

Impact of Design on the Sustainability of Mobile Applications

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Abstract Within the context of a consumer, who is anywhere contactable via mobile phone or a mobile access to the internet and his fast changing needs, it becomes more and more important to create a balance in the product-life-cycle. With regard to the design and sustainability of software the requirements to a programmer and the department of information technology in a company are getting higher, especially on mobile Applications (Apps) for mobile devices. The paper aims to explain what makes a good design for Apps and which types of Apps exist. Afterwards a description of the characteristics of a sustainable designed App and a comparison between Apple Design versus Metro Style (was changed due to copyright issues to “Windows 8-style UI”) follows. In connection to the environmental friendliness of Apps it is to be recorded that material and energy have to be saved everywhere it is possible. Developers have the responsibility to create applications in a way that is as efficient as possible. The design of an App can be updated with just one mouse click which is far easier than updating hardware, because hardware can’t be updated and has to be completely exchanged. The update principle is an important step towards sustainability. Software does not really pollute the environment but there is a kind of virtual pollution of the environment.

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1 Introduction

Today markets are characterized by an extremely fast moving and dynamic environment. By the increasingly more mobile consumers and thus rapidly changing customer needs, it is more and more important to create a balanced product life cycle. The contrast between a stationary computer and a small mobile device disappears not only with high-resolution display, but mainly by powerful processors and fast, reliable and inexpensive data traffic [1]. Thereby the requirements regarding to the design and sustainability of software, especially applications for mobile devices, are not less. The parameters for optimal functionality, security and usability are more complex for a mobile application than a desktop application [2].

The paper focuses on explaining the situation illustrated by the significant design ethics of the famous German industrial designer Dieter Rams. His design philosophy “Less, but better” represents the focus of this work. This paper aims to discuss based on the ten principles for good design by Dieter Rams, whether it is possible to ensure sustainability of mobile Apps and mobile devices through good product design.

2 Good Design for Mobile Applications

2.1 Braun Design as Creative Director of the Apple Design

Apple’s iPhone released in 2007 turn the mobile internet through its innovative interface and its outstanding usability into a new experience. Before that vendors were like Nokia were the global leader in the field of mobile internet. In 2008 the supporting pillar of the app development was the platforms Symbian and Java Platform, Micro Edition. Nowadays, these platforms were hardly discussed. Many companies that specialize in these platforms are trying to develop their systems to the new platforms. The newly introduced platforms, such as Apple’s iOS (2007) and Google’s Android (2009) have made the breakthrough just by the new technical achievements, easy programming and a playfully easy handling and a new design language. Approximately 60 percent of all applications are developed for Android by which this operating system is considered to be the most popular, closely followed by iOS [1].

It has to be emphasized that mobile apps are not a new invention of Apple, which came with the release of the iPhone in autumn 2007. There were small applications before, but with different formats and on another scale. Java applications belonged to most of these applications. Also the handling was not the same as it is today’s. The installation on a mobile device was complicated and time-consuming. In the first step the application had to be downloaded on the pc and in the second step they had to be transferred from the pc to the mobile device. Over

the time the thickness of a mobile device approximated more and more to that one of a sheet of paper. Although the data room can't be really expanded it is today possible to obtain millions of options on the display. To control and bundling these data Apple invented the principle of apps, which users could use for playing, communicating, shopping and informing or entertaining themselves. Today there is an App for almost everything. The iPhone takes over a leading role and shows that it is realizable in just a few easy steps to install and start mobile apps in a very simple way [1, 3].

Since the industrialization products were manufactured with a high degree of attractiveness to be able to sell them better. People buy and use more and more industrially manufactured products and endanger the environment. On that score the demand for the future has to be, that not only the designer but also the other areas within the production process have to take care of a lasting production. Unfortunately there are too many "junk products", which were bought and disposed after a little while because of missing functionality. Accordingly an immense demand at new products arises and the product life cycle gets into an imbalance. The great challenge is to produce less of those products, which waste unnecessary resources and strongly pollute the environment. Instead of this the focus has to be on manufacturing products, which fulfil the demands of their functionality and are an enrichment for life [4].

Over decades Dieter Rams, chief designer and member of the board of the company Braun, pursued the central idea of freeing the world from chaos and to redesign it entirely. Already at an early age he strove for a good industry design, which was rarely at that time. For Rams was the concentration on the essential and the simultaneously elimination of irrelevant characteristics aspects for a good design. Primarily the chaos has increased in the mass production in whereas factors like noise and the pollution of the environment are strongly weighted factors [5]. Everything starts in a small way. Also the beginning of new products or its further development begins in a small way for example the optimization of performance characteristics like a new user interface or an easier handling.

