
Mobile Communication



Mobile phone for a company

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Agricultural Economics and Management

Thesis title

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Objectives of thesis

The thesis is focused on solving decision making problem of selection of mobile devices for a company workers. As a partial goals of the thesis are set:

- to create a literature overview of current mobile communication markets,
- to select basic decision making criteria according to the results of the literature overview and
- to analyse variants and choices of the decision making problem of selection of mobile devices for the use in a company.

Methodology

The thesis is based on a literature overview of the information resources. The solution of the decision making problem will be analysed by using the methods of multicriteria analysis of variants and by workers' preferences. The combination of the synthesis and the analysis of acquired theoretical and practical knowledge will lead to the final conclusion.

Schedule for processing

- 1) Preparation and study of specialized information resources, refinement of partial goals and selection of work process: 6/2011
- 2) Processing of literature overview according to information resources: 7/2011 - 8/2011
- 3) Development of the own analysis, discussion and evaluation of results: 9/2011 - 10/2011
- 4) Creation of the final document of the bachelor thesis: 11/2011 - 2 /2012
- 5) Submission of thesis and abstract: 3/2012

The proposed extent of the thesis

30 - 40 stran

Keywords

Mobile communication, mobile devices, decision-making, criteria, mobile device for a company.

Recommended information sources

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Samuelson, P.A., Nordhaus, W.D. Economics. 18th edition. New York : McGraw-Hill, 2005 . 784 s. ISBN: 978-0072872057.

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Prague March 29. 2012

Declaration

I declare, that this Bachelor Thesis entitled: "Mobile Communication" prepared separately by using only the use of professional sources, which I state in the list at the end of this work, which I quoted in the text conscientiously.

In Prague on the Signature

Acknowledgement

I would like to thank my supervisor Mr. Ing. Miloš Ulman, Ph.D. who gave me more than a year of helping with writing and was always willing to give me some advice or help in solving problems. It is an honor for me to thank my Standards for Thesis Writing and Preparation teachers Mrs. Ing. Bohuslava Boučková, CSc. and Dr. Neil Harvey for their advices.

Summary

This work deals with the issues of Czech Republic's mobile phone devices, operators and their tariffs offer. It analyzes its main offer differences, price difference and technical innovations. It also finds the most preferable choice for twelve dealers for a company which is wishing not to be mentioned. It includes research in the mentioned area and a brief terms encyclopaedia for people from outside the reported industry.

Keywords: Mobile communication, mobile devices, decision making problem, different criteria, mobile device for a company

Souhrn

Tato práce pojednává o mobilních telefonech, operátorech a jejich nabídce tarifů. Analyzuje hlavní rozličnosti jejich nabídky, cen a také pojednává o technických inovacích posledních let. Také hledá nejvhodnější výběr pro dvanáct obchodních zástupců pro nejmenovanou společnost. Zahrnuje i bádání o výzkumu v daném odvětví a snaží se ho i vysvětlit encyklopedickými vysvětleními pro lidi z jiného oboru zájmů.

Klíčová slova: Mobilní komunikace, mobilní zařízení, rozhodovací problém, rozdílná kritéria, mobilní zařízení pro firmu

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1. Introduction

There are many helping factors in today's businesses and one of them should be technology. The main factor which is going to be examined is the mobile world in general with the main focus on mobile devices.

Today, people can find almost all information on the internet, which is going to be included in the chosen devices. Dealers also don't have to be carrying heavy diaries to be informed which meeting comes after the other.

One of the biggest inventions of the modern world is communication system - using telephone from almost everywhere around the planet without being connected anywhere. There are two things that are used through mobile phones. There are "texting" and "emailing". It could sound funny but it is a very young thing. The first commercial cellular system was opened in 1983 and in the Czech Republic it is an achievement of the 90'. E-Mail, on the phone is a combination of internet and the cellular system.

There are many inventions in the mobile world but here it is about inventions which help business. So the thesis of this bachelor is solving what is helping in business today.

2. Objective of thesis and Methodology

2.1 Objective of thesis

The objective of the thesis is to analyze a decision making problem in the selection of mobile devices for a middle sized company. The device should suit their needs the best but it shouldn't be the most expensive one. Output is going to be interconnected with price.

In the first part of the thesis it is going to be said what are the functions and where are they going to be used. In the second part, there is going to be the selection of the devices and comparing and it is going to be chosen by multiple criteria decision making method. The method is chosen because the result is depending on the sum of all criteria, how they are working altogether.

2.2 Aims and hypothesis:

The objective of this thesis is to find the best mobile device for clients from a middle sized company. The device should suit their needs the best but it shouldn't be the most expensive one. Output is going to be interconnected with price which means it can not be the same result as in enthusiast's magazines because they find the best option without comparing how much they pay for the extra function. The hypothesis is based on whether the most expensive device can be the best option although price is taken into account.

The goal is to find a mobile which will do the end users' jobs the fastest and easiest way and also the best way. If the device reads all documents, is accessible in inaccessible localities and doesn't brake down often. The basic aspects will be criteria as battery lasting, visibility of a display in the sun, functionality of applications (MS word, excel, PowerPoint, pdf reader, mAgent), handsfree (it is a device that makes drivers able to speak while they are driving) compatibility and speed of working.

Another partial objective is to find an ideal operator from the Czech trio (T-mobile, Vodafone, O₂) - which company is going to be used and selecting the tariffs from. The operator should be certainly the cheapest because the differences in services are not noticeable.

2.3 Methodology:

The thesis is based on a literature overview of the information resources. The solution of the decision making problem will be analysed by using the methods of multi-criteria analysis of variants and also by workers preferences. The multi-criteria method is chosen because the sum of all criteria decides about the result. The best gets 6 points and weakest 1. The combination of the synthesis and the analysis of acquired theoretical and practical knowledge will lead to the final conclusion.

