Application-based mobile devices in design education

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Abstract
This paper researches the rise of application-based mobile devices and their effect on product design education. Information was obtained from design students and design professionals regarding applications-based mobile device they use and in what ways. A niche market was shown to have been created by smart devices as a large section of the population would like cheaper, simpler devices. The most common use of applications were sharing and presenting work as opposed to creating it directly on the smart devices. The findings of this work reveals the limitations of an ‘all in one’ smart device as currently they can only combine simpler and cheaper product functions but will have to work with the top of the range technology. In conclusion, smart devices have developed into multifunction devices and have therefore made certain areas of product design obsolete.

Keywords - Application-based mobile device, product design education.

Introduction
Over the last six years, there has been a notable increase in the rise of application-based smartphone and tablet devices in everyday use. As such, smartphones and tablet devices have become ever more prevalent and now seen as the ‘must have’ lifestyle and business accessory. In July 2012, fifty five percent of mobile phone subscribers in the U.S. owned smartphones (Nielsen 2012). The work reported here investigated the effect that smartphones have on product design through attempting to answer the following questions:

I. Are smartphone and tablet computing devices making certain electronic products obsolete?

II. Are there new niche markets emerging as a result of smart device application ‘App’ development and what are the implications for design education?

Questionnaires were answered by design professionals and undergraduate designers which sought to elicit their opinions on app-based devices that they use in their workflow and on market trends in application based devices. Furthermore, this work attempted to investigate new market opportunities for smart device applications in product design and whether some products have become obsolete as a result of their functions being incorporated into smart devices.

Literature Review
The Smartphone, known by almost everyone, since the first iPhone was released by Apple in 2007. It was deemed so far ahead of the competition with its novel ‘app’ based system of phone utilities and customisable applications compared to feature phones at that time (Anthes, 2013; Charland, & Leroux, 2011). The app store was launched in 2008 with third-party creation authority which meant that anybody could create applications for people to download and use (Apple Inc., 2013). The App...
Store has a library of approximately 900,000 apps, 375,000 of which are for iPad as at December 2013 and fifty billion apps have been downloaded of which half of which were downloaded in 2012 (Indvik, 2013). The basic idea of apps was introduced by plugging in a memory card that could add even more features like a camera, maps and music.

**Companies in the App-based Marketplace**

The mobile application industry expected to rise by 62% in 2013 to $25 billion (Lessen and Ante, 2013). This a very lucrative market with many economic opportunities, due to the ease of app creation, for small and large software companies alike that are desperately trying to create the most popular application. The only problem with this plan is that there has been a severe lack of talent development needed to succeed in this business. This market gained popularity so quickly that software companies could barely maintain pace with such rapid developments and found it difficult to recruit highly skilled mobile programmers needed to create the high quality applications (Ståhlbröst and Bergvall-Kåreborn, 2013). The initial solution initially was to subcontract this work as companies have a few veteran experts trained in the field and are now hiring graduates for instant, learn by doing, training. The Application market can be argued to be beneficial to the job market as it is creating a vast amount of jobs for these IT professionals but is it having a negative impact other areas of design? If designers are graduating directly into user-interface and app design who will design the products for them to run on?

**Products Rendered Obsolete by Smart Device Apps**

With increasing features accompanying each release of smartphones and tablets, there are issues for older products that could be being deemed obsolete by the so called ‘all in one’ products. The phrase, ‘There’s an app for that!’ rings true as now there are very few things that a smartphone cannot do, ranging from Global Positioning, note-taking, speech recording, internet, word documents, conversions and the list goes on (Nicolaisen, 2012a). There is quite a long list of practices that have been taken up by app-based devices such as note-taking or using paper maps but in terms of the design world certain product makers are being outpaced by the smartphone (Bloem, Doorn, Duivestein, & Sjöström, 2012). For example, the point- and shoot- camera and the flip camcorder to name just a few are no longer produced. In 2011, Cisco announced it would be closing its Flip mini cam business as the global shipments of digital cameras from Japan fell 42 per cent in September from a year ago to 7.58 million units, with compact offerings falling 48 per cent, according to the Association (Gurney, 2012).

