EDISON

Mobile ecosystems

Gated communities

Technology

13 October 2015

The days of walled gardens have passed and users can now come and go as they please. This results in users being able to pick and choose the services they want from different ecosystems. Our analysis clearly indicates the number of services that a user takes from any one ecosystem will have a non-linear impact on the amount of value that the ecosystem owner can extract in the long term. The iPhone 6 has allowed the iOS ecosystem to extend its lead over principal competitors Google and Microsoft. Facebook and Xiaomi are the two emerging players that warrant close observation.

- **Gated communities**– the key for an ecosystem owner will be to ensure that users take as many of its own services as possible. This is because there is a non-linear relationship between the number of services used and the potential for monetisation of that user by any of the three established methods: hardware, advertising or subscription.
- **Google's** recent moves do nothing to solve its biggest problems, which remain software fragmentation and its inability to distribute updates to its users. This, combined with Google Play losing ground to the Apple App Store puts Google in greater danger of losing its grip on Android users in developed markets.
- **Facebook** is far from becoming an ecosystem in its own right, but its path to this goal has become much clearer. Utilising gaming through IM, media consumption through the increasing use of video in its apps and a personal assistant service (Facebook M), would take Facebook to 79% coverage of the Digital Life pie.
- **iOS** has distanced itself further from its peers. Share of high-end users has grown and developers appear to be more focused on the App Store than ever. This gives Apple more time to execute its long-term strategy.
- **Xiaomi** had a fantastic 2014, but has completely run out of momentum as there are limits to the volumes that can be achieved via internet distribution. This means traditional distribution needs to be explored, resulting in higher costs and even lower margins. Xiaomi cannot allow non-Xiaomi devices to run its ecosystem if it ever wants to make a decent profit.
- **Microsoft's** strategy for consumer is increasingly unclear. The rationalisation of its mobile business means that its consumer ecosystem will decline. Other options to address consumer via Xbox or cross-device will be harder to execute and only the Digital Work ecosystem is likely to excel on the platforms of others.

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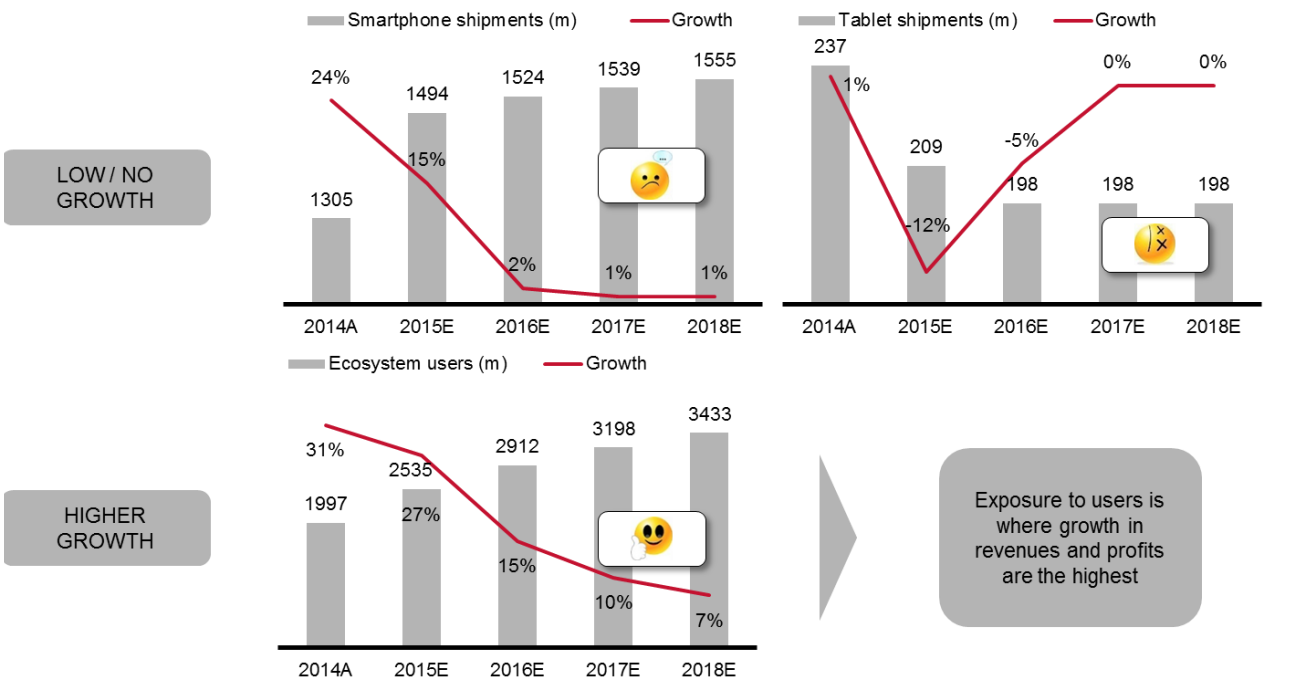
Market update

2015 is likely to be the last year of decent growth in smartphone volumes. The market has grown at an incredible pace over the last seven years, mostly driven by existing users upgrading to a smartphone away from feature phones. This transition is not far from complete as smartphones now make up 79% of all handsets shipped and the feature phone market (off which it feeds) is now down to 100m units per quarter and falling at 25% y-o-y.

The tablet market is in even worse shape (Exhibit 1). We think that growth will be negative for the next two years before stabilising at around 200m units per year. Tablets are being meaningfully eroded by large-screen smartphones, which for many functions obviates the need to carry an extra larger screen device. This combined with the saturated user base has hammered shipment numbers. We continue to believe that the real opportunity for the tablet form factor going forward is the replacement of laptops. The recognition is very slowly seeping its way into the general consciousness, but at the moment the only viable laptop replacement is the Surface Pro 3. It is important to note that we do not consider tablets that run a full version of Windows to be laptops but instead count them as PCs.

Exhibit 1: Smartphone, tablet and ecosystem forecasts, 2014-18e



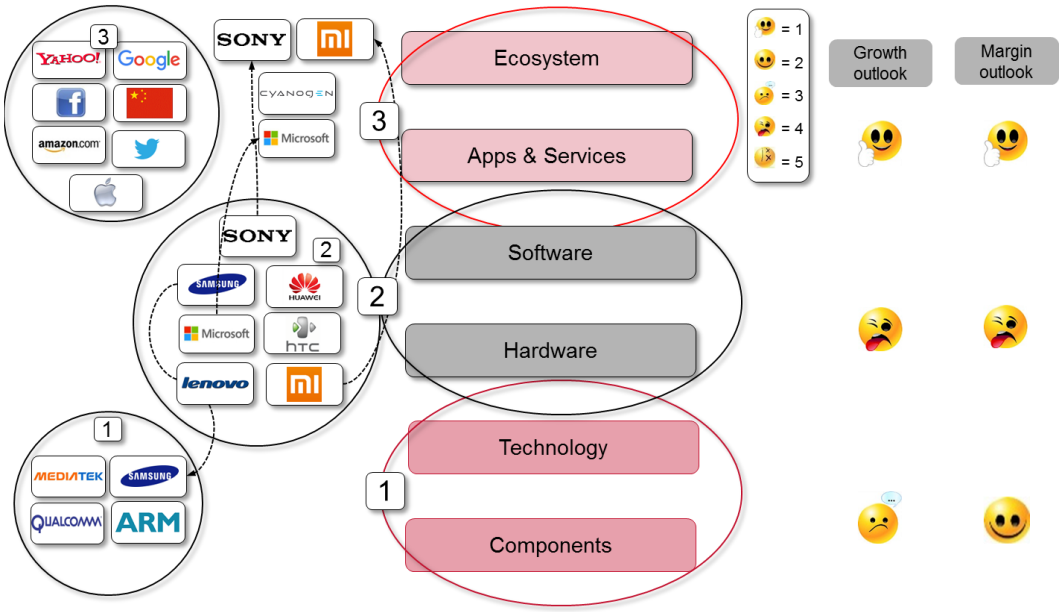
Source: Edison Investment Research, Counterpoint Research

The net result is that the smartphone market is now too big to grow at a rapid pace and after slowing to 15% in 2015e we think that unit growth will be very slow from 2016 onwards. The good news is that the race to the bottom also seems to be slowing down, meaning that price erosion of the overall market will also slow as the market matures. The bad news is that the slowing market will put increasing pressure on handset makers to generate growth, as they will now have to take share from each other to see unit shipment numbers expand.

This has already bitten hard in 2015, with Sony, Amazon and Microsoft seeing significant layoffs and BlackBerry and HTC fighting for survival. It comes as no surprise that all of these players are really struggling in the mobile ecosystem and the importance of which has had a substantial and deleterious impact on their ability to make money. We believe that now more than ever, the key to

profitable growth lies mostly in the ecosystem and partly in the provision of technology or value-added components (Exhibit 2).

Exhibit 2: Growth and profit in the ecosystem



Source: Edison Investment Research

Almost all of the other layers in the digital ecosystem value chain are virtual commodities. The devices look the same and in most instances, the user interface and the availability of third-party apps are also similar. This means that users continue to make their choices based on their experience with the ecosystem of one provider or another. As it has been for many years, user preference is what underpins pricing power and the ability to earn an above-commodity margin. This is why Apple and Google, the owners of the two biggest ecosystems, make almost all of the money earned in the mobile industry today (excluding operators).

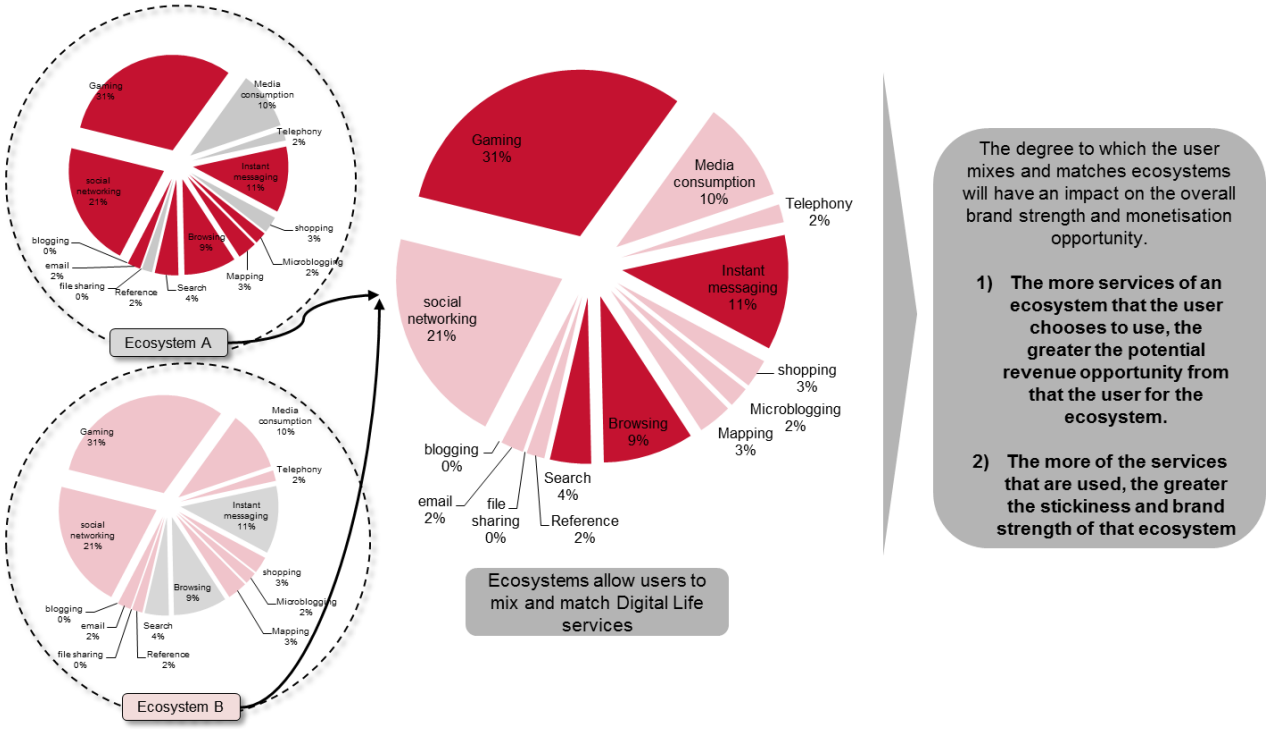
Ecosystems

Gated communities

The last few quarters have further reinforced the importance of the ecosystem in digital consumer electronics. Furthermore, it is something that internet companies are beginning to get an understanding of. From China, through India and to the United States, the internet companies are all showing signs of diversifying away from their core businesses to create a community where users can spend more of their time.

This battle will be very different to the one fought 15 years ago between the internet service providers (ISP) and the operators. Here, each tried to keep users inside their walled gardens. The problem with this strategy was that operators and ISPs tried to force users to remain within their domain by ensuring that none of their services would work anywhere else. The fact that the services were both poor in quality and restrictive in scope meant that users were not willing to remain within the walled gardens and so operator brands crumbled and ISPs become little more than commoditised packet providers. The last of these strategies to fall was Microsoft, which with the retirement of Steve Ballmer, has moved to make its Digital Life services available on every platform available.

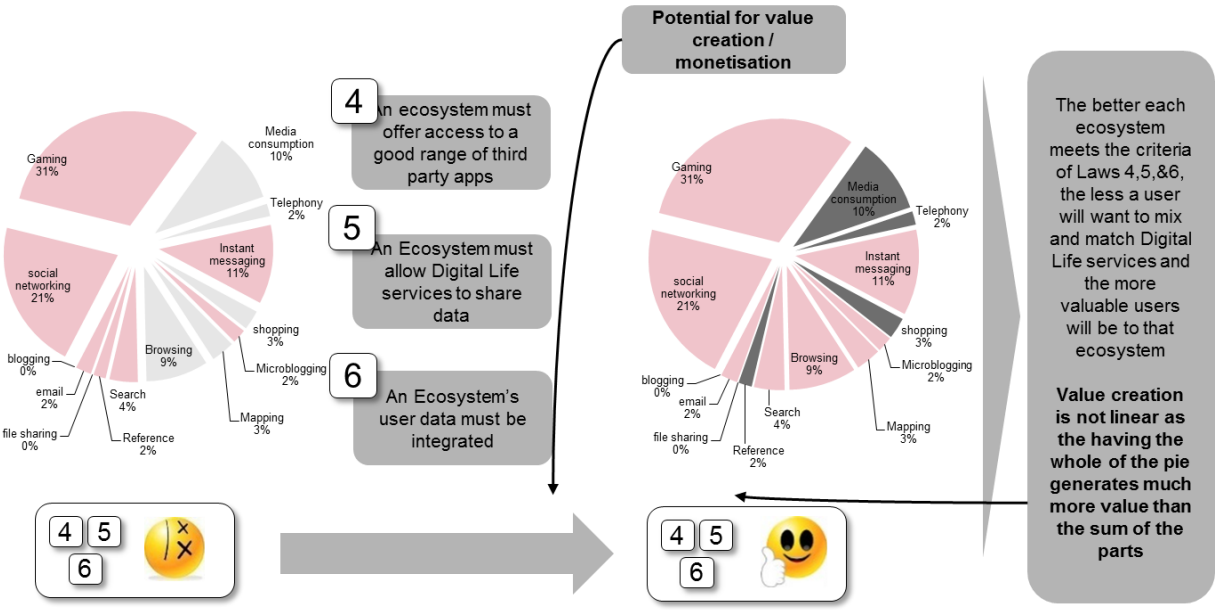
Exhibit 3: Gated community concept in digital ecosystems



Source: Edison Investment Research

We believe that the ecosystem battle will be fought in and around what we have defined as gated communities. A gated community is an ecosystem where the user is not forced to stay if they do not wish to. Furthermore, it is acceptable for the user to mix and match Digital Life services. The user is encouraged to stay as the Digital Life services will be optimised to run better within the gated community but critically he is not forced to do so. This is a much more effective method of competition as it ensures that the best services will always win and it encourages innovation. However, it does make life more challenging for the ecosystem provider.

