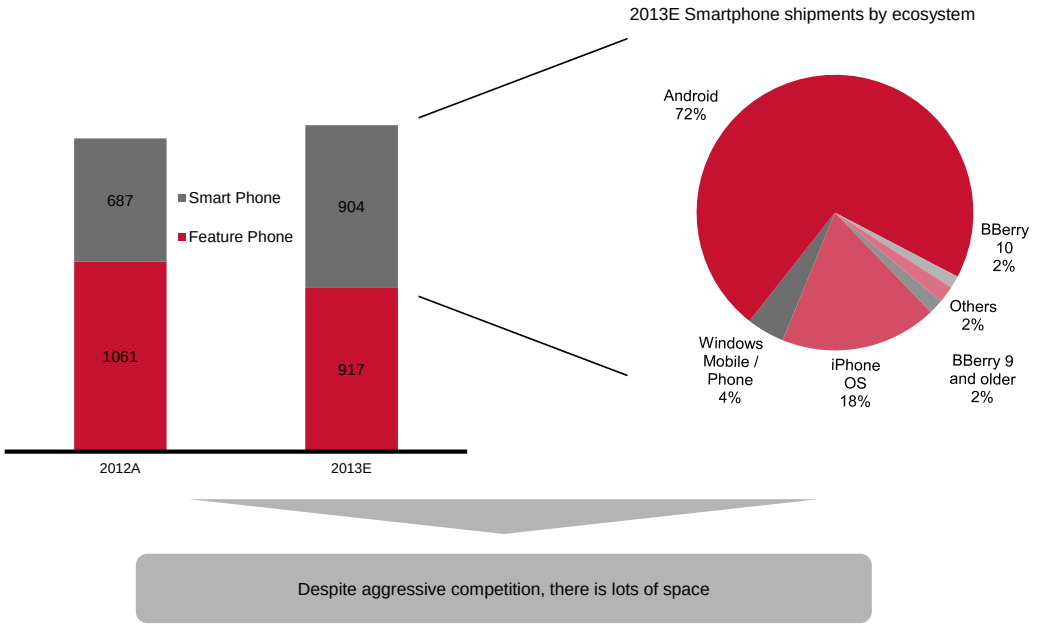
There is a long waiting list. There is no shortage of companies wanting to get into this space as it is high growth with rich rewards for those that can get it right. In fact almost any company involved in consumer electronics, consumer software and internet services will at some point need to decide how it intends to address this space. Denial is not an option as revenues and profits will evaporate in a comparative blink of an eye for those that think that they are immune from the change that is pulling the technology, media and telecom industries together. Broadcast TV has the worst case of denial and looks most likely to sit and fiddle while its business burns.

Smartphone snapshot

Market dynamics

The smartphone market is where all the excitement has been over the last few years. Although the growth is likely to be much lower both in terms of unit growth, it is still a massive market and one where almost all industry profits are to be found. Between them, Samsung and Apple are still accounting for more than 100% of all mobile industry profits. In 2013 we are likely to see the market become more mature, which means that mad, headlong rush phase is now past us. This basically means that growth will be harder to come by and those that must have it will have to fight harder to keep it. This raises the spectre of much tougher competition and falling margins for those that are unable to differentiate their products.

Exhibit 1: Mobile handset market 2012-2013e



Source: Edison Investment Research, Gartner

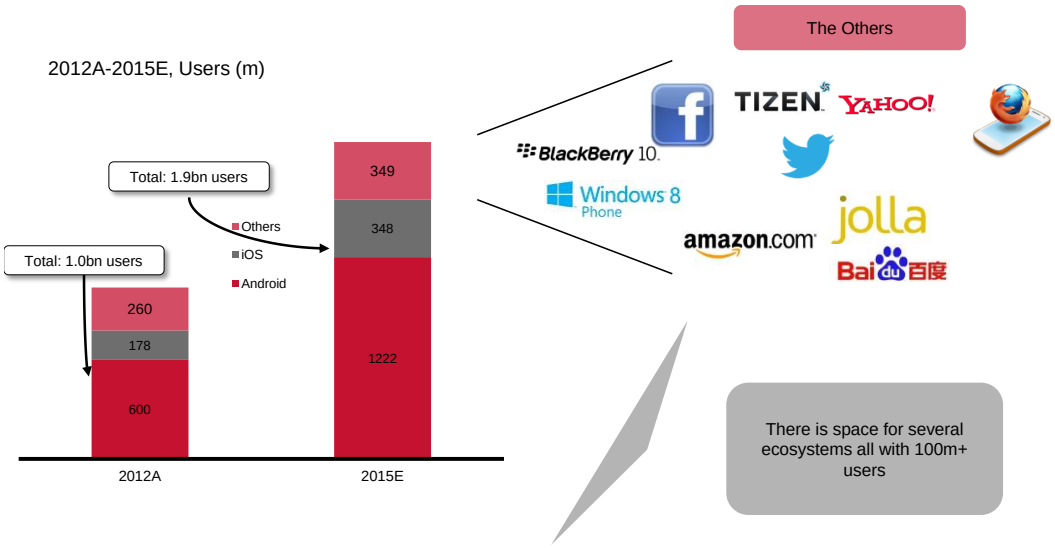
Although the overall market has slowed markedly, the smartphone segment is still experiencing good growth as more and more users look to buy a smartphone for the first time. This has been largely driven by falling costs to make smartphones thanks to the availability of off-the-shelf technology. The combination of MediaTek and Android puts a smartphone within reach of almost anyone and everybody has wanted to jump on the bandwagon. The result has been Android devices at very low price points and very rapid growth in unit shipments in the smartphone market. The main casualty has been the feature phone market where volumes have begun declining and look set to do so for some time to come (Exhibits 1, 32 and 34).

The smartphone also offers an opportunity beyond just handsets for making money. There is a thriving market for applications as well as a large and robust revenue stream to be earned from mobile advertising. This is why companies like Google and Amazon are prepared to give things away for nothing in order to get access to these revenue opportunities.

Edison Investment Research believes that the biggest differentiator when it comes to the user purchase decision is rapidly becoming the ecosystem rather than the handset or the OS that runs it (page 8). For this reason Edison has begun to forecast smartphone users globally as it is clear that the size of an ecosystem will be a central characteristic of its success or failure (page 12). This user base is then divided up among those who are holding themselves out to the market as an ecosystem. On the surface, Android has the by far the majority but it is rapidly becoming clear that

in fact Android is just an OS and that in fact there are multiple ecosystems, all using Android (page 19).

Exhibit 2: Smartphone users by ecosystem, 2012-15E



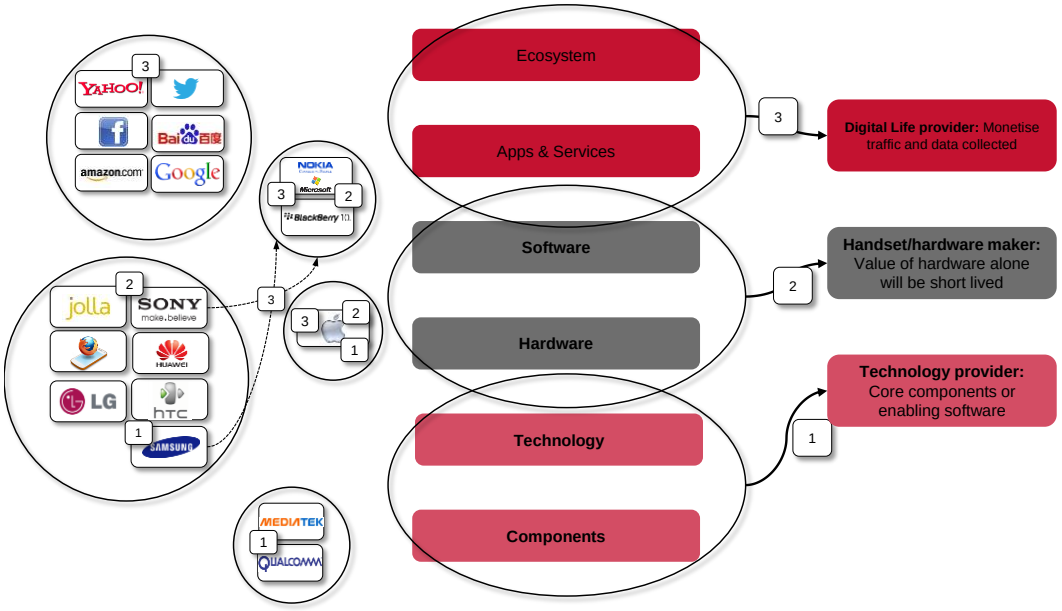
Source: Edison Investment Research, Gartner

Making money

At the end of the day profit is the single most important consideration when looking at the success of any venture or activity in the mobile phone industry. This is often forgotten in many analyses as revenue is equated to success. Edison believes that revenue is a critical step leading to profitability as without profitability an ecosystem, handset venture or application developer will not last for long. Hence, this is central to Edison's analysis.

Edison sees three ways to make money in the mobile phone industry for the next five to 10 years (Exhibit 3).

Exhibit 3: Where to make money in the mobile phone industry



Source: Edison Investment Research

Firstly, excellent returns can be made as a provider of technology to the mobile phone industry. Historically, this has been mostly realised by the wireless chipset vendors, which have made handset manufacture accessible to any company that wants to make a device. Qualcomm and MediaTek are the two leaders in this space and look set to continue their high level of profitability even if growth begins to slow. Edison also sees value in bendable and flexible screen technology as well as other niche areas like security, but this is a subject for another publication.

Secondly, high levels of profitability can be obtained by selling the hardware upon which the user experience or the ecosystem runs. In essence users are paying high prices for the hardware because they value the ecosystem and user experience that runs on those devices. There is of course a minimum level of hardware specification, quality and look and feel that must be met, but this is unlikely to afford profitability for long in the absence of a user experience or ecosystem.

Thirdly, good returns can be made through the monetisation of the user data and traffic that is generated as a consequence of users living their digital lives (page 10) within one's own ecosystem. Edison believes that anyone who is not selling handsets for profit must succeed in this segment or go out of business. It is here that you find the internet companies Google, Facebook, Twitter and so on.

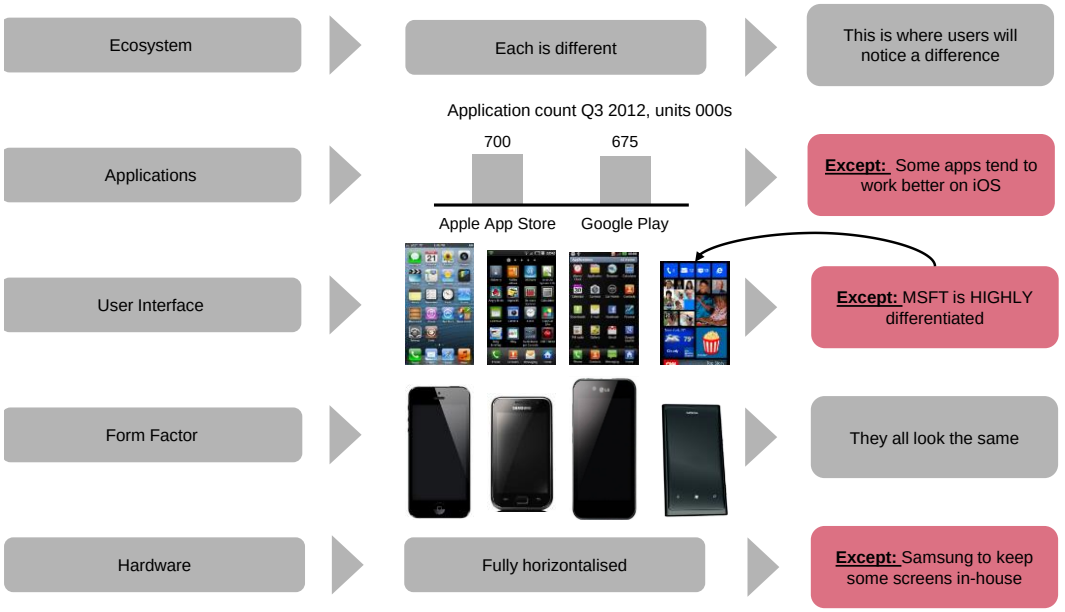
Competition

Over the last 20 years the drivers of the mobile phone industry have changed meaningfully. By far the biggest change occurred overnight on 9 January 2007 with the introduction of the iPhone. For the proceeding 20 years a mobile phone had to be a good phone first and everything else second. Failure to obey this rule always resulted in disaster as the nGage and 7710 clearly showed. In a trice, Apple turned this established maxim on its head and it took Nokia three years to realise that something had changed. At the same time, Apple ushered in the end of real form factor innovation and differentiation with the focus turning to screen size, pixel density and processor speed. Consequently all smartphones now conform to the same criterion, which is a slab of black glass with a single button.

The Apple effect has moved the game on much more quickly than anticipated. Handset makers competed in hardware and the ability to make telephone calls and send texts for 20 years but in the last five years, competition has moved through the user interface, through the applications and is now to be found in the ecosystem (Exhibit 4).

There have always been five levels where differentiation can occur, but now in 2013 Edison finds that only one of them is likely to make a real difference: the ecosystem. This analysis is based on what drives the purchase decision of a user when they come to buy a device. In the old days making a nice looking device that just made calls and sent texts was enough, but now telephony ranks way down the list of important criteria for a mobile phone.

Exhibit 4: The five levels of competition in mobile phones



Source: Edison Investment Research

With some notable exceptions (see below), hardware, form factor, user interface and applications are becoming virtual commodities. This means that users will increasingly decide what mobile device to buy based on the quality of the ecosystem offered by that device. It is still early days as it is still possible to compete in smartphones with just hardware, but this will not last for long.

iOS remains the gold standard and everyone else who cannot afford an iPhone buys something that looks like it. So extreme is this trend that a segment known as display-only-phones has emerged. These devices are very low priced (<$100) Android devices where almost all of the cost has been put into having the largest display possible. Everything else is an afterthought. Hence these devices run Android code taken from the open-source community with no integration, testing

or optimisation. These devices simply fit a very basic market demand: I-want-a-smartphone-so-I-can-be-like-everyone-else. This segment is very low price, very high volumes and is 100% Android. These users do not yet care about functionality, as when these devices are tested in the labs they perform abysmally. A Nokia Asha device will often outperform these devices comfortably in all but display real estate. As smartphone penetration increases, these users will become more sophisticated and when they come to change their devices they will be more aware of the limitations posed by a very cheap device. This is one reason why Edison believes that there is scope for users to switch from Android (page 18) when they come to replace their current device.

Edison Investment Research's statement that four out of five levels of competition are commoditised is a little generalised as there are some exceptions. **First and most relevant is Samsung in the hardware layer.** Here Samsung is preparing curved and bendable displays for market. It is ahead of its peers in this technology and it looks like the handset business will have access to these long ahead of many competitors (Exhibit 4). This is a way that Samsung will be able to still compete in hardware and maintain its very high margins. This will give Samsung more time to formulate and execute a strategy to address software and ecosystems.

The second is in the user interface. Microsoft (page 24) and BlackBerry (page 35) have very differentiated user interfaces, both having decided to design their experience around a hub concept. Differentiated as they are, users have yet to buy into this raising doubt around the UI's ability to differentiate any longer.

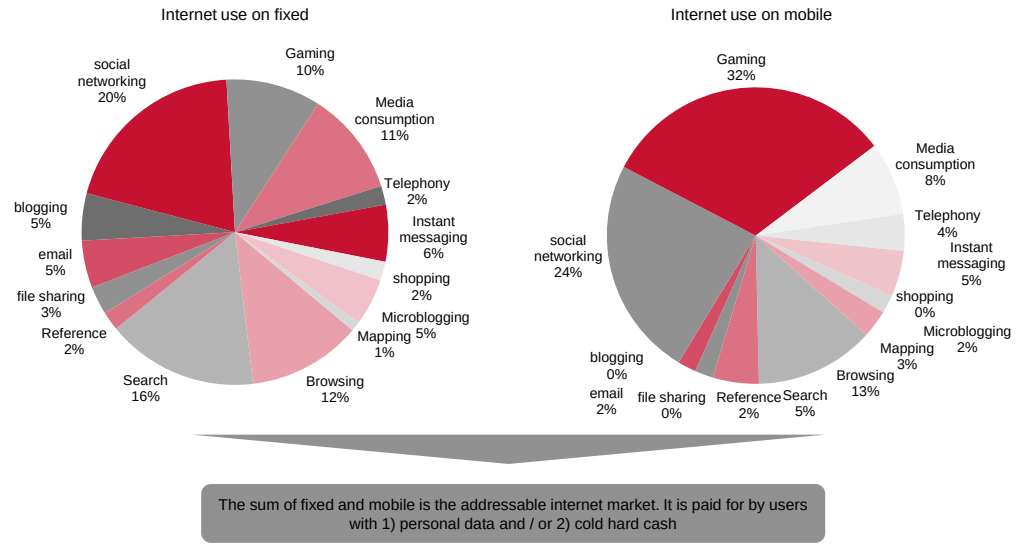
Third is in the application layer. There was a time when every man and his dog were creating an app store but things have since settled down. Now almost every application is available on both iOS and Android meaning that users are unlikely to make a decision based on application availability. However, many applications run better on iOS than they do on Android, and far more versions have been specifically designed for the iPad. This means that application quality is still a factor in competition but one that is unlikely to persist.

