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Markus Tallgren, Olli Pihlajamaa &
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Ubiquitous Customer Loyalty Services

Technology and Market Outlook

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Keywords: ubiquitous services, marketing services, customer relationship management, CRM, mobile advertising, consumer services, context-awareness, mobile payment, location-based services, LBS, product information, community services, entertainment, games

Abstract

An information search was performed on analytical, context-aware and ubiquitous customer services in loyalty programmes, with a dimension of entertainment and games. The results are summarised individually for enabling technologies research and development, and for business development. This is a snapshot of the current and foreseeable business and technology status, meant to help development projects set their goals. Based on the information found, much of the basic technology required for the services seems to be available or will become available soon. Further development is needed in the methods and tools to aggregate these technologies into an open, flexible and sufficiently powerful framework or platform for ubiquitous customer loyalty services. Deeper analyses, e.g. business plan recommendations are beyond the scope of this document.

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Tiivistelmä

Tämä UBICS-projektin teknologia- ja liiketoimintakatsaus tiivistää eri lähteistä kootut, personoituja markkinointi- ja kanta-asiakaspalveluja koskevat tiedot toisaalta palvelut mahdollistavaa teknologiaa, toisaalta liiketoiminnan kehitystä kuvaaviksi osuuksiksi. Katsaus kohdistuu nykyiseen ja nähtävissä olevaan liiketoiminnan ja teknologian tilaan, tarkoituksenaan avustaa alkavia kehityshankkeita tavoitteiden asettamisessa. Selvityksen perusteella on nähtävissä, että valtaosa tarvittavasta perusteknologiasta on jo saatavilla tai lähiaikoina tulossa saataville. Tutkimusta ja kehitystä tarvitaan tavoissa ja menetelmissä, joilla näistä teknologioista voitaisiin muodostaa avoin toimintakehikko, jolle jokapaikan kanta-asiakaspalvelut joustavasti ja tehokkaasti rakentuisivat. Syvemmät analyysit, kuten liiketoimintasuositukset, ovat tämän dokumentin tavoitemäärittelyn ulkopuolella ja jäävät näiden kehityshankkeiden tehtäviksi.

Preface

This Technology and Market Outlook is a deliverable of VTT's *Analytical, Context-aware and Ubiquitous Customer Services in Loyalty Programs (UBICS)* Key Technology Action Project. The project was started with VTT's own resources and funding, but is aiming for new project initiatives with partners and clients.

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Contents

List of symbols and acronyms

aCRM	Analytical CRM
B2B	Business-to-business
B2C	Business-to-consumer
BSS	Business Support Systems
CRM	Customer Relationship Management
HIPERMAN	High Performance Radio Metropolitan Area Network
HSDPA	High-Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
HSPA	High Speed Packet Access
IrDA	Infrared Data Association
LBS	Location Based Services (or Systems)
NFC	Near Field Communication
OMA	Open Mobile Alliance
OSS	Operational Support Systems
PDC	Personal Digital Cellular
RFID	Radio Frequency Identification
UMA	Unlicensed Mobile Access
UWB	Ultra-Wide Band
WCDMA	Wideband Code Division Multiple Access
WiBro	Wireless Broadband
WiMAX	Worldwide Interoperability for Microwave Access
WUSB	Wireless USB

1. Introduction

1.1 Background

This document was compiled by VTT's *Analytical, Context-aware and Ubiquitous Customer Services in Loyalty Programs Key Technology Action Project*, **UBICS** for short. The main objective of the project is to develop and implement a novel concept for ubiquitous CRM services.

The UBICS-related market segment consists of large B2C companies and companies that provide services to these B2C companies (B2C CRM services value chain). Market segment is not restricted to any specific industry; customers can be, e.g. telecom operators, retail stores, amusement parks, etc.

The key technologies identified for UBICS are data mining, knowledge and content management, ubiquitous computing, context-awareness, converging networks and (social) media.

