HELSINKI METROPOLIA UNIVERSITY OF APPLIED SCIENCES

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MASTER'S THESIS

NEW TECHNOLOGY PRODUCTIZATION IN MOBILE DEVICES FROM END-USER'S VIEW

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PREFACE

I started working on this Master's Thesis in January 2010. The goal was to introduce new technology productization via end-users view using discussion threads from different discussion forums.

I would like to thank my supervisor Principal Lecturer Ville Jääskeläinen, from Helsinki Metropolia University of Applied Sciences, for his support and valuable comments during the writing of this thesis.

I especially wish to thank my instructor at Nokia, Jussi Kapanen, for his constructive criticism and proposals regarding the method for extending the basic work.

Finally, I received constant encouragement from my wife and parents, and it is their support that helped me complete this thesis. I am very grateful to them.

May 24, 2010

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ABSTRACT OF THE MASTER'S THESIS

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Every device manufacturer has nowadays at least one device with touchscreen UI in their own portfolio. To these companies this kind of a device was a huge step in the area of new technology area which brings simultaneously two fresh factors to device. The new UI and touchscreen are the components that started a new era.

Burgeon technology together with fierce economic competition have forced companies to innovative solutions. Without any deeper analysis the risks in investments may increase to an unacceptable level. In traditional UI the development of the technology was clear. The advance of the touchscreen UI productization is connected to the end-user in real time

This thesis gives an overview of the touchscreen UI technology and how the productization has been executed from the end-user's view. It analyses some of the most commonly existing solutions that have been taken in use. The results indicate that one scenario is more prominent than the others. It seems that in future the end-user is going to modify device content according to their personal needs.

Key words: productization, end-user, touchscreen, touch UI, device, concept, platform

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Jokaisella laitevalmistajalla on portfoliossaan vähintään yksi käyttöliittymältään kosketusnäytöllinen puhelin. Tälläinen tuote oli jokaiselle yritykselle iso askel uuden teknologian alueelle, joka toi samanaikaisesti kaksi uutta tekijää puhelimiin. Uusi käyttöliittymä ja kosketusnäyttö ovat nuo tekijät, jotka aloittivat uuden aikakauden.

Nopeasti kehittyvä teknologia yhdistettynä kovaan talouskilpailuun on pakottanut yritykset innovatiivisiin ratkaisuihin. Ilman syvällisempää analysointia investointien riskit voivat nousta liian suuriksi. Perinteisen puhelimen käyttöliittymän kehittyminen oli selkeä. Kosketusnäyttöisen käyttöliittymän tuotteistamisen edistyminen on sidoksissa loppukäyttäjään reaaliajassa.

Tämä opinnäytetyö pyrkii antamaan yleiskuvan kosketusnäytön käyttöliittymästä ja kuinka tuotteistaminen on toteutettu loppukäyttäjän näkökulmasta. Yleisimmät olemassaolevat ratkaisut ovat tarkastelun kohteena. Tutkimuksen tulos osoittaa, että on olemassa vain yksi kehityspolku, joka tulee olemaan hallitseva. Tulevaisuudessa loppukäyttäjä muokkaa laitteensa sisällön tarpeiden mukaan.

Avainsanat: tuotteistaminen, loppukäyttäjä, kosketusnäyttö, matkapuhelin, konsepti, ohjelmistoalusta

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ABBREVIATIONS

API	Application Programming Interface
CPU	Central Processing Unit
EMF	Mail for Exchange
GUI	Graphical User Interface
HW	Hardware
IRL	In Real Life
IT	Information Technology
ITO	Indium-Tin-Oxide - a Clear Conductor
LED	Light Emitting Diode
OLED	Organic Light Emitting Diode
OS	Operating System
PC	Personal Computer
PIC	Product Innovation Charter
PLC	Product Life Cycle
PSA	Pressure Sensitive Adhesive
QoS	Quality of Service
R&D	Research and Development
RSS	Really Simple Syndication
SDK	Software Development Kit
SMS	Short Message Service
SW	Software
UI	User Interface
VoIP	Voice over Internet Protocol

1 INTRODUCTION

1.1 Motivation

As the mobile technology evolves, the mobile phone's multimedia features have given end-users the possibility to modify the device's usability in different situations. This technology is new in this scale. How new technology produtization has been carried out in companies varies a lot. Even the term new product can mean different things to different people. Touchscreen UI (User Interface) is the newest and the biggest feature in mobile devices and thus very interesting.

New products management is challenging and it is getting bigger and bigger attention requiring business actions. In the area of mobile device technology the development cycle is excitable and it is not showing anu signs of deceleration. Understanding the significance of productization in new technology implementation gives companies an advantage against competitors.

1.2 Background

At first mobile phone formability was very simple and focused on the outer covering. Offering different color covers with light effects gave a little bit more utility value and brought in new a trend for using a phone, personalization. Speed dialing allowed users to call without having to make several different selections. Selectable selection keys and one-touch keys made the most used applications available much faster.

Special keys like, camera, side volume and key lock were designed to special use so those functionalities could be optimized. The Navi™ key is multifunctional and partly its functionality can be chosen by the user. The sensor enables to silence incoming calls or snooze the alarm by turning the device face down. These features are physicals.

With time, the mobile phone has become a mobile device which has several different functionalities. The UI has always been a challenge to mobile device designers for several reason including the following requirements; small size, low-power CPU (Central Processing Unit), demanding power management and electronics.

The small size is in conflict with electronics and sometimes demands painful compromises. The technology is evolving all the time and multilayer components in the box's body is nowadays normal configuration. The first mobile phones included LED (Light Emitting Diode) displays whose representations were really limited. Including more information on the display, for instance field strength and battery charge, set a requirement more efficient screen technology. A monochromatic display with green backlight was the next step; every pixel was separable but it could even represent graphics.

Monochromatic screens were there for some years with the only changes being higher resolutions. From the year 2003 onwards, mobile devices have been equipped with color screens. Cheaper models are still manufactured with monochromatic screens. Resolution and number of colors have been increased year after year. It seems that 800 x 480 resolution with 24-bit (16.7M) color is the highest usable screen nowadays in touch screen. The screen technology progressed in leaps in the year 2009: OLED (Organic Light Emitting Diode) display were taken in use and the resistive touch screen was superseded by capacitive.

1.3 Research Problem

The research problem of this thesis has to do with evaluating the needs of companies and end-users. This research deals with companies whose product catalogue contains devices with touchscreen UI. The end-user viewpoint has been collected from discussion forums. The question is does the situation today satisfy the needs of both sides. To analyze research results, this study draws heavily on 'New Products Management 8th Edition' by Merle Crawford and C. Anthony DiBenedetto. Several different surveys or research studies could have been used to solve the problem, but one big issue with this particular research was that the attendees were not aware of any research. Another problem was that there isn't any unambiguous statistics available of the sales margins of the companies' touchscreen device. Thus, the end-user's opinion is more conclusive than companies' notices for solving the research problem. [1]

1.4 Scope

It is difficult to pinpoint the exact time for the birth of the touch UI in mobile phone, as there have been devices like for instance Ericsson R380 which had a monochrome resistive touch screen already in 2000. There are also devices which are really hard to be considered serious mobile devices with touch UI like a wrist watch phone; Watchmobile EVO 830. Also the time when this technology was new to companies is tough to describe. This is, why the research is limited to devices with touch UI and those features which have been in a remarkable role during 2009.

Benchmarking is not an objective for this research and it is even avoided as some mobile devices have such different operational principles. Also it is typical that companies are developing several OSs (Operating System) with different UIs.

1.5 Research Methods

The internet is available to almost everyone who has a mobile device. New internet users are going to use mobile device more and more often than a traditional PC in their first internet experience. Thus the latest and most wide-ranging information of end-user's practical knowledge is available from the discussion forums on the internet. One important thing to keep in mind from these writings is that the writers constitute only one part of end-users.

The discussion forums included in this research have a practical attitude and users behave in a correct way. The sites whose only purpose is to damage a specified company's reputation like http://www.ihatemyiphone.com/ have been ignored. Discussions whom schedules in 2009 are included in this research so at starting point there were 50 726 records. [6]-[19]

1.6 Structure of the Thesis

This thesis consists of seven chapters. Chapter two discusses the different processes of a new product. This chapter is mainly based on the book "New Products Management 8th Edition" which is also the inspiration for this research.

The chapter on touchscreen UI starts with an introduction to different HWs, continues to SW solutions and ends with the usability issue which is too often forgotten in new technology productization.

Chapter four 'User's Different Roles' deals with the differences in the end-users' role whom are correctly ideals and not haven't met alone in real life or should we say "IRL". As we all know, "Devices are made to end users, not to engineers."

Chapter five 'Competition over End-Users' is about the competition between companies over end-users and their interests. Could it the first new product be the winner? What about new technology from company means to customers?

The Chapter on Future Value of Touchscreen UI presents a future view with different scenarios. The future is not so clear but the reason for this is; it is due to market turbulence.

The final chapter. 'Summary and Conclusions' summarizes the result and conclusions of this thesis. It draws conclusions about the most important findings, evaluates the key issues and points to potential future work in the area.

2 THE NEW PRODUCT'S PROCESS

2.1 End-User

An end-user is the final consumer of a product. The role of the end-user depends on the industry, in chemical additives for plastics, the customer provides little or no help at all. In mobile device R&D, feedback and ideas from the end-users are greatly appreciated and acted upon. People who use a product often have ideas for improving it, but unfortunately, their ideas are sometimes rather obvious. Some manufacturers have employee and customer idea contents. [1:95]

Every end-user is an individual person with basic needs and thoughts. There is some traditional way of action whom are learnt. Maybe the end-user misuses the device or has adifferent logic than the majority. Below is one discussion thread which points out how difficult it can be to satisfy a customer.

> "Why has Nokia decided to make its touchscreen software illogical, logically & on every other touchscreen device in the world in you want to go down the menu, photos, contacts you move your finger up the screen, but on S60v5 it is extremely illogical and intensively frustrating, it is so frustrating that I have just returned my Nokia 5800, I loved the phone but I will not buy another Nokia s60v5 until Nokia release a firmware update & correct this misguided mistake. Kudos! Thanks!" [6: 02.03.2009]

From the end-users' group we can separate the lead users' part, which is, the customers associated with a significant current trend. Often people don't know how to mediate productization even thought companies are interested in customer opinions. Many problems and misunderstanding has been solved in a discussion forum's thread like these two below. "Lead users are especially helpful in giving new product ideas because their work is of the problem-find-solve type." [1:97]

> "I'm sure the nokia developers know exactly what they are doing. Both types of screens have there own advantages and disadvantages. Ever tried using a capacitive touchscreen in winter whilst wearing gloves? You will find it's impossible. Applications like paint pad cannot work properly on capacitive screens as they are not as precise as resistive screens. The N97 will be resistive like the 5800xm. Also for future reference the developers most likely won't see your comment here and they won't reply. If you want to comment directly to Nokia use the ""contact us"" link near the top of the page. Nokia care may pass on your comments. Message Edited by psychomania on 06-Apr-2009 10:55 AM48)?48:this.scrollHeight)"" > Kudos! Thanks!"[6: 06.04.2009]

It is typical that end-user ideas are for improving an existing product rather than new-to-the-world products ideas. Normally those ideas are also challenging or even impossible to develope into real products.