Exhibit 4: Maximising value creation in digital ecosystems



Source: Edison Investment Research

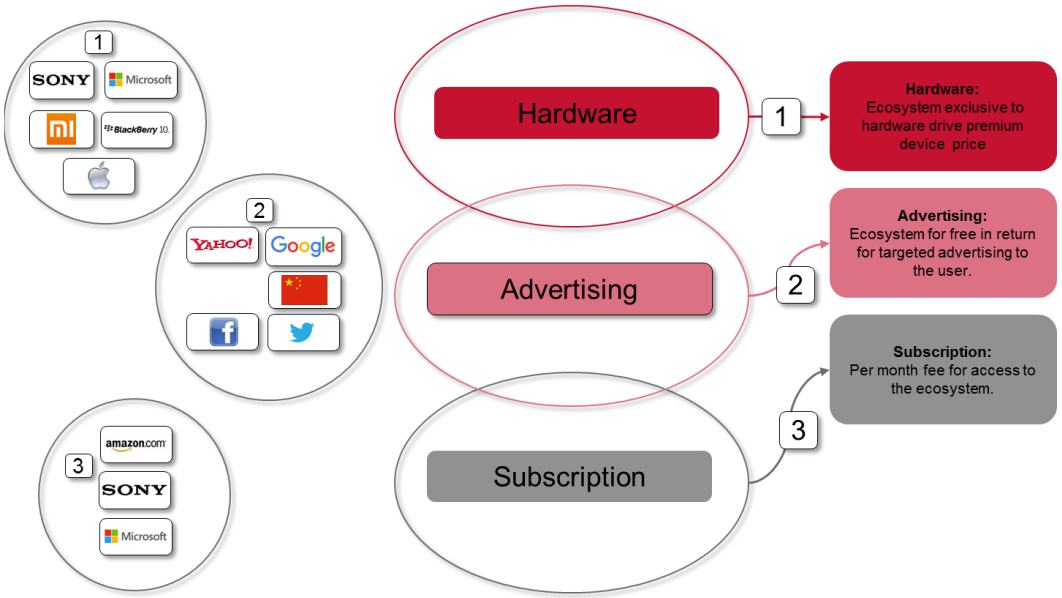
This is where the Seven Laws of Robotics: 4 (app equivalency); 5 (data sharing); and 6 (user data integration) starts to become important. An ecosystem that scores well against these criteria will be able to offer deeper and richer services than those that do not. **Most importantly of all, the Digital Life services belonging to that ecosystem will work better together, meaning that the user will have an incentive to take all of their services from one place rather than mix and match**. When an ecosystem can encourage a user to take all of their Digital Life services from one place there will be a corresponding and non-linear improvement in the value of that user to the ecosystem (Exhibit 4). This is because when an ecosystem has the whole of the Digital Life pie covered and the users are spending all their time within it, the ecosystem can earn far more than can be generated from each of the Digital Life services individually.

This is for two reasons:

First: the more of the services of one ecosystem that the user utilises, the more that ecosystem will know about the user. Therefore targeting will be more accurate, more relevant and hence carry much higher average selling prices (ASPs). This data may also be used to significantly enhance the experience of the ecosystem for that user.

Second: the greater the number of Digital Life services that the user engages with, the more time the user will spend within that ecosystem. Hence, there will be a greater opportunity to target the user with advertising and the greater loyalty that user will have. Combining these two reasons makes it clear that both ASPs and volumes will increase as coverage improves, giving a much greater uplift in overall revenues. This is particularly important for those ecosystems which aim to monetise users via advertising (Exhibit 5), but it is also very relevant for those that monetise through hardware or via subscription. The more relevant data the ecosystem has, the better it understands what it is that the user wants and the more its services can be improved. This results in greater loyalty and higher ASPs for either hardware or the subscription.

Exhibit 5: Three models of monetisation of ecosystems



Source: Edison Investment Research

Digital Life

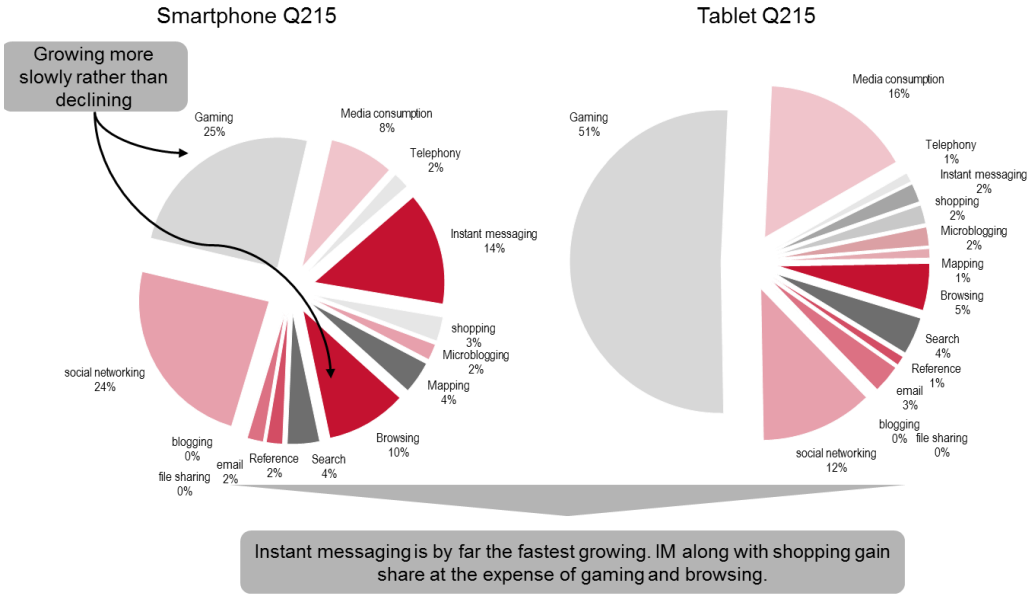
The Digital Life pie (Exhibit 6) remains central to our analysis of the digital ecosystem. It is a measure of how much time users spend engaged with digital services on their devices, (we exclude voice, text and e-commerce). Analysing each ecosystem on this basis gives a very good idea about how well developed an ecosystem's strategy is, and how much more work or investment is needed

to assemble the right assets to have a complete offering for the user's Digital Life. It also gives a good assessment of how big the monetisation opportunity is for each ecosystem as we have long believed that the total addressable opportunity is directly related to how well the activities within an ecosystem are covered.

Usage of smartphones has grown very significantly over the last few years, but as the smartphone's place in users' lives becomes more established, the growth in its usage is also slowing down. We estimate that, outside of voice and SMS, users spend around 90 minutes per day using their smartphones. This is up significantly from the 22 minutes recorded in 2011 but we estimate that growth in usage in 2015 has dropped to 23% down from 35% in 2014 and 53% in 2013.

Furthermore, not all Digital Life services are growing at the same rate which is why the last few quarters have seen some changes in the makeup of the Digital Life pie. The segments which have lost share are not declining. They are simply growing more slowly than the others (Exhibit 6).

Exhibit 6: Mobile Digital Life pies 1, Q215



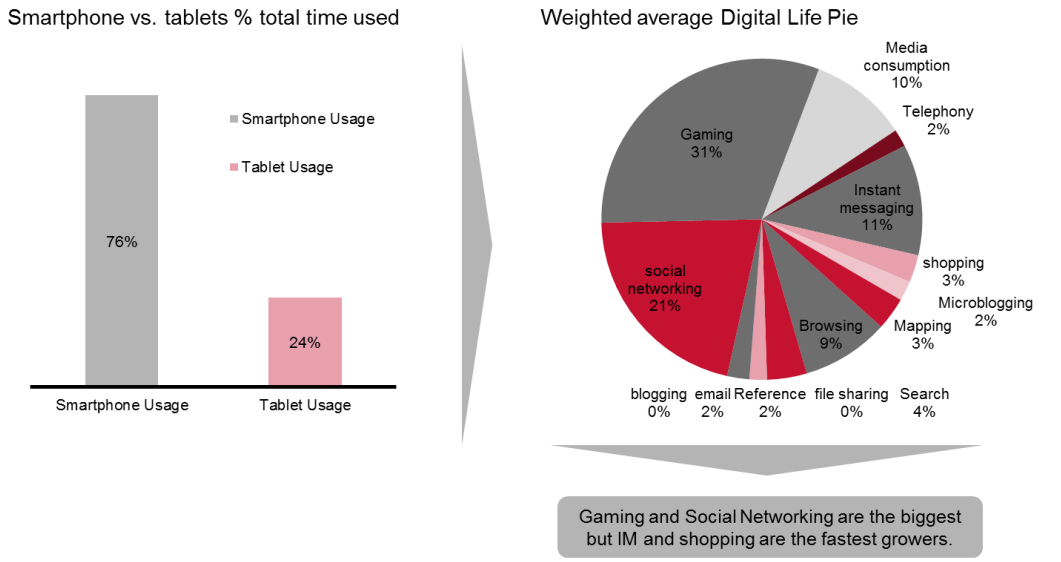
Source: Edison Investment Research, Nielson, Google, Pewinternet.org, CommScore, NetMarketShare

Instant messaging (IM) is by far the fastest growing segment. The last few years have seen the usage of IM move to exponential growth due to the high level of smartphone penetration. Furthermore, the ease of joining and usage of one of the many IM networks available has increased markedly. IM delivers a service that is superior to SMS and delivers everything that MMS promised but failed to deliver. Furthermore, it does all of these things at virtually zero cost, making it a no brainer as far as the user is concerned. The result is that IM now makes up 14% of the overall pie.

The greater ease and security with which goods can be purchased via mobile devices has also led to the shopping segment growing faster than overall usage. This segment excludes wireless-based payments, reflecting the poor reputation of Android for security as well as the overall poor user experience, which keeps this segment as one of the smaller ones. We expect it to continue growing as shopping via a mobile device becomes easier in the coming years.

Most ecosystems are still predominantly accessed via tablets and smartphones. Other devices such as PCs, TVs, household appliances and the automobile have yet to register significant usage of Digital Life, meaning that their contribution to the user's choice of which ecosystem to use is negligible. Hence, we continue to focus on the smartphone and the tablet as the predominant devices that determine user choice. We amalgamate the usage patterns on the two devices to arrive at the weighted average Digital Life pie (Exhibit 7).

Exhibit 7: Digital Life pie 2, Q215

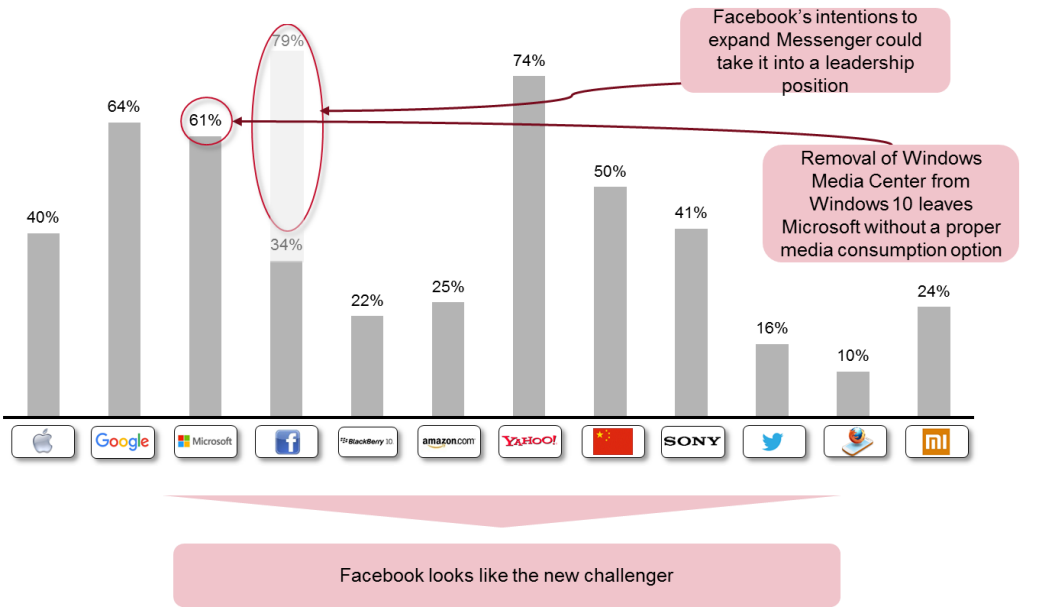


Source: Edison Investment Research, Nielson, Google, Pewinternert.org, CommScore, NetmarketShare

When the different ecosystems were reassessed for coverage of Digital Life services, there was one standout: Facebook. Over the last few quarters, Facebook has made a number of strategic announcements that, if successful, will propel its coverage of the Digital Life pie into first position with 79% coverage (Exhibit 8). These added services have been announced, but have not yet made it to wide availability or are fully developed, which is why Facebook's current score remains at 34%. These new services are media consumption, gaming and Facebook M. Facebook is increasingly becoming a place where users view video, especially on mobile, and we think that in the long term it intends to evolve that position and to take on the dominance of YouTube. Facebook is also following in the footsteps of LINE and KakaoTalk and expanding its Messenger platform into a place where users can play games as well as creating an embedded digital assistant called Facebook M. These three new services add media consumption (10%), gaming (31%) and search (4%) to its services, which in addition to its very strong position in social networking and IM will bring its overall score to 79%. This will put Facebook in top position in terms of coverage, meaning that in theory, it has the greatest revenue opportunity of almost all its competitors.

Beyond Facebook, the change in the relative size of the Digital Life segments has caused minor changes to the score of most ecosystems, but the status quo remains more or less unchanged except for Microsoft, which loses media consumption in Windows 10.

Exhibit 8: Coverage of the Digital Life pie by ecosystem, Q215



Source: Edison Investment Research, Nielson, Google, Pewinternet.org, CommScore, NetMarketShare

Seven Laws of Robotics

While the Digital Life analysis assesses ecosystems on the degree to which they are addressing the opportunity, it makes no assessment of how well they do so. This is where the Seven Laws of Robotics come in. These are seven simple tests that appraise the quality of the ecosystem and how likely it is to succeed. Combined with the Digital Life pie, the Seven Laws of Robotics form the basis of the estimates that we make with regard to users, revenue, profit generation and the value of any one ecosystem.

The seven laws are divided into two groups. The first four are the fundamental assessment of how well an ecosystem caters to the requirements of its users and a major determinate of its ultimate success in generating a return for its stakeholders.

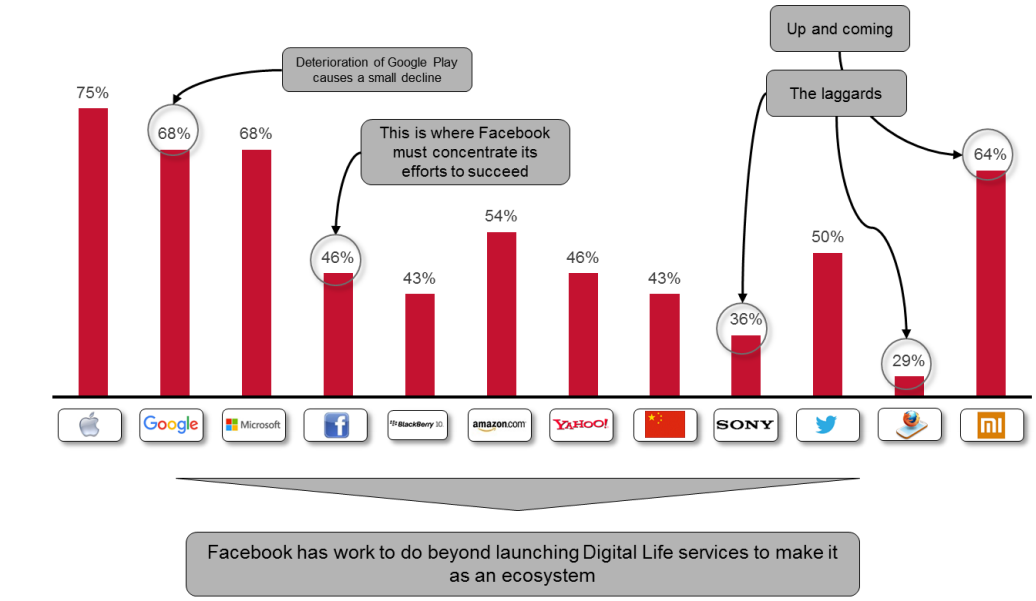
- 1 Easy and fun – an ecosystem must provide easy and fun access to digital life.
- 2 Set Up – an ecosystem must be simple and easy to set up and use.
- 3 Traffic capture – an ecosystem must capture traffic on its own servers.
- 4 App equivalency – an ecosystem must offer access to a good range of third-party apps.

The final three laws are an assessment of how well an ecosystem is set up to compete in the longer term. These assessments are more subtle and assess the internal systems of the ecosystem to ascertain how well it can improve its services and make what it offers deeper and richer for the user. We think that a good score on laws 5-7 is required to be able to fend off the increasing competition that will inevitably materialise when the growth in user numbers begins to stabilise.

- 5 Data sharing – an ecosystem must allow Digital Life services to share data.
- 6 Data integration – an ecosystem's user data must be integrated.
- 7 Software consistency – an ecosystem must have consistent device software.

Although this analysis is subjective, we use a quantitative assessment to be able to compare each ecosystem with its peers. Each ecosystem is assessed against each law and given a score out of 5 based on how well it performs against the criteria. (5 is the best score with 1 being the worst). Each ecosystem can then be given a score out of 35, which is translated into a percentage (Exhibit 9).