"Less but better! Much fewer but much better!" [6]. With these headwords Dieter Rams has changed the design language decisively. Due to the consideration that good design is not quantitatively measurable and that the world is overcrowded with mass market products, within the early 1980s Dieter Rams thoughts to himself what good design means for him. To canonize the bases of his work, he wrote 10 theses in the form of characteristics which distinguish between good and bad design: Good design is innovative, makes a product useful, is aesthetic, makes a product understandable, is unobtrusive, is honest, is long-lasting, is thorough down to the last detail, is environmentally-friendly and is as little design as possible [7].

This thesis arose from years of practice experiences and serves many design-oriented enterprises as a rough guideline to this day. Design is compared with the steady further development of today's technology and culture also a part of it and therefore develops as well [6].

The “10 thesis”, which Dieter Rams strictly followed in his design philosophy, reflect particularly the severe rationality. He put himself in the position of the user intensively, showed great sense of responsibility and was convinced that nothing is left to chance [5].

The German industry designer Dieter Rams was an idol for Jonathan Ive the master designer from Apple on the topic of abstraction and simplification to the necessary. While the creation of each new technical design blue print Apple leader Steve Jobs and Apple designer Jonathan Ive followed Rams main principle “lesser but better” when they thought about how to optimize the product’s design [8]. Steve Jobs developed his preference for a simple and functional design in Aspen, where he participated each year in the “International Design Conference”. Clear lines and forms are a symbol of rationality and functionality. Jobs was a great fellow of the Bauhaus-style, where the functionality and the essence of the products are central and Jobs wanted that Apple products look like the high-tech products of Braun, compact and bright. With this attitude he took the opposite design-pattern to Sony, whose design-pattern more and more became industrial black and heavy. Due to the introduction and evolution of their Walkman and the concept that sometimes “less is more” has a greater use for users. Sony was the first company to be successful on the portable player market. Helpful were the instantaneous reduction for the sake of mobility and growing individualisation [9].

Despite the fact that the Apple-products don’t have better technologies than those of their competitive companies and that they are far more expensive, they sell much better. It is agreed upon multiple facts that Apple’s homogeneous, harmonic design with its logically elaborated and user-friendly design-strategy, such as the image-based support campaigns for each single product released by Apple and their costumer-orientated advertising, Apple is put in the good position to have a continuous attractive product line-up [10].

According to the facts shown above, a label defines and separates itself from other labels by its design. The reason to buy an Apple product is based on its high design quality, which creates a significant additional value. Primary the costumers trust in a label is decisive, which can be achieved throughout a good design. This simultaneously defines the design’s additional value. Apple makes it possible for others to recognize its stability by evolving its design value according to its design strength and design continuity, which enables Apple to outdistance its competitors [11].

Dieter Rams, according to the facts already shown, can be called the forefather of the iPhone, which is characterized by its good design. Good design is till today a minority, whereas non-useful things, which have no self-explanatory quality, are far more common in most products. The environmental pollution takes place most likely on the visual plane. Another problem is the optical attrition. Cultures and with them the tastes blend into each other. A conclusion is that there are less different forms and everything becomes more akin [7].

The Meaning of design for Apple as a design-orientated company is not just beauty in its completeness rather than an amalgamation of three parts: The

simplicity and honesty of the configuration, the integration of the designer from the very start of the whole product development process and the equalisation of inventor and artist. Through all the diverse, innovative technologies and new challenges arise for the product design. The simplification of electronic devices allowed a better handling and achieved an innovative aesthetic. The maximum purism is not just the default for the outward appearance, but also for design of the surface of the operating system and the software. By pressing the Home-button, the only button the iPhone, the screen is activated and it appears a virtual slider, which requests the user to slide it sideways. On the unlocked screen the user sees just an orthogonal grid of the already installed miniature programmes. This clearly shows that the software is just as consequently simple designed as the hardware and the casing, to make sure that it is understandable and clear for the broad class of customers. Another fact is that the technology and the design must perform in sync, because the design has a huge effect on the company alignment [12].

2.2 Types of App Applications

The Apps are basically divided in two concept groups. Applications that can just be installed on own terminal devices and the existing operating system are also known as native applications. The counter model is the web-applications. These are the solutions, which are based on mobile optimized websites and download the compatible components of the applications from the internet [1].