2.4 Structure:

- 1) In the introduction part there will be an outline of the work, a presentation of the topic, and a brief history.
- 2) A summary and explanation of mobile features and technologies will be structurally divided into chapters and sub-chapters. This chapter will explain what are the functions, a brief explanation and a justification of where they are going to be used. That's also where most of the literature review is used.
- 3) Third part will try to analyse what functions area managers (the people who is this work done for) need, and explain how and why they need those functions. In this part also co-operation with the actual area managers will be used and analysed.
- 4) When reader knows what area managers need, the actual comparing and choosing of the device and its operating system begins. That's where the chosen methodology of multiple criteria decision making method is going to be used and found in graphs.
- 5) After selecting the mobile device, the company which is going to be selling and providing the devices will be chosen
- 6) Conclusion in the end will give the best solution, and some of its best substitutes will be presented. The decision will be explained and proved.
- 7) List of resources, where bibliography and internet sources will be given to authorise the use of other authors work.

3 Literature review

This is a review of information and data used in the thesis. It shows options of development and improvements. It tries to describe new ways of thinking and other uses of phones. There will also be described all operators, their tariffs and used systems.

The modern world is improving fast and people change their options and results according to it. These are some of the invented and commonly used methods on mobile phones last couple years.

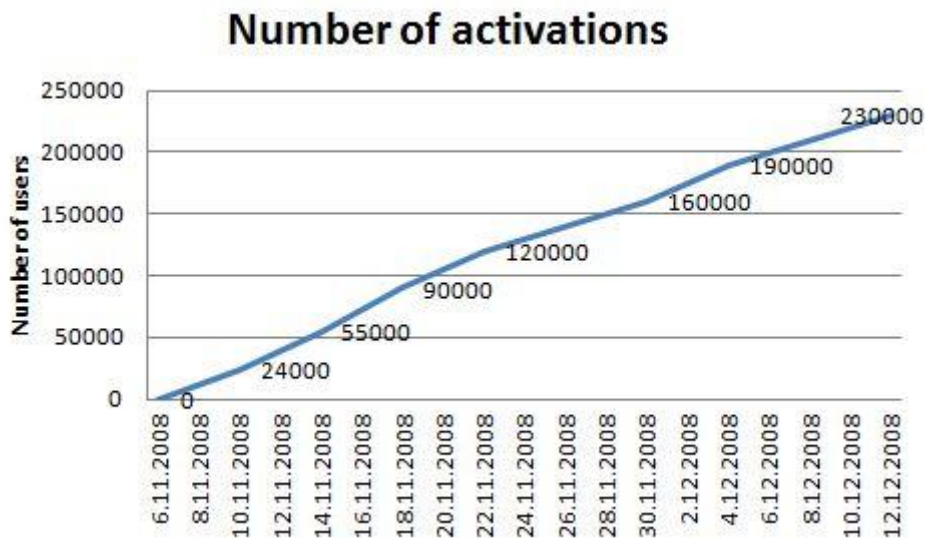
3.1 Mobile internet

Internet in phone devices is nowadays a common thing. It is not as it used to be a last thing to use when for example searching for a address. If nobody knows, today it is not only a slow GPRS wap search. Today there is aslo 3G, HSCSD or even the WIFI, which now is not a high-end equipment of a mobile phone but an everyday element. The three Czech operators are still building the sites, so it can be actually used properly without many losses.



Picture 1 Mobile Internet (<http://www.maximumpc.com/files/u46168/iphone-internet.jpg>)

It is really growing fast as visible on the Vodafone number of activations graph:



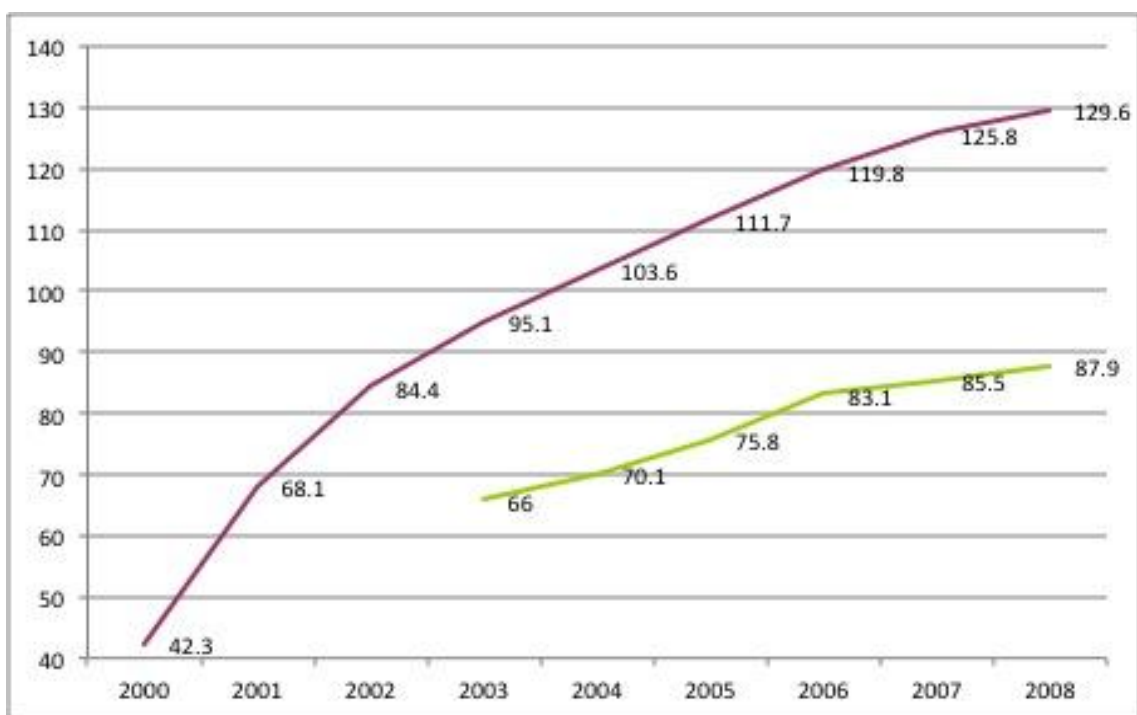
Picture 2 Number of activations (<http://www.lupa.cz/clanky/vodafone-rozhybal-mobilni-internet-v-cr/>)

After the half year action of free trial of mobile internet nearly half of the Vodafone customers activated the mobile internet and because if were not told after the trial time to stop, they are connected till now. Last numbers (2011) show that 2.26 from 13.4 million mobile phone SIM cads in Czech Republic use internet through their phones.

