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Outsourcing Creative Work: a Study of Mobile Application Development

Birgitta Bergvall-Kåreborn

Luleå University of Technology, Birgitta.Bergvall-Kareborn@ltu.se

Debra Howcroft

The University of Manchester, debra.howcroft@mbs.ac.uk

Didier Chincholle

Ericsson User Experience Lab, didier.chincholle@ericsson.com

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Outsourcing Creative Work: a Study of Mobile Application Development

Completed Research Paper

Birgitta Bergvall-Kåreborn
Social Informatics
Luleå University of Technology,
Luleå, Sweden
Email: Birgitta.Bergvall-Kareborn@ltu.se

Debra Howcroft
Manchester Business School
The University of Manchester
Manchester, UK
Email: Debra.Howcroft@mbs.ac.uk

Didier Chincholle
Ericsson
User Experience Lab
Färögatan 6, Kista. S-16480 Stockholm
E-mail: didier.chincholle@ericsson.com

Abstract

As the mobile phone industry converges with the IT/software industry, the emerging internet-enabled multifunctional mobile devices are bringing together many diverse stakeholders. This paper examines the under-researched area of mobile application developers. We frame our study within the wider context of the mobile application industry in order to illustrate how the business models of large IT firms shape the everyday practices of systems developers, specifically those working on iPhone and Android platforms. By broadening out the study in this way we are able to situate seemingly new and distinctive technological artefacts and practices and show how they build on a number of continuing trends within the field. Drawing on qualitative data with developers working in this emerging market, we analyse their practices in order to (a) provide detail on this under-studied area and (b) show the ways in which developers adapt to the turbulent environment of the IT sector.

Keywords: Mobile applications development, Apple, Google, Andoid, iPhone, developers

Introduction

Since the mid-1980s the global telecommunications industry has become one of the core industries of the world economy, and within this the mobile phone industry has become the most important sector (Hess and Coe 2006). When the first mobile phone was launched in 1985, it seemed unlikely it would ever reach a mass market audience. Although it could be argued that today the mobile phone is a familiar technology, it remains a moving target as it continues to evolve and change (Woolgar 2003). The first ten years or so of advances in mobile phone technology concentrated on hardware modifications, so that the mobile phone could become truly portable. As with any technology, it is impossible to predict how the device will be adopted and used, hence the widespread speculation about its effects and implications. No one could foresee that a technology designated for voice communication would be adapted to such an extent for text messaging; likewise, the potential of mobiles as internet-enabled multifunctional devices to potentially threaten the dominance of laptops and desktops is yet to be unravelled.

Within the mobile sector there are numerous stakeholders with differing perspectives. The aim of this paper is to examine the practices of one group in particular - mobile application developers – by recourse to the broader social, economic, political and historical context that shapes and frames their everyday practices. As Pollock and Williams (2009) argue there is a pressing need to go beyond the micro level of study and incorporate the wider influences that shape the everyday experiences of systems development. In order to achieve this we begin by providing an overview of the evolution of the mobile application industry. Any new technology tends to pass through a cycle of ‘cyberbole’ (Woolgar 2003) when the technology is seen as potentially transformatory. This perspective often feeds into arguments that suggest a paradigmatic shift is taking place in the nature of systems development, and indeed, some claim that mobile applications are radically altering the software market. However, we argue that on closer inspection, its current form merely reflects a process of ‘accentuated evolution’ (Kautz et al, 2007) that builds upon existing practices, processes, and artefacts. We draw upon qualitative, empirical data to highlight the practices of developers that are adopted in response to the strategies of large technology firms that operate in the mobile applications market. Understanding these practices offers insights into how developers continually adapt to a diverse set of conditions in environments that are subject to perpetual change.

In order to focus our paper we concentrate on mobile application developers working on Apple and Google platforms. These have been selected given their predominance within the IT industry and also because industry reports point to Apple and Google as market leaders for mobile platforms (Morgan Stanley¹). The next section will discuss the wider context of high-tech firms and markets by offering an overview of Apple and Google in terms of the evolution of their iPhone and Android platforms. The section concludes by situating these developments within a number of ongoing trends within the field. Next, the paper describes the qualitative research approach that was adopted for the fieldwork among forty-seven iPhone and Android developers. The analysis follows, which illustrates mobile application development in terms of the categories of who, what, when, where, why and how. Finally, conclusions are drawn which point to precariousness of the lived experiences of creative work in the IT industry, a turbulent environment that is susceptible to permanent restructuring and change.

The Broader Context: Technology Firms and Markets

Apple and Google

In this section we outline the broader context that frames mobile application development. We provide a brief history of Apple and Google in order to understand their position within the mobile applications market, particularly as regards the specific platforms of iPhone and Google.

The high technology firm, Apple inc., was established in 1976 and has had a chequered business history. Throughout their evolution Apple has prided themselves on a unique aesthetic design, which has built a strong consumer following that is loyal to the brand. Much of its recent success and enhanced market share can be attributed to the emergence of innovative products like the iPod and iPhone. Apple’s incursion into the digital music sector was at a time when the emerging market for portable MP3 players was chaotic and immature. The

¹ [http://www.morganstanley.com/institutional/techresearch/pdfs/2SETUP_12142009_RI.pdf]

release of the iPod in 2001, along with creation of the online media store iTunes, together represented an integrated ecosystem, which was soon to become the 'de facto dominant design' (Dedrick et al. 2009). Their position was further secured by creating 'lock-in' among the user base so that switching costs ensured consumers next digital music device was also an iPod.