The current situation in the market has left very little to the imagination. Users have chosen a device based on the example set by the iPhone. This is now much more commonplace and on replacement Edison thinks that users will be looking for something new and different. This difference will increasingly be made by the ecosystem where fortunes will be made, lost or, perchance, recovered.

Digital life

As far as internet usage goes, it is important to define what the addressable market is in terms of monetisation. To this end Edison Investment Research has defined this opportunity as digital life. Digital life is the sum of all activities that a user does in an online split by the amount of time the user spends engaged in each activity. Edison has assumed that the amount of time spent in each activity is analogous to the amount of information that the provider of the activity can collect about that user. Edison has also assumed that the amount of data collected is directly proportional to the amount of revenue that can be generated through targeted advertising to that user. This, of course, is a generalisation as some users will be more valuable than others due to differences in their disposable incomes. Furthermore some activities will lend themselves to monetisation better than others. At this early stage of the development of the global opportunity, we do not believe that it materially affects the conclusions we have drawn.

Exhibit 5: Internet use on fixed and mobile



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

There is no such thing as free internet. Users either pay with cold hard cash or they pay with personal data. The vast majority of internet users are unwilling to pay cash and the mechanism for them to do so is poorly established. Users are also unwilling to trust start-up internet companies with their credit cards. Hence the vast majority of internet services are likely to be paid for with personal data. This is why if an ecosystem does not make money by selling devices or software, it **must** collect traffic on its own servers. Failure to so this means that nothing is learnt about the user and there is nothing to sell to advertisers (see the third law of robotics, page 14).

Many users persist in the delusion that they are the customers of Google, Facebook, Linked-in and so on when actually they are the product. An attempt to contact a real person inside one of these organisations for help with one's account is testament to what the status of the user really is. These users are paying for this service but they are paying with their personal information. These companies offer these services free of charge so that users spend their time on their property. From their use of these services, Google etc learn about their users and can in turn sell targeted advertising on the back of what they have learned. The more time they spend using the service, the more they learn. This also gives Google etc more time to place advertisements and also greater accuracy of targeting, which is beneficial for pricing.

This is why digital life is so important. The entire monetisation opportunity is the sum of all the time that a user spends online and therefore the greater portion of digital life that a player addresses, the

greater the opportunity for it to learn and monetise the user. If one addresses only a slice of the market, then the opportunity for that player is much smaller. This is why the likes of Facebook (page 33) and Twitter (page 41) are trying to expand beyond social networking and micro blogging. They may dominate their relative segments, but they are only a part of digital life. To grow long term they must expand into other areas and become more than just a part of the user's digital life. The more relevant they are, the more time users will spend using their services and the more information they will collect on their servers. This is why digital life is a central part of Edison Investment Research's analysis and why Edison has analysed this concept for all of the major ecosystem contenders.

Ecosystems

The ecosystem is the glue that holds the entire user experience together on any device. It is everything from the chipsets that run the software to the mechanism by which developers get paid for their applications. It is how hardware, form factor, user interface and applications are held together to produce a user experience and a framework within which the user can live their digital life. It will not be long before this is the only area left where mobile and internet companies can make a reasonable return as the rest of their industry is commoditising (page 8).

It is very much like what happened to the PC industry where all the value moved to the ends of the value chain with chipsets at one end and operating systems at the other. Each end was dominated by a single player. The same is happening in mobile handsets. The one exception is that some players like Apple and Samsung are attempting to be fully vertically integrated, offering everything from components to an ecosystem. At the chipset/component end we find Qualcomm, MediaTek, Ubuntu (page 43) and Samsung (screens and memory) and at the other end a whole host of hardware and internet players all vying to act as a home for the user's digital life.

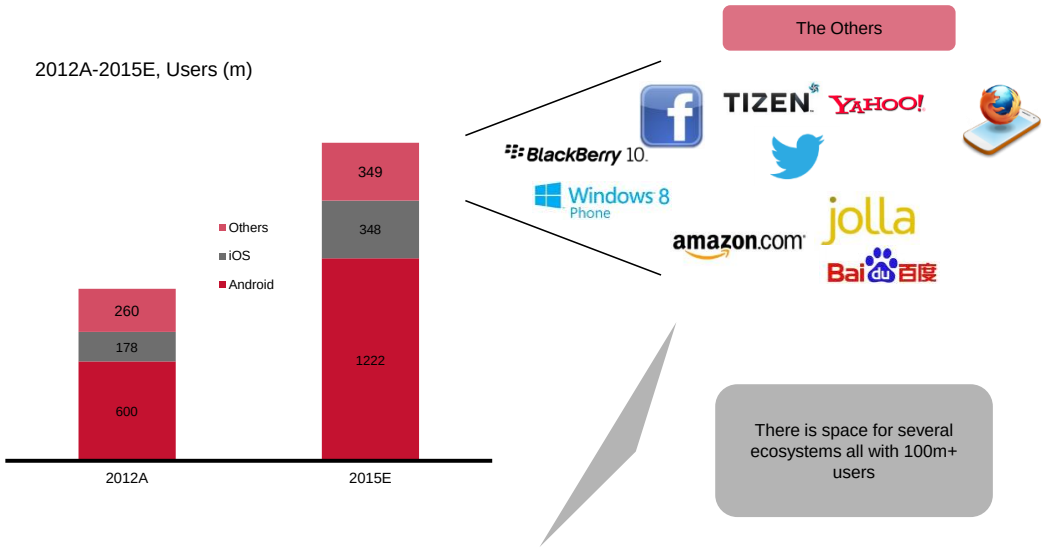
This is an area where the real battles have yet to be fought. This is because with the exception of the high-end, the two main players do not really compete with other (Exhibit 11). Thus, when it comes to buying a smartphone, many users did not consciously make an ecosystem choice. Having had a smartphone for a while, many users are much more savvy and are likely to be much more demanding when it comes to making their next selection. It is here where the real battle will be fought and in reality it is only just getting started.

There are far more ecosystems than one would think. Everybody can think of two (iOS and Android) and maybe a third (Microsoft) but there are in fact at least 12 (see contents page) all wanting be the user's home for digital life. There is also a list of companies that have all complained bitterly about not being on the main list, but this is because they are very far away from having anything tangible (page 44). Hence the list of 12 is not exhaustive and Edison fully expects to make additions and subtractions over time.

With a list of 12, the most pertinent question is how to tell them apart and how to assess their respective outlooks. For this, Edison Investment Research has created the three laws of robotics (page 14) against which each ecosystem can be measured. Combining this with an assessment of how well the ecosystem covers digital life (page 10) gives a complete enough picture to forecast user numbers over the coming years. Edison sees user numbers as the key to a successful ecosystem. The more users there are, the more application developers will support the system. This will lead to more usage, more user data collected and higher advertising revenues. Users are the root from which all profits are derived, be it from devices, software or advertising.

Many commentators and industry participants are of the view that there is only space for one, two or at most three ecosystems but Edison Investment Research thinks that, in theory there could be space for 20 by 2015. This does not mean that there will be 20, but from that premise one can start to see how there could be far more than three.

Exhibit 6: Smartphone users by ecosystem

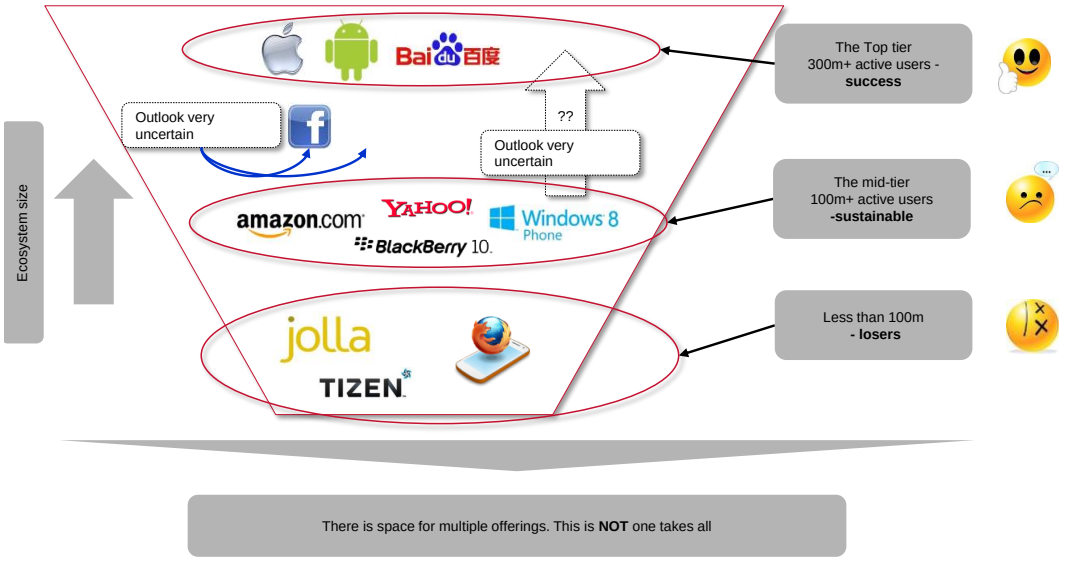


Source: Edison Investment Research

One of the central assertions of this report is that 100m users are required to make an ecosystem viable (Exhibit 6). That does not mean it makes money, but it has reached critical mass where it will stand on its own two feet and generate enough value to sustain itself. To be guaranteed of making good money, Edison Investment Research believes that an ecosystem needs to have 300m users (Exhibit 7). Users means those with accounts, who use the regularly use the services and are an active part of the ecosystem. It does not mean anyone who just turns up for a quick tour.

In all of the charts that relate to user numbers, readers will see two horizontal lines. A dark grey line denotes the 100m user threshold and a dark red line denotes 300m (see Exhibit 10 for an example).

Exhibit 7: Smartphone users by ecosystem, 2015e



Source: Edison Investment Research

With 2bn smartphone users by 2015e (Exhibits 2 and 33), there is in theory space for 20 ecosystems of 100m users each. Edison Investment Research does not for one minute think that there will be 20 ecosystems but the view that there will be just two is not realistic. This is still a very early stage market in that purchase decisions are not yet being driven by ecosystems but that day is rapidly coming. At the moment, the majority of purchases are based on the largest screen at the

lowest possible price, and this is a major reason why Android has picked up such enormous market share (Exhibit 17). In the long term, what is more likely are two to four4 large ecosystems with over 300m users each generating strong revenues and profits and several smaller ones with over 100m users that are viable but not very profitable. At the tail end we are likely to see an ever changing group of small players all vying to be the next best thing. These will come and go but there will always be the possibility for change at the top given the pace of innovation and the mobile phone industry's habit of being disrupted every several years.

The three laws of robotics

The importance of ecosystems in the future purchase decision of a mobile device is clear. The question now is how to assess, quantify and analyse these offerings to reach a conclusion on how good they are and how well they will fare in the market place. For this purpose Edison Investment Research has created the three laws of robotics, which are three simple rules that an ecosystem on a mobile device must adhere to if it is going to going to be a success. The three rules are:

1) An ecosystem must provide easy and fun access to the user's digital life

This rule simply states that an ecosystem must be easy and fun to use. It must also provide full access to all of the functions and services that the user desires as a result of living their digital life. It must perform these functions in a reliable, secure and useful manner. Applications have to be high-quality and easy to discover, purchase, download and install. In the longer term Edison thinks they are going to need to work well together and share information, but at the moment this is a minor consideration. An ecosystem that the user interacts with constantly can be deemed to score well against this law. One that creates frustration and confusion clearly will not.

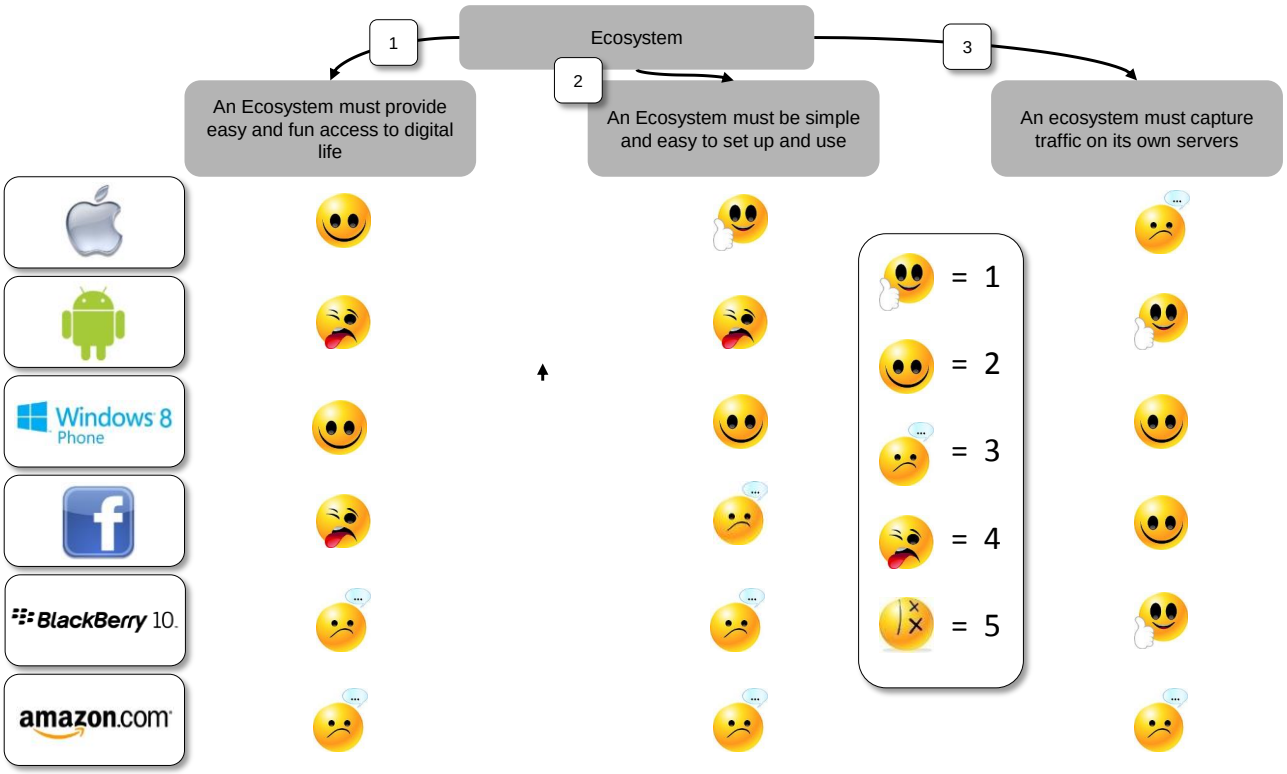
2) An ecosystem must be simple and quick to set up

This rule requires an ecosystem to simply work out-of-the box. Single sign-on and a deeply integrated experience, where the user does not have to make complex and difficult choices, are the kind of features that will score well. A long and tortuous set up process where the user has to be their own systems integrator and spend hours trying to get data from his other devices to synchronise with the ecosystem are very bad signs. The ideal scenario is to take the device out of the box, sign on once and the entire device populates with all of the user's digital life. This is still a dream that has yet to become reality.

3) An ecosystem must capture traffic on its own servers

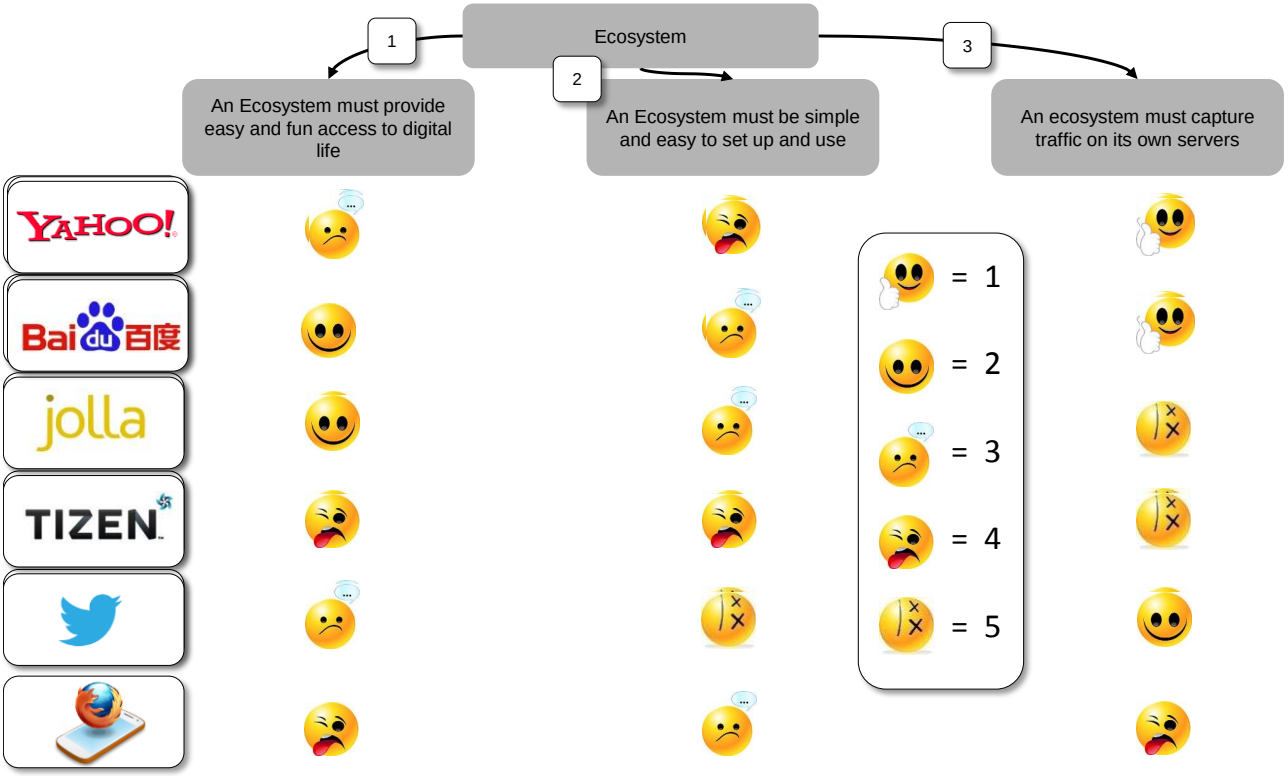
This rule is critical for any ecosystem that intends to make a return through the monetisation of internet traffic and user data. If one is not a technology provider or a handset maker, profitability will be an incredibly difficult feat to achieve (page 7) without a good score against this rule. This rule goes hand in hand with an ecosystem's position in digital life. An ecosystem that has a good spread of popular services will be running those services on its own (or hosted) servers and therefore the traffic and the data that these services generate will be available for analysis to the owner of the service. This data can then be used to sell targeted advertising. Google has already proved that this can be an incredibly lucrative and profitable enterprise. Outside of selling content, applications subscriptions and other goods (eg Amazon), Edison thinks that this is the only way to make money from people using the internet (other than selling the hardware). If Google were to score badly on this rule it would have no business in mobile.