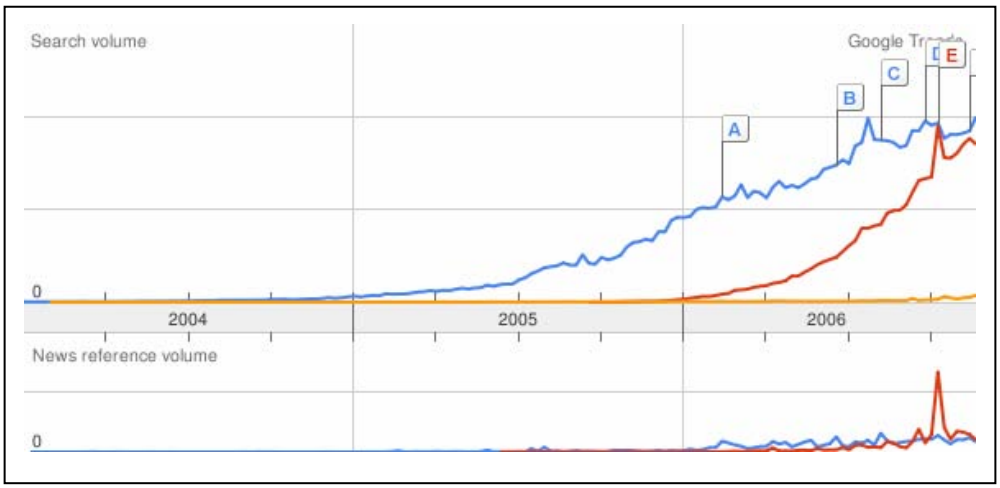


Figure 1. A snapshot of Google search volumes and news references for terms "MySpace" (blue), "YouTube" (red) and "Second Life" (orange). The flags show news events concerning the search terms[1].

As an illustrative example of service potential, Figure 1 displays the search volumes and news references through Google for a couple of recent public services that can be argued to have same background technologies and ways of thinking as those behind ubiquitous consumer services. Even though these results are information retrieval volumes, and not especially focused to our current topic, they still indicate the growth of

[1] http://www.google.com/trends?q=myspace%2C+youtube%2C+%22Second+Life%22&ctab=0&geo=all&date=all

interest towards these kinds of services. What is striking in the graphs is their quick takeoff, suggesting large business potential, provided the right service and business concept can be found.

1.2 Goals

The goal of this document is to help potential parties of research and development projects to grasp the state of the art and current trends in the technology and market aspects of ubiquitous services, especially from an ubiquitous customer loyalty services point of view. The idea is to provide a general view of the relevant technologies, services and concepts currently in use and being introduced, and identifying the technology and business issues that require attention in order to make it possible for the new, ubiquitous service elements to be applied in customer loyalty services.

1.3 Scope

This survey emphasises new developments in technology and the market, as seen from the customer loyalty services point of view, with a dimension of consumer experience, possibly having even a touch of playfulness. This is a snapshot of the present technology and business status, so the intention is neither to be an all-round review of ubiquitous technology or business, nor to give recommendations for, e.g. business planning. General tendencies and possible future visions are, however, pursued.

1.4 Material acquisition, selection and grouping

This document is based on an information search from multiple sources. The raw information has been collected from sources like newspaper and magazine articles, news services, patent databases, and has been complemented through personal communications. The main search which was carried out was systematic, automated and based on keyword profiles and search logic. The complementing, personal part was of a more incidental nature, based on the knowledge of the project group members and other experts from VTT.

The material was afterwards filtered, edited and re-grouped manually. At the highest level, the division is between technology and business categories. Both have a number of sub-categories with topics that were considered relevant in this context. Patents, because of their technology content, are included in the technology part, even though they also have a strong business dimension.

The original material has been suppressed, except for a few examples and patent abstracts (a separate Appendix), but can in most cases be found through the references or links provided as footnotes.

1.5 Limitations and other issues

As with any search among a large mass of information, a compromise between manageability and completeness has been necessary, both in the search and in the finalising phases. Despite this screening and the subsequent compacting, the authors are confident that the output gives an adequately solid vision of the state-of-the-art in the technology and business under review.

The internal division between business enabling technologies and business implementations, perhaps also between technology and business, is ambiguous in some cases. This extends from the fact that business implementations are in many cases service elements, and thus enablers, for other implementations.

Concerning patent information, the reader should bear in mind that patents and patent applications do not automatically become public until 18 months after registration, and the newest patent applications are thus not included in the search results, except when the patent applicant has chosen to publish it during this period.

There is also a technical problem concerning patents: full text URLs fail with some PDF viewer-Web browser combinations. The probable reason is the length of the URLs in question.