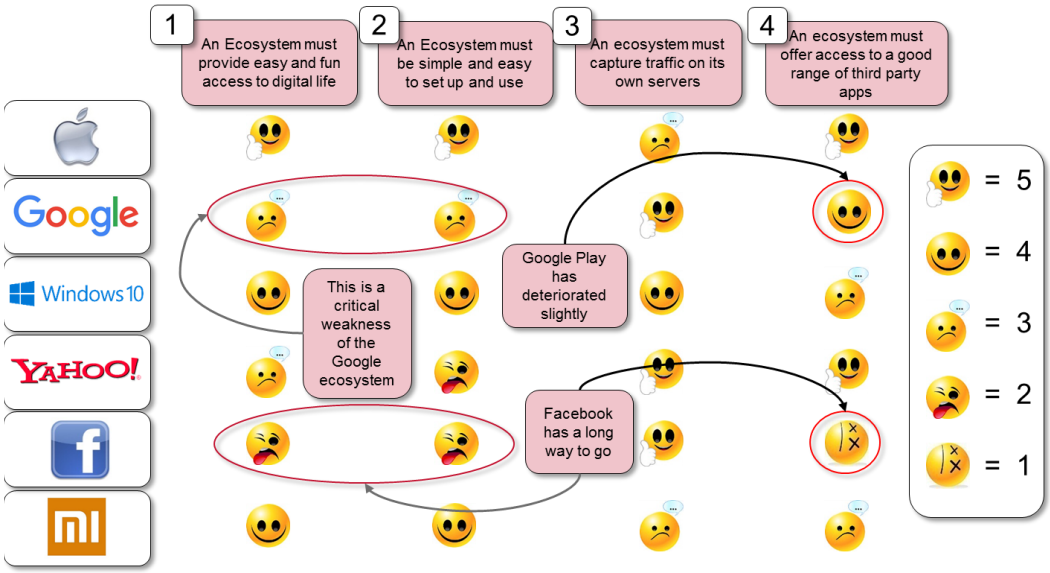
Exhibit 9: Ecosystem ratings against the Seven Laws of Robotics, Q215



Source: Edison Investment Research

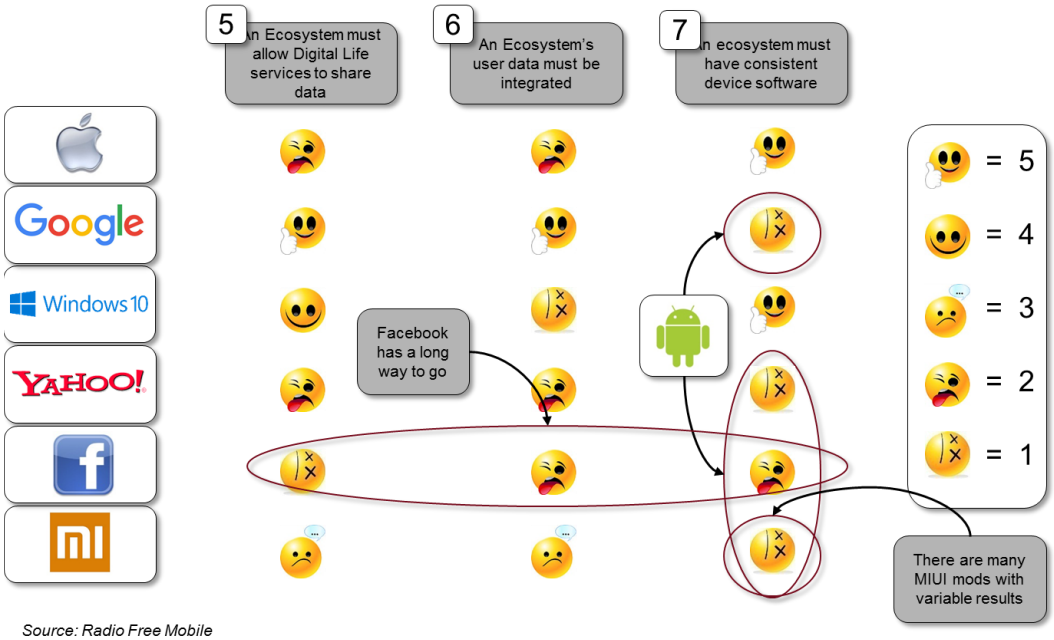
Of the ecosystems covered by us (China coming later in 2015), there are three clear leaders who have understood what is required to create a good ecosystem and have invested the time and money to do so. They are Apple, Google and Microsoft, each of whom scores more than 66% against the Seven Laws of Robotics.

Exhibit 10a: Laws of Robotics 1-4 for the top six ecosystems



Source: Edison Investment Research

Exhibit 10b: Laws of Robotics 5-7 for the top six ecosystems



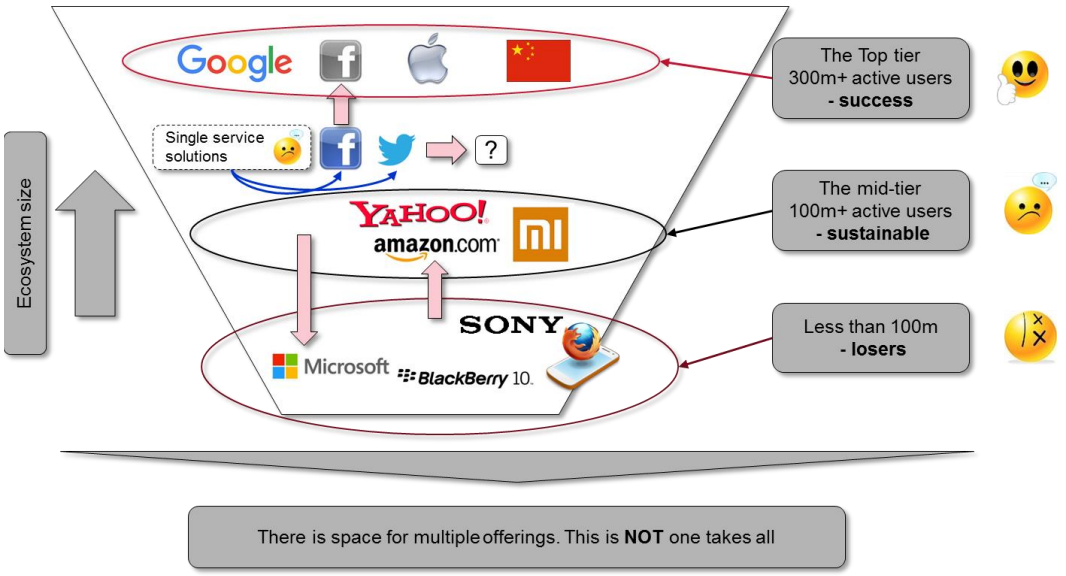
Source: Edison Investment research

Although Microsoft has all the ingredients to be a successful ecosystem, it has yet to live up to this promise as its user base outside of the PC and Xbox is very small and now declining. The real challengers to the top three are now Facebook and Xiaomi. They both still have work to do to augment their ecosystem experience and really challenge the leaders, but they have both momentum and an increasingly clear vision on how they intend to make it.

Ecosystem status quo

The analysis is then used in combination with device shipment forecasts to estimate how big these ecosystems are in terms of how many users are actively using them. **We believe that the size of an ecosystem is the single most important measure of how much value it can create for its owner.** We calculate the current size of all the ecosystems and forecast how they will evolve over the next three to five years.

Exhibit 11: Ecosystem users by provider, 2018e

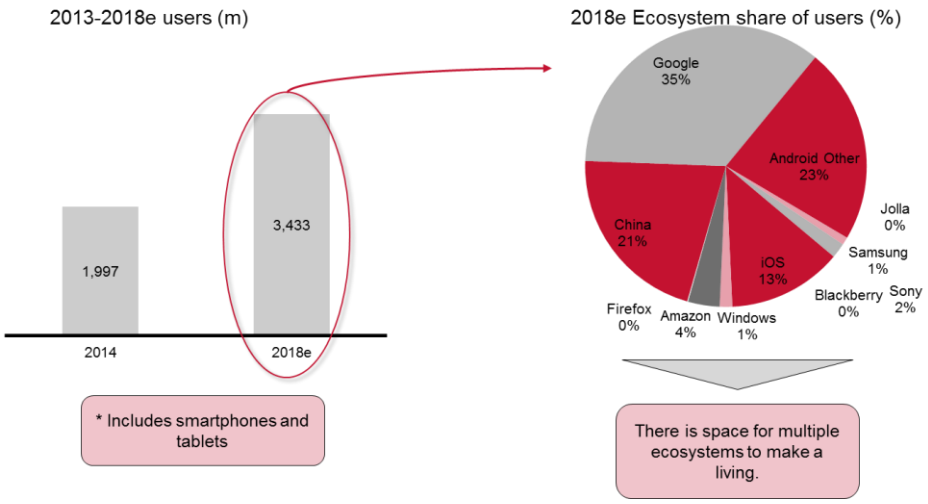


Source: Edison Investment Research

Our key assumption that an ecosystem needs 100 million+ subscribers to be viable and more than 300 million to be really successful remains unchanged (Exhibit 11). Anecdotal evidence from the market is indicating that these assumptions are about right, as the ecosystems that are failing are all below 100 million in size and all those making good money are now well over 300 million in size. Other consumer devices such as wearables, TVs, PCs, automobiles and consoles do not yet contribute meaningfully to the ecosystem and as such have not yet been included in this analysis. We expect to include these other device categories as they begin to have a meaningful impact on the user experience and their decision on where to live their digital life.

It is important to note that we have now extended the time frame out to 2018 giving players more time to amass 100 million or more users. On this basis, Amazon has been promoted from the 'losers' group to the 'sustainable' group. This reflects users accessing the Amazon ecosystem from non-Amazon devices as the company cuts back on its smartphone and tablet aspirations. We now think that Microsoft will still have less than 100 million consumer ecosystem users on smartphones in tablets by 2018 and so it has been shifted into the 'losers' group. Finally, Facebook's strategy is coming into sharper focus and we are close to upgrading our view on Facebook from a single service to a fully-fledged ecosystem. On the basis of its 1.3 billion monthly active users, Facebook would immediately enter into the 'success' group along with Google and Apple.

Exhibit 12: Ecosystem users by ecosystem provider, 2014-18e



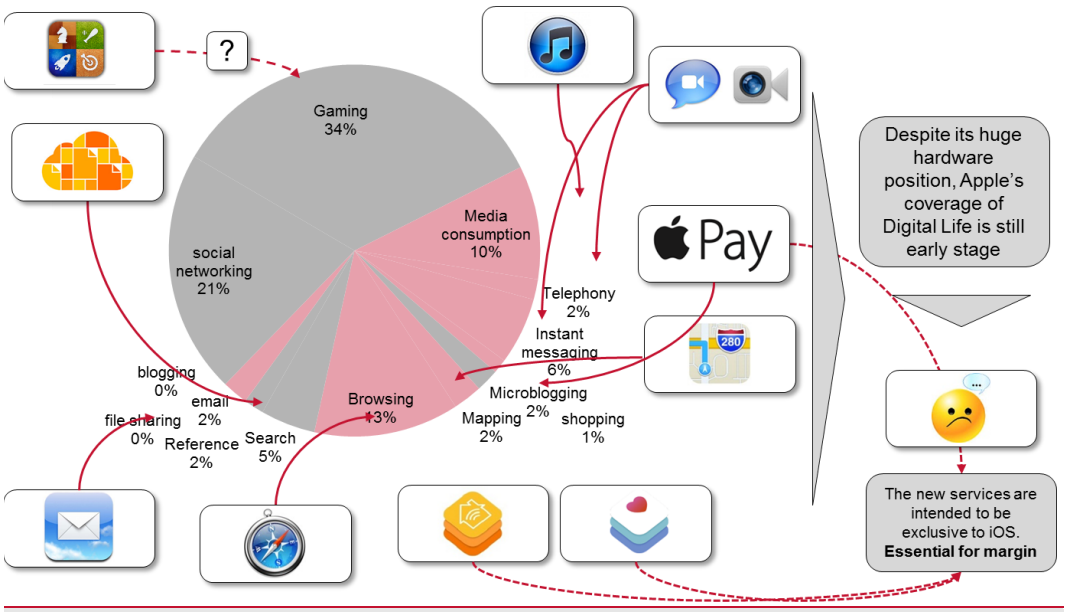
Source: Edison Investment Research, Counterpoint Research

Although the market is becoming more mature, there is still very unlikely to be one ecosystem that dominates all of the others. iOS caters for the high end while Google is much stronger in the mid-tier in developed markets. China remains a market likely to be dominated by Chinese companies and the opportunity is big enough for three to succeed without having to look overseas. With 100 million+ users needed to be viable and 3.4 billion on offer by the end of 2018e (Exhibit 12), in theory there is enough space for 34 ecosystems to survive. In practice there is likely to be five to seven successful, profitable ecosystems with 300 million+, several with 100 million+ and a large group all vying to make it into the big leagues.

iOS

The success of the iPhone 6 has had a profound impact on the iOS ecosystem. Despite having one of the highest ASPs on the market, Apple has gained share over the last 12 months in a market where almost all the growth is to be found in the lowest ASP markets. This has had the knock-on effect of growing the iOS ecosystem more quickly than we had anticipated. Given that the iOS ecosystem is exclusively for the high end, it is natural to expect that its user base will grow more slowly than the overall user base. However, this has not been the case and iOS's share of global ecosystem users has held steadily between 15.5-16.0% over the last 12 months.

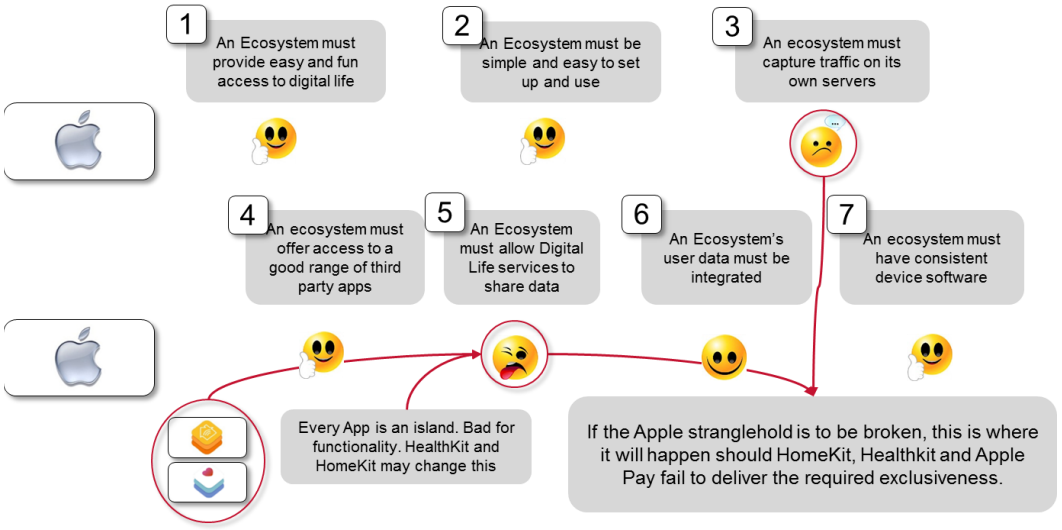
Exhibit 13: Apple's position in Digital Life



Source: Edison Investment Research, Nielson, Google, Pewinternert.org, comScore, NetMarketShare

This strength has come despite Apple's continued weakness in Digital Life (Exhibits 13 and 8) and comes as a direct result of the iPhone 6 meeting a market requirement for the first time (a larger screen). The fact that iOS also offers the easiest, most fun to use experience of any ecosystem on a mobile device (Exhibit 14) is how Apple has won over a number of new users from Android. This trend has been quite pronounced in developed markets over the last 12 months, with all of the Android vendors suffering a meaningful deterioration in both their market position and financial performance.

Exhibit 14: Analysis of the iOS ecosystem using Seven Laws of Robotics



Source: Edison Investment Research

In the long term, we continue to believe that Apple's current position as the preeminent distributor of third-party apps and services is not sustainable. This is because there is no reason why other ecosystems cannot catch up with Apple and all of them are working hard to do so. This is why we continue to think that the long-term strategy for Apple to differentiate its products lies around what it is doing with HealthKit, HomeKit and Apple Pay.

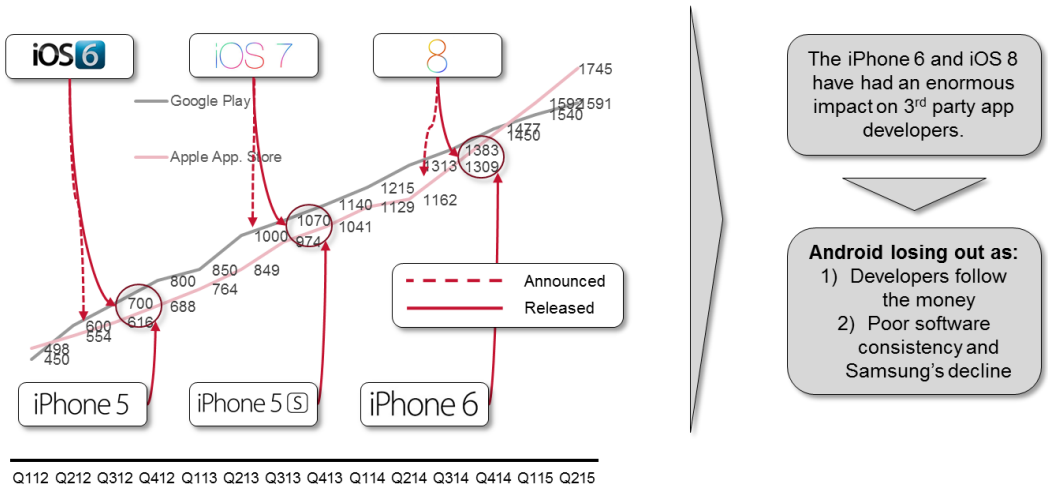
These are not Digital Life services in their own right, but they are facilitators that allow the services and devices of third parties to come together to create a service that has enhanced value to the user. For example heart rate alone does not give a great picture of a user's health. However, the combination of heart rate, blood pressure, sleep patterns, blood oxygenation and physical activity may be combined together to give a useful picture of what is going on and where any potential problems lie. This requires a range of devices and services to all communicate with each other which is where Apple's HealthKit application programme interface (API) comes in. This allows all this data to be stored in one place and to be analysed together when device and service makers make their devices compatible with this API. The situation for HomeKit is exactly the same except that each device also needs to install a small piece of hardware. It is for this exact reason that Fitbit has declined to make its data compatible with HealthKit. It sees the value in the data and has decided to go it alone rather than ceding that value to Apple.