Exhibit 8a: Mobile ecosystems scored against the three laws of robotics



Source: Edison Investment Research

Exhibit 8b: Mobile ecosystems scored against the three laws of robotics



Source: Edison Investment Research

The contenders

iOS: King of glue

Apple is the perfect marriage of hardware and software. Its form factor design has redefined the smartphone market and created the tablet market. However, we think that in hardware things are beginning to slip a bit as the iPhone 5 looks old and tired when put next to the Samsung Galaxy S4 and the iPad looks dull compared to the Sony Xperia Z tablet. Fortunately for Apple this is only half the story as the operating system that it uses for these devices, iOS, works seamlessly across all of its non-computing devices and ties in well with its other hardware offerings such as Apple TV.

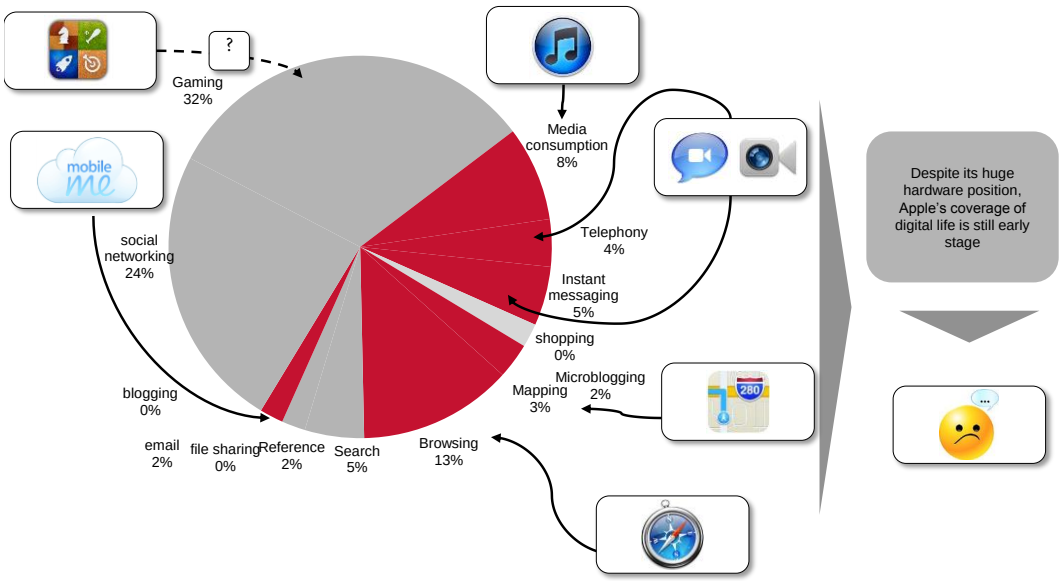
The user interface has led the way and is the gold standard against which Android has benchmarked itself. These days there is not much to tell the two apart but when it comes to the overall user experience that is where the difference shows clearly. iOS offers a simple, easy and fun user experience that ties most aspects of digital life together beautifully. Around this Apple has created a very strong ecosystem of digital entertainment and applications that have a profound effect on the utility of the device to the user.

Apple is not very good at playing with others, but the manner in which its devices work together to enhance the user experience is second to none. This is the advantage of making everything in one place and of having complete control over the software. Its competitors are still quite far adrift of this, but closest on its heels is Microsoft. If Microsoft can bring all of its services together under a single sign on, then iOS has a worthy competitor. Microsoft is still pulling these pieces together and we suspect will take a good deal more time to complete the task. Even then Microsoft will still not aim to take the fight to Apple but will target Android users in the volume tiers below the iPhone.

Given its total dominance of its space, it is surprising to find that Apple's coverage of digital life is inferior to that of Google and Microsoft. To make matters worse, the quality of the services that it has launched are also inferior. One needs to look no further than Mobile Me, Apple Maps and iCloud for evidence of that. This indicates that Apple is the king of making the glue that holds everything together in an appealing way but is lacking when it comes to providing the applications and services themselves.

This is not necessarily negative, but it does mean that Apple's ambitions in seeking further revenues beyond high hardware margins are going to be limited. Users will flock to Apple to use its appealing hardware and great user experience but they will spend the majority of their time using applications and services written by others for iOS. It is no surprise that a very large part of Google's advertising revenues come from iOS devices. This means that Apple will have very limited ability to sell targeted advertising as it is only collecting a fraction of the information about user activity. This means that if its user experience commoditises and all the applications are available on every platform it will have no way of sustaining its very high profitability. iTunes may offer a way out of this, but again, if all the content is freely available for sale on all platforms, its ability to charge a premium to bolster margins will be limited.

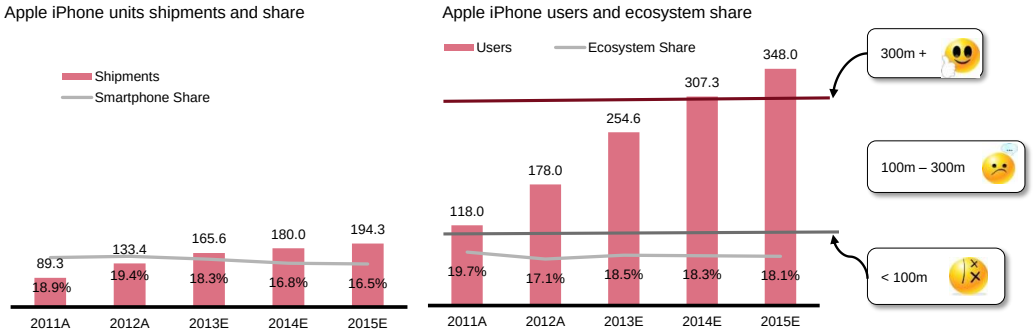
Exhibit 9: Apple's coverage of digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

Hence, Apple finds itself at a strategic cross road. Either invest vast amounts of money in an attempt to develop applications and improve the ones that it has or save the cash and make hay now while the sun shines. Its track record in this department is poor and there is a high probability that it will invest the money and still fail to make any real impact on Microsoft or Google in this space.

Exhibit 10: Edison Apple smartphone shipment and ecosystem user forecasts



Source: Edison Investment Research, Gartner

Android: No safety in numbers

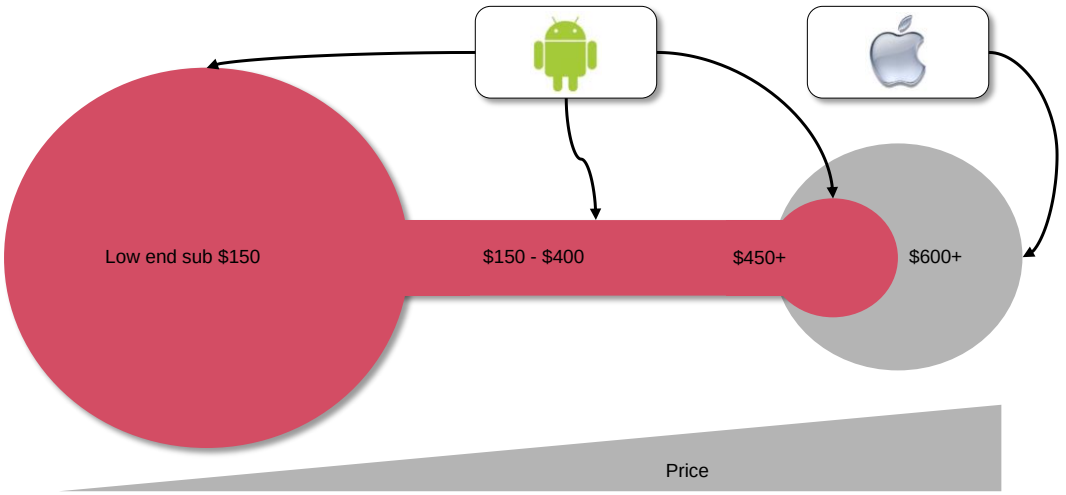
Even the meanest, most negative commentator has to admit that Android has been a colossal success. It commands two-thirds of the entire smartphone market by volume and nearly two-thirds of all smartphone users carry an Android device. This share is likely to erode somewhat as competitors at lower price points launch their offerings, but even then, share looks very unlikely to dip below 50%.

There are three main reasons for its success:

First, the source code is freely available and at no charge. Android is available under the Apache licence, which means that one does not have to contribute code until the software ships in the device. It is also relatively easy to circumvent this licence, making it pretty easy to innovate on top of Android and still keep the software in house. This has made Android incredibly appealing to those looking to produce cheap smartphones.

Second, at the price points at which the majority of Android competes, there has been no effective competition. The iPhone set the trend but only a fraction of the market could afford it. Android provided an iPhone-like experience much desired by users but at a lower price point making it accessible.

Exhibit 11: Price and volume of Android and iOS shipments



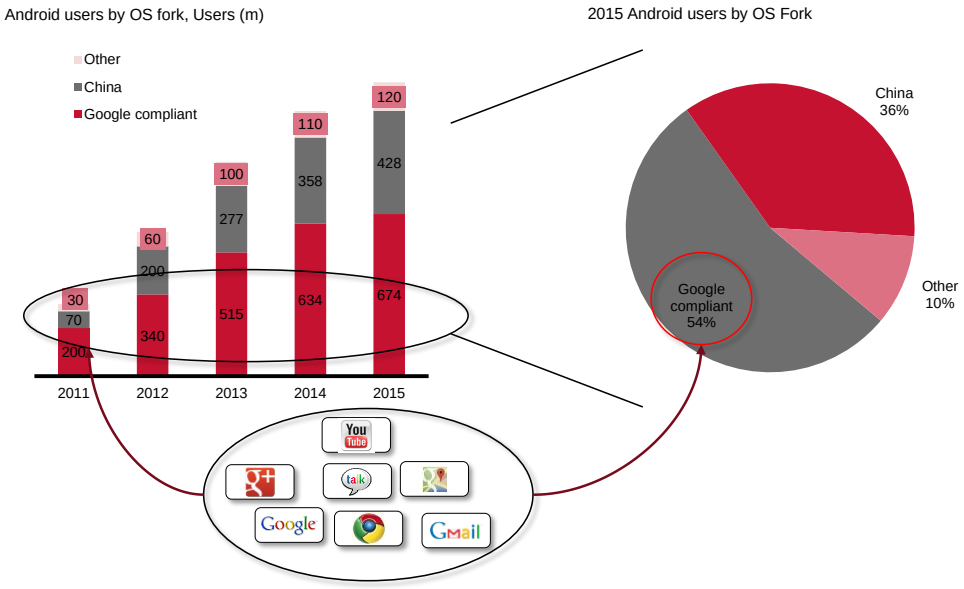
Source: Edison Investment Research

Third, Android enables the show-me market. The majority of smartphone buyers these days want a device to make a statement about their affluence. This has created what the Korean's refer to as a DOP (display only phone) market where all of the bill of materials (BOM) goes into the display and virtually nothing elsewhere. These devices are cheap (<$100) with large screens (>3 inches) but barely function when one attempts to use it for anything other than a fashion accessory. These devices represent the majority of Android shipments today and are counted as part of the ecosystem but in reality the devices can barely function as smartphones.

This is where certainty ends and the confusion starts. The software is open and so anyone can make a device but if the device does not really function as a smartphone or provide proper access to Google services is the user really a member of the Android ecosystem? As far as Google is concerned if the device does not meet its own internal standard of what Android should be then it cannot be called Android nor can it have access to Google Play and other Google applications. These applications are not open source and so to implement them properly one must have a device that passes Google's internal testing. In practice this means that devices at the higher end of the price range are Google-compliant as users in those tiers are demanding Google services. Elsewhere manufacturers can do whatever they like. Google seems to have recognised and

accepted this as its agreements with the large manufacturers who make Google-compliant devices include provisions where device makers are also permitted to make and sell non Google-compliant devices.

Exhibit 12: Android users by OS fork

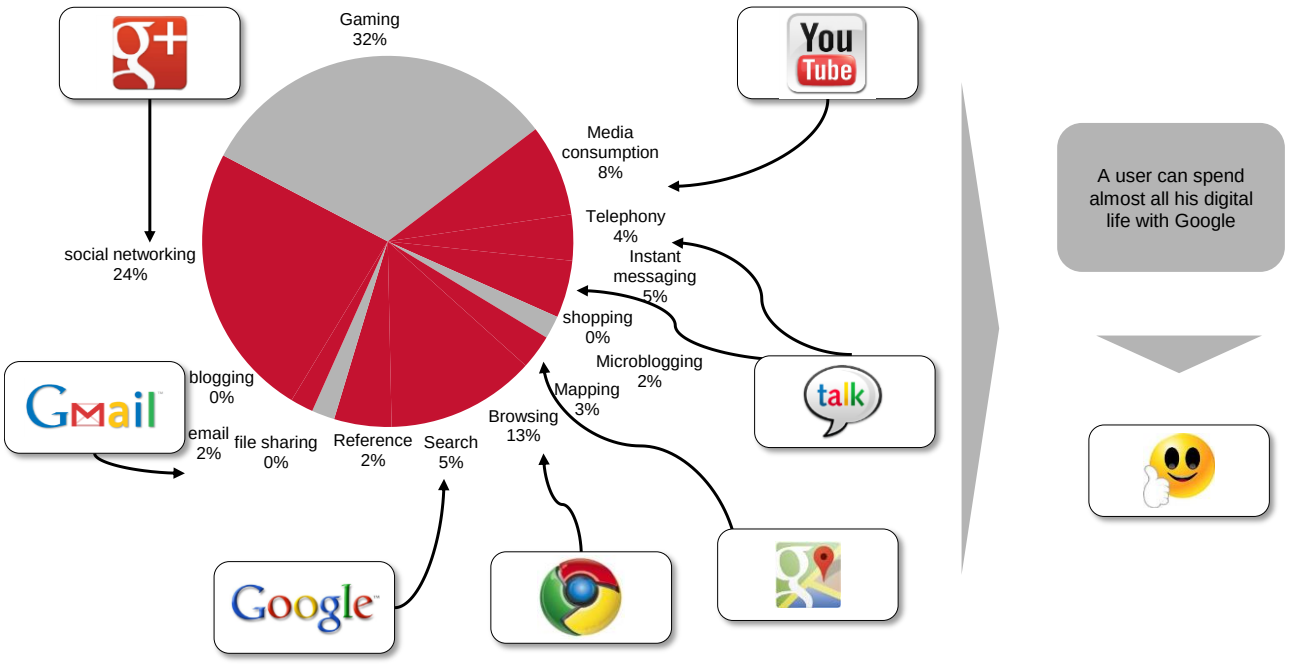


Source: Edison Investment Research, Gartner, IDC, Google

Hence if the Android ecosystem is defined as one that is owned and run by Google, then a very large slice of devices that nominally ship with Android logos and stickers should be excluded. These devices have no access to Google services and Google is unable to monetise these users. Consequently, these devices are not part of the Google ecosystem. Also excluded should be any fork of the code where the manufacturer has taken the software and adapted it for its own purposes. Amazon (page 34) is the classic example of this, but there will be more such as Baidu/China (page 31). However, the number of devices shipping with some description of Android is so large that even if one excludes Baidu/China and the other non-compliant forks of Android (to which Google has no access) there are still a very large number of users that could be part of the Google ecosystem.