The Czech Republic has registered more mobile numbers than people. That should say something. Of course not everybody has a phone; there are many people with work-phone and private phone or just more phones because of better prices or whatever.

Active SIM cards vs. mobile phone users per 100 inhabitants

(Purple – active SIM cards, yellow – mobile phone users)

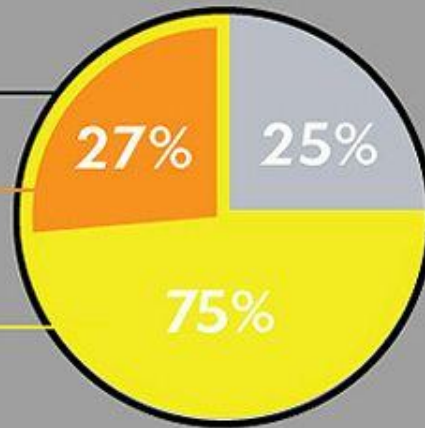


Picture 3 Cards vs. Users

http://www.czso.cz/csu/redakce.nsf/i/mobilni_telefoni_sit

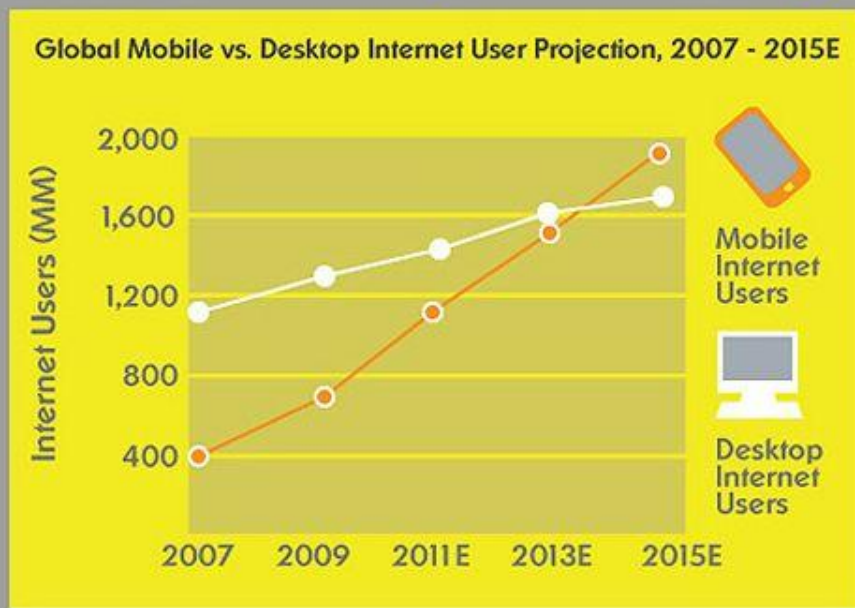
What is the size of the mobile market?

Of the world's **4 billion** mobile phones in use, **1.08 billion** are smartphones and a whopping **3.05 billion** are SMS enabled (950 million are not SMS enabled)



How fast is mobile internet growing?

By 2014, mobile internet should take over desktop internet usage



Picture 4 Mobile market (<http://wallblog.co.uk/2011/04/13/what-is-the-size-of-the-mobile-market-infographic/>)

Number of internet users through mobile phones is rising and rising as it gets more favourable. In the last half year (till October 2011) 2.5 million people used internet on their phones.

3.2 Smartphones

Every year the percentage of smartphones in the phones market increases. In the beginning of the year 2010 a smartphone was only one device of 10, but by the end of the summer it was two of five. It is maybe because of the drop-off the price and also the rise of popularity. Mobile devices are today a thing of style. A smartphone is a phone device which works with an operating system. Operating system can be updated, there can be downloaded many more things than to a phone without a system. Of course even not smartphones work on a system, but a smartphone can use applications from different companies and many different mobiles can use the same application, which means it has advantages for both ways. Consequently the phones have many more applications to choose from and they have also updates of the applications, there is no need to buy a new thing to use new things in old devices. Another thing is that the smartphones are a lot more expensive for development and they have a bit more expensive materials but still, the profit is much more than in the low cost phones. For example [17] Taiwanese handset maker HTC's profit rose by 33% and sales jumped 58% on strong demand for its line-up of smartphones. They can have the sale prices much higher because the price differences can be bigger in the higher class products. Its revenue (2010) rose 58% to \$60.53 billion in the second quarter, from \$38.20 billion a year earlier.

3.3 Instant messengers



Picture 5

Instant messengers

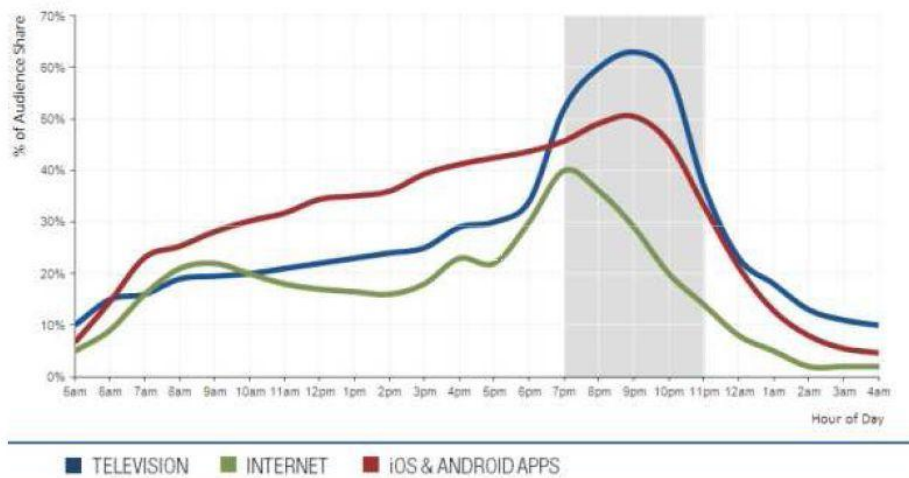
(<http://programy.mzf.cz/images/articles/icq%20mobile.jpg>)