By contrast, when Apple launched the iPhone in 2007, the state of the mobile phone industry was one of maturity and sophistication, and was dominated by five companies that covered around 75% of the world market for handsets (Nokia, Motorola, Samsung, Siemens, and Sony Ericsson) (Hess and Coe 2006). Entering the mobile phone market with a product equipped for regular internet access enabled Apple to dominate the smartphone market within a relatively short period of time. Meanwhile their competitors, such as Nokia, reported their worst ever financial results (Wray 2010). Apple benefitted from the competitive price wars within the mobile phone industry, which had seen a reduction of margins for voice transmission and far higher profit levels with data transmission (Vogelstein 2008). The iPhone represents Apple's most profitable product and its popularity persists with reports of massive growth rates in 2010.

Apple is renowned in the IT industry for the extreme secrecy surrounding new product launches and aim to foster speculation. Steve Jobs' (CEO) annual Apple keynote address has become a media event for the marketing of new products and when the iPhone was unveiled it was perceived as representing something distinct in the more established market of mobile phones (Ling and Sundsoy 2009). The product launch was backed by a successful and costly marketing campaign, with staged launches outside their retail stores, often consisting of long queues of young, hip-looking film extras that were paid by Apple to generate interest in the product (Goggin 2009). The iPhone was marketed by Apple as representing a seismic shift in mobile telephony: "a revolutionary mobile phone, a widescreen iPod with touch controls, and a breakthrough Internet communications device with desktop-class email, Web browsing, searching and maps"³. Three months later, Apple launched the iPod Touch, and announced that both products would be the first handheld devices with wireless access to the iTunes store, thereby enabling content to be purchased and downloaded directly on the devices.

As the lead firm, Apple is the only company that negotiates with other firms in their supply chain, gaining power by using multiple sourcing and working closely with even the suppliers' suppliers (Dedrick et al. 2009). Their artefacts are embedded into a highly centralised and integrated ecosystem that seamlessly links products with the marketplace (iTunes, the App Store). This infrastructure provides a key resource for the rapid roll-out and uptake of applications in the international marketplace, since (regulatory and financial) structures were already in place to facilitate ease of download and purchase.

In keeping with their centralised strategy Apple manages the entire distribution channel for mobile phone applications. In March 2008 they announced they would control the whole value chain from application development to application distribution, with the release of the iPhone Software Development Kit (SDK) which enables third-party developers to create applications for the iPhone and iPod touch. The interest among developers proved to be strong and four days after its launch more than 100,000 developers had downloaded the SDK⁴. The second phase involved the setting up of a distribution channel for applications. The App Store – not dissimilar to iTunes and thereby building on consumer confidence - became operational in July 2008 and enabled users to search, purchase and wirelessly download applications directly onto their iPhone or iPod touch. The App store provided developers with a direct link to users, as they set their own price for the application (including free) and retained 70% of all the sales revenues, with Apple covering credit card, web hosting, and infrastructure costs. Although seemingly straightforward, the entire process is mediated by Apple who maintains firm control over distribution, can halt the release of applications if they deem them to be inappropriate or unsuitable, and demand retail exclusivity. The assessment process and evaluation criteria for applications is undisclosed and if declined, there is no feedback beyond the simple rejection. However, this does not seem to deter developers from submitting their applications.

² [<http://www.apple.com/pr/library/2010/04/20results.html>]

³ [www.apple.com/uk/pr/library/2007/01/090106_iphone.html]

⁴ [www.apple.com/pr/library/2009/11/04appstore.html]

Within three days of the unveiling of the App store, there were more than ten million downloaded applications⁵ and recent figures suggest that the number of downloads exceeds three billion⁶.

Turning to Google, who were established in 1998, their financial success is based on the advertising revenues generated from associations with keyword searches. As a thriving firm who are keen to enter new markets and build on their success, Google has been extensively involved in mergers and acquisitions, with a particular focus on small venture capital companies (such as Earth Viewer [now Google Earth], YouTube, Double Click, Grand Central [now Google Voice]). However, not all of their endeavours have been as well-received, nor are they as lucrative (e.g. Google Books, Gmail, Google's presence in China) and Google has failed to spot the importance of popular social networking trends, such as Facebook and Twitter (Auletta 2010). In search of the 'next best thing', Google are now looking to succeed in the area of mobile technology. Given Apple's swift rise to popularity, a strategy is needed that differentiates them if they are to gain a sizeable market share.

Google announced their Android platform for mobile phone development, which runs on open source, in 2008. Android was initially developed by a small start-up company (Android Inc) in Palo Alto that developed software for mobile phones; the firm was purchased by Google in 2005 and the co-founders moved across. Google released most of the Android source code under an Apache License. The unveiling of Android was announced at the same time as the founding of the Open Handset Alliance (OHA). This business consortium, led by Google, consists of around 50 technology and mobile firms (such as Telecom Italia, Samsung, Motorola, LG, Vodafone, and Intel) that are committed to advancing open standards for mobile devices. In contradistinction to its name, membership of the alliance is not publicly open and is based on personal invitation from Google (Grotnes 2009).

The first joint project of OHA is Android. By joining forces with mobile phone handset makers and carriers, Google has managed to pull together a diverse range of technology manufacturers who are willing to design and develop products that support the Android platform, thereby potentially spurring its growth with a broad industry base. HTC Dream was the first phone that was made available under the Android operating system (October 2008). At the time of writing, Android has a small (2-3%) but increasing share of the market; meanwhile a predictive report from the IT consultancy company Gartner (2009) is forecasting that Android will become the second most popular smartphone platform by 2012. The intention is for Android to create higher overall value than their competitors, thereby attracting operators, manufacturers, and application vendors to the Android platform (Grotnes 2009). This is intended to drive up the use of mobile services and create higher revenues for the operators. It is assumed that Google will generate profit by providing advertisement to mobile users, a strategy that is similar to revenue generation from the Google search engine.