Google has excellent applications and services (Exhibit 13). Google has invested vast sums to ensure that its services such as Gmail, maps and so on are best in class. One only has to look at the mess that is Apple maps for evidence of the effort that Google has put in. These services are both high quality and cover a vast portion of the activities that a user pursues while living their digital life. In essence a user could spend almost all their time using Google services without needling to look elsewhere.

Exhibit 13: Google's position in digital life

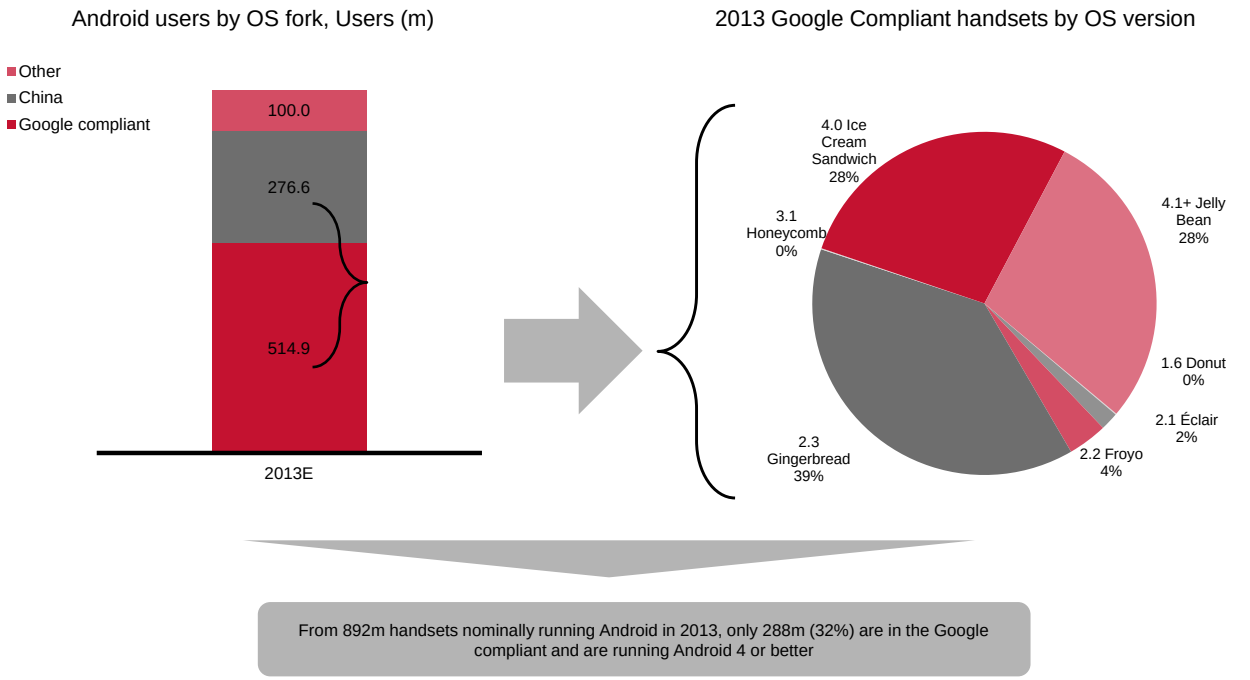


Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

The snag appears when it comes to the glue that holds all of these services together. It is the piece that defines the user experience and holds an ecosystem together. Here Android is very shaky. The main reason for this is the fact that Android is open-source software. Open source means that everyone has full visibility of the code in a language they can understand and can therefore implement any changes that they see fit. This brings us to the contentious fragmentation issue.

Android is very fragmented. In fact it is far more fragmented than many people would like to believe. It is fragmented both vertically (with many different versions of OS lingering in the market) and it is horizontally fragmented with manufacturers making their own tweaks to make Android fit for their own purposes. The vertical fragmentation means an inconsistent experience across devices and a wide range of device capability. This means that an application written for Jelly Bean will probably be too highly specified for or make calls on APIs that do not exist in Gingerbread. If a developer wants to address all of the Android market, different versions will probably be required to ensure good function across all devices. This is not an insignificant problem as 38% of all phones that access Google Play are still running Gingerbread (Android 2.3) with only 56% running Android 4.0 or better. For developers this will effectively mean write a Gingerbread version of the application or exclude oneself from 38% of the addressable market.

Exhibit 14: Vertical fragmentation of Google-compliant Android



Source: Edison Investment Research, developer.android.com

From Exhibit 12 one can see that although there will be around 892m Android handsets in circulation at the end of 2013, only 56% of them will have access to the Google ecosystem. That 56% needs to be split again by Android version in order to understand what the real addressable market is for the developer (Exhibit 14). This also gives a steer on how big the ecosystem really is when comparing it to iOS, Windows Phone and others. If one assumes that the ecosystem really only delivers good-quality digital life on Android 4.0+ then the addressable market for the developer is an ecosystem of just 288m users by the end of 2013 (Exhibit 14). This is far lower than the headlines suggest and Edison suspects that Samsung has a much larger share of this segment than the 50% or so it registers in Android overall.

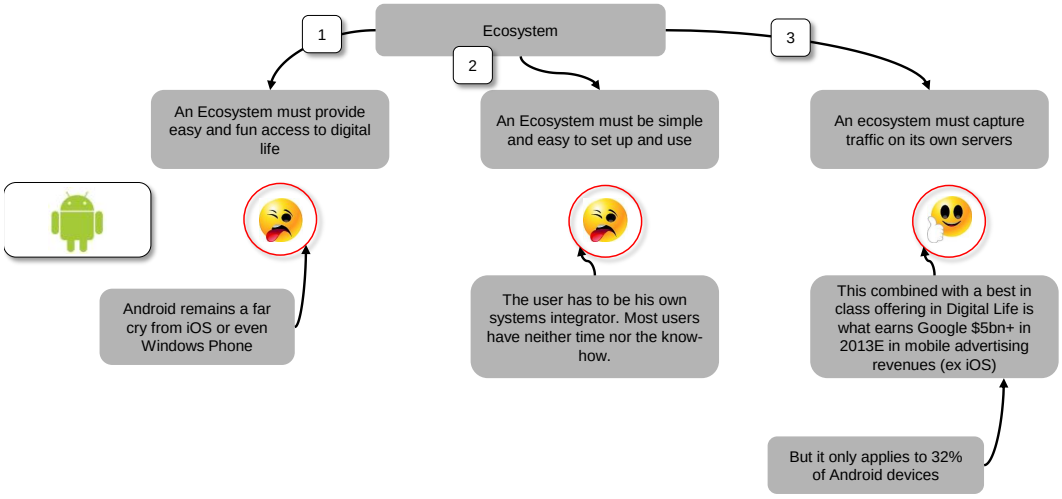
All of this is before the horizontal fragmentation is taken into account. Much has been made of this given that it was fragmentation that destroyed Java (J2ME) on feature phones. In Java, a developer would have to rewrite much of an application to get it to work on handsets from different manufacturers as every handset maker's implementation of Java was very different. Android is not nearly as bad as this but there are noticeable differences between the different manufacturers. (Here, Edison is referring to those manufacturers that are part of the Android camp and not those that have openly gone off on a separate tack like Amazon and China Inc.) These differences mainly occur in the APIs that refer to more advanced functions such as those that deal with network and cloud-based services. This means that a game like Angry Birds will have very good compatibility from one manufacturer (ignoring vertical fragmentation) to the next, but something like Evernote will really struggle.

Despite this, Edison is not convinced that horizontal fragmentation is a big problem. This is because Android remains dominated by Samsung, which is showing no signs of giving up the 50% that it holds. Hence when it comes to the developers, they develop and test for Samsung and then worry about the rest. Covering 50% of the market with one version of the application could easily be a far better proposition than covering 80% of the market with seven versions. This combined with the fact that it is the higher functions where the fragmentation occurs leads Edison to believe that this is a minor problem at this time.

This situation also makes life dangerous for Google. Samsung is now so important that developers pay attention to the modifications that it makes. This means that if Samsung was to decide to take Android off in its own direction, the developers would probably follow leaving Google with no control of the platform. This is not necessarily a problem for Google, as long as Samsung keeps the Google applications, but Samsung is showing every sign of intending to replace them all (page 46). This will be a very tough nut to crack, as Edison thinks that users are now so hopelessly hooked on Gmail, Google Maps and Google Search that they are unlikely to change. That represents around 30% of digital life (Exhibit 13) meaning that the other 70% could still be open if Samsung can come up with a decent alternative. Edison has been wondering for months why Google would want to keep Motorola Mobility. If Samsung cuts off its route to the user, then Motorola Mobility represents an alternative over which it has complete control.

Samsung currently achieves the majority of its margins through its hardware differentiation, scale, logistics, brand and distribution. This is not going to last as hardware is fast commoditising. Samsung knows this and is acting now. It is clearly aiming to take some of the value that Google derives from the Android ecosystem to boost its handset margins as the hardware commoditises. It will do this by both taking as much control of the user experience as it can but also control of user data. A superior user experience will give Samsung pricing power but there could also be advertising revenues on available. If Samsung can get people to start using its applications, it will be in a position to collect and monetise user information in the same way that Google does. This will be income that accrues to Samsung to the detriment of Google. In this Edison believes that Andy Rubin was spot on in his fears regarding Samsung. Now that he has been replaced with the more conciliatory Sundar Pichai, this risk has been increased meaningfully.

Exhibit 15: Analysis of the Android/Google ecosystem

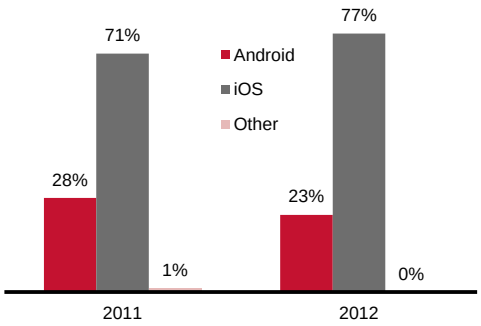


Source: Edison Investment Research

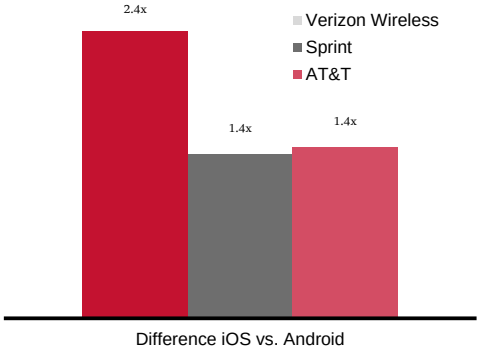
The poor performance of Android against laws 1 and 2 (Exhibit 15) and the vertical fragmentation make it a great target for new comers. Exhibit 11 shows that many Android users never really made a choice between ecosystems when they purchased a smartphone. This implies that they purchased Android because they wanted a smartphone but were unable or unwilling to pay for an Apple device and so ended up with the next best thing. The fact that that they never made a choice leads Edison to think that users will approach replacement with a more an open mind and that developed markets are not as unassailable as the market share figures would have us believe. This and Android's poor performance against laws 1 and 2 shows up in the usage figures where it is clear that iOS devices are used meaningfully more than Android devices (Exhibit 16).

Exhibit 16: Android vs iOS traffic (US)

Mobile traffic share from 2012 Thanksgiving shopping



iOS vs Android data traffic by operator (October 2012-January 2013



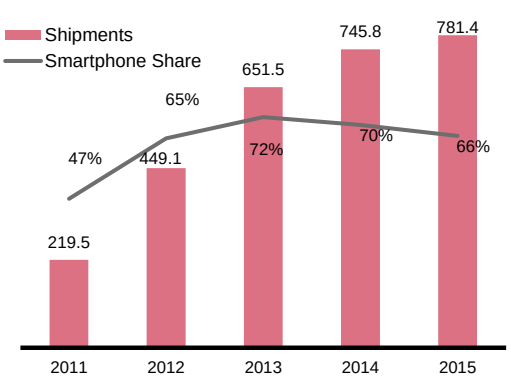
Source: IBM, Fierce Wireless, NPD Connected Intel

These statistics look like Symbian in 2006. Symbian was top of the charts in terms of volumes but no one used it for anything other than to make phone calls or send SMS. Android is not nearly as bad as this but the situation with Android feels eerily familiar. These users had good satisfaction and loyalty statistics but still they jumped ship as soon as something better was offered to them. Edison believes that the same is true of Android today as it was of Symbian in 2006 and that Android users will readily jump ship if offered a superior offering at the same price. This could be a revamped and improved version of Android, BlackBerry 10, Windows Phone or even a mid-range iOS device.

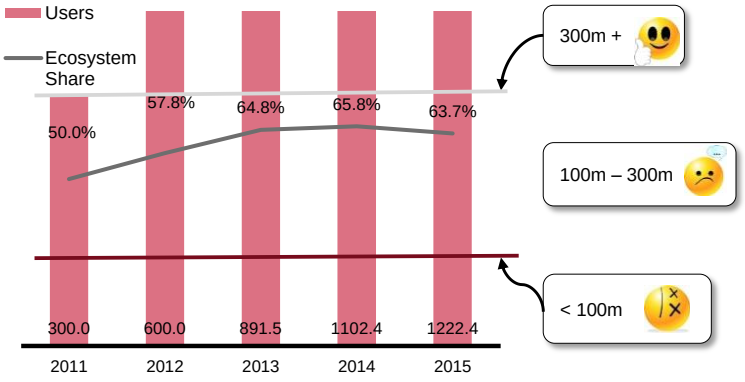
Even with market share loss, Android is here to stay. Even taking into account the fragmentation, Google has created a large and thriving ecosystem that will very soon cross the magic 300m user mark that will give it longevity, sustainability and profitability. The headline figures are much more impressive with the number of Android users approaching 1bn this year and hitting 1.2bn by 2015.

Exhibit 17: Edison forecasts for Android (all forks and versions)

Android units shipments and share



Android users and ecosystem share



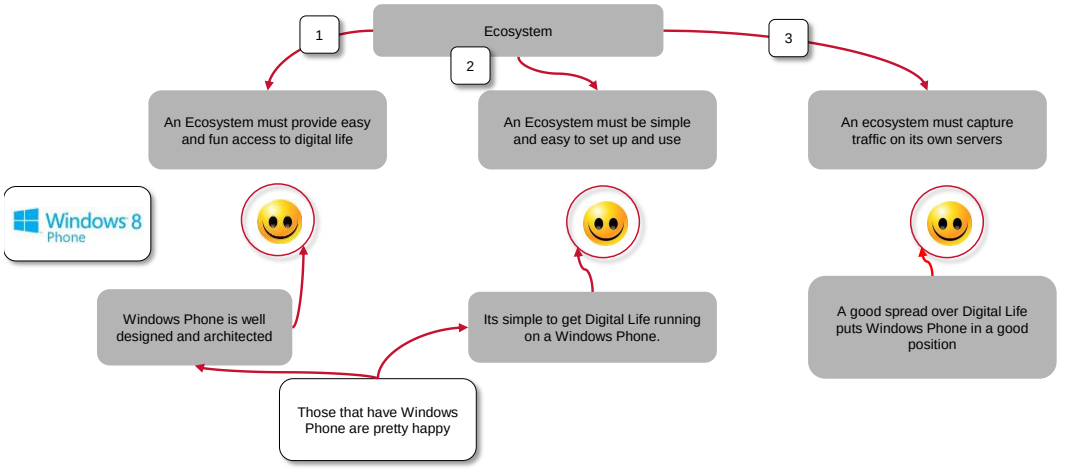
Source: Edison Investment Research

Microsoft: Blue squares of death

For Microsoft it seems that opportunity and uncertainty go hand in hand. Never before has the Windows ecosystem had a better chance of being a huge success but never before has there been greater uncertainty. It was over 16 years ago when Bill Gates stood up with a mobile phone and claimed that he wanted to make $5 from each smartphone in the market. He is still trying today but has yet to make a meaningful impact.

Not only does Microsoft have good coverage of digital life (Exhibit 19), but it also performs well when measured against the three laws of robotics (page 14). Those who have a Windows Phone are by and large positive about it. It has none of the randomness that dogs Android (page 18). Its offering is well defined and structured, making it relatively simple to understand. The core functions are well laid out and the offering comes pre-integrated, leaving the user with a fairly simple task of getting everything up and running. Application availability is an issue but the application count in the store is at 120,000 and growing. A quick skim through the store will reveal about 70% coverage of the core applications that are considered a must-have. There is still work to do but increasingly developers are supporting Windows Phone, which gives Edison confidence that this is a small and temporary drawback. This makes the Windows Phone offering more like Apple in terms of ease of use and set up. There is a degree of jarring as the user adapts to the hubs concept, but this has proved to be temporary and users appear to adapt quite happily.