**Market Opportunities in App Based Products**

Many Companies are beginning to realise that devices like point- and shoot- digital cameras are falling in sales and they need to be redesigned in clever new ways. The addition of wireless networking (Wi-Fi) and social sharing are prospective ways forward. Digital cameras that can now instantly upload to social networking sites such as Facebook, wherever the photo is taken and shared at close range really adds to the digital camera experience (Edwards, 2013a). Simple
devices like personal digital assistants PDA’s have also been updated with Wi-Fi and has been helped possible by the less technology minded generation staying with the times without having to purchase complicated, expensive devices they have no idea how to use.

Cost is a key ingredient to the new idea of fewer features are more, a good example of this is the Kindle e-reader from Amazon that has very simply automated the process of buying and reading many books with low power screens on an elegant tablet device (Edwards, 2013b). Smartphones were becoming as small as possible but with new technology some can barely fit in our pockets - thus smaller was better until phones got smart. It has become evident that they are in fact increasing in screen size as smartphones and tablets are used as progressively used as replacements for laptop computers (Page, 2013).

Convergence of Features on Devices

The convergence of features concerns combining different devices into a single multi-function product like the Swiss army knife (Nicolaisen, 2012b). Convergence represents technological developments which result in an end-user having much greater choice and control over his or her consumption of content in the home and/or on the move (Phillips and Enser, 2011). Nevertheless, a crucial aspect of this is that manufacturers achieve an appropriate combination of features so as not to annoy the customers with pointless features that they would never use or something that really needs to be left out. How the user acts towards the product is very important with a balance between fun and utility engaging the user and creates an emotional bond with the product (Page 2009).

The Demand for Smart Devices

Even with so many smart phones introduced to the market in the past few years they are beginning to take a backseat already with the emergence year of the tablet. ‘Worldwide shipments forecast to total 197 million units in 2013: a 69.8% increase on 2012 shipments of 116 million units. By 2017, Gartner expects tablets to be out shipping desktop computers and ultra-mobiles combined’ (Lomas 2013). The battle for technological supremacy is shifting to larger and more capable devices that are aiming to even over turn the long rain of laptops and PCs (Citrix Systems, 2012). This may become the ‘all in one’ mobile device that will be a smartphone or tablet. The only issue outlined with smartphones replacing laptops will be the interface that is limited by the small size of the screen. A combination of the tablet and mobile could be in order with the ‘phablet’ coming to light as a compromise between the two. However, is this collaboration too far though with improved function but reduced practicality?

Nevertheless, through the analysis of sales figures there is supporting evidence that that smart devices are killing off some areas of product design. The digital camera is an obvious choice for the example as this is an area that looks to be most affected at this moment in time. Sales of digital cameras have fallen dramatically, declining by as much as 29% since 2006, to a value of £598 million in 2011. Today, just under one in ten (8%) UK adults - equating to 3 million consumers -
now claim that they are likely to use a smartphone instead of replacing their current camera when it breaks. The market was valued at an impressive £843 million back in 2006, by 2016 it is forecast to have declined to just over half a billion (£523 million). In addition, the picture is no more positive for camcorders, which have experienced a 21% decline in sales over the past five years, down from £354 million in 2006 to £279 million in 2011 (Mintel Oxygen Reports, 2012).

**Implications for Design Education**

Hwang, & Tsai, (2011) reviewed the advancement of mobile and ubiquitous learning research from 2001 to 2010 based on the articles published in six major SSCI journals. It is found that the number of articles has significantly increased during the past 10 years; moreover, researchers from other countries have contributed to the related field in recent years. These findings served as an extant baseline for further work in the application of mobile and ubiquitous learning research in Design Education.

Hsu & Hwang  (2012) found that students utilizing context-aware ubiquitous learning achieved better effects than those with conventional technology-enhanced learning. Moreover, with context-aware ubiquitous learning, the field-independent students presented higher acceptance of cognitive load, and more positive learning experience, learning perceptions, learning satisfaction, and learning attitudes than the field-dependent students. In assessment, Hung, Hwang, Lin, Wu, & Su, (2013) developed a series of worksheets as scaffolding to support inquiry-based ecology observations in a mobile learning environment.