A mixed result of the internet and smartphones are instant messengers, a communication with friends or colleagues and not paying for how much is written. The only thing that is paid for is the internet data or connection. It is getting to be more and more frequent to get WIFI connection for free in restaurants, bars, pubs, hotels and many more tertiary services.

The internet, nowadays, finds everything. If somebody wants to know how many inhabitants Malta has or where to go to buy fresh bread on Sunday evening, the internet is used. The phones can connect to some encyclopaedias for research about something or discover how to get somewhere.

If the written version of the address is not enough and there is no good map to study on site, more and more devices also include GPS navigation as are known in cars. GPS in the mobile device also saves space and money in the car.

Daypart Comparison, People 15+ Using Medium, U.S.



Picture 6 Daily use (TV & Internet dayparts from analysis by Michael Zimbalist (2/10), Nielsen National People Meter, com5core Megia Metrix Mobile application daypart analysis by Flury (8/11), Flurry Analytics, n=15.2M DAUs)

The mobiles can provide more than the usual communication services (texting, phoning). They can be used for playing games when people are waiting for bus as well as become addicted to some of the games and can't stop playing them. Mobile device can provide a scientific calculator as well as a calendar, play music, write notes, convert units or currencies and take photos or movies. The smartphones are not the most expensive phones any more. Now there are smartphones bought roughly from 3000 CZK. Of course people can buy an iphone4 for around 20 000 CZK but that's another story.

3.4 Internet Conclusion:

Over the last years everything in mobile business was growing. Twenty years ago, there was communication only by mail, post and fixed telephones. The world was communicating in matter of days; today it is a matter of minutes. More than 100 billion emails and IM are sent every day. Before the main entertainment was TV, VHS, walkman but today more than 70% of Americans watch online video as well as, instead of social clubs, there is now more than 800 millions active users of facebook. More than 80% of internet users also bought something online. You can see from some of the graphs [Picture 2] that internet usage on mobile devices is growing as well as number of active mobile numbers. Maybe the operators will let us call to other sites cheaper and they won't restrict our internet with so many factors if their revenues and our talk-times aren't growing in tens of percent but only in percents.

3.5 Operators

3.5.1 Brief information

There are three main operators in Czech Republic. Some people say they are expensive, some people say something else. The point is that customers are not satisfied with the services of telephone operators. It could be true; it also could be how Czech Republic psychology works. There must be something true but it varies. Someone has one operator and says that it is a frauds firm; his friend has the same operator but argues that they offer the best in the country. It mostly depends on each contract and the timeliness of the concrete offer.

The first company entered the Czech market in 1990 and that is the one we will begin with.

3.5.2 Telefónica Czech Republic

The first operator which is being introduced is Telefónica Czech Republic but most people would probably know it as O₂ Telefónica O₂ or even Eurotel. Eurotel Praha spol. s r.o. is the name of the former firm which was bought by Telefónica O₂, a multinational concern. Eurotel was for six years, the only operator in the Czech Republic and was operating almost all mobile services for almost all customers of mobile phone services. At this early stage, there were relatively high income and outgoing calls.

3.5.3 T-mobile

After a time, the wireless communication became more popular. Another company found its place on the market and in the year 1996 a company named Paegas started to compete with Eurotel. Eurotel was mainly for business people but Paegas tried to offer also students and lower income people.

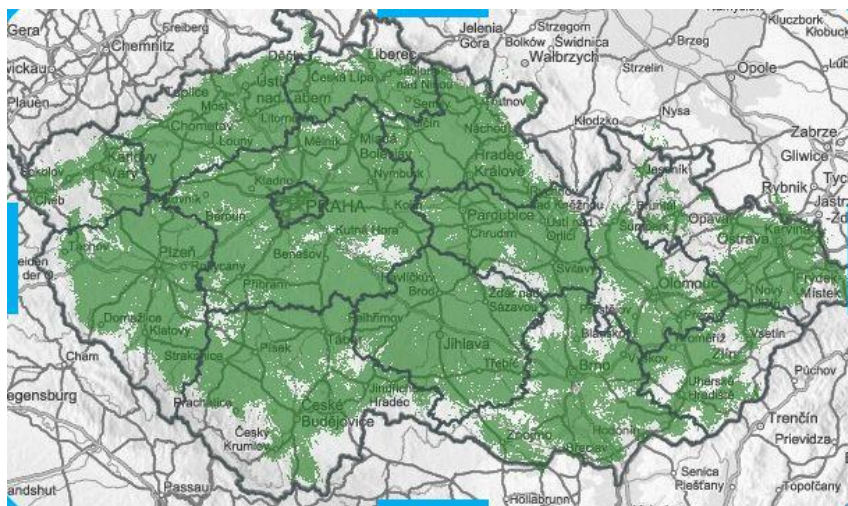
2002 was the year when the change from Paegas to T – Mobile, which is owned by Deutsche Telecom, happened.

3.5.4 Vodafone

As the demands for wireless phones were still increasing another company entered. The third provider was named Oskar but as well as the two before became under world giant Vodafone. Oskar gained many customers because as first provider was charging reasonable prices, good advertisement campaigns and free internet SMS messages.