The founding of the OHA by Google suggests that they are hoping to position themselves so that their operating system is available across a wide range of devices and carriers. It seems unlikely that they will aim to compete with a high-end, strongly aesthetic product like the iPhone, which has captured the market share of young, wealthy users that are keen to have an advanced handset (Ling and Sundsoy 2009). In terms of market, OHA's declaration that '*Building a better mobile phone would enrich the lives of countless people across the globe*' (Open Handset Alliance 2009) seems to imply that their strategy is the global distribution of a more economically accessible product. This is of particular interest given that the United Nations Report on the Information Economy (2009) provides figures which suggest that the mobile is emerging as the preferred ICT tool, with rapid increases in the numbers of subscriptions, particularly within developing economies.

Both Apple and Google operate in an environment that is turbulent, competitive and in a process of global development. Their search for new ways to create profits means that expansion comes in various forms and can include: the development of new commodities that were previously unavailable; spatial expansion into new parts of the world (particularly developing countries); and new forms of labour (Huws 2006). In the case of iPhone and Android we witness the creation of new products, the potential to expand market penetration into different parts of the world, and a novel way to tap into the creativity of expert labour, while avoiding any of the associated costs of direct employment. For mobile applications to remain successful new creativity is constantly required as the failure to innovate carries the risk of eventual displacement from the market, regardless of how good the artefact is. The creation of mobile application stores by Apple and Google effectively outsources product development as an open call to a global base of developers and amateurs that may wish to participate. This form of crowd sourcing has been

⁵ [www.apple.com/pr/library/2008/07/14appstore.html]

⁶ [www.apple.com/pr/library/2010/01/05appstore.html]

aptly named 'milking the masses for inspiration' by Business Week (2006). Consequently, the (arguably unlikely) potential to reap substantial financial rewards has meant that many IT workers have invested their own personal time and resources in learning new technologies so that they can become involved in the mass provision of content for the exponentially growing arena of mobile applications.

Evolution not revolution

Superficially, the mobile application market appears to represent a material change in the nature of systems development, creating low-cost consumer software that is available in abundance, easy to download, and can run on a mobile phone. However, rather than declare that these changes are of a revolutionising nature, we suggest that they merely build upon and accentuate a number of continuing trends within information systems development.

- Firstly, the commodification of software (Quintas 1994) that is developed 'at a distance' from the end-consumer, represents a shift in focus from software processes to products. This has been taking place for some time, notably with the development of enterprise systems as well as small scale, off-the-shelf software packages. The availability of applications for mobile devices merely continues this development.
- The rise and success of IT offshoring operates as the blueprint for the growing trade in the sub-contracting of systems development. The outsourcing of expertise to third-party developers and firms has facilitated a change in perception of managerial thinking. This is with regard to the acceptance of the fragmentation of software processes, along with the generation of faith in sourcing product innovation beyond the boundaries of the firm. Both Apple and Google depend on third-party applications developers to create radical, new innovations in the form of mobile applications. Their business model is based on the outsourcing of non-core activities whereby, as powerful high-tech firms, they retain a premier position within a satellite of distributed suppliers, while successfully outsourcing the risk.
- The emergence and growth of open source software (OSS) has created a virtual, globally dispersed model of systems development whereby expertise can be mined from an international talent base to create high-quality software. While OSS may have radical, anti-commercial origins as compared with mobile applications, nevertheless the emergence of OSS created a movement whereby distributed developers would work on creating innovative software products. Although we do not wish to imply that mobile applications developers are participating for altruistic reasons, as with some OSS developers, time is invested in mastering new technological platforms in anticipation of a future pay off.
- Radical innovations in IT artefacts and systems have often run alongside the restructuring of the IT industry. This has changed from a sector with large, bureaucratic organisations providing clearly defined career structures (as typified in the study of DEC (Kunda 1992)) to a sector with large amounts of outsourced contract work, resulting in boundaryless, project-based and portfolio careers (Barley and Kunda 2004). In order to survive in the industry, many IT workers have had to adapt accordingly; their response includes developing innovative, low cost products with broad consumer appeal, such as mobile applications.
- Finally, building on the growth of consumer confidence in the virtual marketplace, firms such as Amazon and eBay have laid the foundation for the success of portals such as the iTunes music store and the applications store.

Research Approach

In January 2009 we embarked on a study of developers' experiences in the mobile application arena. While qualitative research methods were used, the epistemological assumptions are more broadly interpretive (Orlikowski and Baroudi, 1991; Walsham, 1995) as we attempt to understand phenomena through the meanings that people assign to them as a result of human sense-making activities. The study was originally intended to be based in Sweden and the UK, but after experiencing problems in recruiting informants, the study was expanded to the US. These markets have significant levels of maturity in terms of handsets and the mobile application marketplace. For example, within the Android market, 65% of applications originate from US developers, 20% from the Euro zone

and 12% from the UK⁷ (Distimo 2009), which is reflective of the timeline when paid applications became available in these countries. Given the absence of any comprehensive list of mobile developers, random sampling was impossible and so we aimed to construct a heterogeneous sample in order to capture the experiences of developers involved in a range of different activities, with varying amounts of experience, and with a variety of contracts and employment statuses. Consequently, the sample is diverse consisting of a mixture of permanent employees, freelancers and entrepreneurs, and including a couple of ‘hobbyists’.