The results from a study undertaken by Hung, Hwang, Su, & Lin (2012) suggested that a well-designed concept map integrated learning system demonstrates very promising potential for enhancing both the gifted and average students’ mobile observation competence. The system developed in this study could be a useful resource for elementary school outdoor learning design. Hwang, Tsai, Chu, Kinshuk & Chen, (2012) presented a context-aware ubiquitous learning system with sensing technology to detect and examine the real-world learning behaviours of students, such that personalised learning guidance and feedback can be provided; moreover, the students’ experiences of operating those scientific devices, such as solar power equipment or the constellation simulators, can be conjunct to the knowledge learned from the textbooks. The experimental results from a science course of an elementary school showed that this innovative approach is able to improve the learning achievements of students as well as enhance their learning motivation. Shih, Hwang, Chu, & Chuang, (2011) conducted an instructional experiment in an elementary school with 64 sixth grade students shows that the innovative approach is able to improve the learning achievement, learning effectiveness, as well as the learning attitudes of the students.

Yang, Hung, Hwang, & Tseng, (2013). showed that the concept map-oriented ubiquitous learning approach was significantly more helpful to the students in reading printed books than traditional book reading and the conventional ubiquitous learning approach in terms of learning achievements; moreover, the students had a high level of acceptance of such a mobile technology-assisted learning system in terms of “ease of use”, “usefulness” and "attitude and intention of future use". 
Yin, Song, Tabata, Ogata, & Hwang, (2013) devised and implemented a framework, such that students could experience the following: (1) learning in augmented reality by playing different participatory roles in mobile simulations in the micro-world on a mobile device, and (2) interacting with people in the real world to enhance understanding of conceptual knowledge. The experimental results show that the system was conducive to the students’ experiential learning and motivation. Moreover, the students who learned with the proposed approach gained significantly higher accuracy rates in performing the more complicated sorting algorithm. It is, nevertheless, clear that application-based mobile devices offer design education a great deal of opportunity for further research and evaluation.

Research Methodology

Two questionnaires were created aimed at two target groups. The first group comprised design students who are currently learning and experiencing how smart devices and apps effect their education and design work. The second group - design professionals, to establish their views on their observations over the last five years since the advent of smart device application development and proliferation in product design.

The students were asked in general what devices they use in their everyday work and how they support them in terms of design. This should help determine whether smart devices are influential in this area and/or whether they are still not developed enough for such complex functions to support design work. Next a view into the students’ education was considered with questions about producing new products and whether apps are always in mind when creating them. This may determine whether there is a certain mindset that young designers have and whether they think they need applications in many new products or not. Finally their views on certain theories such as the new niche and the job prospects of app design after their studies will be recorded.

The questionnaire aimed at the professional designers is slightly different and focuses on what smart devices and apps do for them and their design work. By finding out how they use their devices for design, either for creating or sharing, this will give a good indication of the current limitations of the apps or devices and whether this could be improved in the future. The balance between old and new will be an interesting argument since designers in this sector would possibly be used to pen and paper given the emergence of smart devices over the past five years. Finally, they were asked their views on new market opportunities and to whether they believe that certain areas of product design have affected.

Questionnaire Results by Design Students

In total, there were one hundred and five respondents to this questionnaire survey. The first question shows the trend of how far smart devices have found their way into the majority ownership and fifty percent of the respondents own and use tablet devices. Figure 1 shows devices used by students on a day-by-day basis where all students used smart phones for taking notes, recording lectures, photos and sketching in conjunction with the normal phone and text functions. It is
becoming a commonly held view that ‘your whole life is in your phone now’ and it seems that this rings true as no-one would leave the house without it, as it is seen now as a lifestyle necessity. The use of tablets have been increasing over the last 2 years with iPad sales alone increasing by 69.8% from 2012 – 2013 (Lomas, 2013). Now that we can have everything on our phone converted to a bigger screen that is still very simple to carry around, it seems that this could slowly be preferred to much bulkier, heavier laptops.

![Figure 1: Devices used by students on a day-by-day basis](image)

Interestingly there was one mention of a ‘not so smart phone’ that shows that not everyone has jumped aboard the smart bandwagon and that these kinds of phones still exist for their designed single purpose of calling another phone. This begs the question, ‘if you have so many smart devices doing the same thing why not retain an old phone for peace of mind?’ It’s cheaper and stronger with far less emotional attachment by the user who probably would not mind at all if they dropped or even lost it. This is the one advantage of the older phones that may need to be implemented into the smart generation with stronger more resistant handsets as they are used everywhere and all day every day. Some companies are slowly implementing this idea with possible waterproofing so don’t be surprised to see this increase with better technology in the future. Furthermore, it may be seen that laptops and computer are still used due to the extent of work that people have to do but from a sheer transport view its becoming far more regular again to have a desktop PC at home and connect it to all of your devices on the go than take something heavy with you.