3.5.5 Operators Conclusion

After several years due to frequent operator changes, people pushed through number portability when changing mobile phone provider. There are three main operators of choice and there are also other solutions. There is U:fon company which uses CDMA 2000 technology. It does not cover the whole Republic but in the places where it exists, it uses 3G technologies which has bigger capacity and quality. It needs fewer transmitters which means lower prices for calling and even the internet. The coverage is rising and after few months it could be used as a regular operator. Biggest problem is that the whole system needs different devices, which makes it more complicated. Picture 7 shows last signal coverage.



Picture 7 Coverage (: <http://www.ufon.cz/cz/mapa-pokryti/>)

The last news in operators is, that the ministry is planning to do a fourth operator tender.

3.5.6 Comparison with EU

When Czech operators' are compared with other European operators, it shows great differences. The prices show erratic price parameters as well as services. Prices differ a lot. There are huge differences between infrastructures which is not only because of the operators but also the bureaucracy. But despite it all, the Czech Republic did not come out so badly. There are better countries but also worse as Spain. Here is a simplified table:

Table 1: Source: <http://www.internetprovsechny.cz/velke-srovnani-mobilnich-sluzeb-nadnarodnich-operatoru/>

Country:	Own site (EUR/min)	Other sites (EUR/min)	1 SMS (EUR)
Czech Republic	0.12	0.30	0.10
Germany	0.05	0.15	0.19
Spain	0.18+0.18 for connection	0.18+0.18 for connection	0.18

3.6 Tariffs

3.6.1 O₂ Business Tariffs

	Tariff:	Free min.	O ₂ and fixed line	Other	SMS	Cost
1	Business 30	30	4.20 CZK	6.60 CZK	1.80 CZK	234 CZK
2	Business 120	120	3.60 CZK	5.52 CZK		690 CZK
3	Business 150	150	2.64 CZK	5.04 CZK		720 CZK
4	Business 300	300	3.24 CZK	5.04 CZK		1200 CZK
5	Business 360	360	2.40 CZK	3.60 CZK		1260 CZK
6	Business 600	600	3.00 CZK	3.60 CZK		2040 CZK
7	Business 1200	1200	1.80 CZK	1.80 CZK		3480 CZK
8	Business Nonstop	Unlimited	0 CZK	4.86 CZK		1680 CZK
9	Business Unlimited	Unlimited	0 CZK	0 CZK	0 CZK	3480 CZK
+ Internet in Mobile basic – 150 CZK, Internet Mobile Full – 300CZK						

3.6.2 T – Mobile Firm offers

	Tariff:	Free min. (Up to)	VPN	Other	SMS	Cost
1	Business Plus 250	58	0.36 CZK/min.	5.16 CZK/Min	1.20 CZK	300 CZK
2	Business Plus 450	136	0.36 CZK/min.	3.96 CZK/Min		540 CZK
3	Business Plus 700	280	Free	3.00 CZK/Min		840 CZK
4	Business Plus 1100	523	Free	2.52 CZK/Min		1320 CZK
5	Business Plus 1600	941	Free	2.04 CZK/Min		1920 CZK

(Up to – number of free minutes or price adequate SMS/MMS, Business Plus 1100 and 1600 include Mobile Internet Classic, Internet basic 139 CZK)

3.6.3 Vodafone firm Combinations

	Internet	Free voice min.	Free SMS	SMS	Additional	Cost
1	Mobile internet 1	50	50	1.50 CZK	0	362 CZK
2	Mobile internet 1	125	100		0	552 CZK
3	Mobile internet 2	250	100		Unlimited VPN	790 CZK
4	Mobile internet 2	400	0		4 Vodafone friends, Unlimited VPN	1065 CZK
5	Mobile internet 2	400	100		Unlimited VPN	1065 CZK
6	Nonstop internet	400	100		Unlimited VPN	1275 CZK
7	Nonstop internet	Unlimited	Unlimited	0 CZK	Unlimited VPN, Unlimited SMS	3094 CZK

(Mobile internet 1 = up to 100 MB, Mobile internet 2 = up to 300 MB, Nonstop internet = more than 300 MB)

3.6.4 Firm habits

The unspecified firm habits are no more than 10000 CZK a month. All twelve distributors bill an average between 650 to 950 CZK. This billing includes not only calls, SMS, MMS but also mobile internet and VPN calls payment.

In average the 12 distributors use around 70 minutes from their operator, only 6 minutes of fixed line, 85 VPN min., 90 min. of other operators and 150 SMS messages a month. These numbers found one tariff from every operator which will be chosen from Business 120 (O₂), Business Plus 450 (T – mobile) and Vodafone firm combination 2.

3.6.5 Price calculation

After defining the tariffs the final count will be made with the average month usage.

$$O_2 = 85 \text{ VPN} * 0 + \text{fixed 6 min.} * 3.60 + (160 \text{ min} - 120 \text{ min. free}) * 5.52 + 150 \text{ SMS} + 150 \text{ CZK Mobile internet} = 1352.4 \text{ CZK}$$

$$T - \text{mobile} = 85 \text{ VPN} * 0.36 + (166 - 136 \text{ min. free}) * 3.96 + 139 \text{ Internet} + 150 \text{ SMS} * 1.20 = 1008.40 \text{ CZK}$$

$$\text{Vodafone} = 85 \text{ VPN} * 0 + 166 * 0 + (150 \text{ SMS} - 100 \text{ Free SMS}) = 865 \text{ CZK}$$

1	Vodafone (firm combination 2)	865 CZK
2	T – mobile (Business Plus 450)	1008.40 CZK
3	O ₂ (Business 120)	1352.4 CZK

(All prices above are VAT included)

3.6.6 Tariffs conclusion

The prices look relatively easy to choose but the operator companies' work relatively, which means that they make better offers after negotiating. The negotiated offers can not be posted but the post negotiated offers are more similar. That is why the calculations are so simple, because these prices are not the final prices so it is not important. But for official offer or one man conclusion this is the recommended choice.