Given the lack of academic literature in the area, the study was exploratory in nature and focussed on the everyday work practices and experiences of mobile developers. We began with a pilot study that involved two face-to-face focus groups, each consisting of six Android/iPhone developers based in Sweden. This provided a vantage point from which to launch the broader study, feeding into the development of a semi-structured interview guide. We used this guide to ensure that all areas salient to the research were addressed, but were conscious of flexibility being one of the great strengths of qualitative research and so adopted a semi-structured approach. The recruitment process involved various channels including posting advertisements on forums, online communities, blogs, as well as sending personal messages via email and Facebook; the criteria we used was that participants were either Android or iPhone developers and had published at least one application. Both Android and iPhone developers were targeted fairly evenly but we found that Android developers were far more responsive, hence the study contains a greater number of participants from this area (14 iPhone developers, 35 Google developers; 5 of these worked on multiple platforms but as one tended to predominate, they were classified accordingly). Given the participants were either self-selected via electronic networks or part of a snowballing process, they are not representative of the population of mobile developers in a statistical sense, but our intention was to understand how developers make sense of their world, rather than survey them in order to test hypotheses.

We experimented with a mixture of face-to-face, co-located interviews, synchronous Skype interviews, as well as asynchronous online discussion forums. The format selected depended on the informants’ preferences and their geographical location. Each interview lasted from one hour to over two hours in length; all were taped and transcribed verbatim. In Sweden and the UK, the data collection entailed three face-to-face interviews and twelve Skype interviews, primarily with one but occasionally with two developers. There were three online discussion forums with developers based in the US: one with purely Android developers (18 in total); one with purely iPhone developers (7); and a mixed forum (2 Android, 2 iPhone). Each forum lasted for 10 days with a new question posted every working day. This proved a successful technique as one question per day was not perceived as an onerous task for respondents and so the response rate was excellent. The questions covered a range of topics including the respondents’ current work, their reasons for developing mobile devices and attraction to particular platforms; their experience of the platforms; the development process itself; and marketing and publishing strategies. In total, 49 developers participated in the study.

All of the data was inputted into the qualitative data analysis tool, NVivo. The method of analysis was based on an ongoing iterative process of reflection to help identify concepts and themes (Miles and Huberman, 1994). This was informed by our focus on everyday work practices and experiences, while remaining alert to emerging issues. The initial findings were shared with a broad sample of participants from the study and their helpful comments confirmed and elaborated these themes, yielding additional insights. The reaction of practitioners in the field is seen to offer a crucial validation of the interpretation (Klein and Myers, 1999). In order to ensure representativeness, the quotes have been selected from the full range of sites and are chosen as typical views. In the interests of anonymity, names of participants and their workplaces are not cited. The findings are exploratory and are intended to generate insights into the practices and structures that shape mobile application development.

Findings

Given the absence of academic research on mobile applications developers, in this section we provide a broad synopsis of the area in order to link the micro-level of the developer experiences with the business models of large firms. While a number of themes emerged from our data analysis, in this paper we have chosen to outline our findings by drawing on a simple organising framework that was adopted in one of the early papers that provided a summary of open source software (OSS) (Feller and Fitzgerald 2000) at a time when little was known about OSS in

⁷ Obviously the UK is in the Euro zone, but Dimisto separated this out in order to highlight the different trajectories and uptakes.

academic circles. The framework offers the following categories: who, what, when and where, why, and how. These provide a useful framing device for delineating an emerging research area and mapping out the various facets.

Analysis of the Who of Mobile Application Development

In our fieldwork the developers represented a fairly homogenous grouping with extensive coding experience and had each published at least one application. The age ranged between 15-49 years old, but the majority of participants were between 25-30. Those participants of graduate age had all studied technical programmes at college. The IT industry is notorious for the under-representation of women (Adam et al. 2004) and in this study only one participant was female. Around 40% of the developers were self-employed with over two-thirds working in start-ups. These developers were far more likely to work longer hours and forgo some of their leisure time for mobile development.

The respondents' skills were diverse in terms of platform knowledge and publishing experience, which spanned from one to more than forty published applications. While for many of the developers, the number of mobile apps they had published was in single digits, around half of them had published between ten and forty. Most of the developers tended to opt for single platform development in order to focus their expertise, although some developed across multiple platforms. Some developers worked on outsourced applications, whereby a third party organisation commissioned work on their behalf, but the majority 'owned' the product that they were developing. There were differences in levels of success and the amount of revenue generated. The number of downloads for their most successful application ranged from over 1m to just over 10,000. Most of the developers had downloads in the region of 50,000 to 250,000, but there were examples of some applications receiving zero downloads. Overall, there was some reticence to discuss the amount of revenue that had been generated and again this varied widely – from \$100,000 for the most active and experienced developer to just £40 for a developer that had released six applications. However, one multi-platform developer working at a start-up in Stockholm was still able to generate £2,500 from his least successful application (he had released fifteen in total).

While developers own their product and the associated intellectual property rights, they do not own the means of distribution, which is key to disseminating their artefacts. Developer access to the marketplace for the promotion and sale of applications was opened up by Apple and Google and while this was viewed positively by many mobile developers⁸, nevertheless it is entirely within the control of Apple and Google. In this respect, developers operate as commodity producers while giant technology firms are positioned at the apex of the industry, controlling the stores that showcase and market applications into merchandise for a global audience. The industry is defined by outputs and the types of products that are available, yet the market also consists of unpredictability and flops. This highly uncertain environment requires a constant stream of new products with the potential for mass sales, especially as mobile applications suffer from quick rates of obsolescence.