2. Technology

This chapter describes developments in technologies related to ubiquitous services and applications. The content is subdivided into enabling technologies, technology research and relevant patents.

2.1 Enabling technologies

Enabling technology is used here to refer to any technology that has a positive impact on ubiquitous customer loyalty services and business implementation, i.e., is inside our UBICS scope. In this case they are mainly associated with mobile and wireless technologies, or other technologies associated with these, one way or another.

Mobile communication is developing along many different routes. The conventional centralised approach brings new features and services, while new non-telecom solutions appear, partly as rivals, partly as complementing technologies.

The entries below consist of and are based on very heterogeneous material sources. An attempt has been made to form logical groups of items belonging together.

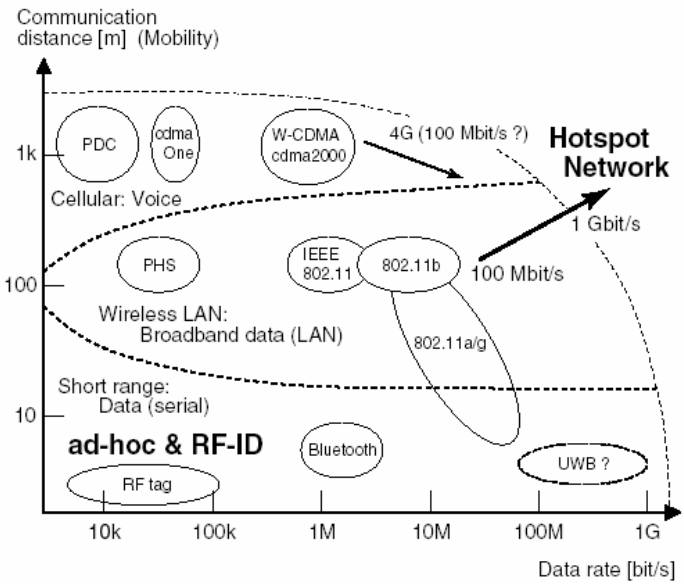
2.1.1 Wireless communication technology

New wireless communication technologies are being introduced rather frequently. A short summary of some relevant technologies is given in Table 1. A visual classification of wireless technologies (with a certain emphasis on Japanese technologies) is shown in Figure 2.

Table 1. Wireless communication technologies relevant to ubiquitous services.

Technology	**Typical range**	**Data rate**	**Typical applications**
WLAN, WiFi, Wireless Local Area Network	~ 100 m	1–54 Mbit/s	General LAN-type wireless communications
WiMAX (by IEEE), Worldwide Interoperability for Microwave Access (IEEE 802.16/a/d/e)	< 113 km	70 Mbit/s short-range, decreases with increasing distance	WLAN-type fixed or mobile (depending on the frequency band and modulation) wireless access with long range and mobility support. First announcements in mobile phones (e.g. Samsung M8000).
HIPERMAN (by ETSI), High Performance Radio Metropolitan Area Network (compatible with IEEE 802.16/a)	< 113 km	70 Mbit/s short-range, decreases with increasing distance	WLAN-type fixed wireless access with long range and mobility support
WiBro, Wireless Broadband (IEEE 802.16e)	1–5 km (intended base station coverage)	30–50 Mbit/s	Korean version of WiMAX-type communications (long range and mobility support); includes also QoS support. Currently being introduced in mobile phones (e.g. Samsung M8000).
Wireless USB, UWB extension to USB 2.0	Typically short; varies with frequency range etc.	480 Mbit/s 3 m, 110 Mbit/s 10 m	Data connection between devices in wireless personal area networks
Bluetooth	~ 100 m Class 1 ~ 10 m Class 2 ~ 1 m Class 3	721 kbit/s version 1; 2 Mbit/s version 2	Data connection between devices in wireless personal area networks
Zigbee (IEEE 802.15.4)	~ 50 m, varies with environment (IEEE 802.15.4)	250 kbit/s, 40 kbit/s, 20 kbit/s (IEEE 802.15.4)	Remote monitoring and control, sensor networks
Wibree	5–10 m	1 Mbit/s physical	Data connection between devices in wireless personal area networks; low power consumption
RFID, Radio Frequency Identification	< 30 cm (passive) < 100 m (active)		Automatic identification
NFC, Near Field Communication	< 4…20 cm	106 kbit/s, 212 kbit/s, 424 kbit/s	Short-range communication technology, currently being introduced in mobile phones (e.g. Nokia N93i, 6131 NFC)
Mobile TV (multiple systems)	Depends on transmitter power	High-rate bursts (system-dependent)	Digital video broadcasting
UWB, Ultra-Wide Band (generic technology)	Varies according to application	Up to 1 Gbit/s (short-range)	Short-range communication, radar, imaging
IrDA (set of protocols)	< 1 m	9.6 kbit/s… 4 Mbit/s, depending on protocol	Line-of-sight communication over infrared light. Frequently used in computers and mobile phones, mainly in Asia.