The use of HealthKit and HomeKit should allow Apple to ensure that the user experience for owners of these devices and users of home automation and health services have a superior experience with Apple than elsewhere. The same can be said for Apple Pay, which is a proprietary service that is exclusive to iOS devices. The fact that software consistency across the entire iOS ecosystem is extremely high, makes targeting these devices much easier for developers. This is how we believe that Apple intends to maintain the exclusiveness of the iOS ecosystem even when all apps and services are available on all ecosystems to an equal level of quality. **Apple is in effect creating mini-ecosystems within iOS, which will not be available on non-Apple hardware.** This is where Xiaomi's strategy has a weakness. In allowing non-Xiaomi devices to run its ecosystem it is undermining its ability to monetise its ecosystem.

Apple App Store and developers

Apple Pay, HealthKit and HomeKit are strategies that aim to deal with long-term differentiation, but at the moment, Apple's differentiation is showing no immediate signs of trouble. In fact the indicators are pointing in the other direction as developers are moving increasingly towards iOS and worrying less about having their apps available on both iOS and Android. We believe that we have uncovered two indicators of this shift.

Exhibit 15: Available apps vs iOS/iPhone availability, Q112-Q215

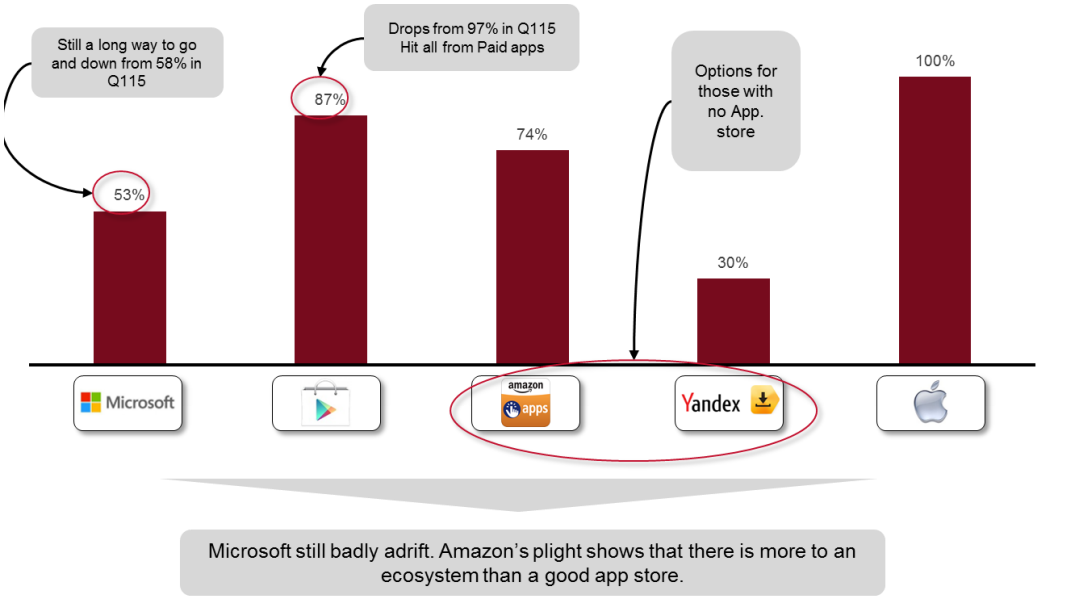


Source: Appbrain, 148apps.biz, App Annie, Edison Investment Research

First – total apps available. Since the release of the iPhone 6, developer economics appear to have moved more in favour of iOS after three years of stability (Exhibit 15). In Q314 the total app count on the App Store started to move upwards relative to Google Play. This has continued

throughout 2015 and the total app count on iOS is now meaningfully above that of Google Play. This implies that developers are now increasingly developing for iOS first and worrying about anything else later. This a meaningful shift as for the last three years, developers have developed for both platforms more or less in tandem and then considered other options afterwards. We think that that there are two reasons for developers to move in this direction. The first is money**.** A developer will almost always follow the money. The change implies that developers are increasingly seeing better returns from developing for iOS than for Google Play, despite its meaningfully higher number of users. This is a strong indicator of Apple's increasing dominance of the high end, where users spend more money on and within apps. The second is software consistency. The more consistent the software across an ecosystem is, the easier and more profitable it is for a developer to offer his app across the entire ecosystem. iOS has excellent software consistency, whereas this continues to be a major drawback of developing for the Android. For the last two years this has been less of a problem as a developer could address 50% of the Google ecosystem by writing code just for Samsung's implementation of Android. However, as Samsung's market share has eroded to be replaced with Xiaomi, Huawei and so on, more porting has been required to address the same number of users as before. The returns remain the same, while the costs rise. Most developers lack the time, the resources and the money to do so and hence this why we think that iOS is increasingly being prioritised over Google Play.

Exhibit 16: Competing app stores vs Apple App Store, Sept 2015

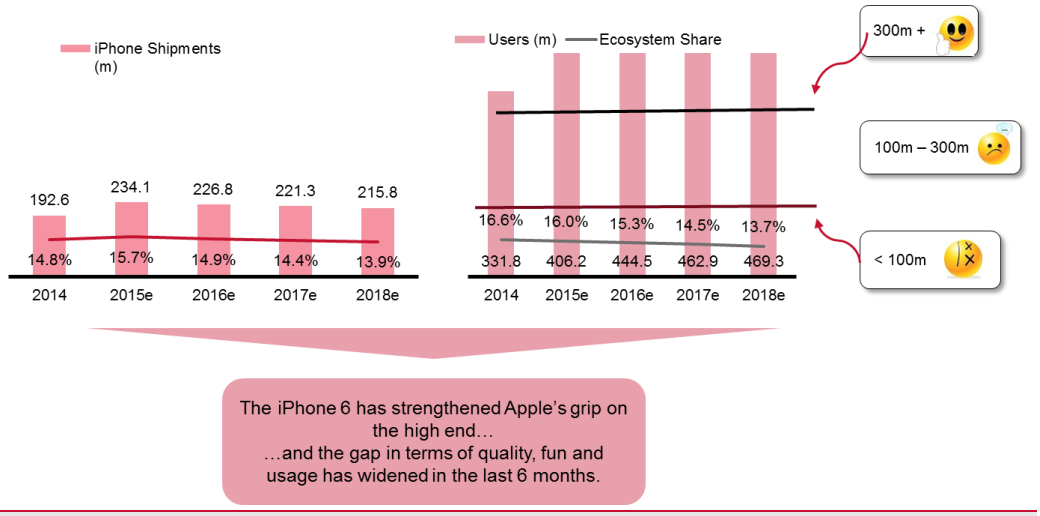


Source: Edison Investment Research, Apple, Amazon Yandex, Google, Microsoft, App Annie

Second – app equivalency (Law 4). Over the last six months, the quality with which Google Play emulates the Apple App Store has taken a hit (Exhibit 16). In Q115, we measured Google Play's app equivalency at 97% but in Q215 this had fallen by 10% to 87%. This has come exclusively from paid apps but it sets a worrying precedent. Taken hand in hand with the observation that Google Play has fallen behind the Apple App Store when it comes to the total number of apps (Exhibit 15), it is not hard to see the beginning of a trend. This is particularly worrying for Google, as another quarter like this and it will be no better than the Amazon App Store. Google Play is almost universally demanded on Android handsets in developed markets, and we think that Google capitalises on this by bundling its other ecosystem services with Google Play to ensure that they are front and centre on every Android device. Should Google Play prove to be no better than the Amazon App Store when it comes to emulating the iOS experience, then its ability to control the ecosystem on Android devices will be diminished. Amazon is increasingly a credible alternative for a handset maker or operator without having to toe the universally unpopular, Google party line.

For Apple this is all good news, its higher app count and decreased ability of its main rival to emulate its experience gives its current differentiation a longer lease of life. Google is increasingly looking like it is on the back foot and Apple is showing every intention of capitalising on that.

Exhibit 17: Forecasts for Apple ecosystem, 2014-18e



Source: Edison Investment Research, Counterpoint Research

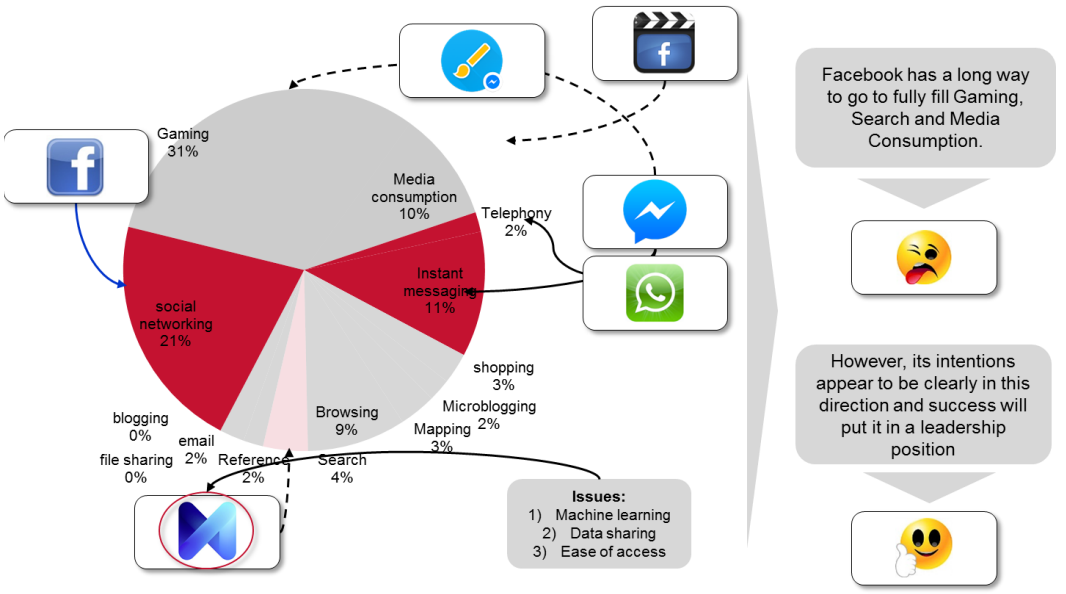
Facebook

Over the last few quarters, Facebook has made great strides and is showing signs of making the right moves towards becoming a fully-fledged ecosystem. It has tried this before but its previous attempt centred on taking control of the home screen of the mobile device and was a failure. This was because instead of providing the Digital Life services that users wanted, it focused on putting social networking front and centre on the smartphone to the exclusion of all else. Facebook tried to implement a walled garden, but as it was not well implemented, it was not fun or easy to use and made it very difficult to use other functions on the device, which led to very low take up. It was rapidly abandoned. The only feature that survives today is the Messenger chat heads feature on Android devices which puts chat notifications on the home screen in a novel way.

Ecosystem 2.0

Facebook Home was deemed to be the end of Facebook's ecosystem strategy, and without a strategy to expand beyond social networking, it was clear that the revenue opportunity would be more limited. The approach now is very different to what went before. This time Facebook is using its dominant position in Messenger to expand into other Digital Life services. This combined with its increasingly strong position in video gives it the potential to evolve three new and important segments within the Digital Life pie (Exhibit 18).

Exhibit 18: Facebook in Digital Life



Source: Edison investment Research, Nielson, Google, Pewinternert.org, CommScore, NetMarketShare, Facebook

The three new segments are: gaming (31%); media consumption (10%); and search (4%). We have not yet added these segments to Facebook's overall score, as the services that it is looking to offer in these segments have not yet evolved to a point where they can compete with other ecosystems. The new services to match the segments are:

Gaming – **i**n March 2015, Facebook opened up its Messenger API to allow third parties to write applications that can run within the Messenger environment. This is exactly what LINE and KakaoTalk have done with great success. To date, there are only a few apps available with one game called Doodle Draw, which is effectively an electronic version of Pictionary. It is basic in the extreme and very far from what we (or anyone else) would consider to be a thriving multiplayer gaming community. This is a seed, time will tell whether or not it will grow.

Facebook M – this is a digital assistant that will appear inside Messenger as a contact that is permanently online and is there to fulfil requests and answer queries. The main difference between Facebook M and Google Now, Siri and Cortana is that Facebook M is part artificial intelligence and part human. This makes Facebook M a cross between the established digital assistants and concierge services, which use humans to fulfil the requests.

Facebook's aim is to move as much of Facebook M as possible into artificial intelligence but even with humans on board, we think that it is facing an uphill battle for three reasons:

First: machine learning. Facebook is a personal data and communication company. The degree of machine learning it has, is not in Google's class. Consequently, it is unlikely to be able to provide better responses to queries than Google Now. Both Apple and Cortana demonstrate better machine learning sitting behind them than Facebook M.

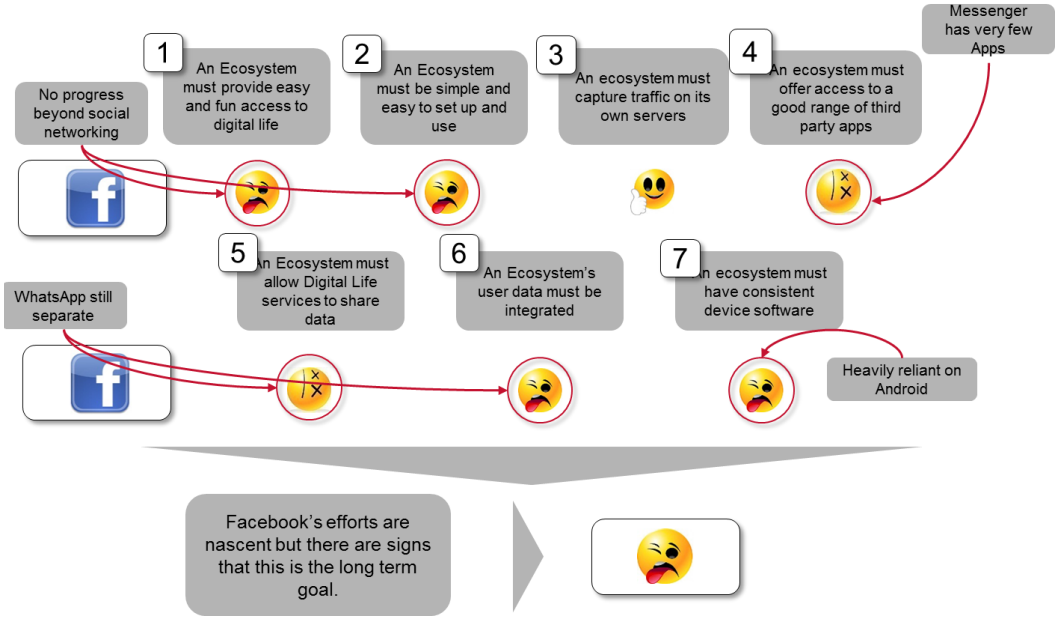
Second: data sharing. Facebook relies on the platforms of others to deliver its service and experience to users. This means that it will not have the same kind of access to other apps and services that will be required to make the service best in class. This is also a reason why Facebook scores badly when assessed against Law of Robotics 5 – data sharing.

Third: ease of access. Facebook M will, for now, only exist inside the Messenger client. This means that the user will have to unlock the device, click on Messenger, click the M user and then put in his query or request. Siri, Cortana and Google Now can all be accessed simply by talking to a locked

device on standby. Ease of access has long been known to be a key factor in how much an app or service gets used.

Facebook Video – Facebook is very different to YouTube. YouTube is a platform where users discover video for themselves, compared to Facebook, which curates the video content on behalf of its users. Despite the differences and debates over metrics, one thing is clear. Facebook is fast catching YouTube in terms of video consumption and in the next year or so may even overtake it. Furthermore, content creators are increasingly posting their video directly to Facebook rather than putting it on YouTube and then sharing. Critically, advertisers with budgets to spend on video advertising are just as willing to buy time on Facebook for campaigns as they are on YouTube. As users become increasingly accustomed to watching video on Facebook there are various directions in which it can take this new usage. It could migrate to offer both content discovery (like YouTube) and curated video as it does today and it could also move into premium content distribution or creation making it look a little like Netflix or Hulu. It is still early days but we see Facebook intending to leverage its vast user base in order to become the largest video destination on the digital landscape.