If we consider other creative sectors, such as film and television, we can see that making a product available on the wider market is a costly commitment (in terms of production, marketing, promotion and distribution) and so the decision as to whether or not to back an enterprise is presented as highly considered. However, if we compare this with mobile application development, most of the cost – in terms of training, product research, development time, and promotion - is borne entirely by the developers themselves. Arguably, the apps stores provide a means for marketing and distributing products, but this simply represents dedicated electronic space for transactions, with Apple and Google retaining 30% from each one. Seemingly more problematic for iPhone developers, Apple maintains ultimate control in deciding whether to allow apps to be made publicly available and, as the quote indicates, some are rejected: 'Occasionally we have had apps refused for no reason. You have heard all the horror stories and they apply to us' (iPhone developer, UK). One developer was irritated by the lack of transparency:

'Another problem is the inconsistency at the App store approval process. They actually rejected us once for a feature that wasn't functional apparently. But we can actually see from their server logs that they had indeed tested it and it worked, but they said that it didn't work, because they were doing it so quickly. They didn't give it their full attention. We know countless people that have been rejected for crazy reasons....'

In relation to users, while it is possible to gain user feedback from the apps stores, there is little information available aside from the number of downloads and stores do not offer any means for developers to respond to user feedback. From the developers' perspective, engaging in dialogue with users could be useful for enhancing upgrades and the

⁸ Previously the operators retained between 50-70% of the content revenue

appeal for future products, but in reality there is very limited interaction with the user community. Mobile applications are an example of a contemporary environment where the development is clearly distinct from use. It could be argued that one of the reasons why Apple and Google invest limited effort in establishing links between users and developers is because many applications are cheap and of a 'throwaway' nature, with only 1% of users who download an application becoming long-term users (Chen 2009). One study suggests that of the users who download free applications from the App Store, only 20% use the app the following day, and this number decreases even more as the days pass. With paid applications, the return rate is only slightly better, with 30% of people using the application the following day (Chen 2009).

Analysis of the What of Mobile Application Development

The *what* of mobile applications has been discussed in section 2, in the context of Apple and Google. Reiterating briefly, the development of wireless communications has introduced new players into the field of global telecommunications: the software and IT sector. This convergence of digital mobile communications and the internet combines the previously separate spheres of voice and data transmission into handheld mobile devices. This coming together of mobile communications and the internet has transformed the mobile phone from an artefact of voice and text transmission into a handheld mobile device with a powerful operating system that runs a variety of software. As mobile phone handsets became increasingly commoditised, technology firms began to offer new value-added services, but the focus was aimed primarily at delivering better business applications (e.g. with the Blackberry mobile phone). From the developers' perspective, creating applications required negotiating a professional contract with mobile phone firms and so many developers were excluded from this process. When the iPhone was launched in 2008, the market saw a shift to a more open marketplace, allowing developers to distribute their applications to customers directly via the App store. Although the iPhone is priced as a high-end technology product, its appeal reaches beyond business software, with the most popular downloads being applications related to games, followed by multimedia, lifestyle and travel (Gohring 2009). Apple's rapid success spurred a number of other players (vendors, operator, and operating system providers) to launch mobile application stores.

Analysis of the When and Where of Mobile Application Development

The development environment is generally one of rapid application, but this varies depending on the type of app, whether it is freely available or incurs a charge, and if the application is being developed on behalf of an outsourcer. The notion of time to market is crucial, particularly if it represents a new innovation, since developers do not want to find themselves in a position where a similar app is released.

For some of the developers the enduring problem of time pressures continues to frustrate. This is evident in the comment describing project development time:

"Lately, it takes forever.... It's just too long. I think our first version, which was pretty basic, took 3 months of evenings for two people. I don't know how many hours that is, perhaps hundreds. And now we have been working on them pretty much full time for the last five months. Some really trivial applications you can do in a day but ours are pretty complicated. Yes, months a really, really long time." (iPhone developer, UK)

Consequently, mobile development can be more time-consuming than other development arenas:

"Developing on a mobile platform takes a lot longer than developing on the web, and this is not just in terms of the code. We find there is approximately five times more code in an iPhone application than in an equivalent web application". (iPhone developer, UK)

In terms of where, crucially all development takes place on the iPhone or Android platform and, in this respect, ownership of the platform permits numerous interventions in development, distribution, and consumption; all of which are at the whim of Apple and Google and beyond the control of individual developers. Numerous participants commented on the difficulties that lack of control created, particularly with regard to transparency and consistency:

'One thing we would like is transparency and sadly even Google and Android have failed on this. We would like to know when the latest operating systems come in. We would like to know why our application failed the App Store process. We would like to speak with people who failed our application and explain that they are wrong. We would like the process not to take two weeks. ...Google promises that they will

release a new version of the operating system and they don't. They never respond to bug requests. They never respond to anything.' (Android/iPhone developer, UK)

Geographically, the developers are dispersed, either working in (predominantly small) firms or as individuals. However, contrary to the assumptions that new media work can be carried out 'anytime, anyplace, anywhere', online forums provide valuable advice and face-to-face relations remain worthwhile as developers create physical space in urban centres for regular meetings.