> "Well I was just in formed by my dad today that he upgraded the sprint family plan to unlimited everything. I have a 2.5 year old motorola krazr that's seen better days, the front is cracked the screen is cracked and its time for a new phone. the plan is to order one off of ebay and switch over my cdma information or however that works.(if anyone has the site that would be appreciated) and then I will be able to use data, text, and voice. I have never texted as that was not on the previous plan but would really like to start so I think that a new phone with a touchscreen and qwerty texting would suit me. Especially in college over here everybody texts and I'm left in the dark a few times because of it. wifi/internet browsing is not as important but would be a plus. My brother and father ordered the Samsung instinct and I am wondering if I should do the same, just want to ask here to see if their are better phones out there for my fit. Thank you," [8: 16.09.2009]

The device could be so good that even with deficiencies the end-users like to use it and offers important feedback from the field to companies. A pure functionality change is a big change for a firmware update but every now and then end-user's extensive requirements have done it as shown by the next note.

> "I love my 5800 it's a GREAT smart phone.
>
> However I do miss the dedicated copy key (Pen Key) which was on the earlier versions of smart phones. This makes very difficult to select multiple items (For each and every item weneed to go through the same menu) But this can be easily fixed bygiving a ticked box next to each item or text massage with the 'mark many' option on the mark menu. "…
>
> "My second issue is when you have hundreds of items inthe gallery or in your text massage inbox it's very hard to scroll through andfind the item you want. One option is 'Searching' but what if you can'tremember the file name (Eg :Something like DCS00583 or DCS00751). It would begreat if we could scroll through the list by pushing pulling the items it self without using thescroll bar on the side."…
>
> "Atlast but bot least Nokia has not taken thefull usage of it's amazing touch phonecapability. Users still have to scroll through menus most of the timeinstead of tapping a onscreen button. As anexample there is no direct tab to switch between 'now playing' and 'musiclibrary' How poor designing is that. You have a touch screen phone still youneed to go through the hassle of going through 'options' menu and selecting 'now playing' or 'musiclibrary'.
>
> I'msure all these can be easily fixed by a firmware upgrade.I hope Nokia will not let us down with their next firmware version.
>
> YJ
>
> Kudos! Thanks!"[6: 05.05.2009]

Three Inputs

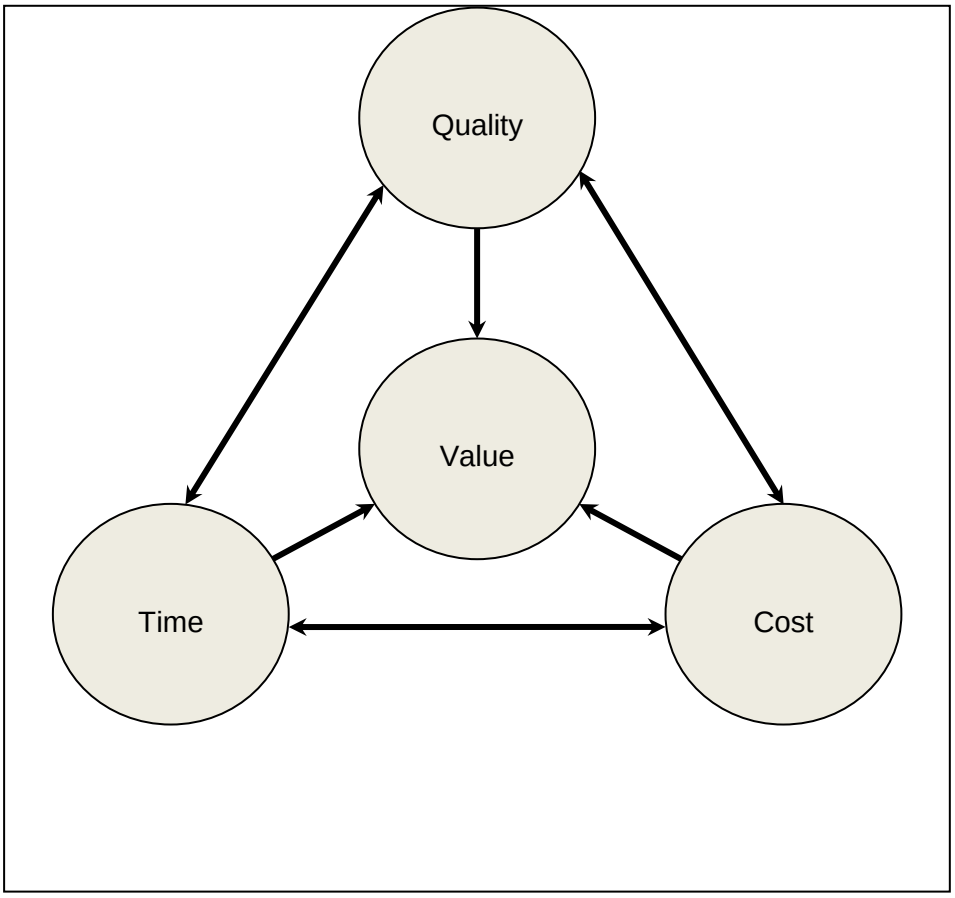

Figure 2-1 Three unique inputs of new products management

In new technology productization's central point is demand of serve products that have valuable attributes, in other words they meet the end-user's needs. Round it are three mandates. These requirements are nearly in case of conflict, even though those can have synergies too Figure 2-1. [1:16]

Manufacturing and design quality constitute one angle of the conflicting set. Quality must be in balance with time and cost or the new product is going to cost too much to the customer or it is absolutely too late in the market. The other angles have the same mission; contribute to the value of the new products, but in different ways and in different amounts from project to project. The set optimizing is really challenging and is mandatory to do in each new product situation.

Individual applications and firmware updates are typical to this day mobile technology. Those enable faster time to market without decreasing quality or raise the device's price. This is normal practice in PC and Linux usage. End-users should notice that there isn't anymore a clear divider between traditionally perceived PC and mobile device. The

following note proves that customers are nowadays aware of new technology productization.

> "Was that article by nokia. Its just a write up about the phone which all phones do go thru criticisms. Any brands or manufacturers venturing in into new technologies will go thru failures and start improvising from that starting point. I believe nokia has not failed but has done a wonderful job with their first touch screen phone. its just the matter of time for them to improvise and fill up the loop holes and come up with a great phone like they always do. If you really test the Samsung Omnia or the Sony Ericsons X1, it is not that perfact as well as they to do have glitches here and there. Not only phones even car manufactures do go thru this and take this as a stepping stone to come up with better products.At the end of the day which product you would prefer to use48)?48:this.scrollHeight)"">Mark me a KUDOS if this has helped... Kudos! Thanks!" [6: 04.03.2009]

2.2 Opportunity Identification

Corporate strategy affects product platforms as well as individual product projects. Product platform strategy will affect all projects related to the common platform. Platform management could break up easily, which allows a larger view. Excellent cross-functional communication, and serious top management involvement and support are important. Those are needed to ensure that everyone agrees on the platform's architecture and how it is adapted to market segment needs. [1: 54]

Markets are changing direction rapidly at present and customers' demands for different product varieties are governed companies, so that it isn't efficient to develop a single product. Each opportunity takes time and money to investigate, so all possible opportunities are not exploited. [1: 56]

A traditional product-market matrix is illustrated in Figure 2-2. The cells show variations in innovativeness risk as a company brings in new product types or technologies. Accordingly, device improvement would involve little or no risk at all. Full new UI would involve dangerous risk.

Risk		Change in operations or marketing mode		
		None	Some	Great
Change in use/ user mode	None	None	Low	Medium
	Some	Low	Medium	High
	Great	Medium	High	Dangerous

Figure 2-2 The Risk of Innovativeness

The term product innovation charter (PIC) reminds us that the strategy is for products, not processes and other activities. It is for innovation and it is a charter. Approximately 75 percent of the companies have a formal new product policy, could count in PIC definition. 29 percent have a formal written PIC. The components of a PIC are provided in Figure 2-3. The best way to perform PIC is that it should be in writin and available to all participants, but unfortunately it is not often so.[1: 61]

There are three types defined in PIC: “(1) profit, stated in one or more of the many ways profit can be stated; (2) growth, usually controlled , thought occasionally a charter is used defensively to help the company hold or retard a declining trend; and (3) market status, usually increased market share.” [1: 66]

These cases are clear to companies, but to end user the main case is new features or even a device with new UI. Sometimes the end user has huge expectations for a new device and when those aren’t fulfilled the disillusion has no limit. In that case the end-user feels that company has cheated with their newest device. Those writers are very easy to discover from the forum’s discussion groups.

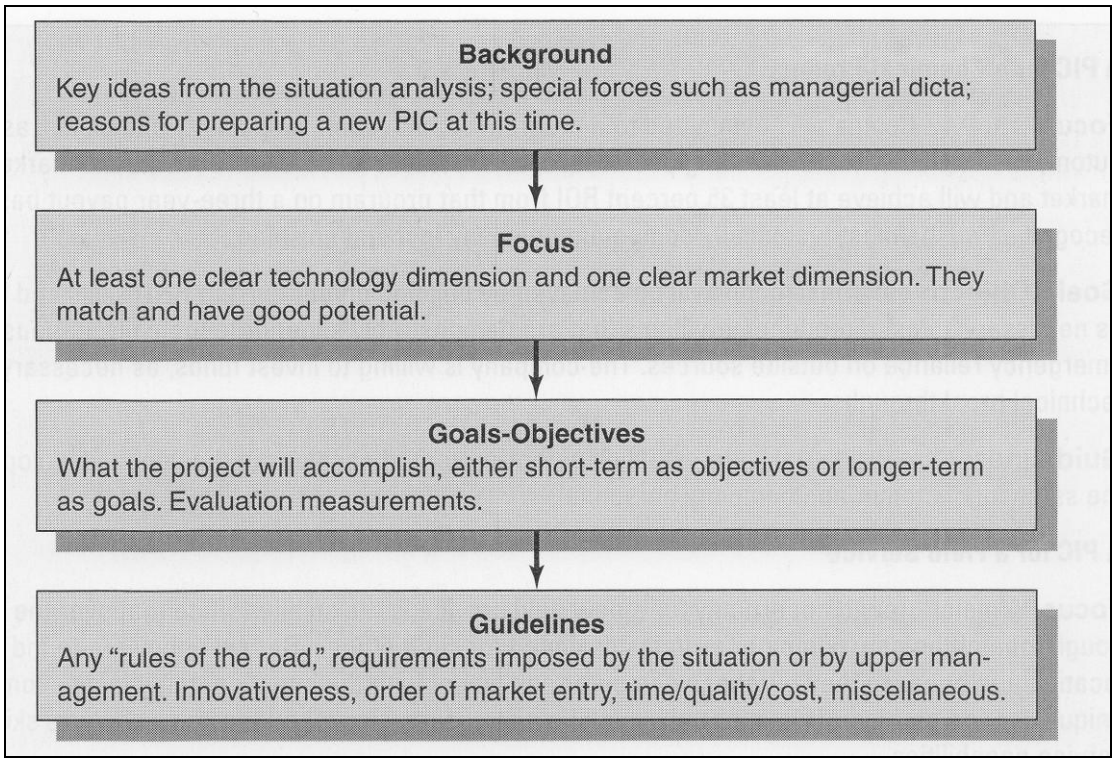

Figure 2-3 The Contents of a Product Innovation Charter (PIC)

As written in chapter 2.1 sometimes end-user’s innovations are impossible to execute but there is often a small fact which could be lead to real innovation. The below address points out several truths with some culmination. In device innovation, less is more. End-users want more than what technology is able to provide.