Exhibit 19: Facebook against the Seven Laws of Robotics

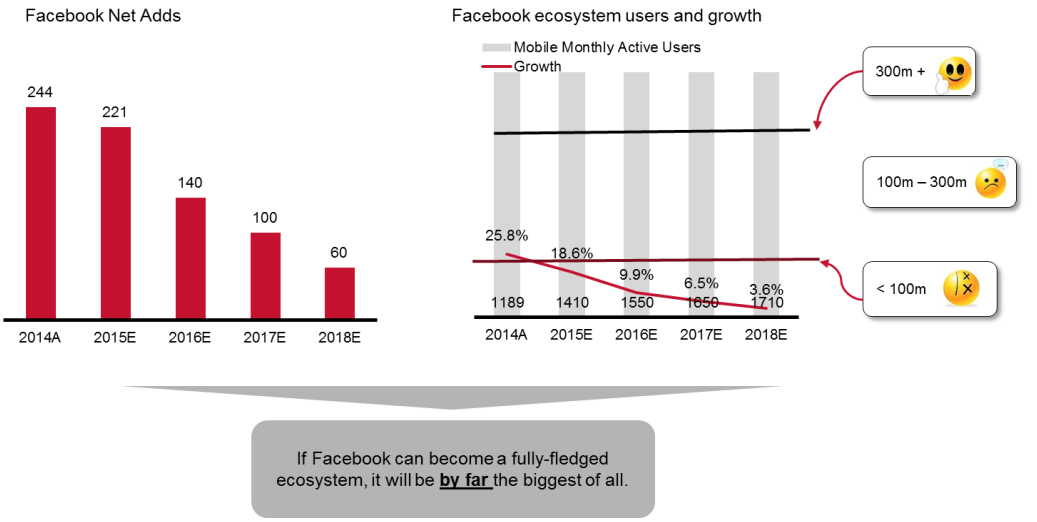


Source: Edison investment Research

While Facebook's ambition looks great on paper, a vast amount of work will be needed to bring it to fruition. This fact is evident when Facebook is assessed against the Seven Laws of Robotics to determine how well it delivers its ecosystem (Exhibit 19). Facebook receives a poor score on six out of seven of the laws, indicating that its transition towards becoming an ecosystem is at a very early stage. Facebook scores very well against the most important law for it to generate revenue (3 – traffic capture), meaning that it will continue to have a viable and growing business while it sets itself up for long-term growth.

Facebook's problem is atypical in that it already has many more users than its nearest competitor. Its issue is to upgrade itself from being a provider of social networking to becoming a fully-fledged ecosystem. It must also accomplish this while presenting its users with an enticing series of new features and functions as it gently ushers them into the ecosystem that it is building around them. The first attempt was not very successful but the second has much more promise.

Exhibit 20: Forecasts for Facebook ecosystem on mobile, 2014-18e



Source: Edison Investment Research, Counterpoint Research

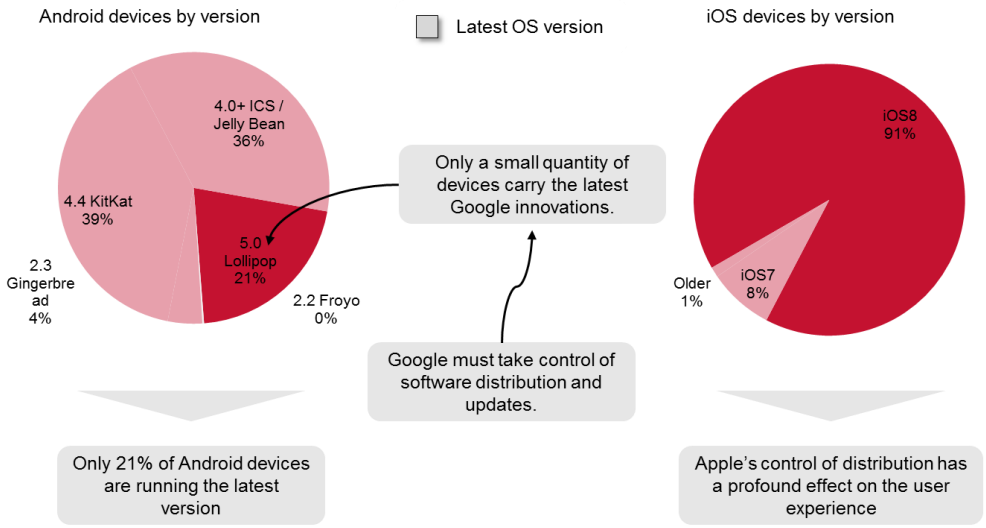
Google

With the way things are today, the best of Google's growth is already behind it (Exhibit 22). This is why Google is once again looking to China and to other areas in order to secure the next leg of its development. This is what we think lies behind Google's renewed charm offensive with the Chinese authorities as well its move to reorganise into a conglomerate-like structure. These moves are focused on the next leg of the company's development, but in the meantime Google still has a host of problems, which threaten to undermine its strong position, despite enjoying being the biggest ecosystem.

Software distribution and consistency

First and foremost of these problems remains Google's inability to distribute its own software. This problem exists because of the open-source nature of the Android software, which has meant that handset makers, device makers and mobile operators can upgrade the devices they make or are on their network whenever they want. Device makers are not incentivised to upgrade existing devices because it makes users less inclined to replace an old device with a new one. This problem is so acute that Lollipop (Android 5.0) is effectively only installed on new devices, with the existing user base remaining largely untouched. Almost one year after launch, only 21% of Android devices that run the Google ecosystem are using Lollipop, ensuring that Google's innovations to make its ecosystem more appealing to users remain unavailable to the vast majority of users. In contrast Apple had 33% of its users on iOS 8 within three days of launch. As of 13 September 2015, this figure was 91% (Exhibit 21).

Exhibit 21: Android and IOS devices by OS version, September 2015

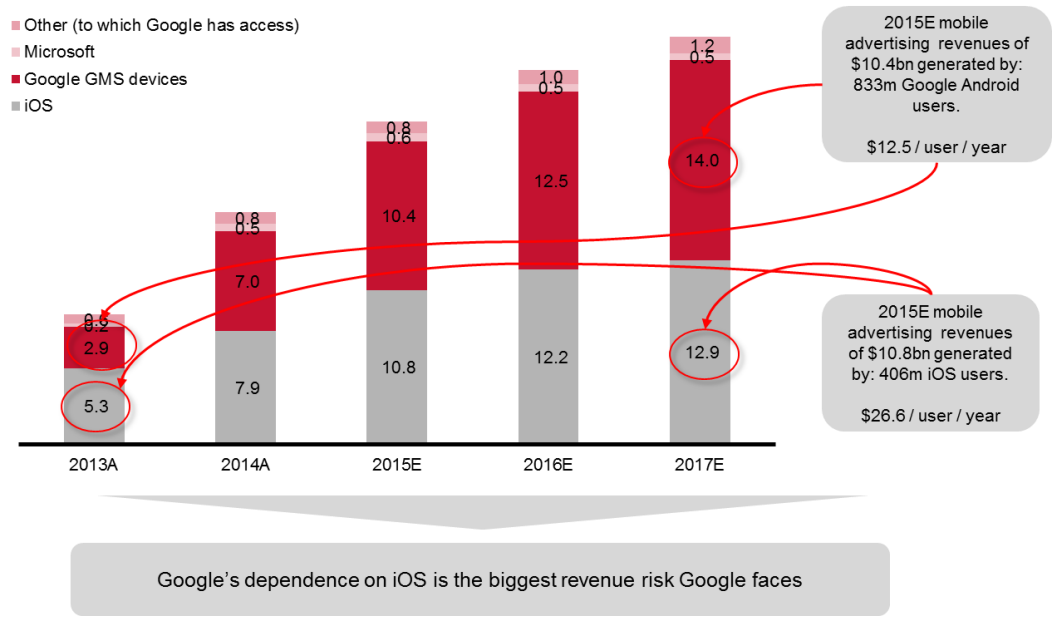


Source: Android.developer.com, Mixpanel, Edison Investment Research

This is a boon for Apple and Microsoft who have a two-year window to implement Google's innovations and get them to the market before Google can get the original into the hands of users. **Effectively, Google's R&D benefits the competition and in our opinion, is the most significant problem that Google faces.** Without fixing this issue, none of its efforts to improve the user experience will matter. By the time the upgrades make it into the hands of the user, they will be two years out of date.

Without the ability to distribute its software, all of the improvements that Google makes to the user experience in order to fix its short comings will remain on the shelf. **It is worth noting that this is only true for changes and upgrades that are made to the Android Open Source Package (AOSP). For Google Mobile Services (GMS), Google can upgrade the individual services at any time simply by posting an updated app to Google Play or the Apple App Store**. Consequently, it is only the features that are still in AOSP that suffer from this problem. However, this has a caveat in that any upgrades to the user experience and the GMS services themselves, require changes to be made in the underlying code to ensure that they work properly. Hence, many of the improvements that Google wishes to make to its services require upgrades to the underlying AOSP in order to function. Now on Tap is a great example of a great service that has huge potential benefit to Google but requires Android M to function. We think that it will be 2017/18 before Android M is in the hands of the vast majority of Android users.

Exhibit 22: Google mobile advertising revenues per ecosystem, 2013-17e

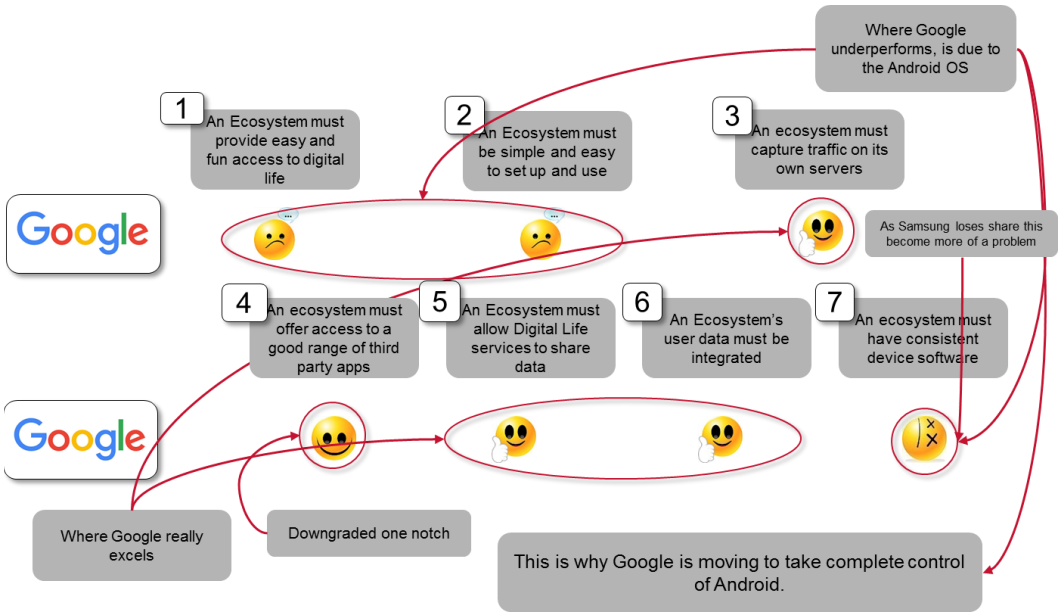


Source: Edison Investment Research, E-marketer

On top of distribution, Google continues to struggle with the quality of the user experience within its ecosystem (Exhibit 23. This is not related to its services specifically, but the underlying issues that are inherent to Android itself. This shortcoming is a major reason why usage on Android still lags that of iOS by a meaningful margin and why we calculate that Google actually earns double from an iOS user in revenues than it does for an Android user (Exhibit 22).

When Google is assessed on the Seven Laws of Robotics, it does not score nearly as well as it should. Looking at the user experience: Laws 1 – ease and fun of use; 2 – ease and fun of set up; and 7 – software consistency, are the most important and it is here that Google scores badly compared to Apple or even Microsoft. These low scores explain the lower usage of Android devices compared to iOS. This remains true even when usage is normalised for differences in demographics leaving us to believe that Google ecosystem users are vulnerable to switching to other ecosystems as they exhibit low loyalty.

Exhibit 23: Analysis of the Google ecosystem vs the Seven Laws of Robotics

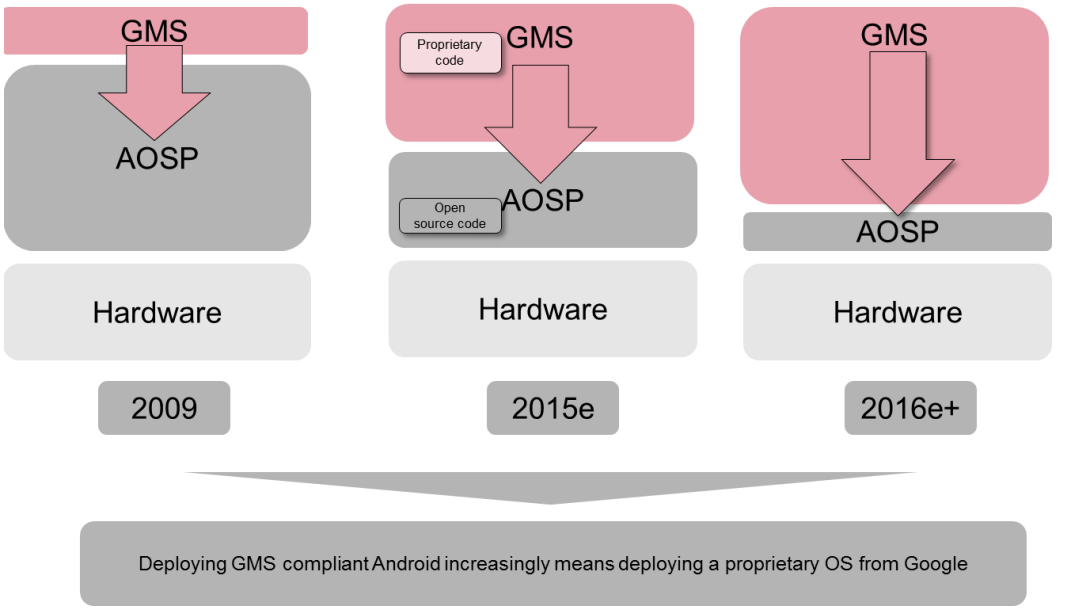


Source: Edison Investment Research

We see only one way to fix this problem and that is to take control of both the software and the distribution. If Google migrates the parts of Android that affect the user experience from AOSP into its proprietary GMS software, then it will have complete control of the user experience. This would allow it to obtain much improved scores on Laws 1 and 2. We believe that this is exactly Google's strategy. The last 18 months have seen a substantial increase in the scope of GMS as functionality is moved from AOSP into GMS (Exhibit 24). Consequently, over the medium term we expect to see AOSP reduced to just the OS kernel with almost all of the functionality that governs the user experience and the running of third party apps moving into GMS.

When one looks at the derivatives of Android that Google has created like Android Wear, Android Auto and Project Brillo, it is not hard to notice that **Google has full control of both the software and its distribution onto both new and existing devices**. By taking control of the software stack, Google will be able to ensure that the user experience is both easy and fun. It will also be able to make third-party apps perform in a consistent way and make sure that as many devices as possible are running the same version of the code.

Exhibit 24: Development of GMS compliant Android



Source: Edison Investment Research

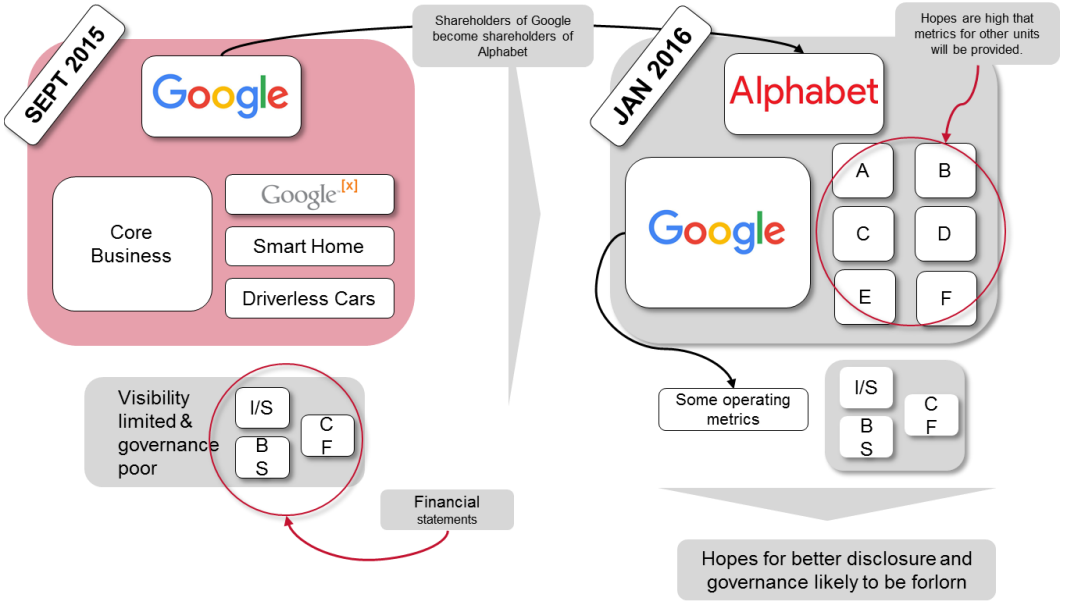
By migrating all of Android's functionality into GMS (Exhibit 24), Google can solve both the usability problem and the software distribution issue. GMS is not open-source code, meaning that Google can maintain software consistency and at the same time it controls the distribution of GMS. Unfortunately, at the moment GMS is not distributed as a single package, but as a series of different apps. This makes Google Play inappropriate for system-level software updates. However, this could be fixed by consolidating all of GMS into a single package that could be distributed through Google Play. With a single software distribution package, Google would also be able to make system-level upgrades and ensure that they make it into the hands of users in a timely fashion. A single package also has the advantage of making it simpler for users to upgrade, also ensuring that as many users as possible are running the same version of its GMS.