Figure 2. A classification of network technologies having relevance to ubiquitous services. The positions of the technologies in the graph correspond their data rates vs. range. [Kameda, Kim, Nakase & Tsubouchi, 2004.][2]



- WLAN, WiFi, WiMAX

Wireless LAN and its derivatives are readily available for mainstream soon. The short-range versions are very suitable mobile customer services and advertising. Longer-range versions, like Flash OFDM, may have indirect effects as it is expected to lower costs of wireless communications in general. Digita and Siemens are building a 450 MHz Flash OFDM network in Finland, and their goal is to cover the whole country with it. Qualcomm has bought the OFDM technology from its developer, Flarion, and this has roused considerations on Flash OFDM's position beside Qualcomm's CDMA. Digita is confident however, anticipating terminal prices to sink below 200 € from the current 300 €[3].

WiMAX is being introduced in networks and terminals[4]. France opens WiMAX sites in Paris in June 2007[5], and Nokia will offer a WiMAX capable mobile in India in 2008[6]. Sprint Nextel Corp., one of the biggest U.S. mobile operators chose WiMAX as its system to complement 3G[7].

All Nokia's Series 80 business phones and an increasing number or Series 60 phones will have WiFi capability. Nokia started its public Unlicensed Mobile Access (UMA) pilot in July 2006, in Oulu[8]. Elektrobit has introduced new WiMAX modules, available for trials in Q3/2007 and for volume delivery in Q4/2007[9].

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[2] Suguru Kameda, Seong-Kweon Kim, Hiroyuki Nakase, Kazuo Tsubouchi: Ubiquitous Network; Research Institute of Electrical Communication, Tohoku University, Japan 2004.
[3] MicroPC.net, 9 Oct 2006
[4] Helsingin Sanomat, 16 Oct 2006
[5] La Tribune, 19 Dec 2006
[6] The Hindu Business Line, 04 Dec 2006
[7] Networking 2006: Mergers, wireless advances InfoWorld Daily (12-06-2006) \ By Stephen Lawson
[8] Nokia press release July 27, 2006, http://www.nokia.com/A4136002?newsid=1066083
[9] Elektrobit Press Release, 04 Dec 2006

WiBro is a Korean Wireless Broadband service based on the mobile WiMAX technology to deliver voice, data and video. WiBro will be launched in China in 2007[10].

- Bluetooth, Zigbee, Wibree

In addition to Bluetooth, new low-cost low-power "wire replacement" technologies are appearing. Zigbee has been for some time available as rival to Bluetooth, and Wibree has been announced as a rival to Zigbee[11, 12].

- RFID, NFC

Close-range communications and proximity sensing offer a new way to provide personalised services to customers in shops, shopping centres and various other service points. Short-range radio communication, generally known as RFID, seems to be the prevailing technology trend. It is often regarded as the replacement and enhancement to barcodes in tracking goods. At least one research institute (RFID Technology Centre, RTC) in Taiwan has adopted mobile commerce as a major RFID research and development objective.[13]

The first 5 cent RFID tags were announced by Smartcode in 2006[14]. The next step, printable RFID tags, is estimated to reach as low as 1 cent, if mass manufacturing becomes feasible[15].

RFID has been applied to tracking of not only goods but humans as well. Schools in Japan have decided to track school children with them, and they have also been used in sports, like 2004 Boston and London Marathons[16] and Helsinki City Marathon 2006, and other leisure events[17].