Exhibit 18: Analysis of the Windows Phone ecosystem

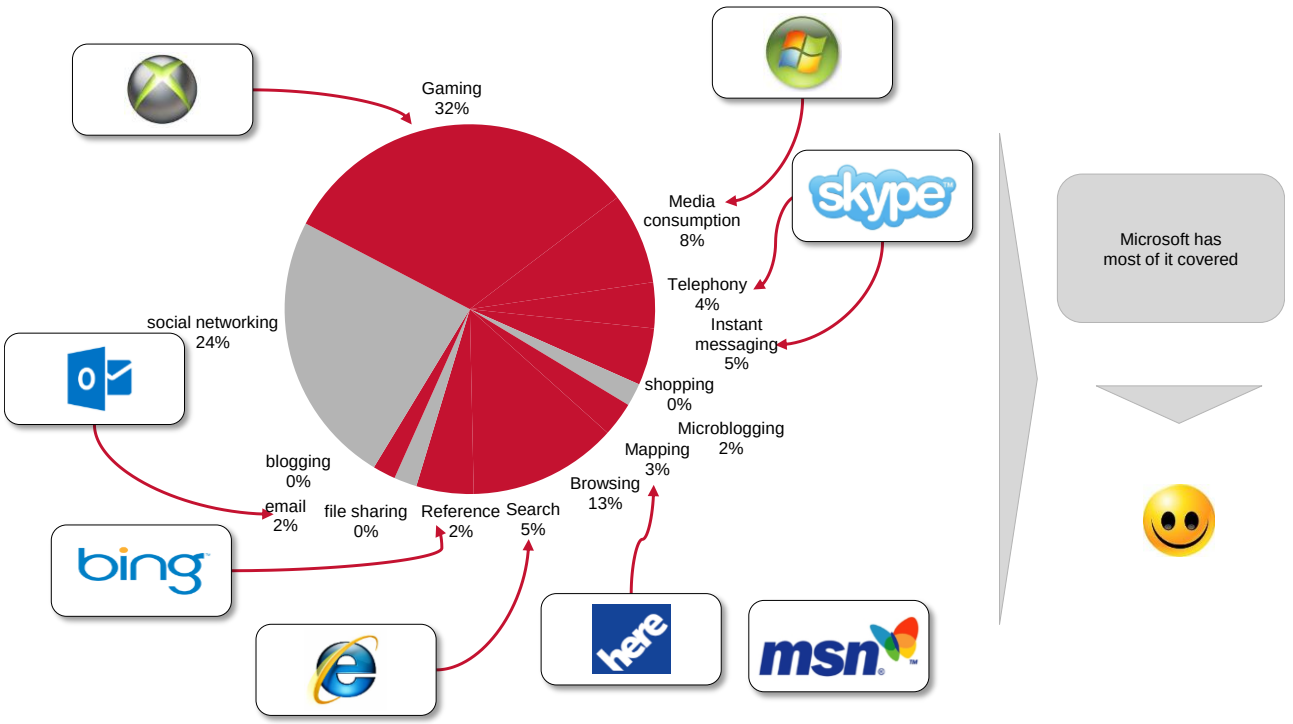


Source: Edison Investment Research

Against law 3 (capture traffic on own servers) Microsoft could fare very well but currently it does not have to. Microsoft has already pocketed the user's cash through the licence fee that was implicit in the price of the device. Hence the user has already paid for Microsoft's services and there is no need to further monetise the user. This is a major difference between Microsoft and the other ecosystem offerings (except Apple). Hence, Edison sees Microsoft looking to differentiate itself as the ecosystem of choice for the privacy minded user. One has already seen this in the form of a marketing campaign around Outlook.com and Edison would not be surprised to see more.

The odds for success have never been better. Microsoft finally has a major handset maker fully committed. It has a differentiated and responsive user experience. It has an excellent position in digital life (Exhibit 19) but it is still struggling to make any meaningful impact. There are a number of reasons for this but all of them lead to the same issue. Users have no clue what Windows Phone can do for them and we think that Microsoft's marketing is totally ineffective at addressing that ignorance. In the smartphone market, choice is only going one way up and that means that pressure will be on all of the ecosystem contenders to demonstrate to users why they should live their digital lives with them.

Exhibit 19: Windows Phone's position in digital life

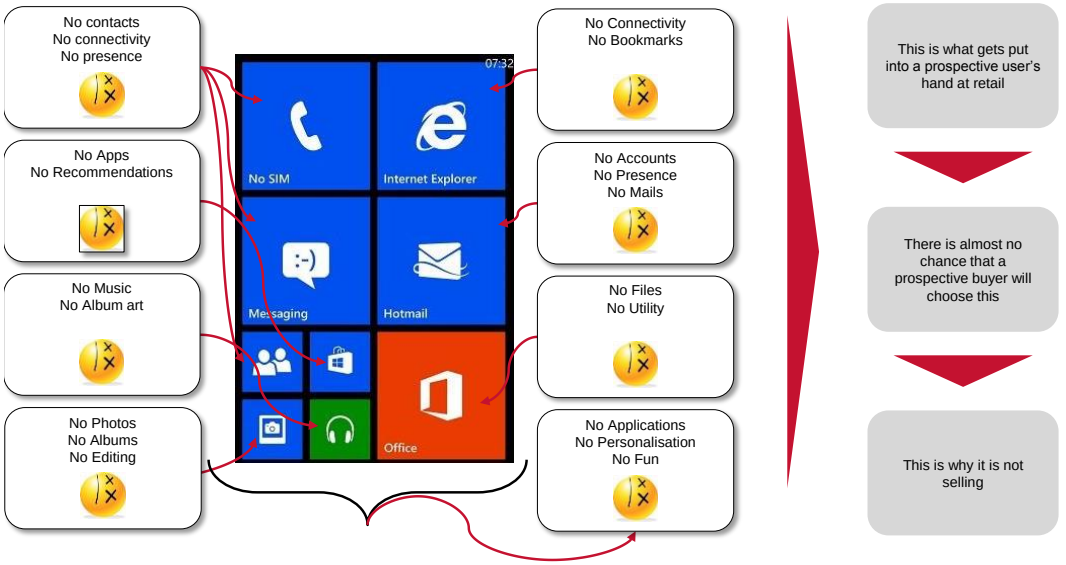


Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

To date, marketing a smartphone has been pretty easy because user demands have also been pretty simple. Provide a pretty looking slab of black glass with iPhone-like pretty icons and cool transitions and devices have sold pretty well. Android (page 18) has sold mostly because it offers an iPhone like experience at a much cheaper price and at that level there has been little or no competition. Users are now familiar with the grid of icons and so when Microsoft turned up with its hubs concept, the users were somewhat bemused. They looked at phones with red or blue squares on the screen in the stores and thought "What is that? I can't be bothered with that" and so the proposition has floundered.

It is here that Edison sees the problem. The users see blue or red squares. They do not see hubs that help them to make sense of digital life. If they did then Edison suspects that the reality would be much different. Users who have for one reason or another become Windows Phone users report a pretty positive experience, but the mass market does not seem to care. For years Microsoft has only had to tell users that a new version of Windows existed and they have come running. This time round a different approach is needed.

Exhibit 20: The blue squares of death



Source: Edison Investment Research

The proposition of Microsoft as an ecosystem is a unified experience across all devices, that is easy to use, integrated and is both useful and delightful. All of this is there for the taking but the message to users is not being sent. Useful and delightful is not what users see. Potential buyers are presented with what Edison refers to as 'blue squares of death'. The excellent Windows 7 managed to relegate the blue screen of death problem to history, but like a bad penny, it has turned up again.

When a user picks up a Windows Phone or a Windows 8 device at retail they are presented with a screen full of blue or red squares labelled People, Maps. Music, Games and so on. Hit any one of these squares and nothing is found. In many cases the device is not even connected to the internet. This is the equivalent of going into a supercar showroom with $100,000 in your back pocket and not being able to have a test drive. Furthermore, Microsoft offers a consistent experience from console/TV through PC, tablet and phablet all the way to the phone. These devices are never displayed together and therefore potential buyers never realise that this is an ecosystem for every device. How Microsoft expects users to buy Windows Phone and Windows 8 when it does not show them what is on offer is a mystery.

The most likely answer seems to be that Microsoft does not care. It still commands around 90% of the PC market. The users that are going to depart for Apple/smartphones and tablets have already done so and therefore sooner or later those that are left will make the upgrade to Windows 8. Hence, all that Microsoft stands to gain is an earlier upgrade. Is that worth billions of dollars in marketing? It probably is not to Microsoft. However, the likes of Nokia, Hewlett Packard, Dell and Acer cannot wait that long. They need Windows 8 to work now because otherwise they will run out of cash or have their users consumed by Samsung and Asustek. Therefore it is down to the device vendors to get Windows 8 into the hands of users because Microsoft seems unable or unwilling to help.

Exhibit 21: The coloured squares of digital life

Source: Edison Investment Research

The key to educating users is to change blue squares of death into coloured squares of life (Exhibit 20). Put simply: bring the tiles to life. The concept is simple and Edison needs to see the following before it can believe that it will not be years before Windows 8 takes off:

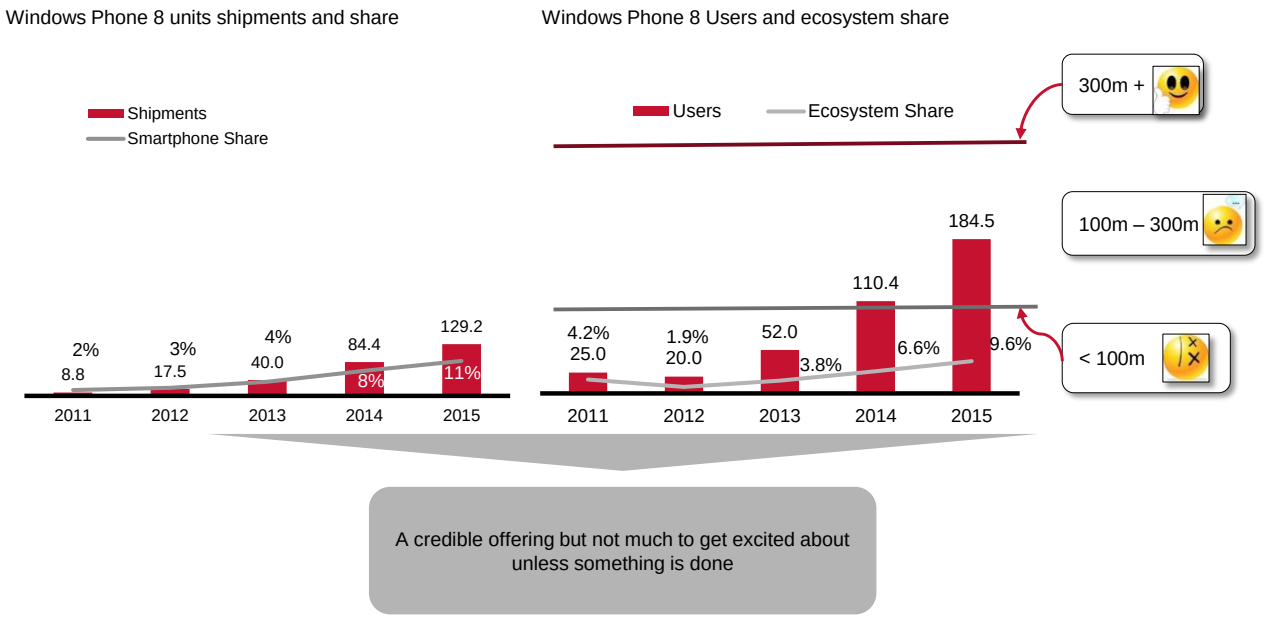
1. Devices displayed together from the largest to the smallest screens.
2. Every device on every display connected to the internet.
3. All hubs populated with real user data that is live and with which users can interact.
4. A retail sales process that is more than shoving a dead device into a user's hands.

The Microsoft proposition is so much more than a pretty user experience, which gives it huge potential but also makes it very difficult to sell. Dixons in the UK have spent $11.2m training their staff to sell Windows 8, but Edison does not know where the money has gone. In the PC World (Dixon's retail brand) stores Edison visited, half-hearted attempts had been made at point 3, but there were still plenty of deadly blue squares. Most of the investment seems to have gone into expert guidance to set the system up once it has been purchased, which is no help at all.

If the hardware makers can address points 1 to 4, then Edison believes that the adoption curve of Windows 8 can be significantly accelerated. This is what Nokia, Dell, HPQ, Acer and so on badly need as these companies do not have the 90% share and huge cash pile that enables one to do nothing and just wait for the sales to turn up. Microsoft seems to be ignoring the potential for incremental sales. Adoption of Windows Phone would help spur incremental volume numbers in mobile but given the lower licence fee per device, its overall impact on Microsoft would be small.

In our estimates, we have included some traction from Windows Phone, mainly driven by Nokia but nothing like the full potential of the ecosystem. Should the device makers take it upon themselves to really show the users what the ecosystem is capable of, then Edison's Windows Phone numbers are far too low.

Exhibit 22: Edison forecasts for Windows Phone



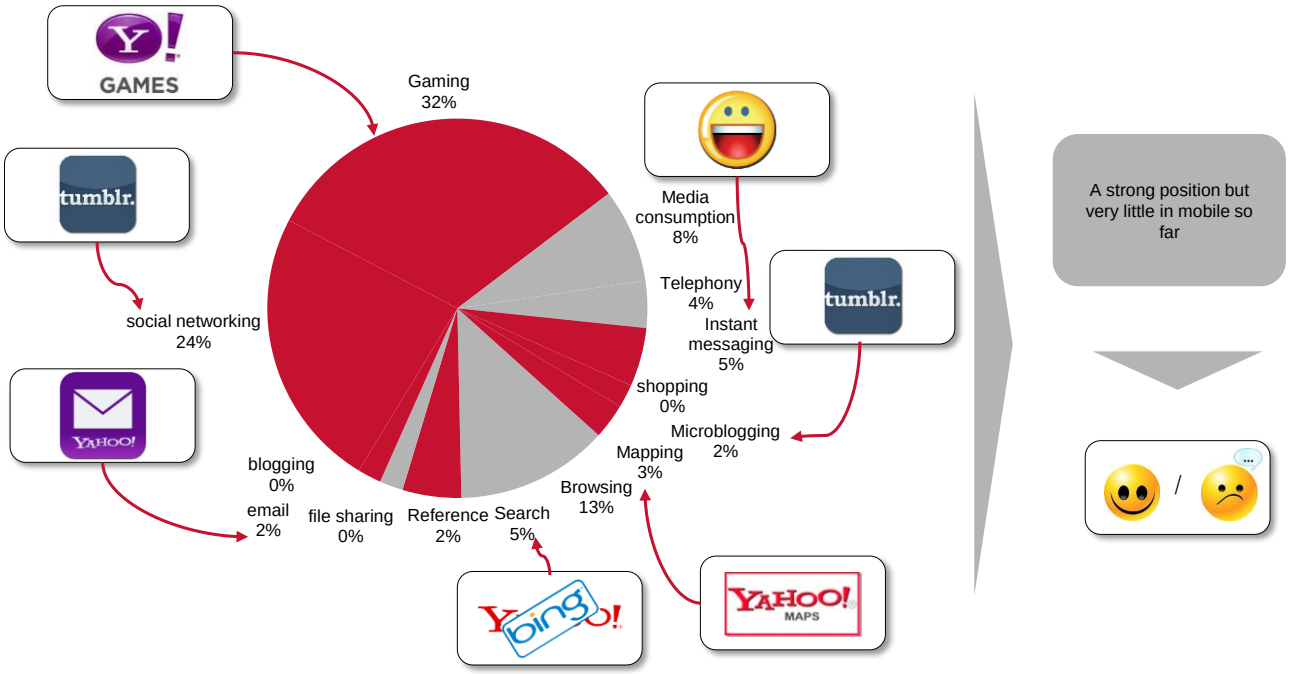
Source: Edison Investment Research

Yahoo!: A dark horse

Yahoo! is often described by many in the same breath as Sony as a company that had it all but threw it away. Over the last 10 years Yahoo! has made a series of strategic missteps combined with poor management to become an also ran in the mobile and internet industries. Yahoo! was there first and yet it allowed Google to barge it to one side. Yahoo! bought the pre-eminent photo sharing site but allowed it to degenerate into an also ran. This was the mess that was inherited by Marissa Mayer when she took over in July 2012.

Since that time things have started to head in the right direction. A number of strategic hires have been made and Yahoo! has regained some of its image as a good place to work, meaning that the talent haemorrhage has stopped. Best of all its usage statistics in fixed internet have remained strong despite almost 10 years in the strategic wilderness. Yahoo! has made moves into mobile over the years but these have come to very little. Its user base remains pretty much all fixed but it is a strong base from which to extend. It is this base upon which the new company needs to be built.

Exhibit 23: Yahoo!'s position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

Despite, poor user experiences and slow innovation, the user base remained loyal and is somewhere around 130m today (CommScore). One hears many numbers circulating in the ether and on earnings calls but without methodology and evidence Edison puts no value in any of these announcements. 130m is a good number and puts Yahoo! already in the viable category (Exhibit 7) even without adding in users of Tumblr. Here, Edison is comfortable with a user number of around 180m and it estimates that there is around 30% overlap between the two. Hence, combining the two user bases (as Yahoo! must do) gives a number of around 250m. This is a big number and not far shy of the magic 300m where proper money starts to be made. However, there is a long way to go before any of this begins to happen.

Firstly, Yahoo! must gain traction on mobile devices. Its assets and its users are largely based in the fixed world and do not work well on mobile devices. **Secondly**, there is nothing to tie all of the different services together and no real user experience to draw users into living their digital lives with Yahoo!. **Thirdly**, the user bases of Tumblr and Yahoo! are very different and a huge cross-selling campaign needs to happen to give the ecosystem scale, coherence and credibility. **Fourthly**, the local assets of Yahoo! need to be effectively utilised to give its digital life offering

differentiation and appeal in territories outside the US. This is an approach that Google has largely ignored with its one size fits all approach. While the majority of the internet activity is in Western countries, this is less of a problem, but the growth in the next 10 years is all going to be elsewhere. Yahoo! looks to be in a better position to meet that change.