The most important feature of a native application is the user-friendly handling that allows the immediate one-click-start of the App on the icon and a direct usage. This eradicates to type in long website addresses, the waiting for the website to be ready for usage and the scrolling and zooming if the website is not adjusted for the mobile usage [1]. Native applications are designed according to the criteria of the User Interface Guidelines platform and are developed and optimized for mobile purpose [13]. They are quasi made out of one piece, because the handling and the appearance are better adjusted to the devices than web-applications. Furthermore are device specific functions like the camera, the movement sensor and the Global Positioning System (GPS) useable without problems and allow the inventor the comfortable integration of the functions into the Apps. Last but not least this sort of Apps needs no active internet connection [1].

Another reason for the usage of the native Apps is the easy traceability in the Apps-store [14]. Due to the fact that more and more platforms get on the market, is the development of downloadable and self-installing Apps connected to a great afford and risk in marketing. The disadvantage is its low range, because the developer can't reach the broad masses and have to build an individual App for each of the significant operating systems. This problem does not only affect the support and marketing, but also has a long-term effect that shouldn't be underestimated. This long-term effect is primarily connected to the management of a contemplated evolution after a launch [1]. Even if the major advantage of the

native Apps is their independence they must pass through a time consuming and expensive certification process of the platform operator before they have to be distributed on a store.

Aside the native ones there are the browser-based solutions, the so called web-Apps, which more and more take the foreground role in the mobile industry. An elegant universal solution tries to combine all relevant platforms to minimize the development effort and costs [1]. To run a web-application a radio network for it completely acts in a browser. Furthermore do those Apps have no access to functions of the system such as the native Apps have [14]. Mobile web-Apps are controlled over a web-address and that's why they are independent from marketing policies of other companies. In addition do not all terminal devices have the same browser installed. All actually available browsers differ in their handling and quality. Despite that the whole development is cheaper and costs less time than the building and maintenance of a native App for all the today existing platforms [15]. The reason therefore is that a lot of companies are obliged in the software development to convert the content and context of a website to the parameters of a mobile terminal device [1].

In the meantime there appeared temporary solutions which usefully combine the important advantages of both models. Starting point is a hybrid-App that is based on a native-App core and a user-interface primarily based on standard-web-technologies. For the user behavior it means that the App is no longer running in a browser and is instead functioning like a native App.

This was enabled throughout the special frameworks named "PhoneGap" which allocates certain hardware functions via interfaces of web applications to directly activate the needed components. Therefore only the web-based components have to be developed by the company itself, because the native components are already implemented in the frameworks for the particular platform. On behalf of the native application it is possible to influence the individual device functions and the App can be published and distributed in a store. As it is a web application its development isn't too complicated and doesn't cause too much effort. The advantage of a hybrid App is that the problem of the diversification of browsers and operating systems is solved in a practical way [14]. The user has to waive in such a temporary solution the "Look and Feel" of a native App, because the App has to be compatible with many different operating systems [13].

An online survey of the agency "Culture to go" determines another rather surprising development of a prognosticated percentage on the continued existence of Apps of just 15 %. 41 of the 112 asked people said that the native App is just a makeshift for the not yet fully developed browser-based applications. On the other side 44 % think that both basic approaches can co-exist. Pure native Apps do have the right to exist, because of the applications that get more complex like games, navigation systems and they can be easily and targeted merchandised via the main distribution channel the App-Store. On the other side will web-Apps remain, because especially companies will use them based on their evolutionary advantages to be in a future-orientated position and that they can be scalable long-term solution [13].

2.3 Characteristics of Sustainable Designed Apps

Often a customer asks what signalizes a good App and makes it unique. During the development a main factor was a stable and errorless basis. A good basis provides an excellent usability ajar to the standard-control concept of the respective platform filled with valuable context. As a result the user doesn't need to spend additional time for learning. Furthermore should the App consist of dynamic processes and should be self-explaining in its use via the clear structure of the surface-screen. When the App is an implementation of a website the company has to put their focus not just on copying the content but also to design the App inciting and service-oriented. One of the main aspects in creating an App is the pursuit of a sustainability strategy. To achieve this, the customer has to have access to updates in regular intervals. These updates should contain bug fixes and feature-extensions (functionality extension of software) [13].