3.7 Operating systems

3.7.1 Introduction

Few years ago, when somebody wanted to buy a mobile phone with an operation system it was easier to choose. The mobile phones were much more expensive which made it unavailable for most and also the choice was much smaller. There were bigger differences which also made it easier to choose. Before, there was Windows Mobile, Symbian, BlackBerry and Palm. Today, the palm is forgotten, Symbian is ending, BlackBerry is losing pace with new technologies and generally is „behind the curve” and the two new platforms are competing for the better. The platforms are of course Android and iPhone. These “newcomers” in few years started to change the traditions. More and more people start buying devices with operational system hereinafter referred to as OS.



Picture 8 – BlackBerry (<http://gizmodo.com/5061086/giz-explains-illustrated-guide-to-smartphone-oses>)

If somebody is buying a new mobile phone there are facts that he should know. In today’s world the devices without mobile internet are so to speak, dead; it will not give much pleasure. The advantage of phones with OS hereinafter referred to as smartphones is that they are bringing many functions together in one device, for example reading E-mails, communicating on instant messengers, Facebook, internet browsing, being navigated to destination through GPS navigation, detect weather and many more things, not only texting and phoning.

3.7.2 iOS

iOS as the system of iPhone was revealed back in 2007. It was called the most advanced operational system and it claimed that it was 5 years ahead of anything else in the market. Since then there was four major updates. All off them brought something special and that is why it is one of the most precious system. Apple made many thousands of applications people can download for their device from App Store for either free or some amount of money. The biggest advantage is also the biggest disadvantage. Many things in the iOS system are the only way how to do it, which makes it easy to do, but also people have only one option how to do things and referring to only one way, there is also always only one model of iPhone which makes the company able to ask for such a high price. Another thing is for example that there can not be used copy and paste and MMS (multimedia SMS messages).



Picture 9 – iPhone (<http://gizmodo.com/5061086/giz-explains-illustrated-guide-to-smartphone-oses>)

3.7.3 Android

Android was unveiled in 2007 as well but the first model was revealed in 2008 with the T-Mobile G1. It is the most rapidly developing system and it is most complete OS but as it is always developing it lack some used experience department. By contrast from iPhone, Android has a large selection advantage, which makes lower prices. There is also the option of huge database of free and also paid applications to get from the Android Market. The biggest plus is that it has no limits on what application developers can do so the most innovative applications hit Android first.



Picture 10 – Android (<http://www.gottabemobile.com/2011/04/21/ultimate-android-2-3-update-list-will-your-phone-be-getting-gingerbread/>)

3.7.4 Windows Phone 7

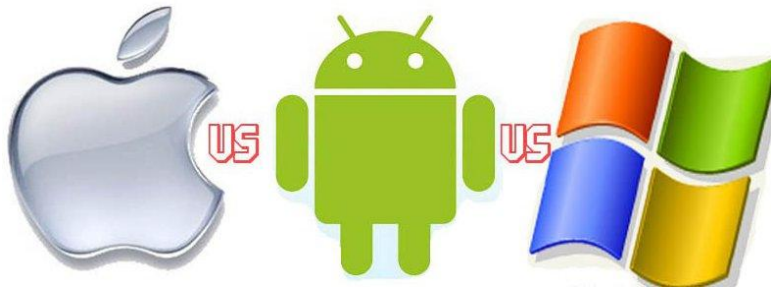
Windows Phone 7 is a continuation of Windows mobile which was revealed in 2003 and it is a product of the Microsoft company. The last version named Windows Phone 7.5 Mango. This system is not as popular as the previous two mainly because of its limitations and its biggest boom should be when the biggest Microsoft's partner Nokia starts pumping out its Windows Phone 7(WP7)-based smartphones.



Picture 11 – Windows Phone (: <http://www.concept-phones.com/nokia/nokia-w6-customizes-windows-phone-7-touch-nokia-identity/>)

3.7.5 Comparing

Each system has its pros and cons. Android has almost endless customizability and hardware options. iOS is polished in hardware and software too. Windows is despite that more user-friendly as it has limited options. These new systems are not burdened with any custom, tradition or conventional wisdom. All these platforms have almost only touch control, which makes them have similar shape, look, weight and function.



Picture 12 Systems table (<http://www.buzzingup.com/2011/06/comparison-ios-5-vs-android-2-3-vs-wp-7-mango-vs-blackberry-7-os/>)

Table 2 (source: <http://www.buzzingup.com/2011/06/comparison-ios-5-vs-android-2-3-vs-wp-7-mango-vs-blackberry-7-os/>)

Features	iOS	Android	Windows Phone
Kernel	OS X	Linux	Windows CE 7
Multitasking	Pseudo	True	True
Cut/copy/Paste	Yes	Yes	Yes
Security	No need for security suites	Susceptible to malware	No need for security suites
Movie Store	iTunes	Android Market	Zune
Music store	iTunes	N/A	Zune
Browser	Mobile Safari	Chrome-based	Internet Explorer 9
Flash support	No	Yes	No
Homescreen	Icon centric	Icons + widgets	Icons + widgets
Productivity suite	iWork	Google Docs	Office mobile
Voice recognition	Yes	Yes	Yes
WiFi Syncing	Yes	Only third party app.	Yes
Updates	Yes	Yes	Yes

Over-the-air updates	Yes	Yes	No
Cloud support	iCloud	Google Sync	SkyDrive
customization	Limited (jailbraking)	Deep	No
Applications	500 000+	300 000+	30 000+
Notifications	Pull-down	Pull-down	Toast
Screenshot ability	Yes	Yes	No
Book store	iBooks	Google Books	N/A

3.7.6 System Conclusion

One of the choices is, that when buying twelve devices, it even more depends on the price which makes Android much in advance from iOS because of the price of iPhone is possible to buy two devices of Android. The best advice is to go to some shop and to try all the devices. If there is no time or opportunity to try, the cheaper and theoretically with the same effect working Android is a better choice. The Windows will be better and stronger later but at this moment the Windows system has not many functions, experience and possibilities.