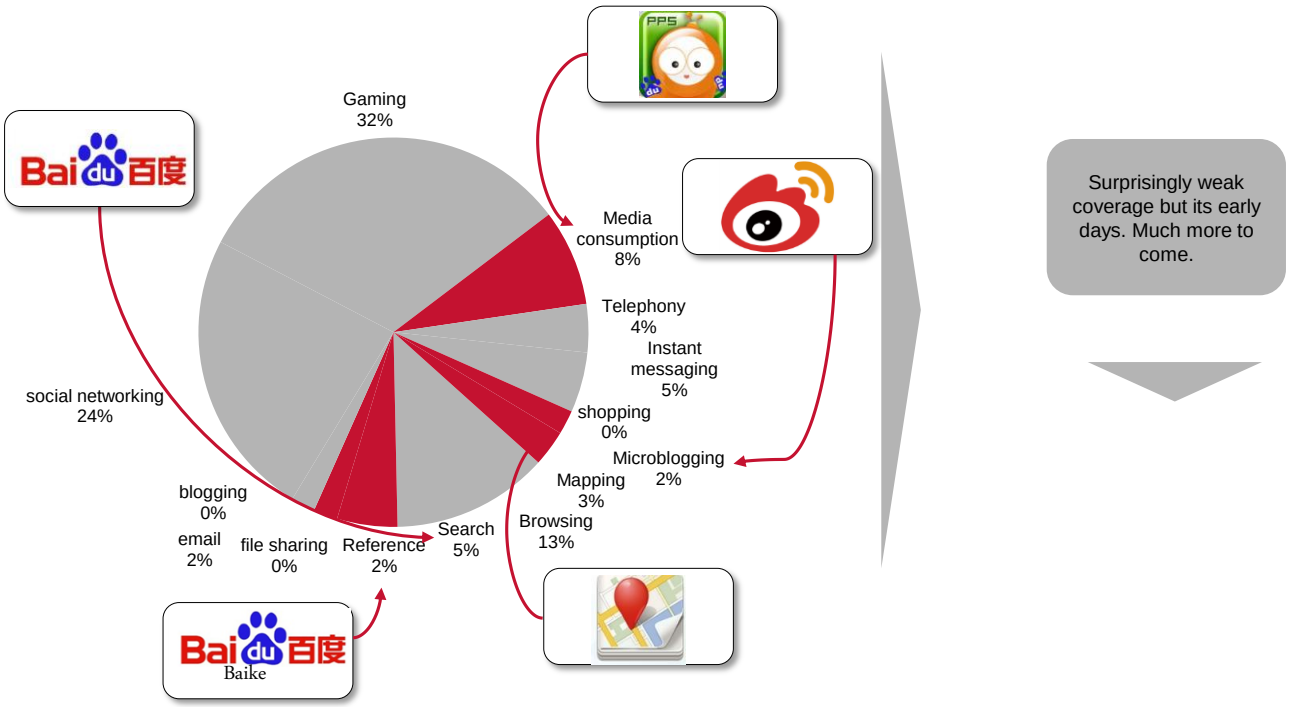
When one looks at Yahoo!'s position in digital life, one is in for a surprise. Yahoo! now has almost as good coverage of user activities as Microsoft and is better than Google (Exhibits 13, 19 and 23). Of course coverage is one thing and quality is quite another. Yahoo! still has a lot of work to do as its services are not yet on a par with either Google or Microsoft. The main point here is that the ground work for Yahoo! to be a major force in mobile ecosystems has been laid; it is now just a question of execution. Consequently, Edison rates Yahoo! as the most likely to succeed of the secondary group jostling for position after the big three of iOS, Android and Windows Phone.

China/Baidu: Gorilla at home

China is a market unto itself. It is so large that the economics for providing elements of the mobile handset value chain can stand on their own two feet by addressing the home market only. This combined with a strong state desire to promote home-grown technologies, software and services means that the Chinese smartphone market is likely to be dominated by local providers. While this is not necessarily true in the handset space (due to the local affinity for global brands) it is certainly true in the application, service and ecosystem space, where many of the global contenders are unlikely to get much of a look in.

The Chinese smartphone market is utterly dominated by the Android OS, which currently has around 80% share of all units shipped. Google has no position in the Chinese market and therefore Android in China is simply an OS upon which other ecosystems are likely to be built. At the moment most of the Android devices are off the shelf code from Google and have no integration or optimisation but this is likely to change. It is relatively easy to modify Android to make it a closed proprietary system. Aliyun from Alibaba, Baidu Yi from Baidu and OPhone from Borqs are good examples but none of them have gained much traction to date. Google has managed to kill these forks by releasing new versions of Android with new features that have rendered these forks obsolete, thereby forcing everyone back to Google's Android. This is unlikely to be a viable long-term tactic as operating systems are rapidly becoming commodities with the differentiation being made through the ecosystem (Exhibit 4).

Exhibit 24: Baidu's position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

Hence, as the Chinese market become more sophisticated and moves away from the largest screen at the lowest price towards ecosystems, then China-specific forks of Android or even other software are likely to become more relevant. Here there are two lead contenders. First a joint effort between Huawei and Baidu on what is probably yet another Android fork and secondly a reference design based on Ubuntu being created for China by Canonical. It is these implementations that are likely to become the most relevant in the Chinese market as the focus will be on the ecosystem and here the leading contender in China is Baidu.

Baidu is the leading search engine in China and has been following Google's path of getting involved in as many digital life activities as possible. This allows Baidu to learn more about its users and sell that information for the purpose of targeted advertising. Looking at Baidu's position in digital life, it is surprisingly weak when it comes to providing services. It has search-related functions related to many of these activities but stops short of providing the services itself. This means that Baidu learns far less and is not in a position to properly monetise activity in that segment and consequently is considered by Edison as absent from those segments (Exhibit 24).

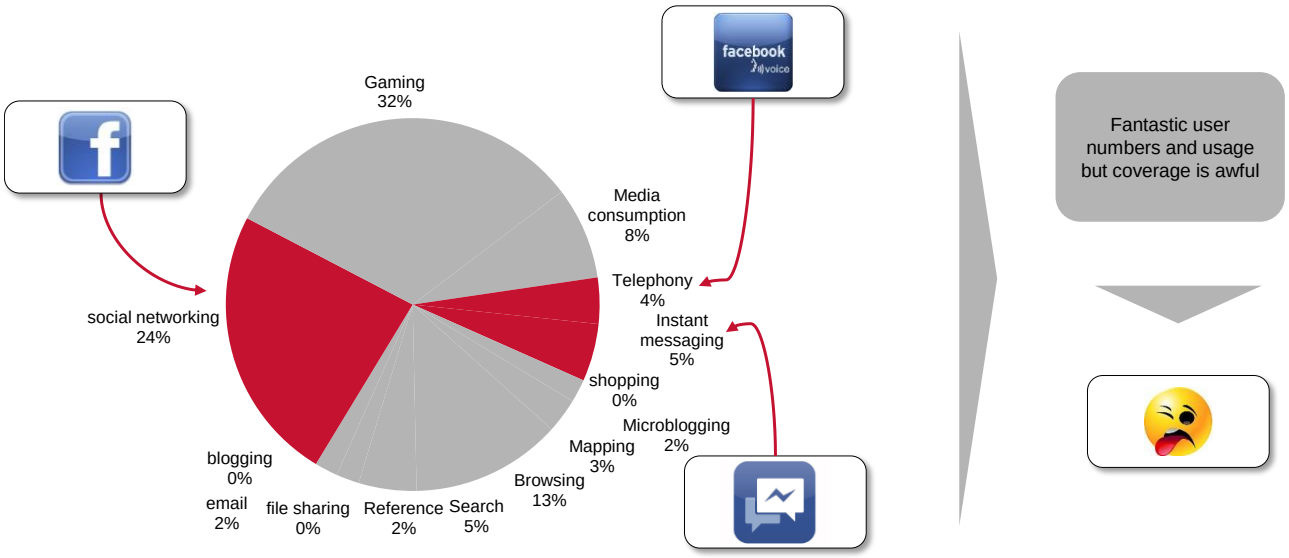
At 20% of Digital Life covered (Exhibit 24), Baidu is about as advanced as Amazon or BlackBerry but it will be much easier for Baidu to increase its coverage. Its recent acquisition of P2P Internet TV service PPS is strong evidence of Baidu's strategy to continue growing its coverage of the digital life pie. Movement around social networking and gaming will be the two most critical moves Baidu makes as that is where the majority of smartphone activity is to be found. Facebook is freely available in China and as a result there will be stiff competition for Baidu in that segment, but the gaming segment appears to be open for Baidu at home.

Baidu's competitors are fragmented with a weak position in the Chinese market, with Google relegated to Hong Kong and Yahoo! China and Microsoft's Bing with relatively low market share. Hence Baidu is in a strong position to be the preeminent Chinese ecosystem easily passing 300m users in time (Exhibit 7).

Facebook: A one-trick pony

Facebook is the undisputed king of social networking but not much more. It has a massive 1.1bn (FaceBook) base of users who use the site at least once a month. Furthermore, its usage statistics make it by far the most used service in the world, with users spending on average 7hrs and 45mins on the site every month. In second place in terms of time used per month is AOL with just 2hrs and 52mins, less than half that of Facebook. Google clocks in at 1hr and 47mins (data collected by Pewinternet.org, CommScore and NetMarketShare). Facebook on its own represents 22% of all time spent on the internet. It utterly dominates this space and is almost certain to capitalise on all the monetisation opportunity in social networking but that is the limit of its current reach. Facebook has so far been unable to offer services outside of social networking that have gained any real user traction.

Exhibit 25: Facebook's position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

This basically means when the penetration of social networking begins to flatten out, and Facebook is efficiently monetising the traffic that is receiving, growth will be over. For a share that is trading on a P/E ratio of 44.3x, this is a frightening prospect. Hence, in order to find long-term growth, Facebook must seek to expand its coverage of digital life. This is exactly what Facebook Home is all about.

Facebook Home is a user interface skin that is layered on top of an Android device making Facebook the default function for every activity that Facebook supports. This has two main drawbacks. First, Facebook Home does not provide easy and fun access to digital life (page 15) and second Facebook's portfolio of services outside of social networking is almost non-existent (Exhibit 25). Facebook Home has been installed on around 1m devices (0.09% of users) and feedback has been pretty universally negative on the experience.

Facebook Home is a failure but critically Facebook knows what the problem is and is trying to do something about it. The time is right as 18% of all time on smartphones is spent on the Facebook application alone, which is a reasonable indication that users could be open to having a Facebook experience on their home screens. It is just a question of getting the experience right and of expanding its coverage of digital life. For Facebook, the hardest part is done. It has sensational user numbers and usage statistics; it just has to come up with other services that will delight users. This is not difficult in itself, as it is clear what those services need to be. It is a question of making its services better than those of the competition and then enticing its existing users to switch. This will not be easy but it does put Facebook in a position of opportunity rather than one of being under

threat. That being said, a lot more needs to be seen before one can get excited with respect to Facebook being anything more than the king of social networking.

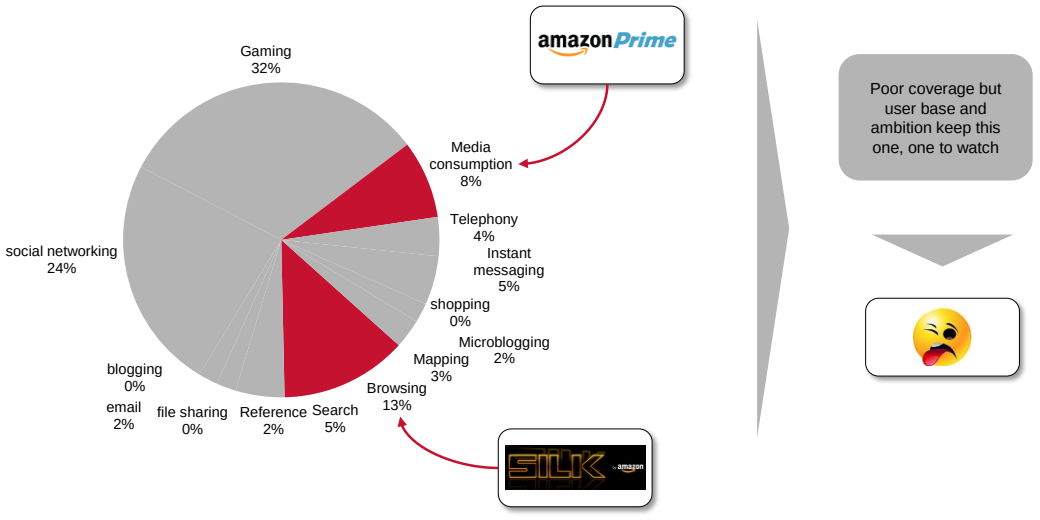
Amazon: Topsy-turvy

Amazon is the major force in online retailing. The website has become the go to place for price discovery and product research. The company has around 150m accounts, all which have a credit card or some type of payment mechanism attached. At this point in time, Amazon's margins are incredibly thin as it is simply a retailer in addition to investing heavily in its future.

This future is increasingly aimed at being a provider of a digital ecosystem and monetising the traffic that it generates from its users. For this to be successful, Amazon has to provide much more to its users and entice them to do much more with Amazon other than compare prices and shop for goods. The seed of this strategy is Amazon Prime. This is a premium service (with 10m subscribers (Amazon)) that costs $79 per year ($6.58 per month) and gives the user unlimited two-day shipping on all purchases, but also gives access to unlimited movie and TV show streaming. It also gives more limited access to e-books on a lending basis on the Kindle. Hand in hand with this strategy is Amazon's foray into hardware with the Amazon Kindle HD series of products and the inevitable mobile phone (yet to make an appearance).

On its Kindle line, Amazon has taken control of Android by ripping out all of the hooks into Google and replacing them with its own. Most important of these is the Silk browser, which offers an optimised browsing experience based on the smaller screen size and more limited bandwidth. The optimisation ensures that all of the traffic flows through Amazon's servers and hence Amazon is in a position to learn about its customers. Putting this together with Amazon prime, there is a framework into which more services can be added to deepen Amazon's coverage of digital life.

Exhibit 26: Amazon's position in Digital Life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

The issue that Amazon faces is that its coverage of digital life is very poor. Outside of media through Amazon Prime and browsing through Silk, it is not yet in a position to offer users services with which they can live their digital lives. This means that even the most dedicated Amazon fan can only spend around 20% of their digital life with Amazon (Exhibit 26). This is a real conundrum as Amazon has already forgone the notion of making money on hardware (see above) and so is left only with monetising the traffic (outside or product and content sales) as a way of making money in mobile.

Amazon's strength lies in its 150m user accounts and the more of these it can convert into Prime accounts, the greater the opportunity will be. It is still early days and whatever Amazon lacks in

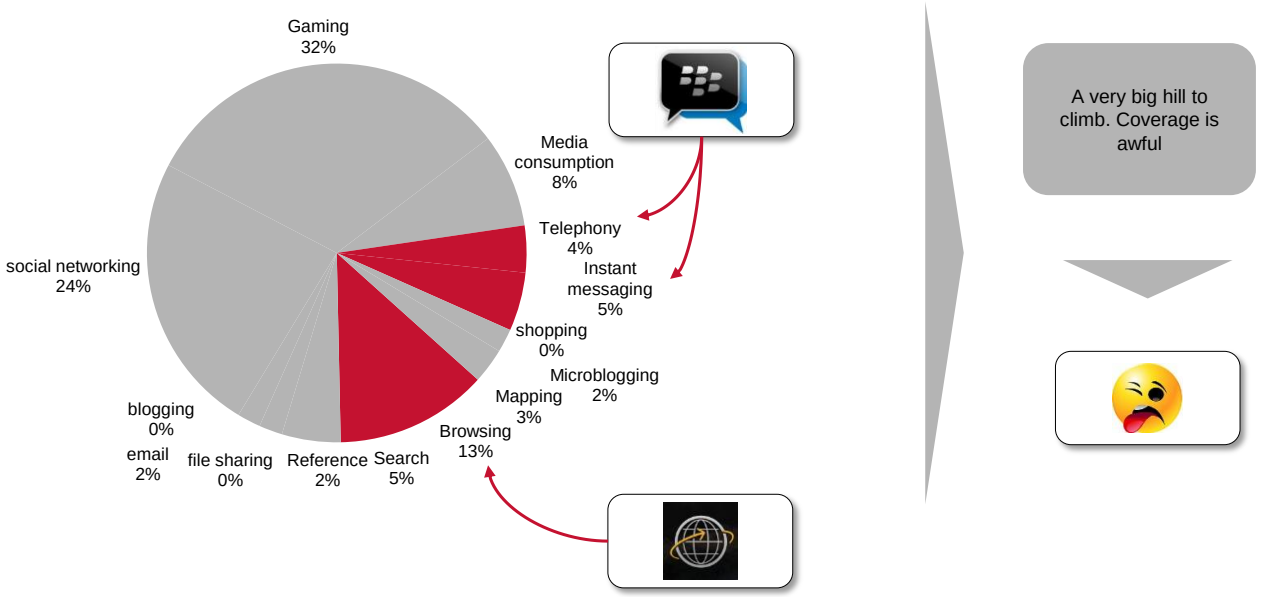
digital assets, it makes up for with ambition. Amazon is a viable contender to be one of the mid-level players (Exhibit 7).