RFID tracking has also found resistance, due to security and privacy issues. This requires close attention when implementing terminals and services[18]. The Near-Field Communication (NFC), a specific close-range RFID implementation, has been

[10] Korea Times, 21 Dec 2006
[11] Nokia introduces Wibree technology as open industry initiative. Nokia press release, October 03, 2006. http://www.nokia.com/A4136001?newsid=1079020
[12] The Inquirer, 07 October 2006. http://www.theinquirer.net/default.aspx?article=34919
[13] The Taiwan Economic News, 22 Dec 2006
[14] RFID Journal, 05/02/06
[15] *Timo Varpula*, VTT. Personal communication on 27 Oct 2006
[16] Internet Reports 2004 "The Portable Internet". http://www.itu.int/portableinternet
[17] The RFID Knowledge Base. http://rfid.idtechex.com/knowledgebase/en/sectionintro.asp?sectionid=118
[18] http://www.dhs.gov/xlibrary/assets/privacy/privacy_advcom_rpt_rfid_draft.pdf

established by the open industry consortium Near Field Communication Forum. This implementation claims e.g. to have taken care of security issues[19, 20].

- Mobile TV and radio

In Finland, one digital television channel multiplex has been reserved for DVB-H, and VTT is licensed to send experimental DVB-H transmissions[21].

Google is working on a system aimed to monitor and analyze TV watching profiles in private homes. As the system is based on microphones, it is causing concerns about personal privacy[22].

China has its own digital radio standards, Gota and GT800. Trial networks are in operation, and it is forecast that in 2010, about 32% of digital mobile radio terminals shipped in China are compatible with them[23].

- UWB

Ubisense, with its UWB location technology, claims to be the first commercially available platform that addresses both the high accuracy and high scalability market requirements with a cost effective solution[24].

SK Telecom in Korea is developing an UWB mobile phone, using Staccato Communications circuit technology. The prototype is scheduled for 2007[25].

2.1.2 Location technologies

Location technologies have been available for a long time, mainly for special, mostly professional purposes until a few years ago. Some of those systems are still in special use (e.g. Loran-C beacons). Consumer use of location technology was limited for years to separate GPS navigators, with hardly any connection to communications networks. With the advent of mobile network location services and GPS add-ons for mobile phones, location in consumer mobile applications finally started to evolve. Now that

[19] http://www.nfc-forum.org/home
[20] New Straits Times, 12 Oct 2006
[21] Digitaalinen televisio. Väliraportti 2006. Ministry of Transport and Telecommunications. http://www.mintc.fi/oliver/upl429-Julkaisuja%2051_2006.pdf (in Finnish)
[22] http://www.theregister.co.uk/2006/09/03/google_eavesdropping_software/
[23] IMS Research 03 August 2006. http://www.imsresearch.com
[24] Ubisense, http://www.ubisense.net/
[25] Prosessori 1/2007

satellite navigation is integrating into mobile phones, the growth can be expected to accelerate.

Satellite navigation is very popular, due to its accuracy and availability and reasonable terminal price level. GPS has been around in full operation since mid-90's, and Galileo, the European sister of GPS, is officially expected to be operational in 2008. The two systems will allow relative easy dual-mode receiver implementations. Galileo is promising signals better and range of service levels wider than the current GPS, also for use in environments that have formerly posed problems for satellite navigation[26].

Satellite navigation is difficult indoors, and other methods are needed instead or in addition. WLAN and Bluetooth location technologies are available, and various sensor or sensor network based methods have been proposed. Close-range location – or proximity sensing – using RFID or NFC and emerging new technologies is relevant to customer services in retail and service points.

2.1.3 Mobile terminals

Mobile phone capabilities are growing, with Japan leading the way. Available to Japanese phones are a range of additional capabilities like [27, 28]

- databases,
- instant messenger,
- calendar,
- schedule note,
- downloaded music;
- recording and playback of voices,
- music,
- images and pictures;
- GPS, also with position plot on a moving map
- TV and radio,
- TV phone,
- e-money with certification functions,
- transport timetable and ticket service,
- vending machine services,
- distress alarm,

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[26] http://ec.europa.eu/dgs/energy_transport/galileo/index_en.htm
[27] http://en.wikipedia.org/wiki/Japanese_mobile_phone_culture
[28] Wireless Asia, January, 2002.
http://findarticles.com/p/articles/mi_hb340/is_200201/ai_hibm1G1103380476

- pedometer,
- read-aloud,
- touch-pad,
- biometric identification,
- mobile centrex service,
- fast software development tools,
- debit or credit cards.