> "I think that the 'Race"" is useless, the MPix race and the ""who will be first with the improvement"". I wan't no improvements but something new! Look, iPhone was the precursor with the large touch screen and some other features. That what's wasn't very good (like GPS/maps) or wasn't at all (qwerty) gave f.e. HTC. We have 3G and great cameras since some years ago. I'm looking for some phone with innovative functions (like f.e. projector). Touch/multitouch, QWERTY, 3G, Zeiss, software markets, dvd quality screens, trackballs, sensors... - these are no innovations. Build a phone with 30 days standby battery, charging time up to 3h, and... stable and reinforced + some revolutionary innovation.
>
> Remember the 3210 or 3310? When the phone was dropped there was another scratch but the phone was undestroyable! Now, drop your N93/95 (etc.) and? Wreck! Where ware durable ones? Besides look on the disscusion board and see how many problems are cause by the OS errors, software failures etc. Maybe it's time to grind the platform? The sadest thing is that the phost have to be

> intentionaly unperfet, they have to be broken some day because the consumer have to buy the new one, right? It's sad ...
>
> And BTW where is environmental thinking?
>
> Kudos! Thanks!" [6: 30.04.2009]

First-to market isn't always the gold mine. There are three ways to get it: state-of the art breakthrough, leveraged creativity and application engineering. The first one means that there is a new way to use technology. Leveraged creativity is kindly new properties of an already known technology and application engineering is just new kind using in used technology.

2.3 Concept Generation

Normally a decision to solve problems is done by thinking reproductively, using the same way that has worked for us in past. Creative genius thinks productively. Creative people's management has mainly two different activities; encourage the creative function and remove roadblock that are slow down or even intercept the progress. [1: 82]

One thing is typical to creative people; they are usually unimpressed by group rewards. Personal rewarding as soon as possible is a much better approach in their view. This is true even it could harm the esprit de corps and be unfair. [1: 86]

Three inputs are described in Figure 2-4 which shows that any two of the three (form, benefit and technology) can come together to make a concept, a potential product. Form is the physical thing to created, e.g. new UI technology using touchscreen. Technology, the enabling factor, sophisticated touchscreen technology. Touchscreen UI can include more information on the screen than traditional UI which is a critical benefit. To an end user who uses the device in multimedia mode, this solution is the answer to their needs.

"Customer has a NEED, which a company finds out about. It calls on its TECHNOLOGY to produce a FORM that is then sold to the customer.

A company has a TECHNOLOGY that it matches with a given market group, and then finds out a NEED that group has, which is then met by a particular FORM of product.

A company envisions a FORM of product, which is then created by use of a TECHNOLOGY and then given to customers to see if it has any BENEFIT" [1: 89]

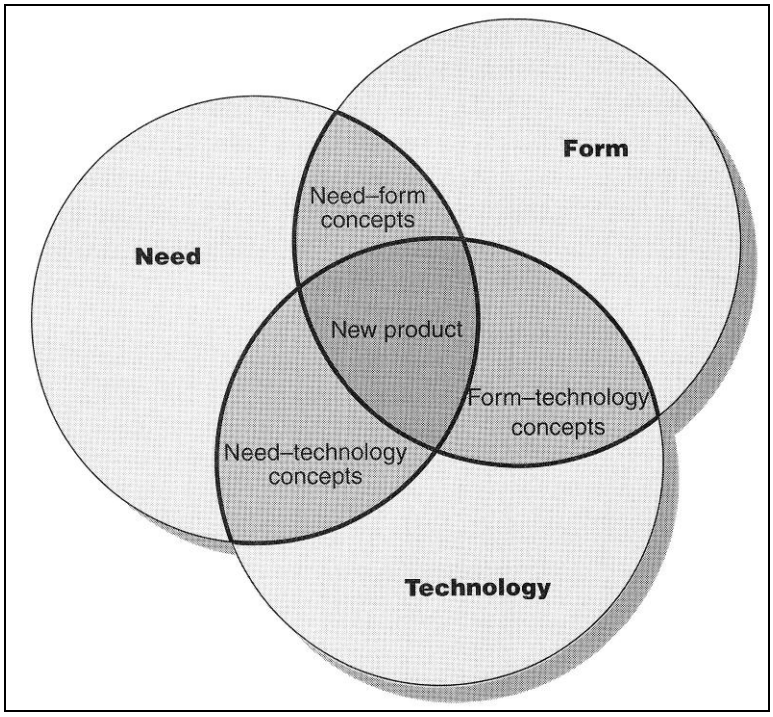

Figure 2-4 The New Product Concept

Customers are the sponsor of the company's action, so it's really important to ask them the correct questions and listen carefully to their answers. There is a huge difference between these two questions: What do end-users want the product to do for them than what they want. Companies get the best benefit from working directly with users to gather concepts where customers are standing beyond the new technology. [1: 97]

Problem analysis is sometimes the key to victorious product design. One commonly used procedure in problem analysis is reverse brainstorming; Choose the correct product or activity category from PIC. Select a group of heavy users and make them part of solution makers. Compare end-user's answers according to what benefits they want versus what they are getting. Finally sort and rank the problems, which identifies the problems that are important to the users. [1: 107]

Scenario analysis directs the view toward future problems. Those are extremely good because most problems has found in focus group have already been told to competitors. This analysis gives time to found solutions to problem before customer even know that they have problem. [1: 112]

When an important user problem has been identified, it has to be solved. Normally problems are sent to technical areas for appropriate solutions. Thus, the solutions are coming from R&D or engineering side. There has been ongoing debated for years on which style has the best problem-solving effort: teamwork or individual. Generally, individuals can handle really new ideas and find radical solutions to problems better than groups can. [1: 116]

A product consists of attributes and it can be described by citing its attributes. Attributes can be divided to three parts; features, functions and benefits. Those parts can be divided into even smaller pieces. It's useful to define attributes broadly. In theory, the three basic types of attributes occur in sequence. A feature permits a certain function, which in turn leads to a benefit. [1: 125]

It is possible to execute an attribute analysis by using several different quantitative and qualitative methods. One of the most common quantitative methodsis perceptual gap analysis, which determines how products are positioned on the market map. Perceptual gap map is based on either attribute rating (AR) or Overall Similarities (OS). Another method is trade-off analysis "conjoint analysis" which is more used in concept evaluation. One good example of a qualitative method is dimensional analysis which is possible via two-dimensional, morphological or multidimensional matrix. [1:129]

2.4 Concept Evaluation

New product is usually evaluated alone. Most organizations have several products under development, sometimes scores. It is normal for management to think in terms of a portfolio of products and evaluates new product projects in terms of how well they would fit with corporate strategy. The primary goal of evaluation is to lead to profitable products by steps whose purpose has been specified literally. [1: 168]

The new product evaluation system costs could be share in three different curves Figure 2-5. The curve indicating average is normally nontechnical business-to-business products or services. The late expenditures- curve represents products whose technical costs may be small, but a huge TV advertising program is needed at launch. Early expenditures is typical to products from technical fields. The biggest segregated part is R&D and device's evaluation cost structure is similar. [1: 170]

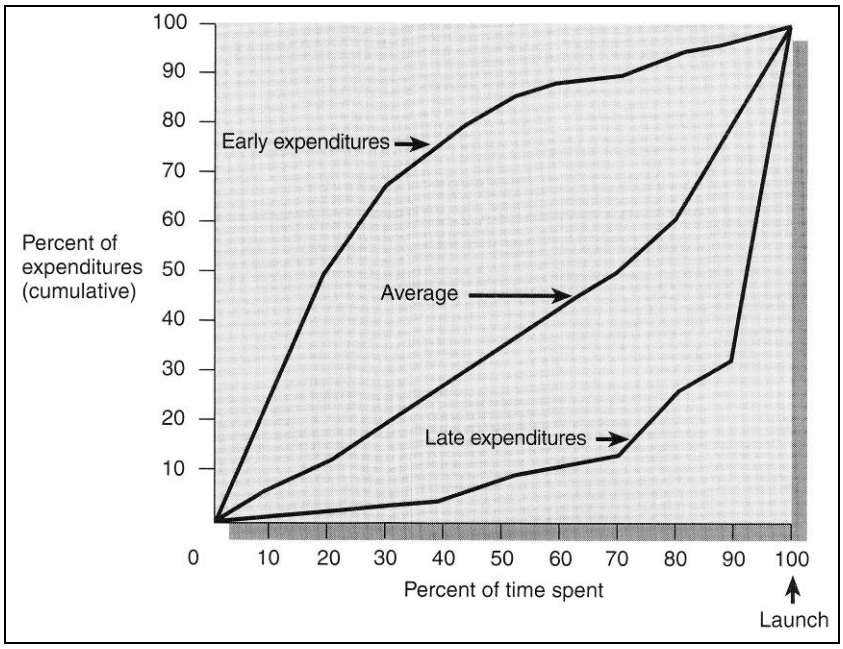

Figure 2-5 Expenditures

In a heavy load R&D process, it's normal that even experts sometimes go a little bit off the track. To a novice, the situation with new specifications and environments is really challenging which means costs which we could read from the note below.

> "Quote:
>
> Originally Posted by Darksshadow
>
> "hohoho bad news... The icon is displayed only on the emulator :(When I generate the .sis and install it on the 5800 device, I don't see anything. I've an other problem: when I install the application on the mobile, I get the warning message ""Application not compatible with phone.Continue anyway?"" I've checked my .pkg file but everything seems to be good (""[0x101F7961], 0, 0, 0, {""Series60ProductID""}"") Once again I need your help :) Thanks.0x101F7961 is the Platform UID for S60 3rd Edition (non-touch) while your application targets a S60 5th Edition device (touch). The two are considered not to be compatible so you have to express the compatibility explicitely. You can either replace that UID with 0x1028315F or add a second Product ID statement to keep the sis file compatible with both platform versions.
>
> More at http://wiki.forum.nokia.com/index.ph...fication_codes As for the icon file, send the SVG to the phone and open it with the image viewer. If it can be rendered correctly it is fine, if not you will have to tweak it a bit. There are several posts here about SVG tweaks for S60 5th Edition, just do a seach and see if they help you.