4 Own Work

4.1 Mobile device choice

After the operation system research, the Android OS is the one which is going to be the device to be chosen from. The research was stopped before the coming of the new OS Android 4.0 Ice Cream Sandwich which was around the end of November 2011 and the last tested version was Android 2.3.4. The mobile world is changing rapidly and it is not possible to change the results every time new mobile device or OS update is released. Majority of manufacturers also made their own graphical superstructure, which allows many changes in the structure of the system and makes the choice easier.

A questionnaire was constructed, which was asking people what the biggest problems of their work-devices are. The questionnaire was done in the target company and there were 12 respondents, as there are 12 dealers in the company and twelve devices to buy. Not all 12 dealers have the same device at the moment. That is one of the points of the bachelor thesis to find the most satisfactory products. Criteria of choice were defined from the respondent's answers.

The most common problems recognized after reading and sorting the questionnaires were operational memory, visibility on sun, battery capacity and display dimensions. There were also recognized things as resistance and manageability, because reading a page long and wide table is not comfortable as on computer but this is not so solvable apart from better and bigger displays. Resistant phones are not so popular among manufacturers. There are few of them, but these devices have different disadvantages. Maybe it is the manufacturer's plan not to make top phones, which would be resistant because then they would not have so many acquisitions after mechanical breaking. There still are no resistant phones with top processor, operational memory and up to date system, which makes people choose again. They have to choose between buying a phone that is fast and not lagging after a small amount of work or a phone, which is resistible. The easiest way of choosing is to buy an up to date

phone and use some type of cover but not everybody is willing to open a cover before every use.



Picture 13 Packaging (http://www.sw-box.com/media/catalog/category/samsung_galaxy_s2_cases_3.jpg)

After choosing non-resistible type we have everything to begin with choosing actual device.

To the final comparison advanced these devices: Motorola Razr, LG Optimus 2X, Samsung Galaxy S II, HTC Sensation XE, Sony Ericsson Xperia arc S and Huawei Vision.

The devices are going to be analysed by the selected criteria which are: battery longevity, visibility of a display, functionality of selected applications (MS word, excel, PowerPoint, pdf reader), compatibility and speed of working. The prices were taken from local electronics vendor (<http://www.sunnysoft.cz/>).

Table 3 Source: author 2012

	Motorola Razr	LG Optimus 2X	Samsung Galaxy S II	HTC Sensation XE	Sony Ericsson Xperia arc S	Huawei Vision 8850
battery capacity	1780 mAh/600 min/6	1500 mAh/300 min/3	1650 mAh/520 min/4	1730 mAh/550 min/5	1500 mAh/445 min/3	1400 mAh/not specified/2
display	4,3"/5	4"/3	4,27"/6	4,3"/3	4,2"/3	3,7"/3
materials	carbon/6	Plastic/4	plastic/4	Aluminum/5	Plastic/4	aluminium /5
speed	1200 MHz/1024 MB/5	1000 MHz/512 MB/3	1200 MHz/1024 MB/5	1500 MHz/768 MB/6	1400 MHz/512 MB RAM/4	1000 MHz/512 MB RAM/3
dimensions	131 × 69 × 7,1 mm/2	124 × 63 × 11 mm/4	125 × 66 × 8,5 mm/5	126 × 65 × 11,3 mm/3	125 × 63 × 8,7 mm/5	119 × 60 × 11 mm/6
weight	127 g/5	139 g/4	116 g/6	151 g/3	117 g/6	121 g/5
camera mPIX/+-	8 Mpx/6	8 Mpx/6	8 Mpx/6	8 Mpx/6	8 Mpx/6	5 Mpx/3
price	14990 CZK/1	8990 CZK/5	12890 CZK/3	13000 CZK/2	9290 CZK/4	7990 CZK/6
Multicriterial points	36	32	37	31	35	33

The numbers after last slash in every criterion is multicriterial score.

4.2 Multicriterial analysis of variants

Multicriterial analysis of variants is one of the methods for multicriterial decision making. The goal is to find the compromising variant which satisfies best various criteria. With multicriterial analysis of variants is everybody encountered in everyday life but not everybody gets it when choosing food in supermarket. The purpose is to find the best option or to eliminate the most ineffective variants. The evaluation depends on importance of the criterion, on the evaluation of the variant and also on evaluation of alternatives. This is used in Table 3 as the number after the slash and in the final multicriterial points.

4.3 Results and discussion

The result is Samsung Galaxy S II as it is the best option as it is not the most expensive, with the best display and the display is also one of the factors that it's not biggest battery last the same time as the other devices with bigger capacity of battery. The hypothesis has been refuted. Motorola is too big for the same size of display as well as the price is higher. The weight is Samsung's winning discipline so the only concern is the use of plastics, which could be prone to scratches or possible mechanical damage. Another view could be that as the plastics have the biggest flexibility, the plastics could also be strong. Batteries are the weak point of all modern equipment and anyway, these phones are chosen for salesmen who spend half of their day in a car, which gives them a big opportunity to charge their phones by 12V chargers which costs just few crowns (CZK).

The result was given by multicriterial analysis of variants where the points were given by adding all points together. The criteria were formed as there are 6 phones which gave six places. Each better place gave one more point. All criteria have the same value which was given by interviewing and questionnaire of respondents, who are the real future users of the devices i.e. salesman of the company. The mobile phone with most points formed the best choice.

5 Conclusion

This bachelor thesis was processed on the topic of “Mobile communication” for finding ideal selection of mobile device, operator and tariff. The company has twelve dealers whom have varied phones and most of them are not working properly or not doing all what they should do properly which made them find mainly an ideal device. The thesis also shows other ways of communication and other used functions.