Video communication is finding its way to mobile handsets, with video services as early as 2001 (NTT DoCoMo) and 2003 (KDDI), even though the service didn't really take off in practice, due to lack of video support in mobile terminals at that time.

Similar development can be seen elsewhere as well, aided by High Speed Packet Access (HSPA) in 3G networks[29, 30]. The development pace varies, due to historical and cultural reasons and perhaps also revenue collecting policies.

WLAN/WiMax connectivity in mobile phones is getting more commonplace. New models are introduced, and the phone-PDA division is narrowing rapidly[31, 32]. Nokia has announced a new E Series communicator, becoming available in 2007. The device will include WLAN, UMTS, and EDGE, and is intended to enterprise solutions. Nokia cooperates with Oracle to develop the EPR package E-Business Suite, to be introduced in E-series devices[33].

Nokia is releasing its first GPS integrated phones in 2007. Nokia has also acquired Trimble's GPS patents[34, 35]. Benefon is planning to release a new location service integrated phone in Q2/2007[36]. Software GPS taking over in handsets seems still to be somewhat further in the future than some speculations have suggested. Hardware implementations are expected to dominate at least until 2010[37]. At the moment, GPS equipment is selling very well in Finland, but GPS-enabled phones have only a few percent share (Benefon, HP, Fujitsu-Siemens, Mio, and BenQ)[38].

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[29] Svenska Dagbladet, 09 Nov 2006, Näringsliv
[30] Tietokone, 25 Sept 2006 (in Finnish). http://www.tietokone.fi/uutta/uutinen.asp?news_id=28160&tyyppi=1
[31] The Korea Times, 12 Nov 2006
[32] Commercial Times, 12 Dec 2006
[33] Tietoviikko, 01 Dec 2006
[34] MikroPC.net, 27 Sept 2006
[35] Tietoviikko, 2 Oct 2006 http://www.tietoviikko.fi/tele_mobiili_docview.jsp?f_id=1036906
[36] Digitoday, 14 Nov 2006
[37] Cellular News, on a report from IMS Research, 3rd November 2006
[38] Tietoviikko, 28 Aug 2006 http://www.tietoviikko.fi/tele_mobiili_docview.jsp?f_id=996539

First 3.5G mobile phones have also started to appear. The capabilities include new capabilities like video streaming close to 2 Mbit/s[39].

Texas Instruments has launched a new chip series, eCosto, for lower costs of mobile phone cameras and other multimedia functions. It is the first single chip with multimedia functions and a three-megapixel camera. Texas Instruments has also introduced a new version of its low-cost phone chip, called LoCosto ULC (ultra low cost). It will e.g. bring media capabilities, GPRS and Bluetooth to low-cost basic phones[40].

China Mobile has decided to install 2D tag reading software on their new handsets. This can be expected to significantly help 2D optical codes to get into everyday use.

Table 2 is a non-exhaustive list of mobile terminals having properties relevant to our current subject.

Table 2. Mobile terminals with properties supporting ubiquitous customer services.

Model	OS	GSM	UMTS	WLAN	GPS	Camera	Available	Other
Benefon TWIG Discovery	n/a	3F	-	-	X	-	2006	
Benefon TWIG Monolith	WM6	X	-	X	X	2Mpix	2007	Maps, navigation, MS Office M
Benefon TWIG Talisman	WM6	X	-	X	X	2Mpix	2007	Maps, navigation, MS Office M
Benefon TWIG Totem	WM6	X	HSDPA	X	X	2Mpix	2007	Maps, navigation, MS Office M
Fujitsu-Siemens Pocket LOOX T830	WM5.0	X	X	b/g	X	2Mpix	Q4/2006	
HP iPAQ hw6915	WM5.0	X	-	b	X	1.3Mpix	Q3/2006	
HTC S620	WM5.0	4F	-	X	-	1.3Mpix	Q4/2006	
HTC S310	WM5.0	4F	-	X	-	1.3Mpix	Q4/2006	
HTC 8600 MTeoR	WM5.0	4F	3F	-	-	1.3Mpix	07/2006	
HTC P3600 (Trinity)	WM5.0	X	HSDPA	X	-	2Mpix	Q4/2006	
HTC P3300 (Artemis)	WM5.0	4F	-	b/g	X	n/a	Q4/2006	