P.S. Now I see that this is the thread I was mainly thinking about. Have you gone through the issues discussed here already?" [7: 25.09.2009]

The decay curve is an extremely good diagram to depict the percentage of any company's new product concepts that survey through the development period. The starting point include all the ideas before concept testing and only 2 percent go to the market at the end as shown in Figure 2-6. Curve C represent a technology leading company, which spend time developing only those proposals worth marketing. Decay curve A represent a company whose focus is on services and it's development costs are low. In other words decay curve is partly a plan and partly a result [1: 171]

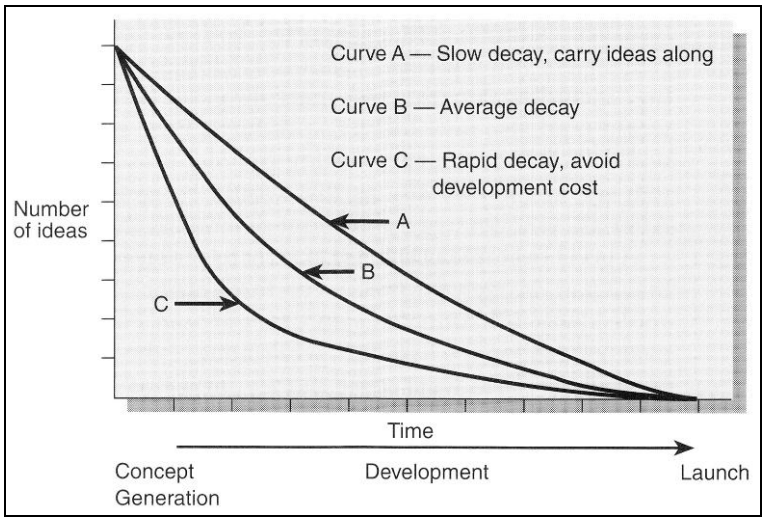

Figure 2-6 Decay Curve

As we can see from figure 2-6 many ideas have to drop before launching. That does not mean that those are going to drop off from device, maybe the occurrence is just moved to a later release of firmware which is the point made in the next note.

"Guys how happy are you with the v21 firmware??Any suggestions to improve or changes expected?? My apologies to my frnds around who still are waiting for the FW. i would like to have: New home page interface with useful tabs, Beep for missed call /Txt msg notifications, New themes, Improvemnt in camera /image quality, Default full qwerty keypad activation on rotating the mobile horizontaly while typing. Kudos! Thanks!" [6: 30.04.2009]

Many major companies make frequency use of concept testing which is part of the prescreening process. The most important purpose of a concept test is to identify a poor concept so it can be eliminated. The second purpose is to estimate the sales rate. The third purpose of it is to evolve the idea. [1: 191]

If a company wants to do more profit it has to be ready to take bigger risks. Managing risk is challenging to new products managers even if they have knowledge about risk which is

bigger than the average as shown in Figure 2-7. Being aware of the company‘s own current level of risk is really important, represented by the first vertical line. The figure itself is just some kind of an average which also explains that the required rate of return line isn’t measurement but conception. High risks influence innovation so that it needs a great deal of attention. [1: 243]

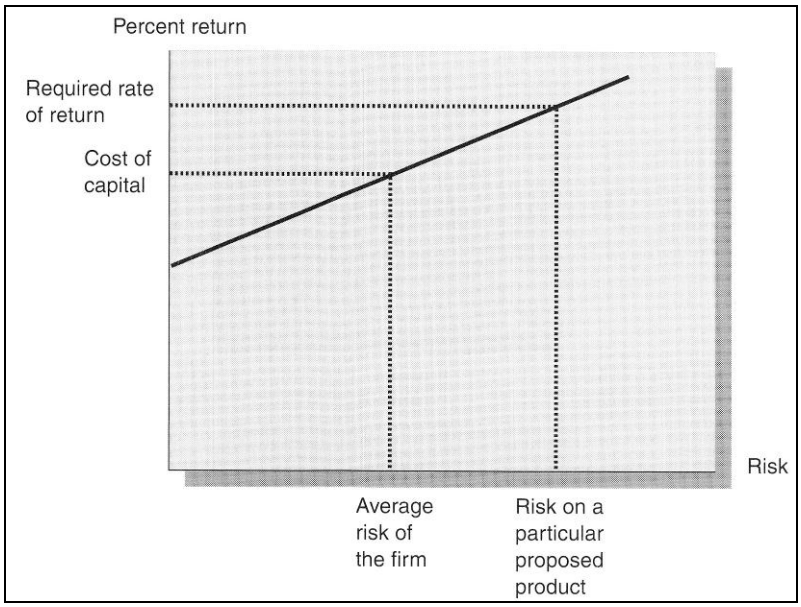

Figure 2-7 New Products’s Required Rate of Return

2.5 Development

The process by which a customer need is developed into product design is product architecture. To get a deeper understanding of architecture development, distribute it to smaller segments helps a lot. The product contains components, a display, that can be combined to chunk, touchscreen. The product also has functional elements, touch UI. The next note illustrates this principle extremely well. “The product architecture is how the functional elements are assigned to the chunks and how the chunks are interrelated.” [1: 287]

> "Quote:
>
> Originally Posted by skyjun
>
> Hello! In my application, I want to implement sound effect and vibration when users tap the screen. To do this what do I do? I already finished to implement touch function. So now I have a sound and vibration issue. Please give me some information about which API I need to use or where I can find some examples. Thanks in advance. skyjun.Well for vibration you can use the vibration API, details

here :- http://wiki.forum.nokia.com/index.ph...on_Control_API As for sound you can use CMDAAudioPlayerUtility, example can be found here :- http://www.newlc.com/en/Playing-a-WAV-file.html Cheers, Mayank" [7: 08.05.2009]

Designing a platform is much more profitable than designing individual products. Platform designing leads to easy chunks or modules replacing and several new products can be designed as technology improves. Cost savings are also guaranteed by using standardized components across many products. [1: 289]

Before becoming full equipped devices, prototypes are used in the development process. Those could be divide in two categories according to performance attributes or features. Focused prototypes are used in probe-and-learn or to learn about how the product works and how well it will satisfy customer's needs. Comprehensive prototype is necessary to determine how all the components fit together and later it can be also used in real usage situations and improved and redefined. [1: 291]

Testing end-user's experience with the new device we can call the activity product use testing, or field testing, or user testing. One name that is a little bit misleading is market acceptance testing. In mobile device companies, the typical naming to this kind of testing is field testing. It means testing the prototype under normal operating conditions. This testing type is really important because a product that doesn't meet the end-user needs fails on the market. [1: 332]

It is normal to field testing that costs and risks are usually small compared to the loss of the earnings flow from a successful product shown in Figures 2-8 to 2-10. The Y- vector in those figures is sales and X- vector is Time. Figure 2-8 illustrates that even if field testing affects sales losses at start, the curves are going to concur in the same point. Another possible situation is depicted in Figure 2-9 where competitor skips field testing and gets the advantage. This is pure theory to device manufacturers.

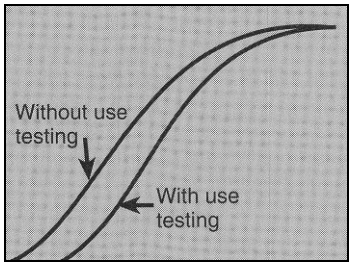

Figure 2-8 Sales Losses

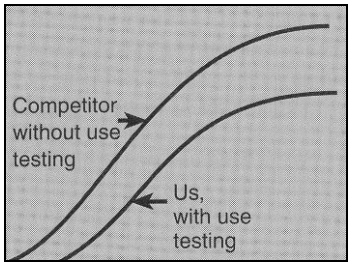

Figure 2-9 Permanent Sales Losses

It is a little bit too black and white to use the expressions ‘without’ and ‘with’ so we could think of without to be more like ‘less field testing’. In Figure 2-10 the curves prove how important field testing is to a product’s market and life cycle. If a bug is found after the testing phase, fixing it could be really challenging and harmful to the device imago.

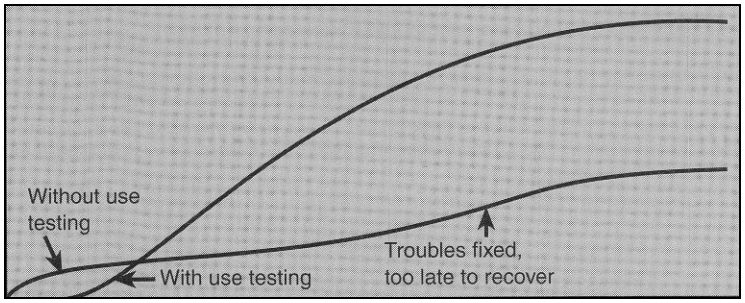

Figure 2-10 Product Troubles

2.6 Launch

As pointed out before there are different levels of newness and that level defines the launch activities. For a new-to-the-world product it is important to develop an entry strategy with the emphasis on stimulating primary demand for the product category. If newness is product improvement or upgrade to existing product the launch is expected to achieve customer migration and stimulation is aiming to replacement demand. For a new entry or line addition in an established market the emphasis is on stimulation of selective demand. [1: 363]

Identification to a new product is essential, and the accurate term for what identifies products is trademark. Another definition is registration which is a little bit more complicated issue depending on the country where it is going to be done. [1:373]

The launch cycle is one part of a bigger entity which we call product life cycle (PLC). This structure is presented in Figure 2-11 where we can see the order of the different phases. The prelaunch stage is when we are building our capability to compete. The day when the announcement takes place is important to device even thought nowadays it is almost impossible to keep it a secret when the formal announcement day approaches.

Preannouncement is a useful action to hype interest for the upcoming device and keep the finance markets happy. [1: 393]

Getting the ball rolling is the synonym to beachhead, the stage which refers to the heavy expenditures necessary to overcome sales inertia Figure 2-11. As the name is coming from military slang and reflect a crucial time in the device's future. This period has to be triumph over surprises. Early growth is the stage where sales and expenditure curves converge, after that backtrack to PLC is natural progressing.