Companies often have to strike up compromises and have to absorb cost and effort for updating their Apps to lead it to success. It has to be mentioned that the usability of today's mobile browsers become more and more similar to those of native apps. The freedom of the internet is an important factor because it allows realizing real time updates grounded on server based App solutions as well as cost reduction. In doing so the platform fragmentation does not matter. Limits for web based applications are adaptabilities of mobile browsers regarding to the navigation. Reason for that is the containing of permanent elements like header and footer. The speed of loading website elements like pictures or stored information of native apps is faster than the speed of web based applications. In addition desired sites, product and user data as well as miscellaneous settings can be stored for offline usage [13].

Altogether devices need a simple surface and a simple interface which allows an easy handling and a fast understanding for the user. But the resolution problem on a small display device is the right balance between information and interface. Too many details overload the interface so that it appears confuse. Too less details cost too much of the user's time to get the information he wants to have. This means that the amount of information shouldn't be reduced, but that the chaos of information and details should be reduced [16]. Good design distinguished with a feeling of safety, confidence and instinct. The familiarity with known things enables the user to develop a relationship to the device. Additionally this familiarity may contain something unexpected for the user [17].

The common run of mankind connects everyday occurrences with familiarity with something and leads to efficiency and usability. Buttons, icons and toolbars can be seen as traffic signs in the App world. Screens without scrollbars need less mental strain and reinforce the illusion of the application to use a physical and not a virtual device. A fixed screen facilitates a feeling of solidity [18].

Today it is hard to sell mobile devices if they have no integrated App-store. That's why Apple integrated the well-known App-store in its new operating

system “OS X Lion”. Microsoft tries to do the same with Windows 8. Microsoft’s new store shall offer full screen metro Apps for the start screen [19].

The number of Apps in the App-stores of the particular platform grows daily about 350 Apps [20]. Potential users notice the new Apps often through all known App-stores. The colorful icon is the first thing the user connects with the App. In such an App-store the Apps initially appear with their name and icon. Their occurrence is most important for the visibility in the lists and the sale. The name of an App should fulfill four important criteria. It should be easy to memorize, if possible contain keywords, be unique and be consistent in different stores and lands [21]. The Icon is the face or business card of the App. Today many people get superficial and believe that something that looks good is good. Especially the icon gets in the beginning a lot of attention, because it’s the first thing the costumer sees. To create an economical success and generate a high recognition value, the icon must be connected with a dominating idea and a perfect design [21]. Icons should never be mysterious and instead be colorful and funny. The symbol should directly display what the App is about and contain a unique personality. This can be a visual description of its function, surface, names or its label [18].

3 Apple Design versus Metro Style

In early 2007 the first iPhone was released with a touch-sensible display. The costumers were euphoric, because it was something really new which hasn’t been there before on the market. On its smooth as a mirror glass-display are cent-sized icons. They seem to be old-fashioned and nostalgic. For example the icon for the telephone function was symbolized by a phone. The mail-function is symbolized by an envelope and the settings with three meshing gear wheels. There are also so called pre-digitalized symbols which shall indicate processes. Per slide-movement with the finger on the display pages can be turned over like in a normal book [16].

First, Steve Jobs was strictly against allowing developers of external platforms to develop applications for the iPhone. If this restriction had been realized, a substantial progress in the App word would not have taken place. The fear of infected applications was the main reason why Steve Jobs was against application developing by external companies [8].

The letter “i” is the recognition feature of Apple and is seen as the product-line label. It is in English a term for internet, information, intelligence, interface, identity, individual, inspiration, innovation, etc. The direct translation of “i” is I which proclaims a strong connection between the user and the device [20]. Apple owes its sale records three central main principles of product design. First to name is the principle of simplicity. Following this principle the visual aspect is based on Dieter Rams principle “good design is as less as possible”. Furthermore, Apple’s product design is influenced through the principle of Integration which organizational requires a strong connection between design and technology. Additionally does the principle of obsolescence affect the products

of Apple. Here should the marketing limit the lifetime of a product to higher the volume of sale.

With the introduction of Windows 8 Microsoft did the greatest change in the classic Windows-user-interface since Windows 95 and is best prepared for the future. First of all the new surface called Metro is to be mentioned. When windows is started first of all a personalized start screen appears consisting of a user defined grid with interactive colorful tiles. The new tiles serve as a kind of conjunction of the programs starting the “Metro Style”-Apps in full screen mode and show actual update information.