BlackBerry: Down, not out

Much like Nokia, BlackBerry was slow to adjust to the changes in its core market and consequently it lost vast amounts of market share to both Android and iOS. Its user experience (pre-BB10), its third-party applications and its digital life offering have been far below par for many years. Until mid-2010 this did not really matter as the corporate lock-in and the extraordinary popularity of BlackBerry Messenger (BBM) in emerging markets allowed market share to peak at 20% of the smartphone market.

However, as bring-your-own-device (BYOD) gathered momentum and the quality of mobile email and messaging services improved on other devices, BlackBerry's appeal began to wane. Market share is now around 3% of the smartphone market and it will take a lot more than just BB10 to win back any of its former glory.

Exhibit 27: BlackBerry's position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

The user experience on BB10 is differentiated but it is not intuitive. Picking up the device for the first time and trying to make calls or send SMSs causes significant difficulties. Furthermore very like Microsoft (page 26), BlackBerry suffers from the 'blue squares of death' syndrome. The devices at the point of sale are all blank meaning that demonstrating the value of the BB10 proposition to potential users is next to impossible. Microsoft, with its mountains of cash, has a much better chance at fixing this problem (page 27) than BlackBerry does.

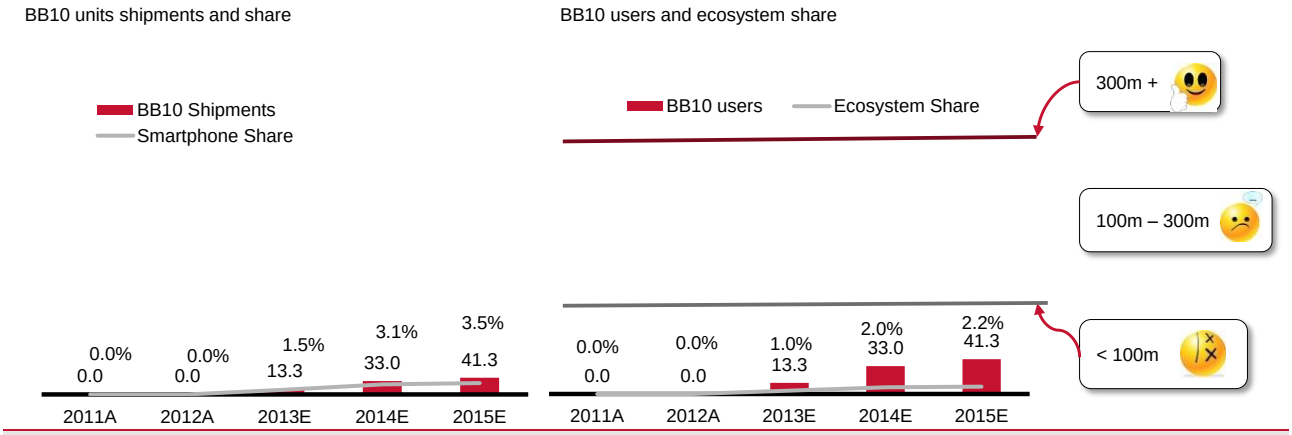
Furthermore BlackBerry's coverage of digital life is very poor (Exhibit 27). This means that even if BB10 proves popular, there is not much that BlackBerry can offer that is not available elsewhere. This also means that BlackBerry's opportunity to earn revenues from learning about its users (Exhibit 27) will remain extremely limited unless something can be done (see below). To compound the issue, getting developers to make their apps and services available on BB10 is tricky given the poor outlook for volume. To get around this BlackBerry has written an emulator that allows Android applications to run on BlackBerry devices. Native Android applications will not run properly and the quality of the emulation of those written to Dalvic is poor, making it very unlikely to fill the void left by the lack of developers.

BlackBerry does have two areas of strength. First it still has around 76m subscribers (Blackberry) and subscriber loss has been far less than the collapse in market share and profitability would indicate. With these subscribers BlackBerry is not far from 100m (Exhibit 29) meaning that it is not far away from being a viable ecosystem despite its very weak position in digital life. Second, the nature of BlackBerry means that all the traffic that the device generates passes through BlackBerry's Network Operating Centre (NOC) regardless of whether or not the traffic is being generated by a BlackBerry service. This gives BlackBerry an unusual opportunity to learn about its users even if it is not providing the service. At the moment all the messaging traffic that flows through the NOC is encrypted meaning that BlackBerry cannot learn from it but this could change for less sensitive services like browsing or social networking.

The initial reception of BB10 has not been as good as hoped, and device price remains very high, dashing hopes for a rapid recovery. The recently launched Q5 has yet to be priced but it shares enough specification with Q10 for it to be priced meaningfully above $200. This will limit its addressable market, meaning that this device is also unlikely to trigger a rapid recovery.

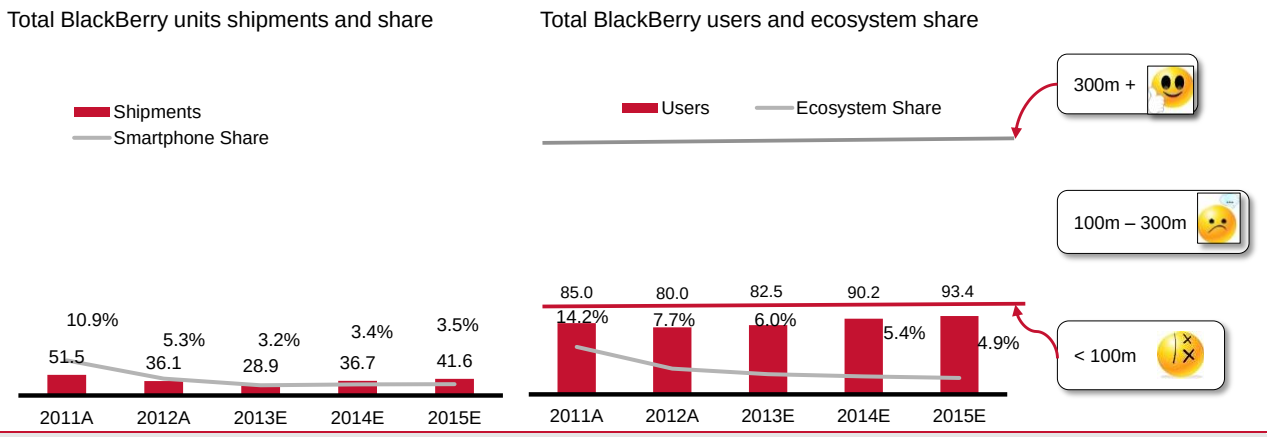
The challenges that face BlackBerry are substantial and Edison is not convinced that it has either the assets or the management vision for a stellar recovery. That being said, it should be able to win enough subscribers to make the ecosystem viable, somewhat lessening the need to spend all the resources fighting fires. This could result in a viable but barely profitable BlackBerry, which does not really make it interesting from an investing point of view. Nokia and Microsoft have a much better chance of making it and shares of both companies offer upside should Windows 8 fulfil its potential (page 24).

Exhibit 28: Edison forecasts for BB10



Source: Edison Investment Research

Exhibit 29: Edison forecasts for total BlackBerry



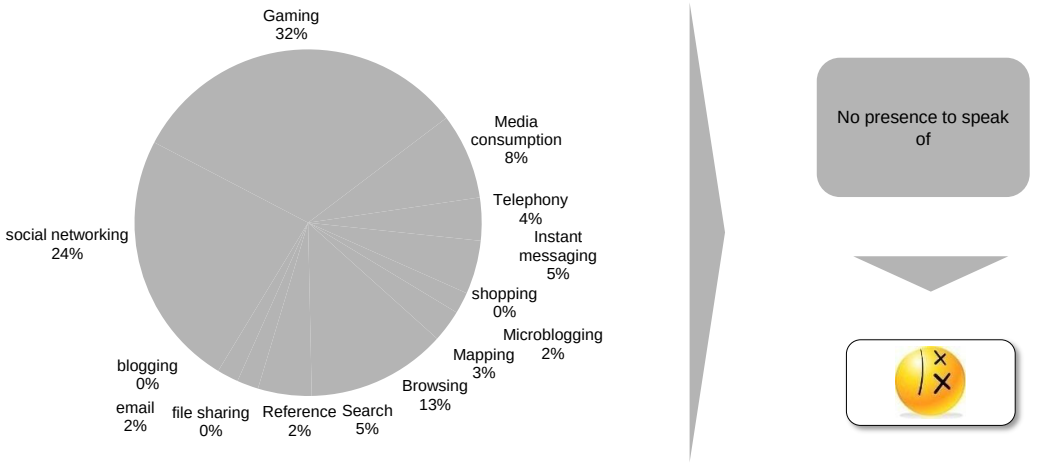
Source: Edison Investment Research

Jolla: Phoenix or zombie?

Jolla promises to be the phoenix that rises from the ashes of Nokia's burning platforms. MeeGo (renamed Sailfish OS) is a smartphone platform based on Linux that was supposed to be the basis of Nokia's smartphones after Symbian. This was terminated in February 2010 with Nokia's move to Microsoft. The MeeGo team spun out of Nokia and created Jolla in March 2011 and raised $200m from its ecosystem partners to develop the software and make the first device. The source of the cash is not clear but it would seem likely that the majority owners of Jolla are most focused on the Chinese market.

Adherence to time tables has been pretty good with the Sailfish OS launched in November 2012 and the handset as promised in May 2013. The new OS has made some interesting tweaks to the user experience with multitasking functionality being implemented using live tile-like functions on the home screen. It has also gone for a novel approach to themes with the entire UI being able to adapt to the colour palette and style of any photograph. The device itself also has some interesting features with novel interchangeable backs. Currently there are a range of coloured backs that when clipped on, change the look and feel of the UI to match. This is a cool, but useless gimmick, but it serves to illustrate the possibilities. Other features like more storage, NFC, input controls and so on could easily be added into the back and these would then become part of the device.

Exhibit 30: Jolla's position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

Jolla, like BlackBerry, has attempted to get around its lack of third-party developers by implementing an Android emulator. Android applications will run on the device thanks to the Alien emulator from Myriad. Myriad has been working on this for a long time and there is hope that Android apps will work much better on Jolla than they do on BlackBerry's awful BB10 implementation. No matter how good it is, it can only serve as a stop gap as the Android equivalent will always be better and consumes less system resources. Hence, Jolla must develop its own ecosystem if it is to have any chance of survival as a player in this space.

Jolla has no position in digital life (Exhibit 30), meaning that unless something drastically changes, it will be unable to earn revenues from monetising traffic. This means it must make money selling handsets in order to survive. With 150 engineers, gross margins of 25% and an ASP of €400, Jolla we think it needs to sell around 250,000 devices per year to break even. That does not sound like much in a market of 900m units, but the high end is already well developed and almost saturated. This will be tougher than it sounds but not impossible. This is especially the case with the significant Chinese backing that Jolla has.

Another option is for Jolla is to license its software to third parties. This is problematic when prices have fallen to $0 thanks to Android, but there is a possibility with customised implementations to

client specifications. This is very similar to the business model of Canonical (page 43). The Jolla handset could serve as the proof of concept and there could be interest from handset makers looking to get out from underneath the skirts of Google and Microsoft. The problem will be the ecosystem. In this instance it would be up to the customer in question to create the ecosystem around the delivered software. The unit royalty will be far less than €400 and so Jolla would need to ship something in the region of 20m units to make this business fly without hardware revenues. Edison thinks that this is the plan B should the handsets not ship in the kind of volumes needed to make the offering viable.

Cash flow is the metric to watch at Jolla. Jolla appeared as a phoenix but without the lifeblood of cash flow, it will be nothing more than a zombie with a short afterlife. At the very least Jolla is a far more viable and complete option than its half-brother Tizen (page 40).

Tizen: Forlorn child

Tizen is end product of endless industry consortia that, for more than 10 years, has been trying to make an independent smartphone OS based on Linux. Tizen's roots come from LiMo (Mobile Linux industry consortium), which in itself was the product of the merger of other struggling industry consortia from over ive years ago. When Intel left the MeeGo project and joined up with Samsung, LiMo was renamed Tizen.

Its main components are a Linux kernel and the WebKit runtime, which are built on the Samsung Linux Platform, which was delivered several years ago as part of LiMo and made it into Vodafone 360 devices (H109). Vodafone 360 was the last time Tizen code made it into a mobile device of any real significance.

With Intel joining the project, a new roadmap was defined and version 1.0 was released in January 2012. 17 May 2013 saw the release of version 2.1 but still no device has come any closer to the market. Devices are expected in H213, but Edison is of the opinion that these will be devices created by Samsung for NTT DoCoMo's network. The outlook for devices with a wider appeal remains unknown.

Tizen seems to be plagued by the same issues that have beset its predecessors, so much so that Tizen seems very similar to the ill-fated Symbian Foundation. Tizen has one major manufacturer (Samsung) in the driving seat and it is this manufacturer that is calling all the shots and writing all the code. So great is this dominance that Edison believes that other manufacturers have found it difficult to become part of the alliance. Even when successful, they are likely to find themselves at a disadvantage as the code will not be optimised for their hardware and their input into the roadmap will be largely ineffectual. Intel seems to be happy to take a back seat and to use the Tizen code for in-car entertainment systems as its focus on handset software seems to be more focused on optimising its chips to run Android more efficiently.

This imbalance ensures that handset makers other than Samsung will never be able to compete on a level playing field. Hence Edison believes that after some time of trying they will give up, leaving Tizen as the back-up plan for Samsung if it is unable to wrest control of Android from Google.

Tizen has no developers (other than the consortia) and no existing assets or seeming intention to offer any aspect of digital life to users. Consequently, Tizen in itself is likely to be only an OS and framework upon which others can implement their ecosystems or user experiences. Edison does not hold out much hope for Tizen as, even in Samsung, commitment is questionable.

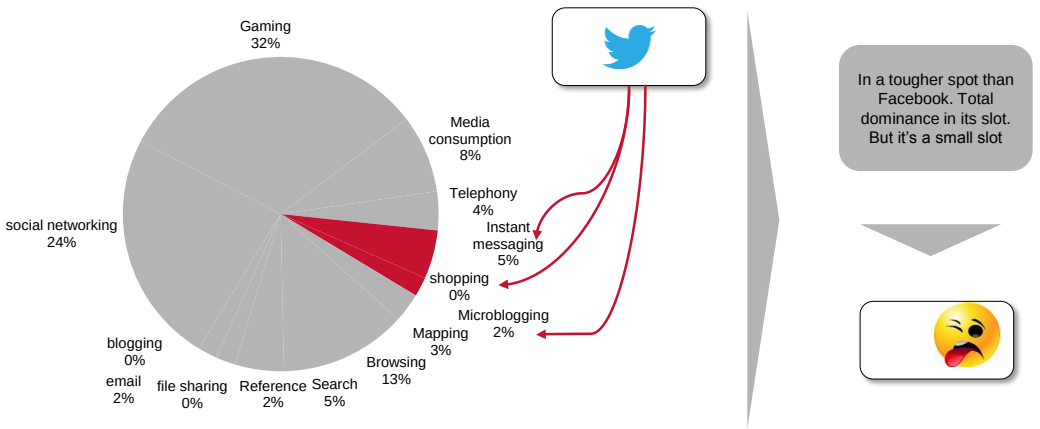
Twitter: Locked in

Twitter is a little brother of Facebook and faces exactly the same problem. Twitter utterly dominates the segment that it occupies but very little outside of that. Like Facebook, it has a substantial user base of 200m (Twitter), but none of those users use their Twitter accounts to do anything other than micro blog or tweet.

Right now this is not an enormous problem as Twitter is just getting to grips with monetisation meaning that there is quite a good slice of growth to go before it hits a brick wall. 200m users with 400m tweets a day (Twitter) has scope to generate significant advertising revenues in both the fixed and mobile arenas. Twitter has also become a firm fixture as a bona fide marketing channel.

In the long term, Twitter must find a way to get out of its niche and find way to appeal outside of tweeting. If this can be achieved then a new avenue of revenue growth will be available. This is because the more of digital life the company can cover, the more it will learn about its users and the better it can target them with advertising. Furthermore, the more time these users spend within a Twitter ecosystem the more opportunity Twitter will have to display advertising or market products to its users.

Exhibit 31: Twitter's position in digital life



Source: Edison Investment Research, Nielsen, Pewinternet.org, CommScore, NetMarketShare

As Facebook has found, breaking out of the niche is extremely difficult and can be very costly but there are some niches where there is a relatively easy fit. In this vein Twitter has done deals with Chirpify and American Express to branch out into e-commerce and take on eBay. It is also trying to increase the richness of its tweets moving from text only to try and include pictures and video. This will help, but it looks extremely unlikely that Twitter will ever be in a position to challenge the big providers in areas such as gaming, social networking or browsing.