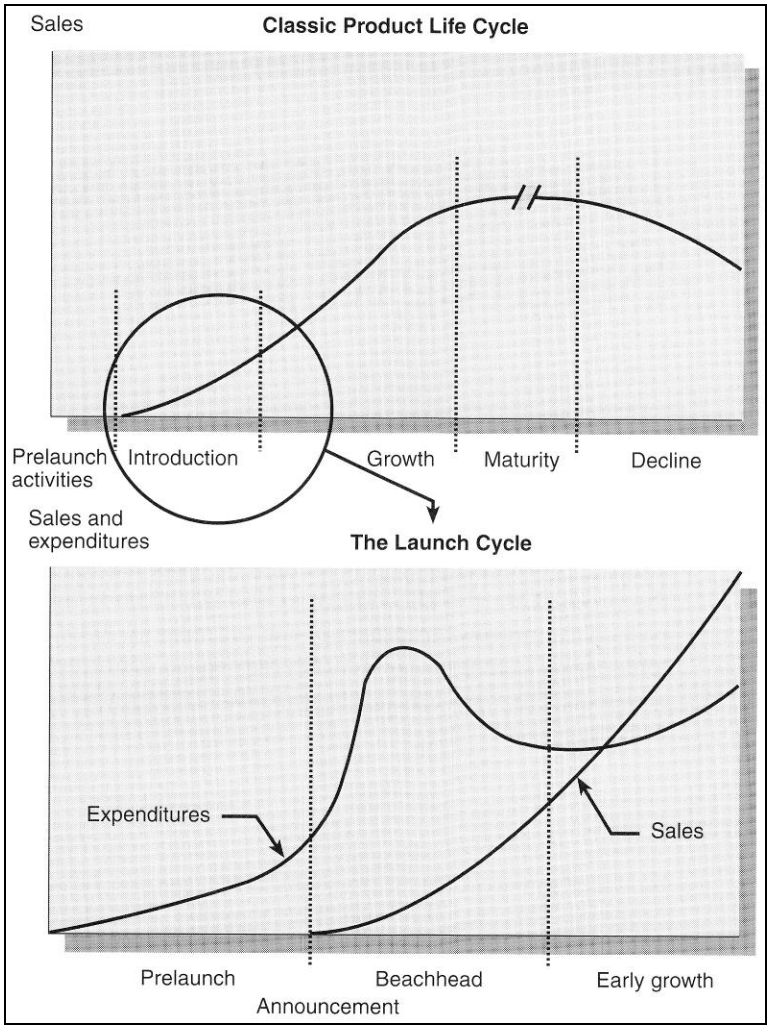

Figure 2-11 The Launch Cycle

3 TOUCHSCREEN UI

UI is normally perceived as software components which human is using to interact with a device. Literally UI includes HW also and in touchscreen UI the display component has such an important impact that we go through the technologies in HW. UI means the same as GUI (Graphical User Interface) and nowadays the term GUI is fading away.

3.1 Technology in HW

There are two most popular technologies which have been used in touchscreen display; resistive and capacitive. The difference is the touch registration method. Since touch screens must act as both interface and display, the power management is much more challenging than in traditional phones. This is a significant problem for battery-powered devices. It seems that to normal end-user the difference between resistive and capacitive touchscreen is unclear. That is a somewhat problematic issue as we can read in the next note.

> "Do you actually know the difference between a capacitive and a resistive touchsreen? Because in many ways the resistive touchscreen is much better. Maybe not in the touch of a finger, but you can not use any other device with a resistive touchscreen, needing something that emits electricity or your body parts, which emit electricity. In this way the capacitive touchscreen is better, because you can use any object to activate it, such as the stylus, a pen, anything, you can write on it, and do many other things that are not possible with a capacitive touchscreen, unless, yes you can use an electrical stylus on one, but that limits the object you have to use.
>
> I hope that this explains the WHY WHY WHY WHY WHY. Because to many people this would be a plus, it is usually only bad to the people that don't know the difference, or don't realize the capabilities of resistive, and only repeating what they have read, or do not use any other object rather than their finger, to them I am sure this is a minus.
>
> I am more than happy with the touchscreen, I don't have to carry a special stylus around, I can just pull out or grab anything I want and work with it, which to me is a big plus, especially when there are apps designed around this feature."…
>
> "As far as attracting more customers, every company wants to do that, but to have somewhere in the range of 35+% of the market share, I think that they do OK, considering there are several other players in the game.
>
> Kudos! Thanks!" [6: 26.07.2009]

3.1.1 Resistive Touchscreen

The resistive touchscreen display is composed of multiple layers which are separated by thin spaces. The main components are two flexible ITO (Indium-Tin-Oxide a Clear Conductor) layers which are coated with a resistive material and by an air gap or microdots, see Figure 3-1 below. A registered touch has been made when two sheets are pressed together, which completes electrical circuits and tells the device where the user is touching. [2]

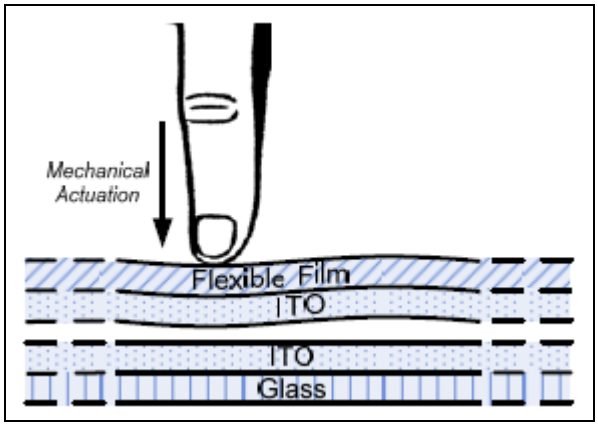

Figure 3-1 Resistive Touchsceen

A resistive touchscreen senses input from contact with almost any object from finger to pen and is a type of passive technology. As resistive touchsreen includes more different layers than capacitive, the resistive display's transparency is lower and those layers reflects too much ambient light so the visibility in sunlight is not so good. It's indoors visibility is typically very good.

High accuracy enables handwriting recognition and interfaces with small control elements but also ram to stylus using. The resistive touchscreen has higher pointer precision than capacitive. Multi-touch isn't possible today without re-engineering a wired solution into a devices electronics. [5]

Since the resistive touchscreen's top layer is soft enough to press down and indent, it makes the screen vulnerable to scratches and other minor damage, which is a common fear as expressed by the next writer. In proportion the plastic screen makes the device generally robust and unlikely to be damaged by a fall. Examples of devices with resistive touch screens are the Nokia 5800 XpressMusic, the Nokia N97, the HTC Touch Diamond and the Samsung Omnia SGH-i900.

> "Yes, resistive screens are superior to capacitive in terms of precision and they have the ability to use any object as a pointer, but they must be soft for the

pressure to register and that significantly lowers their durability. And I certainly don't want my €500 device's screen scratched." [18: 15.12.2009]

3.1.2 Capacitive Touchscreen

The capacitive touchscreen is based on capacitive coupling effects. Contacting the screen with a finger disrupts the slight charge flowing through the screen's skin, which the system registers as the touch of a button. One big advantage of the capacitive touchscreen over resistive is that because ITO layers are printed on glass see Figure 3-2, they don't deform over time. [2]

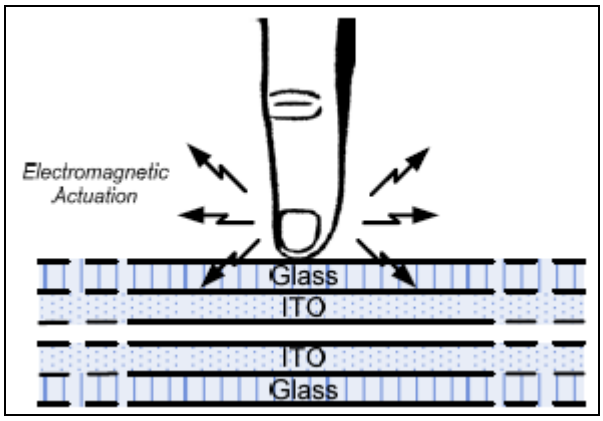

Figure 3-2 Capacitive Touchscreen

The capacitive touchscreen operating temperature is 0° to 35° degree and requires at least 5 % humidity for capacitive effect to work which also forbids using nonconductive material like pen or stylus with it. Because there are not as many layers as in resistive touchscreen the visibility is typically very good indoors and in sunlight. Transparency can be even >90 %. [5]

A low pointer precision makes handwriting recognition really troublesome. Theoretically speaking, accuracy could be in a few pixels, but in practice it is limited by the physical size of user's fingertips. So, pressing any control or selecting area which is smaller than 1 cm^2 on screen is really hard in terms of accuracy. Multi-touch depends on implementation and software. Glass as the outer layer is more resistant to casual scratches and blemish compared to the soft top layer of the resistive touchscreen. Examples of devices with capacitive touch screens are the Nokia X6 and the iPhone.

Sometimes end-users can not specify their expectations. Or expectations are very ambiguous and hard to detect as is the case with next writer.

> "I Love It finally Capacitive screen!! might get it.. _____Home Is Where The ? is.. http://www.youtube.com/watch?v=TBYnjrCynm8 http://www.youtube.com/watch?v=iqOgxUWw_PQ" [19: 02.09.2009]

3.2 Technology in SW

Almost each one of the device manufacturers has their own modified UI that runs on an OS which could be also the manufacturer's own or one of those biggest. Windows Mobile shown Figure 3-2 is from Microsoft and it has several congruences with Microsoft's operating system (OS) to PC, for example, Vista. The architecture view includes a full software development kit (SDK) where we can find at least same component names than in other SDKs. SDK enables a work environment to developers without a device. Nokia provides Symbian S60, Apple has OS X.