[39] Manila Bulletin, 15 Nov 2006
[40] Prosessori magazine, 19 Feb 2007 http://www.prosessori.fi/uutiset/uutinen.asp?id=49965

Model	OS	GSM	UMTS	WLAN	GPS	Camera	Available	Other
HTC TyTN (Titan)	WM5.0	4F	3F/ HSDPA	b	-	1.3Mpix	07/2006	
LG CL400		3F	-	X	-	X	Q2/2006	UMA
Nokia E70	S9.1 (S603rd)	3F	X	i/e/g	-	2Mpix	07/2006	
Nokia E90	S9.2	4F	HSDPA	g	X	3.2 Mpix +video	Q2/2007	Maps, office tools
Nokia N77	S	3F	X	-	-	2Mpix	Q2/2007	DVB-H TV
Nokia N93i	S9.1 (S603rd)	3F	X	b/g	-	3.2Mpix +video	Q1/2007	NFC
Nokia N95	S9.2 (S603rd)	4F	HSDPA	b/g	X	5Mpix +video	Q1/2007	
Nokia 3220 + NFC shell	S	3F	-	-	-	VGA	Q1/2005	NFC
Nokia 6110 Navigator	S9.2 (S603rd)	4F	HSDPA	-	A	2Mpix	Q2/2007	Maps, routing; OMA DRM
Nokia 6131 NFC	S	4F	-	-	-	1.3Mpix	Q1/2007	NFC
Nokia 6136	S	4F		b/g	-	1.3Mpix	Q3/2007	UMA
Qtek 8500	WM5.0	4F	-	-	-	1.3Mpix	02/2006	
Qtek 8310	WM5.0	4F	-	X	-	n/a	08/2005	
Samsung P200	WM	X	-	X	-	1.3Mpix	Q3/2006	UMA
Samsung SGH-i600	WM5.0	X	HSDPA	b/g	-	1.3Mpix	Q4/2006	
Samsung M8000	WM2003	n/a	n/a	X	-	1.3Mpix +VGA		WiMAX, WiBRO, S-DMB TV, QWERTY
SonyEricsson P990i	S9.1 (UIQ 3.0)	3F	X	b	-	2Mpix		
T-Mobile Ameo	WM5	X	HSDPA	X	X	3Mpix	Q1/2007	QWERTY, removable

Explanations:

- WM = Windows Mobile
- b/g = WLAN 802.11 b/g
- 4F = 4 frequency bands
- A = Assisted GPS (A-GPS, AGPS)
- UMA = Unlicensed Mobile Access

2.1.4 PC, laptop

At least one laptop PC vendor (Dell) is integrating Nokia's 3G chip in its next generation laptop[41].

2.1.5 Network infrastructure

During recent years, wireless service providers have developed their network capabilities to attract new customers and more network activity. These new features include, among others, authentication, packet data service, assisted GPS (A-GPS), Internet access, WLAN hot spots, wireless access to e-mail, MMS, games, push-to-talk service, ring tone and music downloads, TV/video services, paging services, and access to information services, such as traffic, weather, sports and financial services.

- Infrastructure standardisation

Open Mobile Alliance (OMA), descendant of WAP Forum, Location Interoperability Forum (LIF), SyncML Initiative, MMS-IOP (Multimedia Messaging Interoperability Process), Wireless Village, Mobile Gaming Interoperability Forum (MGIF), and the Mobile Wireless Internet Forum (MWIF), aims to promote interoperable mobile service enablers. Its scope includes, among others, device management and location protocols[42].

The TeleManagement Forum[43] was founded in 1988, as the OSI/Network Management Forum to accelerate the availability of interoperable network management products. Their NGOSS initiative is a business solution framework for creating next generation OSS/BSS software and systems. The program is delivering a framework for producing new generation OSS/BSS solutions, and a repository of documentation, models, and guidelines to support these developments. The NGOSS goal is to facilitate rapid development of flexible, low cost of ownership, Operational and Business Support System (OSS/BSS) solutions[44]. TeleManagement Forum also manages OSS through Java (OSS/J) initiative. This set of (parallel) Java, XML and Web Services APIs support the business and technology goals of a telecom operator:

- End-to-end management of core business processes
- Flexible, component-based solutions
- Standardised technologies to ensure vendor independence.