The good news is that this is a long-term issue and unlikely to hobble growth over the medium term. Even with the current limitations, there is still growth left in the Android user base for Google to monetise. Exhibit 22 shows that the next two years should see Google's advertising revenues from Android increase by 35% driven by the continued growth of Android users as well as its own ecosystem (Exhibit 26). These estimates include some market share loss to iOS at the high end as well as erosion in terms of average revenue per user (ARPU) which is to be expected given that new Android users are increasingly in emerging markets.

Alphabet soup

We see a strong rationale behind the move to restructure Google, but those that are hopeful that visibility and corporate governance will be meaningfully improved, are likely to be disappointed. In effect Google is reorganising itself into a conglomerate. The non-core operations such as Google X, driverless cars, smart home etc will be stripped out of Google and will become separate legal entities. All of these, including the core Google business, will be grouped within a holding structure called Alphabet (Exhibit 25). This reorganisation should be complete by January 2016, making Q415 the first quarter in which Google will report, based on the new structure.

Exhibit 25: Google today vs Alphabet in 2016



Source: Google, Edison Investment Research

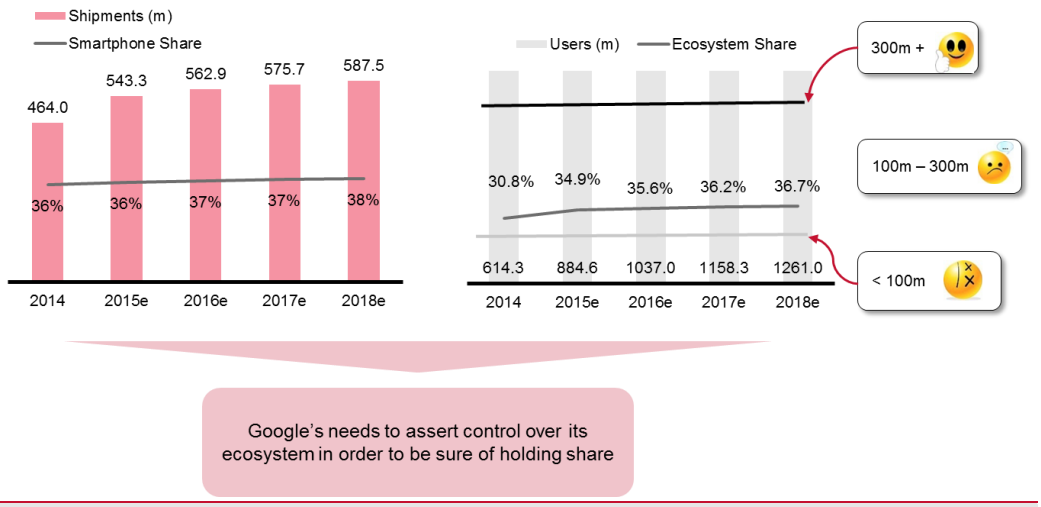
We think that the main reason for the restructuring is to allow the developing businesses to become legal entities, meaning that they will have their own share structure. This will have two advantages. Firstly, it will make it easier to attract and retain talent. We understand that Google has had trouble retaining talent, in part due to the lacklustre share price performance. If employees of the developing entities are able to participate in share incentive schemes, it should be easier to retain them, as the scope for upside could be many times greater. Secondly, it gives the entities themselves access to a currency with which they can raise capital, or engage in M&A outside of the Google group if needed. There are increasing concerns over the capital drain of these developing businesses. Allowing outside investors to participate should help reduce the pressure on the Alphabet group overall.

There are hopes that this structure will provide greater transparency and corporate governance but we think that this is fairly unlikely. Google has said that Alphabet will report as it is required to do so by the SEC and that it will give operating metrics on the core Google business, but has committed to nothing more. Furthermore, the existing share structure will remain unchanged with the rights of all three distributions remaining unchanged. Shareholders in Google will become shareholders in Alphabet. Consequently the substantial shortcoming in corporate governance is likely to remain uncorrected.

Google ecosystem

The Google ecosystem is the biggest by quite a large margin. If one includes iOS users (who almost all use some or all of Google's services) then we estimate that Google will have nearly 1.3 billion users from which it is earning revenue. The vast majority of these are Android users but due to the inferior user experience and the lower demographic of most of these users, the revenue generated per user is less than half that of iOS (Exhibit 22). However, it is still the main engine of growth for the Google ecosystem as Android continues to expand in emerging markets.

Exhibit 26: Forecasts for the Google ecosystem, 2014-18e



Source: Edison Investment Research, Counterpoint Research

Xiaomi

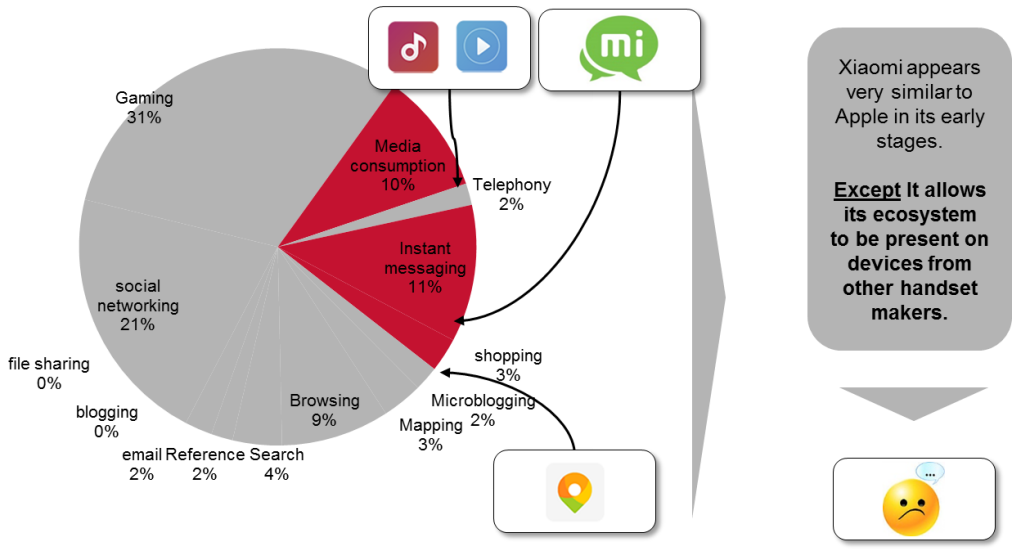
The party of 2014 is over and Xiaomi is left with a hangover and sitting at a crossroad. Its initial strategy to sell devices through the internet has been spectacularly successful, but there are limitations to this distribution strategy. This came as a rude awakening towards the end of 2014, when quarterly growth in shipments ground to halt at around 18m units. Almost all of these were in China. The company has two options for growth and neither of them will deliver the badly needed profitability.

Growth options

The first option is to expand outside of China, with the same internet distribution business model. So far it has launched in both India and Brazil and is making noises about entering the US. If Xiaomi devices prove to be popular in India and Brazil, then shipments should once again resume their upwards trajectory, but this will not deliver profitability. This is because Xiaomi's ecosystem is designed for Chinese users and does not cater for non-Chinese users. The fact that all mention of the ecosystem was conspicuously absent from the MIUI 7 (Xiaomi's user experience for Android device) launch in India in August 2015, is a strong indication of just how irrelevant Xiaomi is outside of China. To fill this gap, it is shipping Google ecosystem devices, which almost certainly guarantees that Xiaomi devices will be commodities, just like every other Android vendor shipping Google-compliant Android devices. These shipments should help Xiaomi to improve its volume-based efficiencies globally, but unless it can ship substantially more Android devices than anyone else, this is unlikely to allow margins to progress beyond the 2-4% which Android handset makers earn. Xiaomi has been causing Samsung some anxiety recently, but Samsung still out-ships Xiaomi by nearly four to one, which allows it to earn 10-12% margins despite the blistering pricing pressure in the market.

The second option is to start using the traditional distribution methods of the handset industry. These include selling handsets through third-party distributors and operators. This will bring volume, but clearly at a cost. Not only will operating costs rise at Xiaomi to support this mechanism, but it will also have to discount its devices to distributors and operators. The net result is that any scale benefit the company gains from greater volumes is very likely to be eaten up through higher costs, resulting in margins staying right where they are.

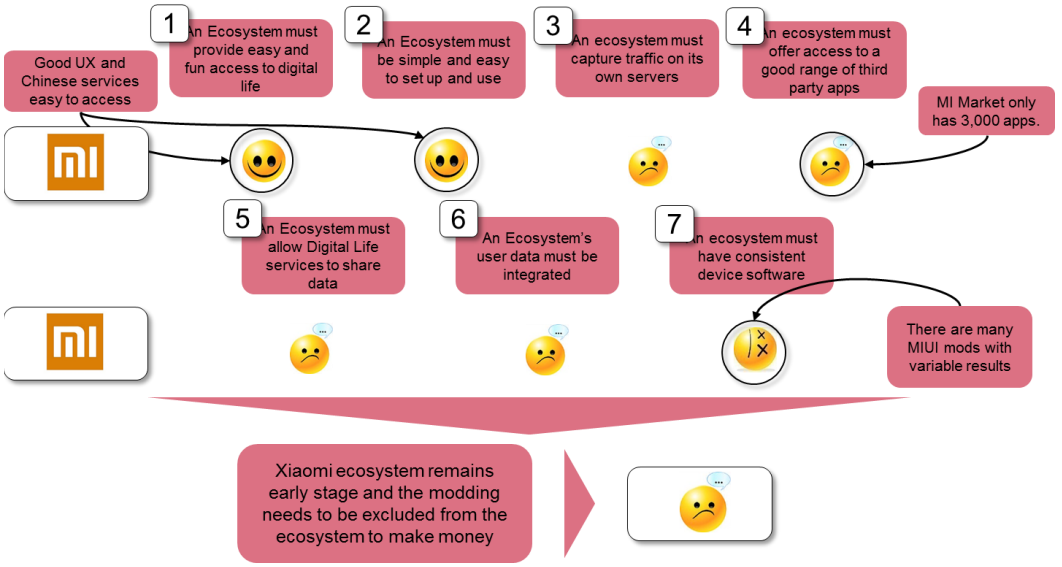
Exhibit 27: Xiaomi in Digital Life



Source: Edison Investment Research, Nielson, Google, Pewinternet.org, CommScore, NetMarketShare

The only option for Xiaomi is to make its ecosystem desired and adored by its users, such that they will be willing to pay a premium for a Xiaomi product in order to access it. Xiaomi has clearly chosen to monetise its ecosystem through hardware and to do that it must have a more complete Digital Life offering as well as improve the quality of the overall experience of MIUI (Exhibit 27).

Exhibit 26: MIUI against the Seven Laws of Robotics

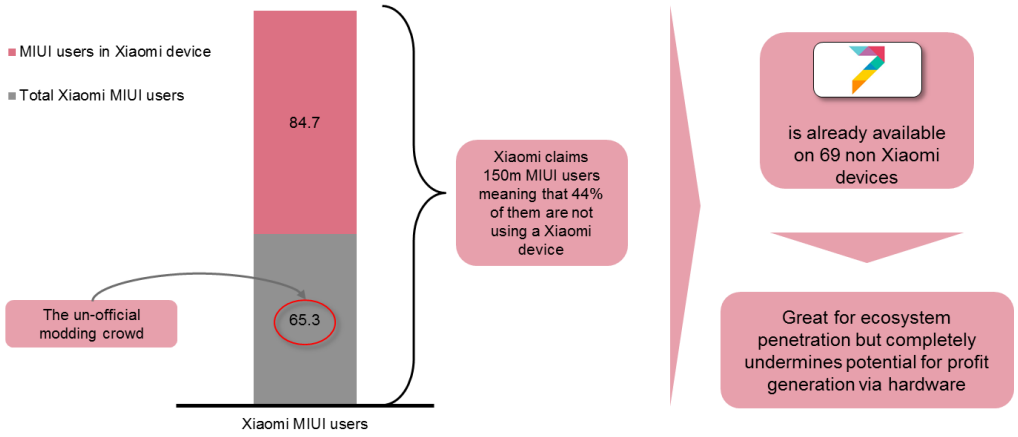


Source: Edison Investment Research

On both of our main ecosystem measures, Xiaomi still has a lot of work to do. In this regard, its coverage remains weak compared to the major players (Exhibit 8). It has great usage figures stemming from media consumption in China and this needs to be expanded into other areas. This is where the difficulties will arise as its local competitors, Baidu, Tencent, Alibaba have developed or bought most of the Digital Life services that Chinese smartphone users already engage with. We estimate that 14% of all Chinese smartphone users use a Xiaomi device, giving it an opportunity to develop and distribute these services, but the opportunity won't last for ever. The longer that Xiaomi handset users engage with services from rival players, the harder it will be to encourage them to migrate to its own services when it finally launches them. **This is critical as it is great services**

that will underpin user preference for its devices, which is what will allow it to make more than a commodity margin on its hardware?

Exhibit 27: MIUI users on Xiaomi and non-Xiaomi hardware, Q215



Source: Edison Investment Research, Counterpoint Research, Xiaomi, MIUI China Forum Porting Team

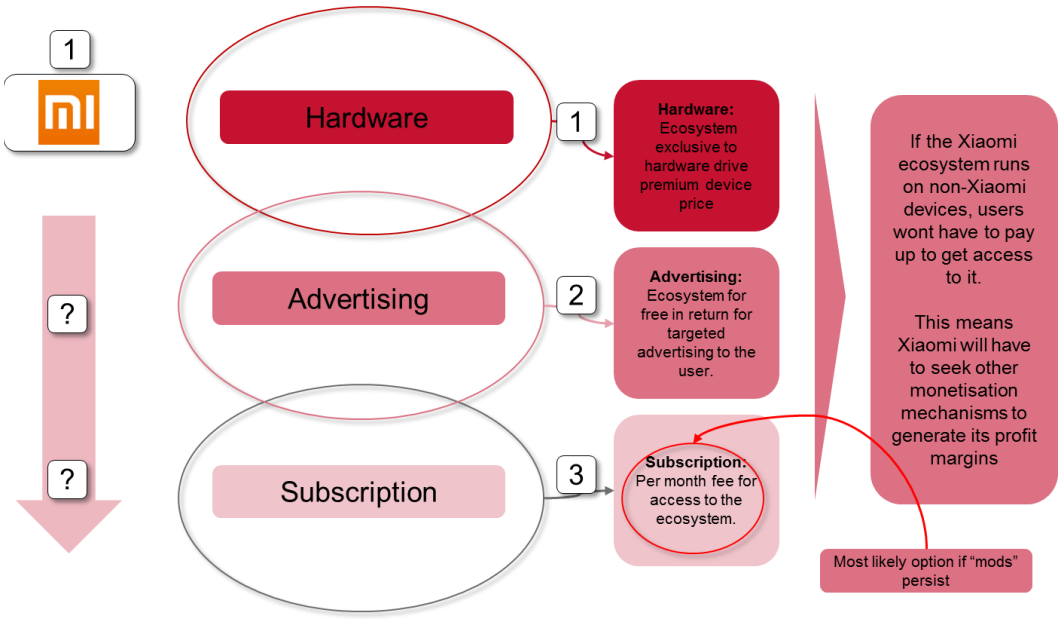
The 'mods'

On top of this, Xiaomi also needs to improve the quality with which it delivers its services to users (Exhibit 28). Successive updates to MIUI have allowed meaningful improvements to be made but more is needed if Xiaomi is to compete in this segment long term. We think that the biggest problem it faces is the lack of consistency across its user base. This is because the MIUI software is available for many devices that are not made by Xiaomi. The latest version of its software MIUI 7 is already available for 69 non-Xiaomi devices and we estimate that there are 65.3m users (44% of the total user base) of MIUI on a non-Xiaomi device. These 'mods' have not been extensively tested for these different devices and require the user to re-flash the device in order to install MIUI. Consequently, the performance of MIUI on these devices is uncertain and no guarantee is given that the code will be stable or behave predictably. We think that this has a significant and deleterious impact on the user experience and consequently do not believe that these users have the potential to really be part of the Xiaomi ecosystem. Furthermore, we think that many of the 'modded' MIUI users are outside China and currently Xiaomi's Digital Life services and ecosystem have little relevance to non-Chinese users. For these reasons, 'modded' users have been removed from the estimates of Xiaomi's ecosystem (Exhibit 29).