**How useful are these Apps?**

The next task was to find out how useful these apps and devices are in terms of completing design tasks. The users were asked to rate how they felt about using certain apps to help with design ranging from 1 being not at all and 10 being they couldn’t live without them as may be seen in Figure 2. From the data it is clear to see that it was split fairly 50/50 with the highest single value answer at the ‘not at all’ end of the spectrum. This is surprising due to the amount of apps available on the smart devices. There are a limited number of advanced design-assisting apps available with
complex features like CAD packages or Photoshop. However, there is a different way of looking at this question. If apps are helping with the design work in terms of data storage and note taking then they could be construed as very helpful. This is the mindset of the closest set of results at the high end of the spectrum with 6 people rating above 7. This is backed up by the kind of apps that are listed as their favourite.

![Figure 2: Use of apps in design work](image)

The most commonly used app was Dropbox showing that the effective apps at the moment are not actually helpful with specific design work but the management of documentation. Smart devices have enabled users to combine necessary tasks into one place, which in turn assists the designer’s work, be it note-taking or quick sketching. Even though the core functionality is not present the various viewer technologies make presenting and sharing the work easy. It will be possible in the not too distant future to have the high processing power design applications on the tablets making it a useful design tool.

**Perceived Limitations that Mobile Devices have on Design**

With the increasing market of products with accompanying apps and the endless list of features on the latest smart devices, it poses the question whether the task of coming up with something new is as simple as it used to be? Obviously the million dollar ideas are always the most elusive but now looking back at the origins of the smartphone one must conclude, that they make a lot of practical sense. Having everything connected to a small, light, rectangle in your pocket actually is very convenient. The students were asked how this affects how they come up with their project ideas and to whether they feel at all limited by smart devices. Fifty eight percent of the user group stated ‘to a certain extent as apps are everywhere with products’ with a further twenty five percent helping to confirm by answering ‘Yes I did, as tablets and phones can do so many things now!’ With the remainder of the participants answering that they didn’t think it affected them it clearly shows that even at this early stage in education that the rise of smart apps are having an effect on the design community. The result of this effect has been that the designers have developed applications that accompany certain products they create. Even lamps and furniture can be controlled by mobile apps today due to the ease of use from this master device that everybody has.
User Experience Design (UX design)

With the increase in app-based devices there is an increased need for good interaction design. It is becoming ever more important to have a user-focused app with intuitive features and aesthetically pleasing design as if not it will never succeed in the sea of 775,000 (300,000 native to iPad) as of Jan 2013 (Costello 2013). Interaction design covers the entire use of an app, be it from what it looks like to how the user can navigate around its many features. However, it is not just limited to mobile applications as everything from satellite navigation systems to games consoles need the same approach to make the experience engaging for the user (D’Souza, D, 2010). The students were asked whether they felt that due to the increase in app design being a necessary skill for so many new products whether they should be taught it throughout their design education. This needn’t be computer programming as such but simpler user interface design to have a better understanding of how to arrange an application. Eighty six of the students stated that they felt that they could benefit from it in the future, which shows that the younger designers know that this would be an important skill to have in industry. This area of design has been shown to be struggling to find the amount of skilled programmers it needs and by starting to learn early the job prospects for those that do could be dramatically increased. Would being taught the subject change their mind?

Students had this to say “User research was probably the most important and most applicable to all areas of research. This module really excited me and has pretty much been the only module that I fully engaged with and found most rewarding!” “If people find navigating an app so difficult imagine how some people find operating a product. In this sense it opens up your eyes as a designer to how other people may use your product.” From these comments alone it is clear to see that other designers are applying these skills to all aspects of the profession.

Market Opportunities Created by Mobile Device Applications

It was outlined earlier that tablets are gaining more and more features by the minute and hence moving closer to laptop and PC functionality. The question is: do the public want this in their electronic devices? The first company to hit on this idea was Amazon with the Kindle e-reader. The ability to change books into a 5mm thick rectangle is nothing short of remarkable. It’s lighter, easier to read, you can carry it on a plane and have it on the beach in direct sunlight and you rarely have to charge it! It’s underrated as a product but it has solved almost every issue with the common paperback book. As the slogan states ‘you have millions of books at your fingertips as opposed to going to a shop or a library to pick out just a few’. Considering how well these devices have performed with only one feature it poses the question. Is it possible to go further with a single function device for a different task?