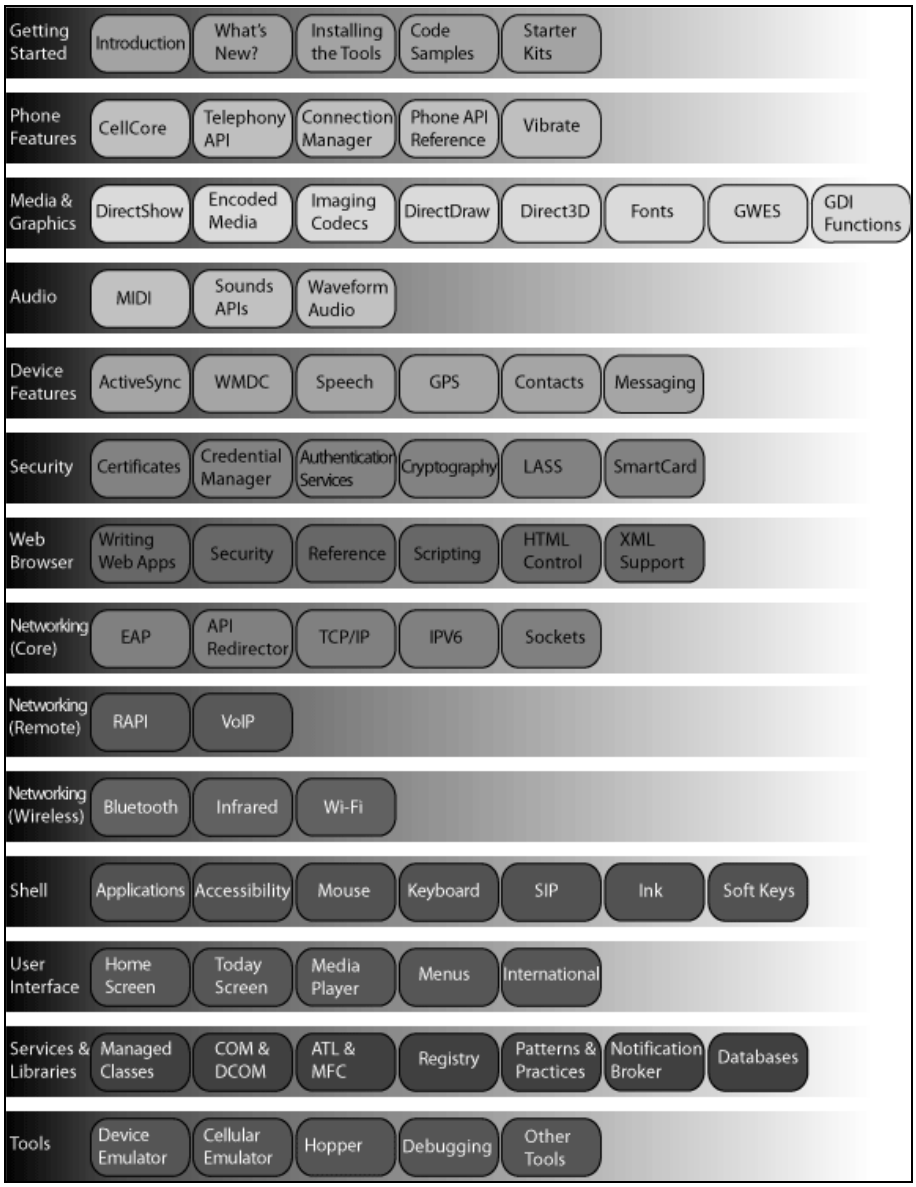

Figure 3-3 Windows Mobile SDK Architecture

How those several layers are in a device is defined in Figure 3-3. It defines the interfaces between the layers. A growing trend is that After-market add-on applications part is getting more and more weight. All manufacturers offer applications that are centralized e.g. Nokia offers Ovi Store, HTC's distribution point is Android Market and Apple has App Store. A general item in touch UI is widget which is a small, focused web application. Widget's development has been simplified so that almost every developer should be able to create it.

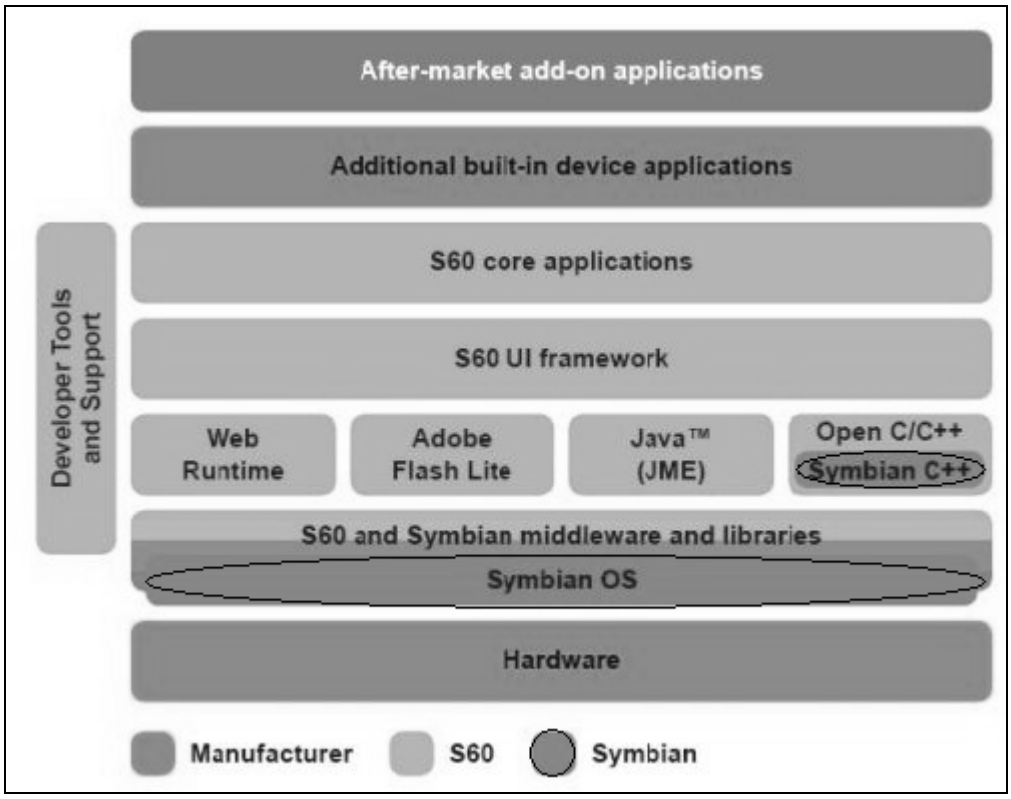

Figure 3-4 Symbian OS, S60 5.0 Device Architecture

Touch UI support needs new APIs compared to traditional UI. One good example list is from Form.Nokia.com:

Handling Pointer (Touch) Events

Toolbar API

Long Tap detector API

Stylus Popup Menu API

Tactile Feedback Client API

Adaptive Search Feature

Choice List API

Generic Button API

SingleStyleTreeList with Hierarchical Lists API

SingleColumnStyleTreeList with Hierarchical Lists API

From this list we can see how descriptive names those APIs have. Another observation is that new APIs are implemented to touchscreen use, so there is no legacy code included.

It is true that the devices are mobile computer but some HW specific features set limitations to SW porting. Even if it were possible a lot of knowhow is needed about the differences of the devices and their integration which seems to be what the writer below is missing.

> "Multitouch is good but while buying n97 I was considering about the multitouch and I asked myself how many times I use multitouch?....less than %1 of my phone usage and how many times I use my camere like 3-4 times a day...nokia's camera is still ages ahead of iphone and I dont knwo much about HTC hero's. But htc hero has an android software, I like the android but as I have reasearhed a little if you want andreoid you can install it on a n97 (nobody tired yet as far as I know).
>
> HTC hero could be faster than n97 but as I cleared my C on n97 it got faster. about the design I dont like the chin design of HTC hero. 48)?48:this.scrollHeight)"">n97 (RM-505)user.
>
> Kudos! Thanks!" [6: 23.08.2009]

3.3 Usability

Usability has been a huge challenge across the time in devices. If the traditional UI needs some developing every now and then, how could the new touch UI satisfy end-user's needs? Moving from point A to B is likely to be jumping and the shortest way is only one tap. So the time of traditional stepping-through-menu-items is over. Quick movement through the interface, requires a streamlined UI and makes core navigation very clear. Touch UI is based directly on manipulation like our physical world too, so controls have to be simple and intuitive.

Keyboard-based input should be used as a last resort. It is really important to make a clear difference between system-level gestures and application-level gestures. System-level gestures should be kept simple and linear. Application-level gestures could be much more specified. The main rule is that those levels' functionality should not be in conflict with each other.

Using stylus needs exercise and sometimes it is even impossible so in this section we concentrate on considering the interface's usability by finger. This has an impact on both the sizing of interface elements and the objects that surround them. In chapter 3.1.2 is specified the hit target size. An easy mnemonic is that if the button is small it demands a bigger gap to the next one. Screen resolution is the dominating characteristic of the hit target's size.

The device's interface should be designed to suit the end-user's age. What is easy to use for adults is not automatically handy to young children. The biggest problematic functionality for young children is drag-and-drop whereas point-and-click is much easier. Even the usability testing with non-contemporaneous end-users should be done using different methods and sessions. [4]

The most annoying thing with the device is the indefinite status. The end-user does not know absolutely whether the interface has registered the touch and whether is doing something or not, so feedback is needed. Feedback should be given as soon as possible. Clear feedback could be visual, audible or haptic. Normally, end-user switch off the audible feedback. The combination of visual and haptic gives more freedom to mobility and smaller attention in use case. Transaction animations confirm that action has taken. It does not have to be gorgeous, it is enough if it gives information that progress is happening. Researches studies which go deeper into haptic feedback are; Emilia Koskinen's Optimizing Tactile Feedback for Virtual Buttons in Mobile Devices from Helsinki University of Technology and Matti Nisula's Actuators for Haptic Feedback in Mobile Phones from University of Oulu.

4 USER'S DIFFERENT ROLES

These end user roles are purely fictional, but via those it is much easier to get a vision how many different things are nowadays possible via using a device. Almost all manufacturer devices include the same basic functionality and the biggest difference is how those features are available for use. The used applications are available in Ovi by Nokia Store or ready and waiting in device.

4.1 Technology Oriented

A technology-oriented end-user does not see any difference between laptop or device usage. EMF is synchronized every tenth minute if hotspot is available, otherwise every fifteenth. Their device that has HandyWi installed in them is almost all the time connected to a Wifi hotspot. While the end user is reading their e-mail, they can also dictate SMSs about the evening meal using Vlingo. They use Weather Touch to fast check the weather report, search for some French component names in Dictionary & Translation Pro which

are added to Shopping list and then print it out to be added as an attachment for a draft contract.

On their coffee break they verify the newest change in prices from Nordea Stock Prices Widget and from Bloomberg. Then, fast checking of the newest component.xls sheet, zipping it with the latest architecture_specs.pdf and saving the zip file to a group folder. The last thing to do before changing to leisure is checking from the Mobile Database Viewer Plus that the Oracle database is in order. After the workday, the end-user changes his device profile free time home screen.

4.2 Media Centralized

For the media centralized end-user the most important daily issue is to stay abreast with the latest news. This is possible via several different sources of information. Device default web browser is typically a combination of several independent features and can not be functionally specified to a couple features. The solution to this is optimized browsers. Skyfire Free Mobile Browser provides web browsing that is exactly like PC browsing. Now and then fastness is the order of the day which is enabled via Opera Mini Web browser.

The most important sources are RSS subscribed and updated to the phone using RssNews-Mobile Rss Reader or mNews. The end-user may get hint of news, but the source is not known. So the solution is to use search engines like SeekBert, k-search or Woofeed which include already defined sources. Traditional newspapers have their own home pages on the internet and they are offering services to device end users. The supply scale is wide ranging from global publications such as Telegraph News or Khaleej Times to national papers like Helsingin Sanomat Widget.

Watching the newest movie trailer or downloading Rihanna's newest album is more enjoyable if there is a hotspot available which is normally faster than 3G. Easy Wifi Network or HandyWi shows a map of the nearest hotspot locations. If there are many hotspot available WeRok logs onto the strongest free-access within range.

4.3 Member of Social Networks

Social networks are a growing area in IT and many use their device to connect to these networks. Depending on end user's needs to update theis status via Tweets using Twittix, larger information sharing is possible from Facebook via Facebook Nokia N97. Personally chatting takes place with SMSChat. Google Talk and Flickr are really useful links to different blogs and contents sharing. These online communities are only the tip of the iceberg.