Making margin

In addition to the user experience problem, we believe that making the ecosystem available on non-Xiaomi devices will severely reduce Xiaomi's ability to monetise its ecosystem through hardware. Put simply, in order to justify premium pricing and thereby earn above the 2-4% margins generated by pure hardware manufacturers, Xiaomi needs to ensure that its ecosystem is only available on its devices. If the user can buy a cheaper device with the same hardware specification and download the ecosystem onto it, then clearly there will be little incentive to pay a premium for a Xiaomi device.

Exhibit 30: Xiaomi's options for monetisation of its ecosystem

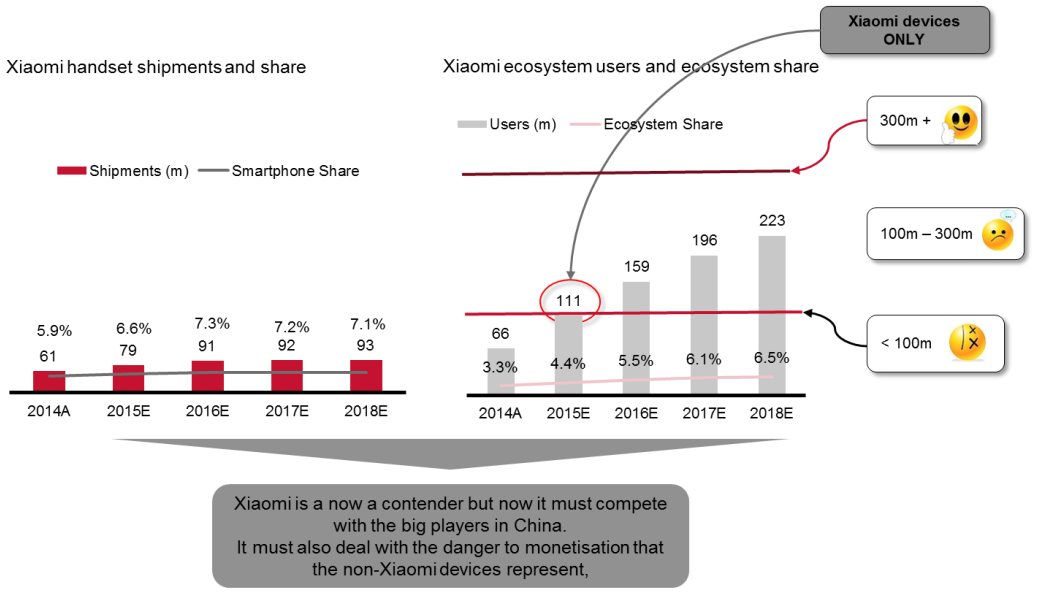


Source: Edison Investment Research

If Xiaomi fails to prevent its ecosystem from being on devices that it does not make, it will have to explore other ways of monetising its ecosystem. These would include selling advertising inventory within its ecosystem to marketers (Google, Facebook etc) or charging a subscription to access its Digital Life services. We think that subscription would be the most likely option as this could be included in the price of a Xiaomi device, thereby justifying the premium charged. Non-Xiaomi device users could then be made to pay a fee to get access to the Xiaomi ecosystem on their devices. We suspect that this move could encourage 'modded' users to migrate to a Xiaomi device as non-Xiaomi devices are very likely to continue suffering from the performance issues described above.

We still see Xiaomi building enough of a user base in the Chinese market to have a viable ecosystem, but volumes are just not big enough build a user base greater than 300 million in size by 2018e. Xiaomi with 223 million users by the end of 2018e will command around a quarter of the Chinese market, giving it an opportunity to promote its ecosystem. However, to be successful here, it badly needs to round out its offering in Digital Life as well as improve the quality and depth of the services that it offers to its users. On this basis we think that margins of around 8-9% could be achieved, but there is still much to do.

Exhibit 31: Forecasts for Xiaomi ecosystem. 2014-18e



Source: Edison Investment Research, Counterpoint Research

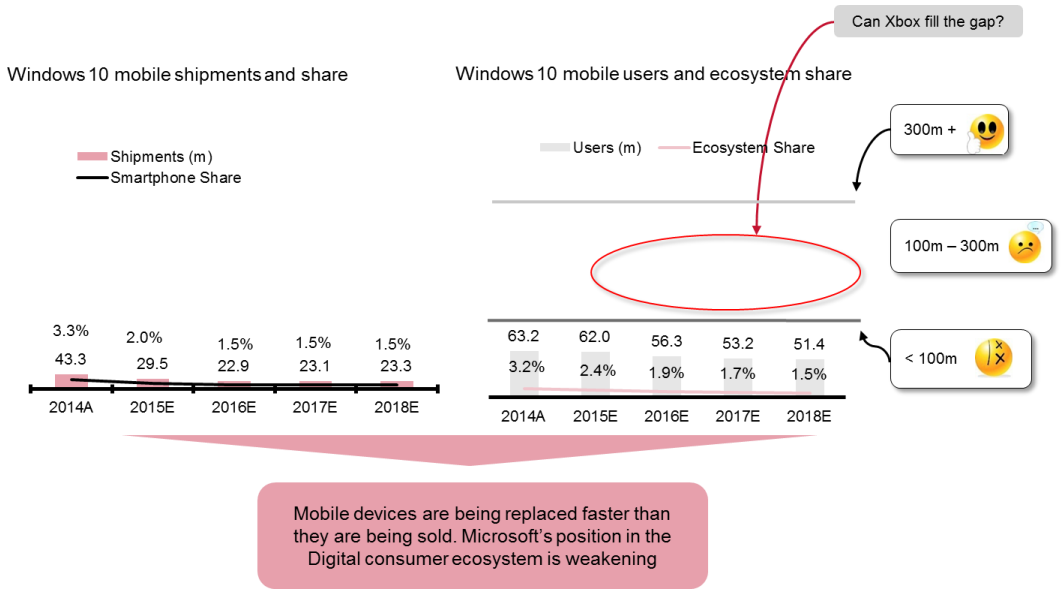
Microsoft

Even as Microsoft stands on the brink of success with Windows 10, the foundations of its position in the digital consumer ecosystem are crumbling. For the time being, we believe that the battle for the consumer will be won and lost on the smartphone and the tablet. Of the two, the smartphone is the most important as this is where the user spends the vast majority of their time. In smartphones, Microsoft is very weak and getting weaker, as a result of its inability to gain traction with the end user. The current restructuring of the acquired Nokia business means that fewer models will be released and for the time being less resources will be employed, to encourage users to get involved with Microsoft's Digital Life services on mobile devices.

Consumer crumble

The net result is a further loss of market share when it comes to devices shipped and we have cut its market share forecast to just 1.5% going forward. Unfortunately, this means that **more Microsoft devices will be replaced than are shipped, meaning that the number of users of the Microsoft consumer ecosystem on mobile devices will start going backwards.** The net result is that Microsoft is now unlikely to bring its consumer digital ecosystem to a level of 100 million users, meaning that it will continue to lose money until something is done. **Either Microsoft bolsters its consumer position to return its consumer ecosystem numbers into growth territory, or it needs to jettison those assets. Otherwise they will continue to drag on the enterprise and PC businesses until user growth restarts.**

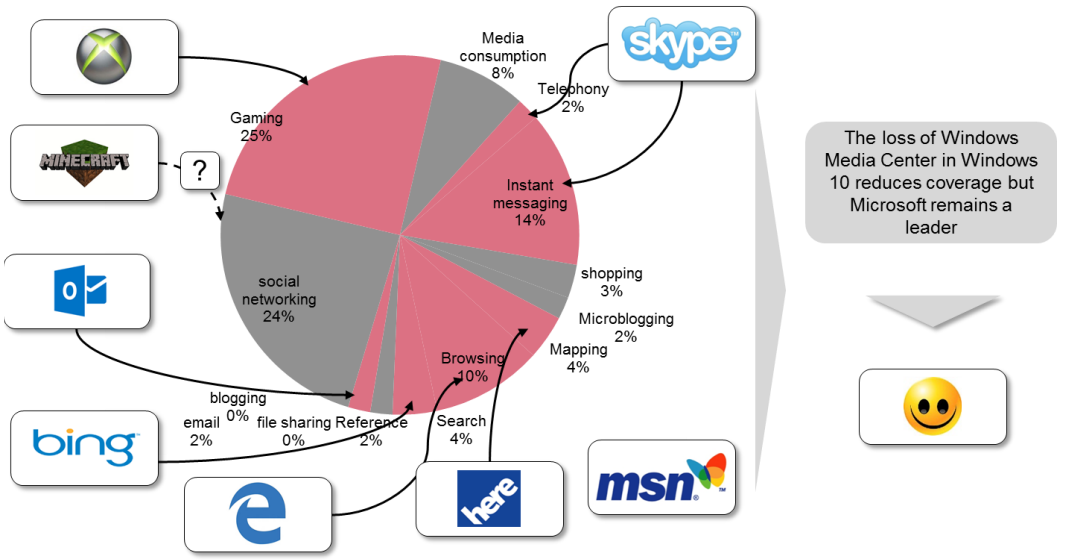
Exhibit 32: Forecasts for Windows 10 on mobile, 2014-18e



Source: Edison Investment Research, Counterpoint Research

In terms of assets, Microsoft still has everything it needs to create a thriving consumer-led ecosystem. Its position in Digital Life has weakened slightly with Windows 10, but not enough to meaningfully dampen its appeal. Windows 10 will no longer include Windows Media Center (WMC), which was a media-oriented experience that placed all of the user's media in a single place for easy browsing and access. We think that Microsoft intends to follow the example of iTunes and to migrate its media offering into the Windows Store Windows Store but it is still very early days, and development of the media experience is clearly required before it has a full offering in this space.

Exhibit 33: Microsoft's position in Digital Life

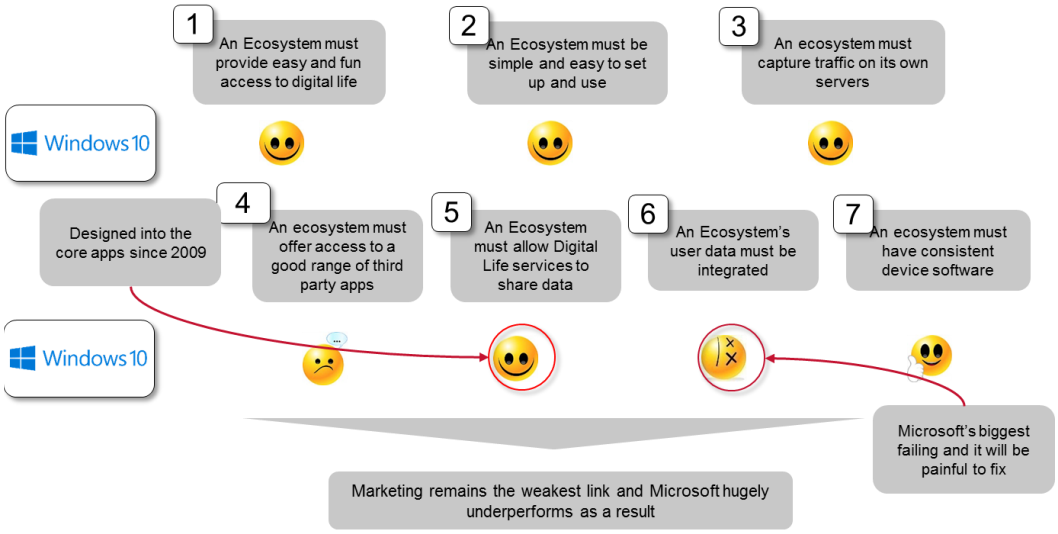


Source: Edison Investment Reseach, Nielson, Google, Pewinternert.org, CommScore, NetMarketShare

Even with the loss of WMC, Microsoft still has a good position, scoring 61% (Exhibit 8) compared to Google on 64% and Apple on 40%. However, the lacklustre performance of Yahoo, which scores 74%, but has failed to develop a meaningful position in the digital mobile ecosystem, shows that more than just good coverage is needed.

Yahoo's weaknesses show up in the Seven Laws of Robotics analysis (Exhibits 10a and 10b), where its strengths are mostly due to its ability to offer a good range of third-party apps (Law 4, via Android) and its ability to capture traffic on its own servers (Law 3). Outside of these two, Yahoo scores very badly, strongly highlighting how it is failing to execute on the assets it has. In contrast, Microsoft continues to score reasonably well and also scores quite well on the key measures of usability and user experience (Laws 1, 2 and 7). However a combination of poor marketing, bad timing and ongoing weakness in third party apps has prevented it from seeing meaningful traction with consumers.

Exhibit 34: Analysis of Microsoft ecosystem vs Seven Laws of Robotics

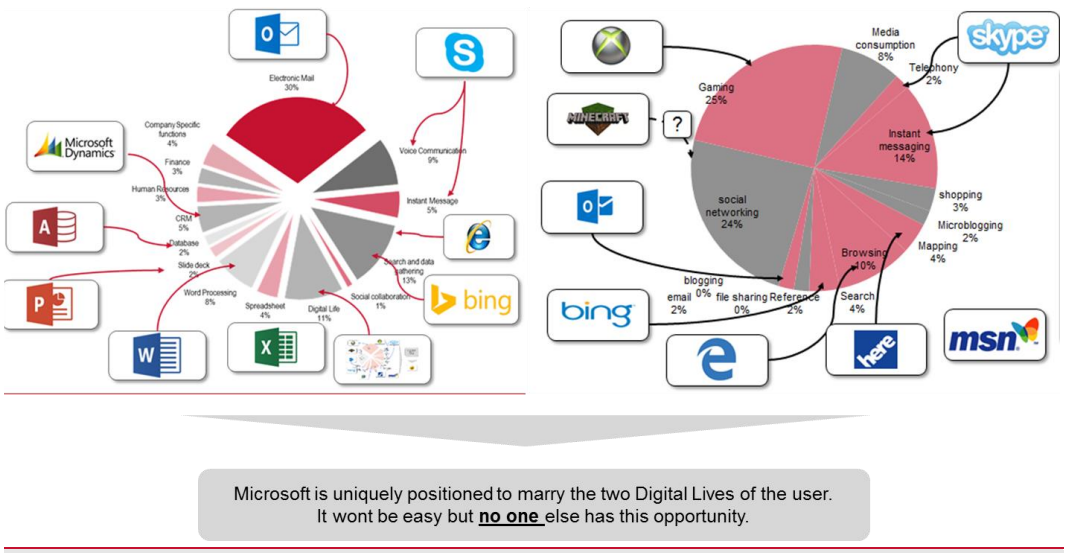


Source: Edison Investment Research

Digital Work

With regard to the consumer and mobile devices, Microsoft is currently in a period of retrenchment. Increasingly, the strategy appears to be pushing its ecosystem onto other platforms such as iOS and Android. This should work very well for its Digital Work (enterprise and productivity) ecosystem, but will still result in its consumer offering falling even further behind.

Exhibit 35: Microsoft's enterprise and consumer ecosystems.



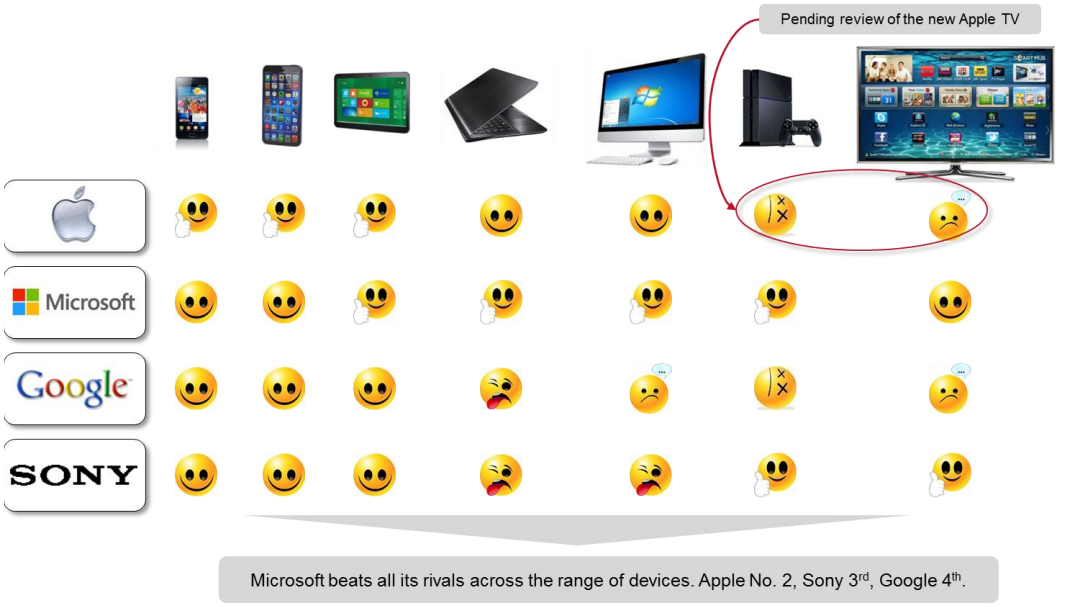
Source: McKinsey, Radicati, Workfront, Microsoft, Webtorials, Edison Investment Research, Nielson, Google, Pewinternert.org

This is because its Digital Work ecosystem is best in class and is something that users will want to have access to. This combined with the attractive pricing options for the Office apps on other platforms has already made Microsoft very strong in productivity on Android and iOS. Consequently, there is a possibility for Microsoft to pull users through to its consumer ecosystem by marrying the Digital Work and Digital Life experiences together in a seamless, easy and fun to use way. **We think that this will be much more difficult than it sounds.** History has shown that the pull tends to work in the opposite direction, ie from consumer to enterprise, not the other way round. We believe that a big reason why Apple has won some penetration into the enterprise is due to its substantial appeal to the consumer. After all, CIOs and senior executives are also consumers.