The goal of analysis of decision making problem was finding the best option of selection of mobile devices for a selected company. According to the dealers responds, there were found almost the strongest devices which eliminated the processor and RAM capacity. Exception for Huawei, all the phones had the best cameras for making photos of products shop windows and shelves. As already mentioned the batteries are hard to measure and depend on many factors. After considering all influences, there were only few factors for indicating the best option. The company could find different answer or find a bigger investment solution which would affect the criteria of selection but for this case this would be the final result.

In this sector the options are changing rapidly and it is needed to refresh the data often. New technologies are invented and new workflows are used. People improve their abilities and their style changes.

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6.1 Text

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6.3 Pictures

Picture 1: <http://www.maximumpc.com/files/u46168/iphone-internet.jpg>

Picture 2: <http://www.lupa.cz/clanky/vodafone-rozhybal-mobilni-internet-v-cr/>

Picture 3: http://www.czso.cz/csu/redakce.nsf/i/mobilni_telefoni_sit

Picture 4: <http://wallblog.co.uk/2011/04/13/what-is-the-size-of-the-mobile-market-infographic/>

Picture 5: <http://programy.mzf.cz/images/articles/icq%20mobile.jpg>

Picture 6: TV & Internet dayparts from analysis by Michael Zimbalist (2/10), Nielsen National People Meter, comScore Megia Metrix Mobile application daypart analysis by Flury (8/11), Flurry Analytics, n=15.2M DAUs

Picture 7: <http://www.ufon.cz/cz/mapa-pokryti/>

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Picture 13: http://www.sw-box.com/media/catalog/category/samsung_galaxy_s2_cases_3.jpg

7 Supplements

7.1 Questionnaire:

Questionnaire for the firm's employees:

1. What are the most bothering things about firms' mobile phones?
2. What are you missing on the phone?
3. Which parts of the phone would you like to be improved? (better display, battery, size...)
4. Which mobile system would you prefer?
5. Any preferred mobile phone?
6. Other suggestions?

7.2 Used Terms

Mobile phone industry is a new and also innovative sector that is why the first chapter is going to explain terms and abbreviations.

3G – it is a third generation of mobile phones. These phones can transfer both – voice of phone call and also data, which are things like E-mails, messages, downloaded data. Mainly it was done for video calls. Easily said, it is a faster data exchange speed (webopedia.com)

Browser – that is a software thought which user finds and views internet pages

E-mail – it is a fully electronic mail system. Messages are transmitted and received by digital devices through WWW network. It allows sending text, graphics and even sound or videos (webopedia.com)

Facebook – Facebook is a social networking site which connects people around the world. It is internet connected site which keeps friends in touch as well as they are able to share photos or links. Users see others profiles after confirmation of “friendship” (webopedia.com)

GPS – Global positioning system. It is a space- based radio navigation system which broadcasts highly accurate navigation pulses to users on or near to the Earth (webopedia.com)

GPRS – General Packet Radio Service. It is a standard in wireless communication. It sends data at 115kb/s (webopedia.com)

GSM – Global System for Mobile Communications. It’s speed for sending data is 9.6 kilobits (webopedia.com)

HSCSD – High-speed circuit-switched data. This is another data transmission method. This one's speed is up to 57.6 Kb/s. (mobilni-telefony-biz.cz/slovník/hscsd)

Instant messenger – (IM) – It is a system which delivers messages by internet not by SMS or E-mail (webopedia.com)

Internet – it is a system architecture which allows various computer networks around the world to interconnect (Britannica.com)

mAh – mAh is an abbreviation for Milliampere-hour which is a unit batteries are rated (webopedia.com)

Mb – megabit. A unit for digital data. Which consists of 1 000 000 bits (1 000 kilobit)

MB – megabyte (1,000,000 or 1,048,576 bytes, depending on the context) (webopedia.com)

MHz – abbreviation for megahertz. It stands for one million cycles per second. In megahertz is measured the speed of microprocessors. Microprocessor is a silicon chip contained in computers. The larger number the faster the microprocessor is (webopedia.com)

MMS – Multimedia Message Service abbreviation. It allows sending not only text but also sounds, videos and pictures (webopedia.com)

Mobile (phone) – it is an electronic telecommunications device (cellular, cellphone) which connects to a wireless communications network through radio waves (britannica.com)

Mpx – Mpx stands for megapixel (MP or Mpx) which means one million pixels in an image. It indicates quality of a digital image.

Multitasking – it is an ability to execute more than one task at once in the mobile phone industry (britannica.com)

OS – abbreviation for Operating system – it is the most important program on the device. It makes it work and tells it how. It runs all the other programs as well as it recognizes all inputs and displays them on the screen (britannica.com)

PC – Personal Computer. A digital device designed for use by one person at a time

Productivity suit – collection of software which allows people to read and work with text files, presentations and spreadsheets.

SIM card – stands for Subscriber Identity Module which is a portable memory chip used in almost all types of cellular phones. It makes it possible to change cellular phones and still have the same number. The card holds personal identity information, its number and some other things like text messages (webopedia.com)

Smartphone – it is a device which integrates benefits of cellular and handheld. There is no official definition of a smartphone but one of its most significant differences is the availability to run third party applications and easy (and more frequent) operating system updates (webopedia.com)

SMS – short for Short Message Service. Up to 160 characters long messages which contain no images

VPN – Mobile Virtual private network (mVPN), in this occasion it is meant as a private site between workers of one company who have better prices of calls between one another or sometimes even free for some set fee (webopedia.com)

WAP – Wireless Application Protocol. It is a secure protocol that allows users to access information via wireless devices (webopedia.com)

WiFi – a wireless technology which allows electronic devices to exchange data wirelessly over a computer network. The abbreviation has no specific meaning. It is one on the most used technologies to connecting to internet (webopedia.com)

Windows – it is a computer operating system developed by Microsoft Corporation. It is the most common OS to run PC's.

WWW – World Wide Web, an information network often called The Web. It is leading information retrieval service. It gives users access to a vast array of electronic connections which allows access to pieces of information (Britannica.com)