The participants of the survey were asked whether they believed this question and if it could expand in the future. The data showed a unanimous result that this was in fact true with only slightly varying views on the subject. Not a single person believed that this effect was not present in the design community. Forty four people answered yes to the question with the belief that it
could go further in the future with a sixty one participants also agreeing but commenting on its limitations. The argument is that this could be a lucrative area but maybe only in the short term. Most devices now are just touchscreens of varying sizes so where else can they be applied? As stated earlier, companies making digital cameras have added features like Wi-Fi to keep them competitive becoming the expected requirements from a standard device. If the term ‘less features’ is used instead of ‘single feature devices’, it may open a few more niche areas.

**Single Device Preference**

With the evidence that app-based devices are dominating and are looking as if they are here to stay, it is difficult to see it changing any time soon. Could there ever be the return to multiple devices as we are currently used the smart devices we have now? The results from asking this question are interesting as it was anticipated that the majority would be adamant that they would not change now but this was not the case. Fifty one of the participants said that it is just easier this way, which is true as not many people want to have three or four products in their pockets instead of one but an equal number of people were open to something different if it was a good option. With a small, thin rectangular screen where is the change and creativity that some people are looking for? As always these days there are trends and phases that technological products go through that could die out in a few years if history can be the judge but the mindset has definitely changed about smart devices. In the past many people felt they would not buy an iPhone and now inevitably own one. Again we should challenge the thought process around the use of multiple or single devices. The new meaning for multiple devices is a smartphone, a tablet and computer. All are smart and equally important in the modern way of life.

**Questionnaire Results – Design Professionals**

The same structure was used as the previous survey with multiple choice answers and tick box options. The questions are aimed towards professionals in the design industry to elicit their opinion on the literature outlined earlier and in the student survey. The results can then be compared between the two areas of the design community for a broader conclusion. In all, there were twenty three respondents to this survey.

**Devices Used and their Benefits**

Here it was important to find out what devices the professionals use day-to-day and what effect it has on their design work. All the participants said that they use both smart phones and tablets all the time showing that there is not always a preference for one or the other but both find specific uses in different situations. How people use the devices vary more though with seventeen participants saying they use specific design apps with the rest using them more for calendars and reminders. There is no doubt that the smart devices have streamlined the organisation of an individual with a digital diary and calendar with various reminders and features. In the professional world this is a very important element to their design work and the cross compatibility between devices in the home, on the go and at work make this task extremely simple. The advancement in
the technology moves them away from the old Palm Pilot era and into something far more engaging. The general trend seems to be that the designers are beginning to use tablets and phones for more with specifically helpful apps. As we saw with the students their list of useful apps were all examples of always being able to access their work when switching between devices. Again the best example of this is Dropbox verses the USB stick with the speed and access to files dramatically increased. Because of this ease of use it is not a surprise to see that four out the five professional surveyed personally chose to purchase the devices and have therefore found them useful for their work. The final individual found it necessary to purchase the devices to keep up with the trends and his co-workers who were already using them.

**Personal Preference for Smart Devices**

However helpful smart devices can be with certain tasks, there will always going to be areas that such devices cannot yet support. With note-taking slowly slipping away with the combination of voice recording and speech recognition what else could be moved to the digital age and be made better and easier. The results to the question of preference between applications and the ‘old way’ were broad across the choices but equally interesting eighteen respondents stated that they ‘use both traditional tools and smart devices on a regular basis’. The final four answers confirm this as one answered that they, two that they ‘prefer the old way during the design stage’ and one said that ‘pen and paper were best where possible.’ Five respondents expressed a limitation to the technology on the tablets, in particular, as nothing has come quite close enough to sketching with a pencil.

It is acknowledged that there are many drawing tablets around that are used to produce highly defined images and many designers use them on a regular basis. With improved touchscreen technology it may become a very comparable feeling drawing on a screen to drawing on paper. It is also easy to interpret the benefits if this became true as the reason the population like smart devices is that there are essentially tens of useful products in one place. If sketching can go this way too you could have a tablet that stores pages and pages of drawings with templates and different paper types with one stylus comprising of all the pens, pencils and markers you could possibly need. As the student survey showed the main reason for a change in technology is because the alternative is just as good. Comments made by respondents comprise.