Specific applications made for just one purpose of use have better features than messaging service type applications. But using one application to simultaneously log in to several communities and not forgetting popular messaging services such as Skype, Windows Live Messenger, Yahoo! Messenger, ICQ, Google Talk, AIM and Gadu-Gadu.

An ex tempore physical meeting has been made really simple nowadays; Phonelocator Periodic shows to justified persons in http://periodic.phonelocator.mobi the device's location. If the end-user has a high speed packet data contract it makes it possible to offer hotspot from their own device to other by JoikuSpot.

Content sharing is nowadays one of the biggest part of data communication. The individual end-user does not produce a lot of data traffic, instead several thousands of end-users constitute a huge data flow from devices. Touchscreen UI has made this even much easier than traditional UIs. People are also demanding devices which are not only easy to use but also fancy as expressed by the writer below.

> "Nokia Photo Browser: Browse your photos with stunning 3D effects As its name suggest, Nokia Photo Browser is photo browsing application that pretends to replace the quite boring and slow default gallery application on 5th edition devices. It's designed to be finger friendly and easy to use application, whenever you want quickly browse through your images. User interface is optimized for touch controls and designed to give fast access to all your photos with a number of eye catching features, including stunning 3D effects, transitions, intuitive zooming controls and very, very handy fisheye magn... .. Read more: Browse your photos with stunning 3D effects- full story Sincerely yours, Teo_____Owner of a Nokia 5800, a SE p990i and a cowon D2. Let the dark passion play!" [18: 31.03.2009]

Sharing photos plus videos with friends and other community members, is easy and fast. Maybe the easiest could be use Ovi by Nokia or directly from the device using applications like VideoCam Premium or TTPhotoPicker.

4.4 Combination of Roles

Of course a technology oriented person can also use Facebook or different RSS readers. Almost all of the applications mentioned earlier are also available in a non-touchscreen device. But touchscreen UI offers a lot more of utility value. If a device includes several home screens, widgets and shortcuts, the positioning could be the same as with those fictional roles. So, before there were only voice profiles, whereas now touchscreen UI enables an entirely profiled device.

5 COMPETITION OVER END-USERS

Companies have several different options to influence the customer's buying decision. Customers of all types know much less about their current products and other options than companies would like. A new concept may well offer a benefit that the customer doesn't even realize is new. One solution is to provide a full data sheet about each competitive product.

Offering detailed definitions enables end-user's independent opinion. But there are a numbers of factors which affect the customer's buying decision as was discussed in chapter two. A conclusion from all those components could be similar to the note below.

> "it's somehow a good mobile phone released by Nokia, even though the firmware is a lil bit new and thus caused lots of bugs. yet it's ok because the bugs may vary from phones, just check seriously when buying. u may need to buy a zitron or Avaxx 5800xm so that u can claim the safest warranty from Nokia, if u can't wait for the 2nd batch to come out. i've purchased one for myself weeks ago. what makes me going towards this hp is:
>
> 1) the 1st Nokia s60 touch os
>
> 2) the condition and built working is nice
>
> 3) functions are complete & perfect such that it contains Xpress music, Carl Zeiss Optics, WiFi, 3.5mm music jack, 3.5G HSDPA, stereo speakers, micro sd extend up to 16GB, handwriting recognition, 3.2' 640x360 highest resolution 16:9, 16 million TFT screen, FM Visual Radio.
>
> 4) 1st s60 that finally supports fullscreen wallpaper.
>
> 5) the best quality stereo speakers ever in Nokia, bass reproduction is strong
>
> overall it's a very good phone. Kudos! Thanks!"[6: 14.03.2009]

Another issue turns on whether to a price in the concepts statement. Sometimes even the price isn't the deciding factor. A unique design or extra accessories make special effect for the customer. Accessories are typically used in a new device's campaign or promotion.

> "Quote:
>
> Originally Posted by Tommie
>
> Whether you use an N97, an i8910HD, a Storm, a TouchPro2, a Hero, an iPhone, a Pre, or whatever else, be happy with it and if you're not, buy something else. The best device available is what best fits you.The advice that's so often missed with mobile phones, usually brand loyalty comes into it. If you ask me, the OmniaHD is the most innovative phone this year, though it's not without it's flaws as Tommie

> pointed out. The biggest thing about it is the single LED flash. But apart from that, it's a very very good phone. To put it very simply, it's by far the best specced phone out this year, and it's well built, AND stable. I'm glad I got it, and I think I'll be keeping it."[11: 02.09.2009]

One interesting issue is the device's different appearance with different way of using, even though they are using the same OS. One good couple is the Samsung i8910 which is also known as Omnia HD and the Nokia N97, which both have Symbian OS.

Often customer service and support have smaller weigh than the above-mentioned but those have a huge effect for customer loyalty in the long term. A customer-friendly attitude means that communicating and establishing customer relationships are really the essence of a service job. Customers love the companies that treat them the way they like to be treated every time they have contact with the company's service.

5.1 Touchscreen UI Landing

It is impossible to say when the touchscreen UI landed but it is not hard to say which company started the landing with an aggressive advertising campaign in 2007. As chapter 2.7 described, the beachhead phase from Apple to iPhone was extremely spectacular. It is worth noting that iPhone has not got some of the features which were default in normal UI devices. Despite this Apple managed in launching the touchscreen.

Even though touch UI was not anymore new to the world all manufacturer's first touchscreen devices were a success for them. For each company this type of device was a big step, which also meant gorgeous advertising campaigns. The Sony Ericsson Aino is a little bit hard case when discussing touchscreen UI, as it actually includes two separated UIs. One is the traditional keypad and the other touchscreen for music, videos and pictures, when the keypad is closed.

5.2 First Impression

The device consists of a large number of parts including buttons, chassis, speaker, and display. Each user has different, specific reactions to each of these components, thus affecting the usability or attraction of the products in different ways. The key to discovering what makes a product usable or attractive for a large number of customers lies in investigating the relationship between the consumer's overall impression of the product and their response to particular components. For a particular product, it is important to know why some people feel it is usable and others do not.

> "I have to say, I'm already falling for this phone. Yes, mine has a nice size gap in the right hand side of the lens cover... Sure, the colors of the screen aren't the best

> (it is a bit dull and drab) but holy crap, I don't care. I know there are a lot of 5800 owners out there, and I have to say... I now see why you love the device so much. It's so responsive... I can't believe people say this phone is unresponsive to touch. I've had zero problems at all with either onscreen keyboard. Even the mini is fine to peck at with fingernails. The large keyboard is phenomenal. It blows away my typing on my E71 (which I always struggled with).
>
> The UI is so damn intuitive. I was like... how do I turn on/off Bluetooth... hmm... let me try holding up near the top of the screen. Sure enough, a connectivity menu opened up! I've been playing with it all afternoon... It's just blowing me away. This phone looks like an easy replacement for my E71, and now I seriously can't wait to see what the N97 will bring to the table. I don't know... I haven't been this excited about a phone in a while It was completely worth the wait for us here in the US." [11: 31.03.2009]

For example, the company could make a perceptual gap analysis of devices with attributes like "easy or hard to use" or "like or dislike." These attributes express an overall impression of the phones. Then company may include attributes for specific components to describe a detailed impression of the phones such as "hit target is too small or too big," "the body is too narrow or too fat". These analytical attribute techniques are felt to be more useful in Western culture than in Eastern[1: 127]

The attributes are really easy to identify from the above note. But even without any analysis it is clear that this end-user is obsessed with the device. If the completeness is going to glare customer the buying decision is much easier to make than after a long comparison between the positive and negative sides of the device. From all those records which were introduced in chapter 1.5 two diagrams 5-1 and 5-2 were made. Because there weren't any questions posed but these attributes were picked up inside the text, detailed attributes are impossible to set up. Those diagrams are intensified examples of attributes. Only the opinions matter, it isn't even necessary that the respondent has used the device. Without any deeper knowledge, using attributes in a different analysis could be extreme fatal.