Cross-device

Another option for Microsoft is to capitalise on its seamless offering across different device types. Microsoft's ecosystem is currently available across most types of consumer electronic devices and the degree of consistency across these devices is substantially improved with Windows 10. This is because every device is running the same code.

Exhibit 28: Ecosystems across different device types



Source: Edison Investment Research

This is where the Xbox could come into play to salvage the consumer ecosystem (Exhibit 33). We calculate that the Xbox has 44 million users, which if correctly incentivised could begin to use other Digital Life services more on their consoles. Although Microsoft is way behind Sony in the current generation in terms of units shipped, we think that it is way ahead of Sony when it comes to the user experience. In fact, Sony is so far behind that we think that its PlayStation user base will be under significant threat in the next generation, when the digital consumer ecosystem will play a much greater role in the user's choice of device. Hence we think that Xbox is well positioned to win a lot of users in the next generation. However, we harbour serious doubts as to whether it can fill the gap created by the weakening position in mobile. This is because the vast majority of consumers do not spend a meaningful part of their Digital Lives on a console. Those that do, spend almost all of their time either playing games or consuming media, and as a result are unlikely to make decisions about which ecosystems they spend their Digital Lives in based on this experience. Until the console is more widely used and more deeply integrated into the digital consumer ecosystem, we think that it will not have a meaningful impact on consumer ecosystem purchase decisions.

Consequently, as the strategy stands today, Microsoft appears to be relying on the pull through from enterprise and productivity to drive demand for the Digital Life assets that it has. Windows 10 will provide some help in terms of tying different devices together, but we see no change to the importance of the smartphone or the tablet in driving who wins and who loses in the digital consumer ecosystem. Microsoft's position in both of these areas remains very weak, with no turnaround in sight. If Microsoft has a plan to turn its smartphone business and its consumer ecosystem around, it is keeping it very quiet.

The good news is that financially this does not matter enormously at the moment. The market has pretty much already written consumer off both in terms of its expectations and in Microsoft's share price. Hence, any success that Microsoft is able to wring from the consumer represents upside to both expectations and for investors. Our analysis shows that even if Microsoft is only successful in migrating its legacy businesses (Windows and Office) to the next generation, it is not difficult to value the shares at around $60. This is meaningfully above where they are trading today, offering investors a free option on the chance that a stroke of genius or luck makes the consumer part of the ecosystem come right.

Conclusion

Ecosystems are becoming more complex. In the near future, the provision of Digital Life services will become table stakes in the ecosystem. This means that the focus will move to the integration of those services and how it can make the experience richer and deeper. The walled gardens of ten years ago have gone, to be replaced by what we define as gated communities, where users can mix and match services. The more an ecosystem owner can encourage a user to use all of its services, the more value it will be able to extract.

The landscape with the big players is changing. While we think that Apple's position is not sustainable in the long term, its grip on being the best third-party app ecosystem has strengthened meaningfully with the success of the iPhone 6. Both Google and Microsoft have weakened over the last six months, with Google Play's equivalency compared to iOS diminishing and Microsoft rethinking its entire approach towards its ecosystem on mobile devices. Meanwhile, it is Facebook and Xiaomi that are now the ones to watch, even though both of them have a lot of work to do to be considered fully-fledged ecosystems in their own right.

Exhibit 29: Mobile ecosystem user numbers and share

Ecosystem users (m)	2012	2013	2014	2015e	2016e
Symbian	50.0	21.2	0.0	0.0	0.0
Tizen	0.0	0.0	0.0	0.0	0.0
Blackberry	0.4	0.4	0.0	0.0	0.0
iPhone OS	195.4	257.1	331.8	406.2	444.5
Windows	20.0	44.4	63.2	62.0	56.3
Facebook	625.0	945.0	1,189.0	1,410.0	1,550.0
Amazon	12.7	18.2	27.7	42.7	63.0
Firefox	0.0	1.2	1.9	2.3	2.5
Jolla	0.0	0.1	0.4	0.9	1.2
Android	614.5	1,030.0	1,517.4	1,978.2	2,320.4
o/w Google	179.4	360.1	614.3	884.6	1,037.0
o/w China	254.0	421.7	556.9	661.0	697.5
o/w Other	181.1	248.2	346.2	432.6	585.8
Yahoo!	0.0	0.0	0.0	0.0	0.0
Samsung	10.4	117.4	21.2	25.7	28.6
Sony	35.0	53.0	63.4	62.6	61.7
Xiaomi	7.2	21.6	65.7	111.3	158.9
Total	**925.6**	**1,523.4**	**1,997.1**	**2,534.5**	**2,911.5**
Ecosystem share of users	**2012**	**2013**	**2014**	**2015e**	**2016e**
Symbian	5.4%	1.4%	0.0%	0.0%	0.0%
Tizen	0.0%	0.0%	0.0%	0.0%	0.0%
Blackberry	0.0%	0.0%	0.0%	0.0%	0.0%
iPhone OS	21.1%	16.9%	16.6%	16.0%	15.3%
Windows	2.2%	2.9%	3.2%	2.4%	1.9%
Amazon	1.4%	1.2%	1.4%	1.7%	2.2%
Firefox	0.0%	0.1%	0.1%	0.1%	0.1%
Jolla	0.0%	0.0%	0.0%	0.0%	0.0%
Android	66.4%	67.6%	76.0%	78.0%	79.7%
o/w Google	19.4%	23.6%	30.8%	34.9%	35.6%
o/w China	27.4%	27.7%	27.9%	26.1%	24.0%
o/w Other	19.6%	16.3%	17.3%	17.1%	20.1%
Yahoo!	0.0%	0.0%	0.0%	0.0%	0.0%
Samsung	1.1%	7.7%	1.1%	1.0%	1.0%
Sony	3.8%	3.5%	3.2%	2.5%	2.1%
Xiaomi	0.8%	1.4%	3.3%	4.4%	5.5%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Edison Investment Research, Counterpoint Research

Exhibit 30: Global handset shipments by vendor

Total handsets	2009	2010	2011	2012	2013	2014	2015e	2016e
Units by vendor Units (m)								
Apple	11.4	24.9	46.6	89.3	133.4	159.3	192.6	234.1
Huawei	7.0	13.5	30.0	46.0	49.4	55.7	77.4	112.7
HTC	6.5	10.8	24.9	43.3	32.5	23.0	21.2	21.1
LG	102.6	122.1	114.2	86.4	58.4	71.0	78.4	72.7
Google Motorola	106.6	58.5	38.6	40.3	35.3	16.7	31.7	29.9
Nokia/Microsoft	472.3	440.9	461.3	422.5	335.2	256.0	198.8	107.7
BlackBerry	23.1	34.3	47.5	51.5	36.1	18.7	7.8	4.7
Samsung	199.2	235.8	278.6	316.2	386.2	462.5	401.9	367.3
Sony Mobile	93.4	54.9	41.8	32.6	32.7	38.5	39.8	30.3
ZTE	14.2	16.0	50.0	69.3	69.6	54.3	49.5	74.4
Others	185.8	199.6	463.4	579.6	578.5	586.5	756.0	859.9
	1,211.2	**1,596.8**	**1,776.9**	**1,747.3**	**1,742.1**	**1,855.1**	**1,914.9**	**1,934.1**

Market share handsets	2009	2010	2011	2012	2013	2014	2015e	2016e
Apple	2.1%	2.9%	5.0%	7.6%	9.1%	10.4%	12.2%	11.7%
Huawei	1.1%	1.9%	2.6%	2.8%	3.2%	4.2%	5.9%	6.5%
HTC	0.9%	1.6%	2.4%	1.9%	1.3%	1.1%	1.1%	1.1%
LG	10.1%	7.1%	4.9%	3.3%	4.1%	4.2%	3.8%	3.6%
Google Motorola	4.8%	2.4%	2.3%	2.0%	1.0%	1.7%	1.6%	1.1%
Nokia/Microsoft	36.4%	28.9%	23.8%	19.2%	14.7%	10.7%	5.6%	3.5%
BlackBerry	2.8%	3.0%	2.9%	2.1%	1.1%	0.4%	0.2%	0.2%
Samsung	19.5%	17.4%	17.8%	22.1%	26.5%	21.7%	19.2%	19.3%
Sony Mobile	4.5%	2.6%	1.8%	1.9%	2.2%	2.1%	1.6%	1.5%
ZTE	1.3%	3.1%	3.9%	4.0%	3.1%	2.7%	3.9%	4.1%
Others	16.5%	29.0%	32.6%	33.1%	33.7%	40.8%	44.9%	47.3%
Smartphone market %	**15%**	**19%**	**27%**	**39%**	**60%**	**70%**	**78%**	**79%**

Source: Edison Investment Research, Counterpoint Research

Exhibit 31: Global smartphone shipments by vendor

Of which smartphones	2009	2010	2011	2012	2013	2014	2015e	2016e
Units by vendor units (m)								
Apple	25.1	46.6	89.3	133.4	159.3	192.6	234.1	226.8
Huawei	13.5	0.4	15.6	29.0	48.1	75.4	112.2	125.5
HTC	10.8	24.6	43.0	32.5	23.0	21.2	21.1	21.0
LG	0.6	5.6	19.0	26.4	47.7	60.2	59.2	58.0
Google Motorola	2.6	13.7	17.4	16.6	16.2	31.7	29.9	21.9
Nokia/Microsoft	70.9	102.2	84.6	36.4	33.6	42.4	29.5	22.9
BlackBerry	34.3	47.5	51.5	36.1	18.7	7.8	4.7	4.5
Samsung	5.9	25.4	90.5	212.4	322.5	313.5	305.3	311.9
Sony Mobile	1.4	10.3	19.6	34.8	38.5	39.8	30.3	29.6
ZTE	0.0	0.0	10.5	29.5	36.2	39.9	66.0	70.4
Lenovo	0.0	0.0	0.0	19.9	46.2	63.1	38.9	38.7
Xiaomi	0.0	0.0	0.0	7.2	18.8	61.2	79.2	91.1
Coolpad	0.0	0.0	0.0	19.0	32.5	40.7	31.5	32.5
Others	20.7	23.0	30.7	53.5	207.7	315.6	452.5	469.3
Total	**185.7**	**299.2**	**471.7**	**686.7**	**1,048.9**	**1,305.1**	**1,494.4**	**1,524.0**
Market share smartphones	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015e**	**2016e**
Apple	13.5%	15.6%	18.9%	19.4%	15.2%	14.8%	15.7%	14.9%
Huawei	7.2%	0.1%	3.3%	4.2%	4.6%	5.8%	7.5%	8.2%
HTC	5.8%	8.2%	9.1%	4.7%	2.2%	1.6%	1.4%	1.4%
LG	0.3%	1.9%	4.0%	3.9%	4.5%	4.6%	4.0%	3.8%
Google Motorola	1.4%	4.6%	3.7%	2.4%	1.5%	2.4%	2.0%	1.4%
Nokia/Microsoft	38.2%	34.1%	17.9%	5.3%	3.2%	3.2%	2.0%	1.5%
BlackBerry	18.5%	15.9%	10.9%	5.3%	1.8%	0.6%	0.3%	0.3%
Samsung	3.2%	8.5%	19.2%	30.9%	30.7%	24.0%	20.4%	20.5%
Sony Mobile	0.8%	3.4%	4.2%	5.1%	3.7%	3.0%	2.0%	1.9%
ZTE	0.0%	0.0%	2.2%	4.3%	3.5%	3.1%	4.4%	4.6%
Lenovo	0.0%	0.0%	0.0%	2.9%	4.4%	4.8%	2.6%	2.5%
Xiaomi	0.0%	0.0%	0.0%	1.0%	1.8%	4.7%	5.3%	6.0%
Coolpad	0.0%	0.0%	0.0%	2.8%	3.1%	3.1%	2.1%	2.1%
Others	11.1%	7.7%	6.5%	7.8%	19.8%	24.2%	30.3%	30.8%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Edison Investment Research, Counterpoint Research

Exhibit 40: Global smartphone shipments by OS

Smartphones	2009	2010	2011	2012	2013	2014	2015e	2016e
Units by OS units (m)								
Symbian	81.0	111.6	88.4	28.1	1.3	0.0	0.0	0.0
BlackBerry	33.9	49.7	51.5	37.8	18.7	7.8	4.7	4.5
iPhone OS	25.1	46.6	89.3	133.4	153.4	192.6	234.1	226.8
Windows Mobile/Phone	15.0	12.4	8.8	17.5	37.8	43.3	29.5	22.9
Linux	8.1	6.4	3.8	1.9	3.3	6.5	7.5	7.6
Android	6.8	67.2	219.5	449.1	785.8	1,031.1	1207.3	1,250.9
Others	15.8	5.4	10.4	18.8	48.8	23.9	11.4	11.4
Total	**185.7**	**299.2**	**471.7**	**686.7**	**1,048.9**	**1,305.1**	**1,494.4**	**1,524.0**
Smartphones	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015e**	**2016e**
Share by OS %								
Symbian	43.6%	37.3%	18.7%	4.1%	0.1%	0.0%	0.0%	0.0%
BlackBerry 9 and older	18.3%	16.6%	10.9%	5.5%	1.8%	0.6%	0.3%	0.3%
iPhone OS	13.5%	15.6%	18.9%	19.4%	14.6%	14.8%	15.7%	14.9%
Windows Mobile/Phone	8.1%	4.1%	1.9%	2.5%	3.6%	3.3%	2.0%	1.5%
Linux	4.4%	2.1%	0.8%	0.3%	0.3%	0.5%	0.5%	0.5%
Android	3.7%	22.5%	46.5%	65.4%	74.9%	79.0%	80.8%	82.1%
Others	8.5%	1.8%	2.2%	2.7%	4.7%	1.8%	0.8%	0.7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Edison Investment Research, Counterpoint Research

Exhibit 41: Global tablet shipments by vendor and OS

Tablets	2012	2013	2014	2015e	2016e	2017e
Units by vendor (m)						
Apple	65.8	74.2	63.4	51.7	49.2	49.2
Microsoft	0.9	1.6	0.4	0.0	0.0	0.0
BlackBerry	1.1	0.7	0.0	0.0	0.0	0.0
Samsung	17.7	37.6	42.4	37.9	35.5	35.5
Amazon	10.5	11.3	4.6	3.6	3.4	3.4
Asustek	7.0	12.2	11.3	7.2	6.7	6.7
Lenovo	2.7	9.0	11.5	11.5	11.1	11.1
Acer	2.6	6.1	3.6	3.5	3.1	3.1
Dell	0.0	0.0	0.1	3.0	0.0	0.0
HPQ	0.0	0.8	1.1	0.5	0.5	0.5
Sony	0.0	1.6	3.2	3.1	3.0	3.0
Others	54.8	80.4	95.3	86.6	85.9	85.9
Total	**163.0**	**235.5**	**236.9**	**208.7**	**198.3**	**198.3**
Tablets	**2012**	**2013**	**2014**	**2015e**	**2016e**	**2017e**
Share by vendor						
Apple	40.4%	31.5%	26.8%	24.8%	24.8%	24.8%
Microsoft	0.6%	0.7%	0.2%	0.0%	0.0%	0.0%
BlackBerry	0.7%	0.3%	0.0%	0.0%	0.0%	0.0%
Samsung	10.9%	16.0%	17.9%	18.2%	17.9%	17.9%
Amazon	6.4%	4.8%	2.0%	1.7%	1.7%	1.7%
Asustek	4.3%	5.2%	4.8%	3.5%	3.4%	3.4%
Lenovo	1.7%	3.8%	4.9%	5.5%	5.6%	5.6%
Acer	1.6%	2.6%	1.5%	1.7%	1.6%	1.6%
Dell	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%
HPQ	0.0%	0.3%	0.5%	0.2%	0.2%	0.2%
Sony	0.0%	0.7%	1.4%	1.5%	1.5%	1.5%
Others	33.6%	34.2%	40.2%	41.5%	43.3%	43.3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Tablets	**2012**	**2013**	**2014**	**2015e**	**2016e**	**2017e**
Units by OS						
iOS	65.8	74.2	63.4	51.7	49.2	49.2
Microsoft RT	0.9	1.6	0.4	0.0	0.0	0.0
BlackBerry QNX	1.1	0.7	0.0	0.0	0.0	0.0
Android	62.6	141.7	164.1	149.1	141.6	141.6
Linux	0.0	0.0	0.0	0.0	0.0	0.0
Others	32.5	17.3	8.9	7.9	7.5	7.5
Total	**163.0**	**235.5**	**236.9**	**208.7**	**198.3**	**198.3**

Source: Edison Investment Research, Counterpoint Research

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