- “The phone/tablet use tends to be more for presentation/review rather than creation as the Apps are really there for that yet - certainly not for 3D model creation or rendering”
- “Despite having apps for sketching I prefer to use pen and paper”
- “It depends which stage of the process you are at. A mix of inspiration/tech insights etc. from the internet, quick sketches paper/digital lash up models and CAD are used.”

**Specific Stages of Use**
There is the understanding that the designers like to use the original pen and paper at certain stages of a products design where do the smart devices specifically help? Fourteen respondents declared that the apps on smart devices help most with sharing the initial ideas between colleagues with another individual happy to use both forms regularly. Apps are more of a visual aid be it presenting or reviewing and are preferred to showing complex information that may be limited by solely using paper. For example, a 3D model can be shown and interacted with promoting the form and function of the design as opposed to photos printed on paper. Another use that has been identified is simple the accessibility of data on the move in terms of a simpler way of using the Internet. There are so many different apps out there now for magazines or specific websites that are used fundamentally for inspiration around the topic or catching up with the latest news. The cross application compatibility is key to why the devices are so successful with the ability to find a product or an article and share it with countless people through Facebook or Twitter and instantly gain a response straight back. Facebook groups have changed how to push information to many people in one go without the need for a mass email that is long winded and complex. For a group of student designers, the ability to set up meetings or ask questions to specific people really speeds up the productivity. All these areas seem to be most effective when helping designers with their work. In turn there will be more powerful applications that can also be used on the same device making a design concept for example, efficient and easy. Participant comments comprise: “The devices are really better for sharing/review/presentation to clients”; “The tablet helps capture meetings and discussions but sketching is still best done on paper”; “Apps like Pinterest are invaluable for inspiration and Facebook for quick chats with remote workers/collaborators”; and “There are not enough powerful apps for actual design work but the viewers are very useful.”

**Compatibility and Companion Apps**

As professional designers, the respondents will have witnessed changes that have been made in terms of product design and smart devices. It is clear that there have been advancements in mobile technology in the past five years with tablets following closely behind. The trend that has been harder to notice was the rise of the companion app and compatibility features between products and smart devices. It sounds obvious now to think that certain products come with apps that could control it or tell you how it works but as designers, has this caught on as a necessity to stay up to date? It is not a surprise to see that all the participants said there has been a steady rise in compatibility and that you cannot help but notice the sudden boom of the devices. The interesting side of this question is that again it raised the topic of ‘viewer’ applications. Every shop or website has an app now and even TV shows and computer games, but now you see computer companies making simpler versions of their software for the mobile devices. As we have seen from the previous data these kinds of applications are currently the most useful to designers.

**Popular Devices**
To help answer the first question asked at the beginning of this study, ‘Are smartphones and tablets making certain areas of product design obsolete?’, the professional designers were asked to what extent they felt some products have been killed off because of the smart devices. The notion that smart devices have killed off certain areas of design is compelling as the evidence for it is all around us. The majority of us now own smart devices and use them for tasks that would once have been completed by separate products. The key to answering this question may be not just a simple ‘yes’ or ‘no’ answer but to find out to what extent this effect maybe happening.

Due to the development in smart phones and tablets the most popular answer was that nineteen of the participants can see some areas of design are being surpassed by new devices. Four respondents stated that to an extent it seems that companies are being pushed to make their products better than the smart devices possibly with increased functionality but more importantly with something different and clever to set them apart. There was also an interesting comment raised by one of the participants. “Mobile phone cameras have all but killed off compact cameras, but it is unlikely that the need for SLR cameras will be removed in professional scenarios”.

This is a great example of where the limitation is for the smart devices. In the future the gap between the everyday devices and the professional ones may be much closer but it may never be removed. This is an argument against the ‘all in one’ product solution and how there is again a limitation of how far it can go. Professional products are always going to be the best at what they do so companies that are being surpassed by the smart devices has the incentive to create a product closer to the professional quality or by doing something new, different or cheaper to stand out from the standard devices.