Moreover the tiles of Apps can be customized depending on usage scenarios and customer requirements [19]. Instead of traditional desktop surfaces with windows, taskbar and start menu, Microsoft opened a new interface which is similar to the smartphone operation system Windows Phone 7. The new desktop surface consists of mostly usage-friendly touch tiles. Touching a tile with the finger starts the application immediately in a way that the entire screen can be used without the alongside occurrence of traditional menus and scrollbars [22].

While the operating system Lion from Apple is based on Apps in the form of compact icons of the iOS-attempt, Windows 8 has adaptable tiles which give some space for useful information in a little area. The “Metro Style”-Apps are the focus of this new, consistent and elegant experience. Especially it should be invested in a good tile. A tile is similar to the basic idea of an icon, because it can be found on the start screen too. It has some kind of a private life and is up to date. A tile also facilitates personal information, is present via a miniature picture and therefore arouses the interest of the user [23]. Users shall identify themselves directly with the content and developer shall permanently try to find new interactions. Apps and user perception should become lively by using reasonable animation and intuitive touch gestures to create a feeling of durability [24].

4 Aspects of Environmental Friendliness

Both the design and the designers are forced to make a contribution to protect raw materials and take care of the environment. The physical pollution of nature is just as harmful as visual pollution in the product design [6]. Aim of every design should be handling materials and energies consciously and healthily. Material and energy should be saved wherever it is possible. Normally software does not have any direct impact of nature because it is a non-physical asset. In the last few years the growth of the mobile data use has increased exponentially due to the strongly progressive innovative technologies. In the field of mobile telephone the data volume has tripled every year and in the foreseeable future there is no stagnation visible. Reason for that is the current boom of mobile devices like smart phones, laptops, netbooks or tablet-PC's. This is shown by a report of the federal net agency [1]. The fast and secure mobile internet use was enabled by the strong expansion of the worldwide covering of the mobile communication standard 3G [13].

For today's mobile users, there are two ways of connecting to the internet: cellular and 802.11 WiFi. Thanks to the increasing availability of mobile phones and tablets, the mix of fast connectivity and the explosive spread of applications results in a high performance and users respond to throughput for each technology. In a direct comparison, it is clear that WiFi offers a clearly superior download performance. In regard to the upload this performance difference is much smaller, but can strongly vary. However, the cellular variant by their relatively predictable performance of some network providers as well as its ubiquity reflects the better option for everybody. With the advent of improved throughput access technologies such as LTE, this will probably be the preferred option for wireless connectivity in the coming years. Finally, the stability and performance of both technologies in the larger markets shows, that through further developments of both sectors, an infrastructure can arise, which could improve the performance in smaller markets [25].

At the development of applications the developers have the responsibility to design them as efficiently as possible. Nowadays developers of mobile applications and operating systems pay more attention at the life time of batteries than to the health of the network. All participants of the network have to share the available capacity of the network. The data checking every 30 s could have negative impact of the network. Hence the broadband demand increases whereas the price is reduced. Many applications need a constant connection to the internet to receive the required data. If the connection cannot be built up, the applications are useless [26]. In connection with the health of the network badly written program code can have negative impact of the data volume, which has to be loaded from the internet. An example is the application "Google Maps" with its navigation function. With this kind of App two aspects of pollution are mentioned at once. On the one hand vast amounts of data are loaded from the internet and on the other hand the environment is polluted indirectly by the users driving.

5 Outlook

The design of an App can be updated with just one mouse click which is far easier than updating hardware, because hardware can't be updated and has to be completely exchanged. The update principle is an important step towards sustainability. Apps that are already distributed in App-stores expire the monetarisation and strain the mobile networks. Furthermore do they deprive from physical mediums like compact discs (CD) and digital video discs (DVD). Software does not really pollute the environment but there is a kind of virtual pollution of the environment as it was already mentioned. Consequently software and hardware has to be considered as a coherent unit and inconsistencies will arise in the future too. It is considered to be proofed that some facts which caused the past success of Apple are going to be more and more a burden. Especially the rising profit of the company in the past years and the high numbers of sale of the iPhone and iPad

indicate that both mobile devices will not be much longer seen as luxury goods. It is estimated that in the next three years the tablet-PC market will increase threefold and that it will not only be Apple devices but that there will also be tablets with Windows 8 in the stores.

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Information Technology in Environmental Engineering
Selected Contributions to the Sixth International
Conference on Information Technologies in
Environmental Engineering (ITEE2013)

Funk, B.; Niemeyer, P.; Marx Gómez, J. (Eds.)

2014, VIII, 228 p. 50 illus., 13 illus. in color., Hardcover

ISBN: 978-3-642-36010-7