Analysis of the Why of Mobile Application Development

Business commentators suggest that the iPhone/Android platform is seen to provide new business opportunities for small firms and individual developers, enabling them to enter new markets (Juniper 2009). The financial risk is fairly minimal, since the outlay for the SDK is negligible for the iPhone (\$99) and free for Android. The new technology, its capabilities, and the process of mobile development were viewed positively by many: 'My main motivation to develop on the iPhone is because of the fun when coding for such a great device' (iPhone developer, US). Many developers were fairly partisan in their preferences, often making negative remarks about the platform they were not working on. However, there were a number of critical voices, as one iPhone developer in the UK remarked:

'I love the iPhone, but the reality of Apple lets me down relative to the dream they are selling. That is my problem with Apple, they sell a dream that they are only able to sell by brainwashing people'.

A number of interviewees were developing mobile applications to enhance their technical portfolio and to supplement their income. Of these, the majority lived in the US, developed on the iPhone platform or on multiple platforms, and worked in small companies that they themselves had founded. Some of the participants developed applications 'as a sideline' for extra income and also because they hoped to accumulate experience and increase their visibility. An Android developer in the US commented: 'My goal is to create a portfolio of apps that demonstrate my skill and opens doors to paid positions in programming'.

Developers see themselves as being at the 'cutting edge' of development and creating applications for mobile devices, as opposed to mobile phones. Apple and Google are recognised as leading brands and developers described other internet players as 'lagging'. Aligning oneself with a strong commercial player is seen as advantageous since their popularity offers a large addressable market, which is further supported by the app store for distribution purposes.

When choosing whether to develop for the iPhone or Google (or indeed multiple platforms) our findings point to developers making choices that are based on pragmatic reasons as opposed to an evangelical commitment to any one particular platform (see Table 1, which offers a summary of the benefits and drawbacks arising from the fieldwork). Many of the iPhone developers began to develop on this platform since it preceded Android and therefore they need a strong rationale to convince them to switch. Some are considering developing Android applications in the future, but this depends on Google's ability to extend their user base. Many Android developers were drawn to mobile development because of the open source aspect which enables them to share and reuse code. Android developers expressed reasons for choosing not to go with Apple: namely that the iPhone is 'too controlled' with numerous conformance rules, developing an app may not always lead to acceptance for the App store, the iPhone is a premium-priced and elitist product, and that a Mac is essential for development.

Android developers recognise that Google is a large enterprise and their current endeavours relate to 'hedging their bets' in anticipation of an increasing variety of Android devices and carriers. In this respect, the platform is used pragmatically in the hope of reaping benefits in the future, while working with an open source platform. As regards developing for multiple platforms, most of our participants had tended to adopt an 'either-or' approach, simply because this optimised their use of time and specialisation. However, for those developers operating in a business-to-business environment, developing applications that are sponsored by an outside company, then multiple platforms are used in order to expand reach to their target audience.

Table 1: Benefits and Drawbacks of Apple and Google

	Apple (iPhone Platform)	Google (Android Platform)
Benefits	<ul style="list-style-type: none"> • High-end brand with strong aesthetics • Available on the market before Android • Building on the success of iTunes, the legal and financial infrastructure for the Appstore is already in place in various countries, thereby enhancing geographical spread (In Dec 2009 Apple paid applications were available in 77 countries, whereas the figure for Android was 8) 	<ul style="list-style-type: none"> • Android can build on the success of Google • Open source platform, which enables the sharing and reuse of code. • Potential for greater market share given the variety of carriers and devices. • Viewed as ‘morally satisfying’ as compared with the more business-oriented approach of Apple
Drawbacks	<ul style="list-style-type: none"> • Limited user feedback • Limited communication with developers regarding upgrades and system amendments. • \$99 fee for the SDK • Requires an Apple Mac for development • Very limited feedback with rejected apps • Degree of censorship • Inconsistency in the approval process • Seen as ‘too controlling’. 	<ul style="list-style-type: none"> • Limited user feedback • Smaller user base • Limited communication with developers regarding upgrades and system amendments. • Does not offer the slick ecosystem that Apple can offer, whereby the Appstore, the website, and the iPhone seamlessly integrate. • Poor search facilities (seen as ironic given Google is a search engine) • The paid model has limited geographical availability (e.g. not available in Sweden)

Analysis of the How of Mobile Application Development

The respondents were mainly developing applications by themselves or in a small group within a company. If development was carried out in teams, they tend to be co-located within the same firm as opposed to distributed. Working either individually or as part of a small team required versatility on the part of many of the developers and meant that many were involved in the totality of the process. This contrasts with trends in systems development that veer towards mass customisation with fragmentation of the process and a lessening of control by individual developers (Quintas 1994). Mobile developers not only focus on software coding, graphics, interaction design and animations, but also idea generation and customer care activities. Here is a detailed example of the development process, which is reflective of many of the practices we identified from our data analysis:

“[With iPhone] the whole coding and iterating time takes a really, really long time. With that in mind we have to make sure that our products are pretty much perfect before we start coding them. What we tend to do is, we are working in notebooks, we sketch the applications, and if there is something that we are not familiar with we will then create a series of animations that we then show users and they can help tell us whether or not the sequence of the user interface is correct, how they are expecting it to be used, normal user experience stuff. Once we are happy with that... then we will start coding it. It would be kind of a rough version of the app to have the core functionality. This is usually in a process where we use existing libraries that we have already coded. We produce things quite roughly that are just barely functional and have a lot of errors, and then once the interface is set in stone and looks really good we will then simultaneously improve the aesthetics as well as improving the actual software behind it to the point where we are pretty happy. We then test it and test it and fix it and test it and fix it and test it until we can’t find any problems any more, and then we release it. We don’t really do much

in the way of serious unit testing; it's just too time-consuming for the iPhone. Once we think we are happy we push it through the App store and then ninety-nine percent of the users will be happy. One percent will call us and tell us that something doesn't work, and if it makes good business sense we will then fix that problem and release another version. We keep doing that until it doesn't have any problems any more or until it doesn't make any sense to work on it any more." (iPhone developer, UK)