**Market Opportunities Created by Mobile Device Applications**

The majority of the participants answering ‘yes’ to there being a niche market opportunity but with the underlying comments highlighting that there were limitations. Now it will be interesting to see whether the professionals have similar views. The example comparison made was a Kindle verses the iPad and there were fourteen answers confirming that there do seem to be different markets for less complex devices. As a link to the previous question there were also nine answers for the comment that companies have to come up with better ways to compete with the smart devices. Again this all comes back to the increase in competition and how companies are striving to maintain sales and evolve their product to prevent early obsolescence. The last comment was the only one against saying that they did not think that people do in fact want less features. This belief is in the minority but still points towards the overall conclusion of limitations in terms of the niche. “It’s about priorities of features and this will give rise to more differentiated products.”

The follow up question to this was to whether they believed that this niche market could go further in the future and do well? The answers were again very consistent with previous comments as 20 respondents said that it does indeed push companies to be more adventurous with the technologies. The final answer was again commenting on the limitations of such marketing opportunities but still thinking there was some scope in the future. “Extremely low cost simple
products that do similar things may be required. Go pro cameras are wonderful for capturing interesting activities, but are expensive and unreliable. Cheap smart objects could open up a whole new world of video and data gathering”.

**Reliability and Validity of Data Collection Methods**

The online questionnaire was double-tested in a ‘technical’ manner and in the ‘running’ of the questionnaire as a whole. One of the primary criteria for the evaluation of this research tool is the demonstration of practical usefulness, including relevance, simplicity and ease of completion by the respondents. Lehtonen, Page, Thorsteinsson, and Hepburn (2007) devised a test based on the number of responses (response rate) to the questionnaire in relation to the total number of invitees. A weak response rate was deemed to show less than fifteen percent response rate. A semi-strong response rate was one in the interval between sixteen to forty five percent. Finally a strong response rate was deemed to by fort six percent or above. This study fulfils the strong response rate as there were two hundred and seventy four responses from a total of five hundred and seventeen students invited to reply.

In this study, the research work underwent regular steering meetings where the research questions and the questionnaire was repeatedly reviewed and tested. A pilot was undertaken with fifteen students in order to refine the questions and categorisation of responses. The objectives of the steering meetings were to specify research project targets and supervise the research progress. Furthermore, it decided on publication of the results achieved during the project.

**Conclusion**

To answer the three main questions of the paper, different techniques were used. They consisted of a literature review, analysis of specific product sales numbers and structured questionnaires. By completing the literature review and the empirical research, there is compelling evidence to confirm that the answer to this question is true. The data showed that the majority of designers owned smart phones and tablets and that they found these devices very affective at the multiple tasks they can accomplish, compared to using many older, separate devices. The sales numbers available strongly support the notion that areas of product design are becoming obsolete with the fall in sales of digital camera and camcorder being one of the strongest indicators. However there is limit to how fast the design community is being affected, as it was noted in both the questionnaires that smart devices do not possess the capabilities necessary to replace more powerful products as well as complete tasks as effectively as older design techniques. Personal preference is important in this question but the young designers are at the forefront of testing new technology. The companies who are producing products that are becoming less favored by users are now being forces to create new products in order to compete against the smart devices.

The key issue that was raised by this question was the limitation that new market opportunities have has. Many respondents agreed that the new niche products are a lucrative area of design, which is also backed up by how well products like the Kindle have sold. But with so many electronic products like this adopting simple touch screen technology, it is questioned how many
other devices this can be applied to. The market that needs to be exploited is that aimed at the less technologically proficient as many people still struggle to master the technology. With so many products available the question was raised whether companies need to produce alternatives that are cheaper and easier to use in these niche areas. These companies also need to exploit new technologies before the smart device companies in order to retain their unique selling point.

Many respondents pointed out that the core functionality for complex design work was not achievable yet on a smart device, leading to the conclusion that these devices are being used mainly for presenting and viewing work on the move. The most interesting comment that emerged from the questionnaires was that however good the smart devices become they will never be as effective as a professional device that is specifically designed to excel at one task like an SLR camera. This again shows the limitations of an ‘all in one’ smart device as currently they can only combine simpler and cheaper product functions but will have to work with the top of the range technology. In conclusion smart devices have developed into multifunction devices and have therefore made certain areas of product design obsolete. However these smart devices have become complex and this complexity has led to the evolution of niche products focusing on one key application. In view of the high level of technology required within devices for professional use and the consequent high cost thereof, there will always be a specific need and demand for specialist products.

References