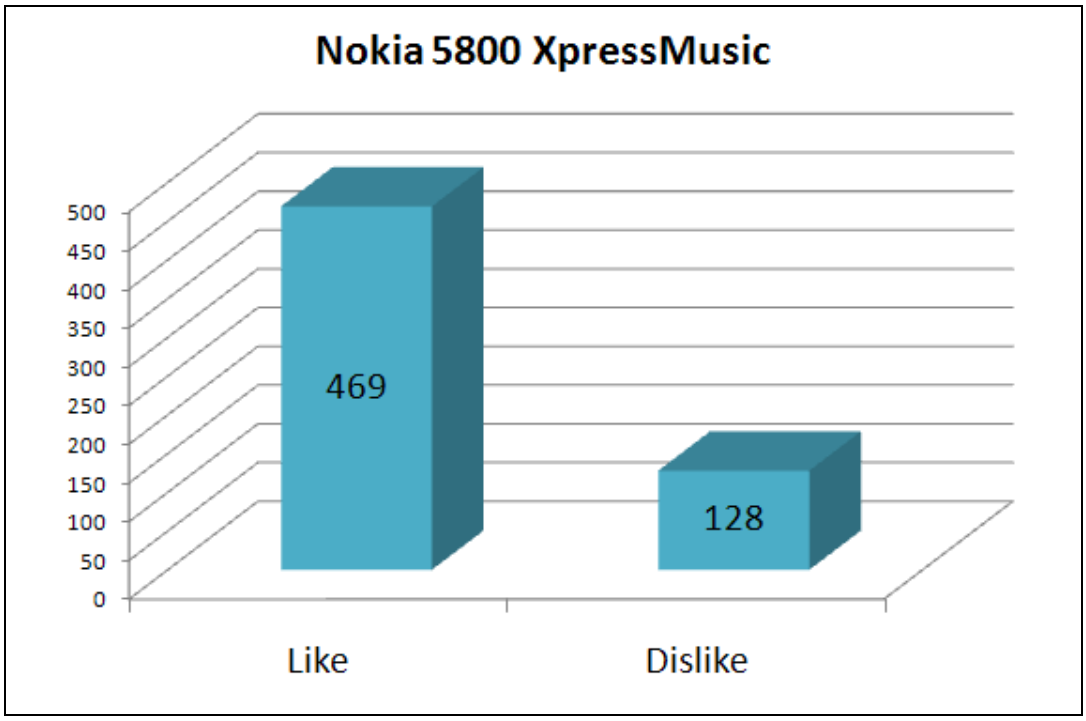

Figure 5-1 Basic Attribute of Nokia 5800 XpressMusic

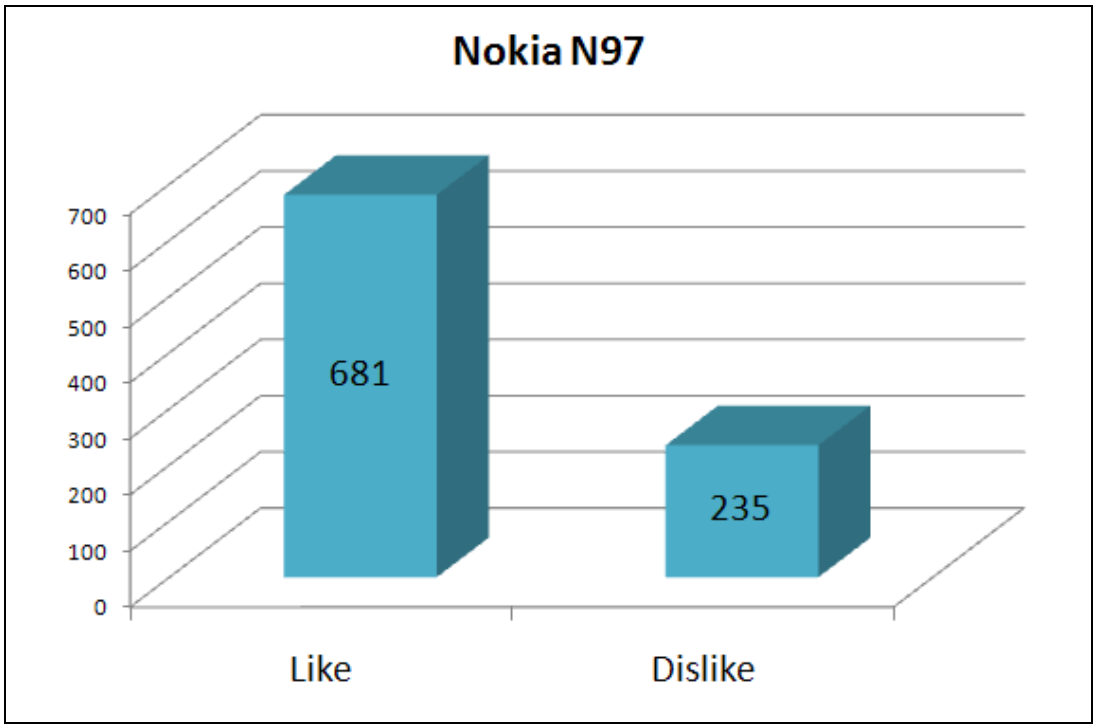

Figure 5-2 Basic Attribute of Nokia N97

> “Motorola Milestone Android phone launched,have amazing features like five mega pixel digital camera,a slide out QWERTY keyboard,3.7 inch touchscreen,Wi-fi....and much more....so nice phone,i like it.....guyz u can buy it n enjoy...” [12: 08.12.2009]

The notes above and below seems to be written by the same end-user. Separated proceeding gives an image of a customer who is infatuated with the device. It wouldn’t be suprising if the two were written for commercial purpose.

> “Samsung Corby S3650 CDMA phones have really amazing features like touch screen facility and access to YouTube, Twitter and muchhh more.... 2.0 MP camera,Stereo FM radio with RDS and Bluetooth....its great phone.....guyz u can buy it!!! n enjoy it...” [12: 07.12.2009]

While companies are spending time to build some great features and make their products more scalable, they shouldn't forget to use time, lots of it, in the areas that customers touch and see. Nowadays this means making the install process as easy as possible and making the device's UI intuitive and easy to use.

5.3 Features Versus Usability

New features are candy for the end-users. The company which introduces a new feature in a device at first has the advantage over other companies for a while. The successors can only try to do that feature in a better way. It is possible that the feature’s first way of using is going to be permanent. Even thought there could be easier ways to use the device, end-users like to stay with the one they learned first.

For a while, the end-user is satisfied with the device, but daily use brings out situations that could be handled in a different way, at least from the end-user’s view. Maybe some of the features could be even add to the device’s usability or the other way around, those features could be fatal to usability and the customer’s user experience. Below is a very good example which include both of those cases.

> "I got a 5800 just over a week ago, and so far so good, but I definitely agree with some of the points raised.
>
> 1) perhaps nokia could make use of the volume key on the side to control the up/down scrolling of lists?
>
> 2) a bit annoying at times, especially if you've been out of the room for a short time and not realised your phone has gone off, but I guess its seen as a power saving feature.

> 3) my home screen is very sparse to say the least none of the settings really suit me, for example a mix between the shortcuts bar and contacts bar would be perfect, nothing from my calendar seems to show up in the home screen at the moment, and there are things in there. so maybe they can offer this combination at a later date? "…
>
> "I've heard that the new firmware is out there, but each time i've checked on the phone, there is no new version available yet, so hopefully vodafone will put out a new version very soon. something else I've found with my handset, its a completely unbranded unlocked handset straight from the local vodafone shop, not that i'm complaining as it means it can switch between my contract and pay as you go sim card whenever I like. But I was really surprised when I tried it." [16: 18.02.2009]

5.4 Market's Reaction and Influence to Productization

Customer loyalty is really important to companies, because it's the best type of commercial for the company's devices. An end-user who is satisfied with their devices is often trying to change their own old working methods to suit the device. One good example is the electronic book which is normally used via a special reading device. China is a really fast growing country in mobile literature field. Writers don't even try to do literary art. The main thing is sales proceeds that are huge to the most loved writers.

> "Every week or so I send an email to eReader.com to ask them how they are doing on creating an ereader for the XM 5800 Touch Screen and they inform me that work is continuing, but that no completion date is soon to arrive. Sooo, my question is, has anyone found an EASY method to read ebooks without having to convert files or carry two devices? I downloaded EZReader and Fictionbook Designer and was willing to go that route, but every time I tried to open one of my ebook files, Fictionbook Designer would tell me it could not open, [.pdb], Palm files, which is the format in which all my ebooks are. Any help or suggestions would be greatly appreciated." [11: 16.09.2009]

One other good example is localization. Many devices have got different inbuilt map systems with guidance. The touchsreen's display is about the same size as traditional navigators. Nobody could predict that Nokia is going to make the license free. To end-user this means one more reason to buy a device which enables several different operations.

Packet data connection's speeds and Quality of Service are nowadays so high that using e-mail via touchscreen UI device is growing all the time. E-mail configuration was really challenging at first and sometimes even impossible without technical experience. So, the only thing to do to get more e-mail users via device was to simplify the e-mail account configuration. In N97 e-mailbox creation is behind one selection from the homescreen widget.

6 FUTURE VALUE OF TOUCHSCREEN UI

6.1 Evolution of Mobility

Mobility is the future keyword. Working at a desk is decreasing and actual working isn't anymore confined to a place. So desktops are automatically excluded in this case. Laptops are enable tough working, which has traditionally been done using desktops. But even e-readers which are for the time being A4 size are perceived a little bit heavy-handed. A touchscreen device which includes a large display in relation to the size of the device itself is the solution to the problem. The below writing describes the future extremely well.

> "Well, planning to sell 45 million and actually selling them are two different things. Apple's future is interesting. We're reaching a point soon where iPhone owners will be coming to the end of their operator contracts. Apple don't have a better device available to entice them. I wonder how many will consider trying something else. At the same time, the competition is getting stiffer. Apple's hardware has hardly evolved at all, and the software upgrades mainly add features that all otehr devices already had. Meanwhile, Nokia, Sony Ericsson, Motorola, HTC, RIM,Samsung, etc, are bringing out new devices at a phenomenal rate. Android has come into existance, and the Symbian, Windows Mobile and BlackBerry platforms are all evolving. Even Series 40 now offers 320x480, GPS, Wifi, WebKit browser and a 5Mp camera. I doubt Nokia are worrying much about
>
> Maemo right now. The 5800 XpressMusic is now available for €200, a fantastic price for a full-featured, touch-screen smart phone. If Nokia aren't selling these as fast as they can possibly make them, they should be really worried." [7: 26.09.2009]

Devices have a huge advantage compared to PCs. PCs UI is traditionally used with a keypad and mouse whereas device usage is based on constant controls. Touch UI doesn't need basically anything else than touchscreen. So there isn't any need for retraining when touchscreen use in daily work is growing. But it is wrong to say that touchscreen enables mobile working. It would be better to say that touchscreen UI enables a whole new lifestyle. Watching streaming videos on a train journey or playing a real time first-person shooting game on the internet can provide a better way of life for many.

6.2 Different Scenarios

A high resolution display combined to a convenient size and efficient processor, constitute an impressive wholeness. If we compare the progression of traditional PCs and devices, there are more similarities than differences. At this moment devices have several different

OS which are not compatible. Will there be fewer OSes in future or could it be possible to strike the golden mean? This is the biggest question which will prove the development.

Chapter 3.2 introduced some companies' own application sharing point. This orientation is clear, i.e.companies provide HW and SW chassis to end-user's chosen applications. So there are ready and waiting, -basic features in the device and the end-user is going to tun e it according to their own needs. As almost all of the touchscreen's controls are on the display, the whole content is easy to reinstall with end-user's needs. In this case, it would be better for software houses, if there was less OSes, or if those could be compatible on some level.

The other direction is to encapsulate the product. This scenario is not very probable and already now all big device manufacturers are sharing their SDK with software houses for SW development.

Touchsreen UI technology has ascended with huge steps from the buildup time and it is certain that it is going to be part of all future devices. Whether the device will be equipped with a full qwerty keyboard or without a keypad, the Touch UI will be the key to the growth of the device's usability.

7 SUMMARY AND CONCLUSIONS

In this chapter the results of the thesis are summarized and assessed. The productization is always challenging for a company and new technology productization also includes a remarkable risk. It doesn't help, if the product is a technological success but the end-user doesn't care a fig about it. Another important thing is the newness aspect, i.e. is the product new to the whole world, the company or only the end-user.

Touchscreen UI productization was extremely challenging because of two big factors, a new HW for display and new UI for a new way of using the device. On HW side it seems that capacitive technology is getting more foothold in the market than resistive. There is ongoing excitable product development to connect those techniques together. On SW side the challenges were even bigger because the end-user's input to the device had to be designed again, starting from the basics.

The end-user's role has changed a lot in the past decades and now that role includes taking an active part of productization. Companies are using several different analyses and researches to identify end-user's needs and wishes. The interaction doesn't finish after the phone has left the store. Companies are publishing firmware updates to devices. The duration of firmware support also defines the device's importance to company. E.g. to IPhone 2G this number is 18 from launching to May in 2010.

New technology productization does not affect only the company's first device which has been made using new technology. Instead it is going to form the ground for upcoming

device generations. This was really clear to all device manufacturers when devices with touchscreen UI were launched for the first time as benchmarking between those products was very rough.

Comparing the firmwares which companies have released to their first released the touchscreen UI and the opinions expressed on the discussion forums it is possible to answer the research question and conclude, that companies and end-users are both pleased with the situation. For example in 5800 XpressMusic case; like versus dislike can see from Figure 5-1.This means that, the goal of the thesis to evaluate the needs of both companies and end-users was reached.

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