Centring on the technological complexity of application development, most of the participants described the relative ease with which they became proficient, although this usually required a substantial commitment of their own time and resources. Some participants were able to reuse their expertise and many agreed that the process of mobile app development was similar to web development. However, the resources impose constraints:

"...you have more limited resources on a mobile and may need to think more about the design and development. It may be a bit harder on the mobile, but in general you need to go through the same steps." (multi-platform developer, Sweden)

While technical proficiency is clearly important, idea generation is crucial. Being the first in the marketplace to generate innovative and novel ideas is seen as key to success. This was described as follows:

"The first mover advantage, as it is commonly called, is extremely beneficial. If something is written once it's original, if it's written twice it's a cliché, and it is the same thing in software." (Android developer, UK).

Further demands are placed on developers since the marketing of products is vital. While application stores offer a virtual marketplace to targeted consumers, the proliferation of applications means that it is a highly crowded arena. Therefore, in order to maximise the attractiveness of their products to consumers, developers adopt a variety of different strategies. Having an application positioned in the 'Top 100' enhances publicity:

"In all cases but the most extreme, if you just put your app on the store and sit, it will fall into the abyss. However, with creative marketing and the right support, your app can achieve great popularity. I found that a review on the popular site TUAW boosted my apps sales a ton and that boost was enough to put it into the Top 100 Paid apps in the US which led to further success" (iPhone developer, US).

Developers are keen to release their app in a timely fashion and to a high standard in order to generate favourable product reviews and volume sales. Every new app is placed on the list of 'Just in' applications, therefore providing several releases of the same app allows developers to improve the product and further increase visibility (since every update is listed as 'Just in'). However, it is important not to release too prematurely, as it can be difficult to recover from poor ratings. Making available a free 'light' version may also engender user interest in the app before the paid version is released. One developer described the difference that this creates in terms of downloads:

"Free apps get more notice and more downloads than paid ones. Our apps (VoodooDoll and TwitterTime) can get around a hundred downloads a day when we charge 99 cents but get more than 2,000 downloads a day when it's free." (iPhone developer, US).

A couple of developers provided examples of how they linked related applications together into a cluster, in order to encourage consumers to purchase the set. This is illustrated below:

"My strategy for increasing my sales is to try and design my applications so that they interoperate. I will give you an example. The application I am going to be releasing in a couple of weeks is called Daisy Garden. It's an application that allows people to grow virtual flowers on their phones' desktop ... something fun that people can enjoy. The next application I am going to be releasing is something called Daisy chase. The two applications will tie together. What I am trying to do is to provide encouragement. When they buy the one application they will buy the other. The intention is that it increases the spend per user because although each individual application will be cheap, if you can get users to buy more than one application, of course you are making more money per user. And secondly, it increases the discoverability of the applications, and this is a concern I have in terms of marketing my applications. How are people going to discover that my applications exist? As the marketplace becomes fuller and fuller, it's harder to get people's attention." (Android developer, UK).

Many of our participants volunteered details of the strategies they adopted to maximise success, which is often adjudged according to the number of downloads, positive reviews, high ratings, chart position, and revenue. These included: being the first to solve a particular problem or provide a novel application; advertising with Google adwords and banner ads on various review sites; the linking of applications together on various web forums so that others will review your app for you; the provision of good user support in the hope that users will go on to promote

the app; using social network sites, which include blogs, creating videos of the app on Youtube, getting connected with expected users on Twitter; and releasing updates on a Friday in order to remain in the 'Just in' section over the weekend. Being reviewed in a high-profile distribution outlet is also advantageous since it may increase sales:

"I was lucky to get reviewed in MacWorld early on (August 2008) and I was the app store pick of the week once so those were good traffic drivers, but you really can't count on those things." (iPhone developer, US)

Given the sheer volume of applications that are available, visibility is a challenge. One developer explained how he enhanced exposure:

"Basically, developers need to treat iTunes as if it were PayPal, i.e. a payment/checkout mechanism. They cannot rely on just showing up in the App Store and being seen or purchased. I have a great website with a Flash demo. I advertise it with Google AdWords, banner ads, and print ads in iPhone Life Magazine, plus postings on review/user sites. I maintain an email mailing list with 10,000 plus users." (iPhone developer, US)

Discussion and Conclusion

The aim of this paper has been to provide an overview of mobile application development and to situate this within the broader context that structures the practice. Our focus has been on Apple and Google and their mobile application platforms since these large IT firms are seen as being either current or potential market leaders. By providing detail on the companies themselves and the evolution of the platforms, we offer insights into the emerging business models that are shaping the conditions and environments within which developers operate. By broadening our focus from the micro-level practices of developers, we are able to contextualise how seemingly new and distinctive technological artefacts and practices build on ostensibly unrelated developments within the field. Therefore our argument is positioned against the tendency within the mainstream IS literature to declare a paradigm shift whenever new practices emerge, such as mobile software applications, and instead we suggest that these developments represent a process of 'accentuated evolution' (Kautz et al. 2007), which builds on a number of continuing trends, such as outsourcing, open sourcing, and the commodification of software.