Therefore it seems likely that Twitter will be able to grow in the medium term but once it has saturated its segments and expanded into a few others, things will become relatively static. Twitter looks certain to dominate the opportunity in its segment across all ecosystems as there is no credible alternative. Growth beyond that opportunity looks like it will be very hard to come by.

Firefox OS: The vital promise

Firefox is one of the most popular browsers on the internet but is almost unheard of on mobile devices. Partly because it is not approved for iOS, but also because it is not the default browser on Android. Firefox is the brainchild of Mozilla, which is a non-profit organisation dedicated to openness and interoperability on the internet. Its failure to gain any real traction on the existing OSs in the mobile space meant that a more direct approach needed to be taken. As a result, Firefox OS was born.

This was launched in February 2013 and is a mobile phone operating system based on Linux where the functionality of the device is written in HTML5 using open web standards rather than the platform specific APIs of the existing smartphone OSs. The beauty of this system is that APIs are isolated from the hardware meaning that there is no need to re-write or port any applications to run on devices from different manufacturers.

In theory this is every application developer's dream but in practice this approach has always suffered from awful performance because of the processing overhead involved in making sure that the APIs are properly abstracted from the hardware. Mozilla claims to have solved this problem, in much the same way that SavaJe did, but what was shown on the stand at Mobile World Congress 2013 did not inspire much confidence.

The promise of Mozilla is **mid to high level smartphone performance for a mid to high level feature phone price.** A small screen device with a jerky bubble popping game fulfils the price end of the promise but is way adrift when it comes to performance. The problem is that in the last six months, Android has made massive strides in this price category and the Firefox OS device from ZTE already looks obsolete.

Firefox OS's other problems are legion. It is open-source code with 50% of the code being contributed by volunteers. What is more Mozilla's philosophy is for total openness with no one having overall control. This is all very well, but this is a recipe for total anarchy. Android is already chaotic enough and is incredibly vulnerable because of it (page 22). Firefox OS could be far worse meaning that the users can never really get on top of the proposition. Security is going to be a nightmare. Loads of app stores and developers delivering code directly to users basically means that there will be virtually no control preventing malicious code from getting past hapless users. There may be some way of controlling this by running apps in the browser, but this not going to solve the problem entirely. Furthermore, Mozilla and its partners have chosen the most brutally competitive and toughest part of the market to address. This is why it must deliver on its promise or no one will ever notice.

Ubuntu: Tools of the trade

Ubuntu is not an ecosystem in its own right, which is why it is absent from Exhibits 7, 8a and 8b, but it is an enabler and as such it is worthy of a brief discussion. Ubuntu started as a desktop operating system based on the Debian Linux distribution and is free and open. Although it is open it is effectively controlled by Canonical as it writes the vast majority of the code and organises the master code line into distinct releases.

A variant of Ubuntu was released for Android devices in February 2012. Both Android and Ubuntu can run on the same device as they share a common kernel but it would seem likely that user experience will suffer from running two OSs at the same time unless the device has a particularly high specification. The version for Android is expected to converge fully with the desktop version in 2014.

In reality, the devices that have been shown at trade fairs and on videos are really a proof of concept using a generic version of the software. Anyone can take this code and create a user experience and an ecosystem of their own but Ubuntu in itself will not become an ecosystem or aim to compete in this space.

This is where Canonical comes in. Canonical makes its money from Ubuntu by working on behalf of hardware makers to create software to run on specific hardware configurations and to the client's specifications. For example Ubuntu Kylin is a version of Ubuntu created by Canonical to the specific requirements of The China Software and Integrated Chip Promotions Centre, which is keen to create a software environment specific for China. At the moment this is going to be a desktop operating system but it is almost certain to be extended into mobile devices when the two code distributions merge in 2014. This is one of the options that may end being used by Baidu on which to base its ecosystem in portable devices (page 31).

Ubuntu is important to track as it is likely to be the foundation upon which new ecosystems are built, but there is clearly no intention for Ubuntu or Canonical to start targeting a user experience and wooing consumers into an ecosystem. Ubuntu is the tool from which to build an ecosystem, not the ecosystem itself.

The waiting list

Every man and his dog

Edison Investment Research's list of ecosystem contenders is in no way exhaustive and there is a whole line up of contenders just waiting in the wings for the opportunity to break in. This is because many existing players can see the writing on the wall for their own businesses. Exhibit 3 shows that a company can make money either by selling technology, hardware (making a return on hardware, software and the ecosystem together through premium pricing) or monetising traffic. To compound the issue hardware, OS and user interface are all rapidly commoditising (Exhibit 4), meaning that increasingly differentiation when it comes to the user's purchase decision will be made in the ecosystem.

Hence any consumer electronics company with a position in smartphones, tablets, PCs, televisions, game consoles or set-top boxes must either make a difference in the ecosystem or become a commodity.

This effectively means that device manufacturers will have to change from being focused on hardware differentiation to making a difference through software and services. No one realises this more acutely than Samsung Electronics, which is quietly investing very heavily in creating its own ecosystem. Now is the right time for Samsung to do this as it has effective control of developers as those developing for Android will ensure that their applications are optimised for Samsung Android before any other version. It is going on quietly in the background and no one wants to talk about it, but the day is likely to come when Samsung takes the Android code and makes its own fork, this resting control from Google. With developers onside, Samsung's version will effectively become the master code line, but Samsung had better make sure that it can innovate and add hardware support more quickly than Google can. This is how Google has killed other attempts to do this in the past (page 31).

Samsung has a viable strategy to position itself for the long term, but the likes of LGE, HTC, Sony, Motorola, Panasonic, Sharp and so on have a very bleak future ahead of them. They will become trapped as commodity hardware makers, just like the PC makers before them, and there will be no escape other than leaving the market. Sony also has some awareness of its predicament and it has some assets that it can pull together, but its ability to do this to date has been woeful. The new CEO is well spoken and dynamic, but Sony is a stalwart of the Japanese consumer electronics boom of the 1980s to which change is most likely to come too late.

Conclusion

The age of the ecosystem is upon us but there are still, and will be for a few years yet, rare opportunities to make money from hardware differentiation. A typical example will be in next-generation screen technologies where the Koreans are currently leading the way. However, these opportunities will be few and far between, meaning that if a company wants to make money it must do so in one of three ways: 1) provision of unique technology, 2) provision of a popular ecosystem monetised through premium hardware pricing and 3) monetisation of traffic through the provision of applications and services in digital life (Exhibit 11). (Do not forget that this analysis excludes the sale of products and content like movies or applications.)

Routes 2 and 3 require the company to have at least a participation in the provision of an ecosystem otherwise profitability will be very low at best. The industry sees this coming and players are beginning to jostle each other for position in the race to create an ecosystem within which users will want to spend their digital lives. These are not going to be walled gardens but more like gated communities. Users can come and go and no one is locked in, but the focus will be on keeping the user within the community for as much time as possible. Some offerings such as Facebook (page 33) and Twitter (page 41) may not make it as ecosystems in their own right, but they have the scope to dominate one type of activity (such as micro blogging) in every ecosystem. This will be an effective way of earning revenues, but the total addressable market for each of these companies will be lower than if they were fully fledged ecosystems.

It is this trend that is largely responsible for the closure of many APIs (interfaces) allowing third parties access to a service on their own platform. The problem with allowing third parties access is that it limits one's ability to monetise the traffic that one is generating. For example the locking out of third parties from Twitter was to ensure that access was carried out on Twitter's own applications or website thereby giving it the control and the opportunity to monetise.

This trend is also responsible for the ongoing M&A gold rush that is going on in digital life among the ecosystem providers, as those with significant gaps move to fill them. Most active in this space recently has been Yahoo!, which has plugged some large gaps with its acquisition of Tumblr (page 29). Google's failure to properly address gaming (Exhibit 13) and Microsoft's lack of a social networking platform (Exhibit 19) serve as good indications of the kind of assets these companies may be seeking to acquire. Baidu also has a long way to go and its acquisition of PPS may be far from the last it makes.

Against this backdrop it is fairly clear where the opportunities lie when it comes to investing in this space. **Upside opportunity is to be found in Yahoo!, Nokia, Microsoft and potentially BlackBerry.** Apple, Amazon, Google, Samsung, Baidu and Facebook are unlikely to see much of a change in their current direction that could drive a major share price move. Investors need to treat Sony, LGE, HTC, Panasonic and Sharp with extreme caution if they are not already doing so.

Market forecasts

Exhibit 32: Global handset shipments by vendor

Total handsets	2008	2009	2010	2011	2012	2013e	2014e	2015e
Units by vendor units (m)								
Apple	11.4	24.9	46.6	89.3	133.4	165.6	180.0	194.3
Huawei	7.0	13.5	30.0	46.0	49.4	54.2	77.8	78.6
HTC	6.5	10.8	24.9	43.3	32.5	20.4	21.4	23.6
LG	102.6	122.1	114.2	86.4	58.4	78.0	70.4	68.8
Google Motorola	106.6	58.5	38.6	40.3	35.3	26.3	19.5	19.7
Nokia	472.3	440.9	461.3	422.5	335.2	265.6	291.8	294.8
BlackBerry	23.1	34.3	47.5	51.5	36.1	28.9	36.7	41.6
Samsung	199.2	235.8	278.6	316.2	386.2	423.3	463.2	471.6
Sony Mobile	93.4	54.9	41.8	32.6	32.7	29.9	32.2	35.4
ZTE	14.2	16.0	50.0	69.3	69.6	57.0	58.4	59.0
Others	185.8	199.6	463.4	579.6	578.5	671.4	694.3	677.7
Total	1222.2	1211.2	1596.8	1776.9	1747.3	1820.7	1945.6	1965.0
Market share handsets	**2008**	**2009**	**2010**	**2011**	**2012**	**2013e**	**2014e**	**2015e**
Apple	0.9%	2.1%	2.9%	5.0%	7.6%	9.1%	9.2%	9.9%
Huawei	0.6%	1.1%	1.9%	2.6%	2.8%	3.0%	4.0%	4.0%
HTC	0.5%	0.9%	1.6%	2.4%	1.9%	1.1%	1.1%	1.2%
LG	8.4%	10.1%	7.1%	4.9%	3.3%	4.3%	3.6%	3.5%
Google Motorola	8.7%	4.8%	2.4%	2.3%	2.0%	1.4%	1.0%	1.0%
Nokia	38.6%	36.4%	28.9%	23.8%	19.2%	14.6%	15.0%	15.0%
BlackBerry	1.9%	2.8%	3.0%	2.9%	2.1%	1.6%	1.9%	2.1%
Samsung	16.3%	19.5%	17.4%	17.8%	22.1%	23.3%	23.8%	24.0%
Sony Mobile	7.6%	4.5%	2.6%	1.8%	1.9%	1.6%	1.7%	1.8%
ZTE	1.2%	1.3%	3.1%	3.9%	4.0%	3.1%	3.0%	3.0%
Others	15.2%	16.5%	29.0%	32.6%	33.1%	36.9%	35.7%	34.5%
Smartphone % market	**12%**	**15%**	**19%**	**27%**	**39%**	**50%**	**55%**	**60%**

Source: Edison Investment Research, Gartner

Exhibit 33: Global smartphone shipments by vendor

Of which smartphones	2008	2009	2010	2011	2012	2013e	2014e	2015e
Units by vendor Units (m)								
Apple	11.4	25.1	46.6	89.3	133.4	165.6	180.0	194.3
Huawei	7.0	13.5	0.4	15.6	29.0	42.9	53.6	59.1
HTC	6.5	10.8	24.6	43.0	32.5	20.4	21.4	23.6
LG	0.2	0.6	5.6	19.0	26.4	43.7	28.8	23.6
Google Motorola	2.7	2.6	13.7	17.4	16.6	9.1	5.4	5.9
Nokia	60.9	70.9	102.2	84.6	36.4	33.6	71.9	115.5
BlackBerry	23.1	34.3	47.5	51.5	36.1	28.9	36.7	41.6
Samsung	4.7	5.9	25.4	90.5	212.4	279.4	343.0	378.0
Sony Mobile	2.4	1.4	10.3	19.6	28.3	29.9	32.2	35.4
ZTE	0.0	0.0	0.0	10.5	29.5	32.5	32.2	35.4
Others	27.2	20.7	23.0	30.7	106.1	217.8	266.9	268.7
Total	146.3	185.7	299.2	471.7	686.7	903.7	1071.9	1181.2
Market share smartphones	**2008**	**2009**	**2010**	**2011**	**2012**	**2013e**	**2014e**	**2015e**
Apple	7.8%	13.5%	15.6%	18.9%	19.4%	18.3%	16.8%	16.5%
Huawei	4.8%	7.2%	0.1%	3.3%	4.2%	4.8%	5.0%	5.0%
HTC	4.5%	5.8%	8.2%	9.1%	4.7%	2.3%	2.0%	2.0%
LG	0.1%	0.3%	1.9%	4.0%	3.9%	4.8%	2.7%	2.0%
Google Motorola	1.9%	1.4%	4.6%	3.7%	2.4%	1.0%	0.5%	0.5%
Nokia	41.7%	38.2%	34.1%	17.9%	5.3%	3.7%	6.7%	9.8%
BlackBerry	15.8%	18.5%	15.9%	10.9%	5.3%	3.2%	3.4%	3.5%
Samsung	3.2%	3.2%	8.5%	19.2%	30.9%	30.9%	32.0%	32.0%
Sony Mobile	1.6%	0.8%	3.4%	4.2%	4.1%	3.3%	3.0%	3.0%
ZTE	0.0%	0.0%	0.0%	2.2%	4.3%	3.6%	3.0%	3.0%
Others	18.6%	11.1%	7.7%	6.5%	15.4%	24.1%	24.9%	22.7%

Source: Edison Investment Research, Gartner

Exhibit 34: Global smartphone shipments by OS

Smartphones: Units by OS units (m)	2008	2009	2010	2011	2012	2013e	2014e	2015e
Symbian	72.9	81.0	111.6	88.4	28.1	1.3	0.0	0.0
BlackBerry 9 and older	23.1	33.9	49.7	51.5	37.8	15.7	3.7	0.3
iPhone OS	11.4	25.1	46.6	89.3	133.4	165.6	180.0	194.3
Windows Mobile / Phone	16.5	15.0	12.4	8.8	17.5	40.0	84.4	129.2
Linux	11.3	8.1	6.4	3.8	1.9	0.9	1.1	1.2
Android	0.0	6.8	67.2	219.5	449.1	651.5	745.8	781.4
BlackBerry 10	0.0	0.0	0.0	0.0	0.0	13.3	33.0	41.3
Others	11.0	15.8	5.4	10.4	18.8	15.7	24.0	33.5
Total	146.3	185.7	299.2	471.7	686.7	903.7	1071.9	1181.2
Smartphones: share by OS %	**2008**	**2009**	**2010**	**2011**	**2012**	**2013e**	**2014e**	**2015e**
Symbian	49.9%	43.6%	37.3%	18.7%	4.1%	0.1%	0.0%	0.0%
BlackBerry 9 and older	15.8%	18.3%	16.6%	10.9%	5.5%	1.7%	0.3%	0.0%
iPhone OS	7.8%	13.5%	15.6%	18.9%	19.4%	18.3%	16.8%	16.5%
Windows Mobile / Phone	11.3%	8.1%	4.1%	1.9%	2.5%	4.4%	7.9%	10.9%
Linux	7.7%	4.4%	2.1%	0.8%	0.3%	0.1%	0.1%	0.1%
Android	0.0%	3.7%	22.5%	46.5%	65.4%	72.1%	69.6%	66.2%
BlackBerry 10	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	3.1%	3.5%
Others	7.5%	8.5%	1.8%	2.2%	2.7%	1.7%	2.2%	2.8%

Source: Edison Investment Research Gartner

Exhibit 35: Mobile ecosystem user numbers and share

Ecosystem users (m)	2012	2013e	2014e	2015e
Symbian	50.0	21.0	0.0	0.0
Tizen	0.0	0.5	1.5	4.3
BlackBerry 9 and older	80.0	69.3	45.2	13.8
iPhone OS	178.0	254.6	307.3	348.0
Windows Mobile / Phone	20.0	52.0	110.4	184.5
Linux	20.0	13.9	10.1	7.7
Android	600.0	891.5	1102.4	1222.4
BlackBerry 10	0.0	13.3	44.9	79.5
Jolla	0.0	0.3	1.8	4.6
Mozilla	0.0	1.0	3.9	7.5
Others	90.0	59.0	47.9	47.4
Total	1038.0	1376.3	1675.5	1919.8
Ecosystem share of users	**2012**	**2013e**	**2014e**	**2015e**
Symbian	4.8%	1.5%	0.0%	0.0%
Tizen	0.0%	0.0%	0.1%	0.2%
BlackBerry 9 and older	7.7%	5.0%	2.7%	0.7%
iPhone OS	17.1%	18.5%	18.3%	18.1%
Windows Mobile / Phone	1.9%	3.8%	6.6%	9.6%
Linux	1.9%	1.0%	0.6%	0.4%
Android	57.8%	64.8%	65.8%	63.7%
BlackBerry 10	0.0%	1.0%	2.7%	4.1%
Jolla	0.0%	0.0%	0.1%	0.2%
Mozilla	0.0%	0.1%	0.2%	0.4%
Others	8.7%	4.3%	2.9%	2.5%

Source: Edison Investment Research, Company data

To entertain as well as inform

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