While a number of these trends have laid the foundation for mobile application development, outsourcing is especially relevant here. Studies point to the increase in IT and ITES (IT-Enabled services) offshoring as ICTs have a profound influence on work organisation and its geographical diffusion. As the impact of the financial crisis intensifies in many developed economies, one can assume that this upwards trajectory is set to continue. Yet, despite these trends, offshoring, although advantageous for many, continues to be beset by a host of problems (Oshri et al., 2009). There is a trade-off when searching for a lower-cost solution that may involve compromising within an appropriate cultural context and regulatory framework. In this respect, the desire to leverage lower costs remains the principal economic driver behind the relocation; however other elements enter into the equation and it is an ensemble of factors (including infrastructure, connectivity, telecom costs, regulatory environment, skills, educational levels, managerial knowledge, linguistic capability and cultural empathy) combined with the lowest possible costs that provides the basis of comparison between places and informs locational decisions.

Turning to the outsourcing of mobile applications, we can see that Apple and Google have managed to successfully erase many of the problems and challenges that face firms wishing to outsource aspects of their business. Issues of infrastructure, connectivity and regulatory environment are determined entirely by Apple and Google and their ability to set up online stores in national settings. Once this is established (and here Apple has far greater penetration, riding on the back of the success of iTunes) there are no limits as to how many applications can be submitted by developers and made available to download. Many outsourcing firms are attracted to lower cost locations because labour regulations and human resource policies are comparatively lax. In the case of mobile applications developers employment contracts are immaterial as there is no alternative other than freelancing, in the hope that revenue will be generated. Drawing on the global labour market of systems developers enables Apple and Google to leverage a highly educated and technically competent workforce that largely consists of individuals who take personal responsibility for the updating of their ICT skills. There is no need to specify a contract or deliverables, since mobile application developers readily supply huge numbers of applications to the online stores. A key problematic regularly picked up by the media concerns issues of linguistic and cultural compatibility with offshore destinations, but these are eliminated as the vast majority of developers are based in Westernised, developed economies.

By outsourcing idea generation to a broad and dispersed population of IT workers (crowdsourcing), Apple and Google have managed to capitalise on the production of large quantities of software products that have a rapid turnover rate, while at the same time managing to avoid the incurred costs of directly employing a high-skilled workforce. The transactions that take place between the Apple/Google marketplace and developers occur virtually and enable Apple and Google to draw upon a large, international spread of developers and reap the benefits of mining talent from a large base. This business model supports Apple and Google's imperative to expand in the context of competitiveness and rapid change. At the same time, the 'myth of Silicon Valley' (Tapia 2004), which is based on the belief that hard-working individuals can become overnight millionaires in the IT industry, combined with unstable, individualised and competitive working conditions, ensures a continual supply of innovation. It remains to be seen whether this business model is sustainable in the long-term.

Analysing the qualitative fieldwork with mobile application developers allows us to sketch out how they respond and adapt to this emerging market as they work in an industry that operates within a cycle of continuous change. Situating developers experiences within the broader context of the mobile applications market allows us to point to the shifting nature of software work, while illustrating the attraction for developers. For them, the opportunity to work on new and 'leading edge' technological platforms, which demands distinct levels of creative expertise, often within the totality of the systems development process has much appeal. However, there are a number of drawbacks, which include working in a highly competitive and increasingly saturated market, the lack of consumer feedback on products, and the problems associated with being in position that reacts and responds to Apple and Google rather than one of greater influence and control. The framework helps reveal the everyday working practices of IT professionals, which are far too frequently romanticised as IT workers are portrayed as either geeks or pioneers that are driven by the desire to 'crack the code' or 'scratch the itch'. While creative workers are seemingly in high demand, the new economy labour market is increasingly precarious (Huws 2006), often typified by short-term contract work, long hours, the need to constantly keep ahead of latest technological developments, increased insecurity and instability, and work intensification (Evans et al., 2004; Greenbaum and Stuedahl 2000; Tapia 2004). In contrast to the seductive image of pioneering innovators, many IT workers are simply striving to survive in this competitive sector.

Drawing attention to the precariousness of the IT profession is not intended to downplay the positive side of creative work, which still retains its appeal to young people who are attracted to the potential for autonomy, social prestige and self-expression associated with working in the industry. A sense of personal satisfaction may still exist, but this is often in a highly competitive environment, where individual stardom and high financial returns remain elusive (Huws 2006). The difficulty with the creative industry is that ideas may have a short shelf-life – hence the cliché that you are only as good as your last idea. The success of the mobile applications business model is based on the continual generation of innovative ideas, ideas which may have limited durability. As our study shows, the mobile application market is highly competitive and recent figures attest to the huge numbers of applications that are available. Drawing attention to products is a challenge and the comparatively low cost of these software commodities requires volume sales. Developers have responded in inventive ways to enhance publicity in the hope of maximising downloads, yet the market is becoming increasingly crowded and applications have limited shelf-life.

Some may consider that a limitation of this study is that it does not allow us to determine how broadly the findings apply and a survey may be useful in this respect. Our exploratory study was intended to generate some initial insights into this under-researched area which could be refined and expanded upon in future work. The framework that has been used in this paper has been useful for outlining this emerging area, and no doubt the application of robust theory would illuminate other aspects which we have chosen not to focus on. We would welcome more research, particularly of a longitudinal nature, since that could allow one to follow the life histories or career narratives of individual developers, or to gain insights into how particular firms operate. This will enable a more sophisticated understanding of an increasingly relevant area of systems development.

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