These standards were originally initiated by Sun as Java Community Process standards.

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[41] MikroPC.net, 28 Sept 2006
[42] Open Mobile Alliance http://www.openmobilealliance.org/release_program/index.html
[43] http://www.tmforum.org/
[44] http://www.tmforum.org/browse.aspx?catID=1911

- Infrastructure developers, vendors and services

Huawei, a Chinese telecom service provider, is offering a palette of value-added services[45]:

- infoX-SMS (Short Message Service) is a Huawei-developed Short Message Center (SMC) system,
- The infoX-MMS (Multimedia Message Service) is enhanced messaging based on ordinary SMS and the enhanced SMS (EMS),
- infoX-WISG, an enhanced WAP gateway, is widely applied by over 45 operators in UAE, Brazil, USA, and Thailand etc.,
- infoX-Streaming is employed by operators of several countries/regions such as China Mobile, SUNDAY in Hong Kong, B Mobile in Brunei, and ETISALAT of UAE,
- TELLIN-CRBT (Color Ring Back Tone) customizes ringback tones, replacing the tones played by the end exchange of the called party back to the calling party,
- The TELLIN-WIN (Wireless Intelligent Network) product provides Intelligent Network services for the mobile network operators,
- infoX-IMPS (Instant Messaging and Presence Service) consists of Presence Server, IM Server, Group Server, and Share Content;
- nfoX-LBS: Location Based Service provided by the mobile communication network,
- infoX-Download service downloading of scripts, pictures, ring tones, etc.,
- infoX-Gaming complies with OMA standards, with an online game platform, emulated 3D virtual community and virtual life,
- The infoX-MDN (Media Delivery Network) is an video streaming network,
- The TELLIN-FIN (Fixed Intelligent Network) provides IN services for fixed network operators.

Nokia's Communication Core Networks offer voice and data services solutions. The Communication Core comprises[46]:

- MSC Server (MSS) System and Mobile Business Voice (MBV) solutions for voice services
- Voice over IP Server

[45] http://www.huawei.com/products/valueadded/products/productHome.do
[46] http://www.nokia.com/A4126027

- IP Multimedia solutions – IMS (IP Multimedia Subsystem), Push to Talk, Presence and List Management solutions
- MMS and SMS solutions for messaging

Mobile Cohesion offers a mobile gateway and partnership self-service platform on top of it[47]. BEA WebLogic Network Gatekeeper provides a gateway between public Internet and operator network, so that a service provider can offer services (SMS, MMS, others) to operator's customers and take advantage of operator infrastructure (i.e. charging and billing)[48]. BEA also offers a WebLogic SIP server[49] and RFID infrastructure support[50].

Photo and moving-picture mail services, with handsets supporting them, have been available for some time now[51]. Add2Phone and HP have put together a set of applications and content to enable mobile operators to easily launch MMS services for end-users. The service is named MMS Bazaar Bundle[52].

2.1.6 Information discovery and retrieval

Ask.com is offering a new search engine service, AskCity, integrating user's local maps with local services and businesses. Local searches are now at about 10% of all searches, and this share is expected to grow[53].

Microsoft has introduced a pre-modelled approach to user profiles and context sensitivity, in its Bayesphone project. This is aims at simplification of user profiling[54].

The term "Web 2.0" has been more or less established to refer to new, social media oriented way to use the Web. Even further speculations have been presented, e.g. more profiled, context-based and interactive, more process-oriented and more automated but

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[47] http://www.mobilecohesion.com/
[48] BEA press release June 5, 2006 http://www.bea.com/framework.jsp?CNT=pr01664.htm&FP=/content/news_events/press_releases/2006
[49] http://www.bea.fi/products/wlcom/sip/index.jsp
[50] http://www.bea.fi/products/rfid/
[51] e.g. Vodafone's "Sha-Mail" and "Movie Sha-Mail"
[52] Add2Phone press release 08/01/2003. http://www.add2phone.com/pressevent_08_01_2003.html
[53] The New York Times 4 Dec 2006, http://www.nytimes.com/2006/12/04/technology/04ask.html?_r=1&oref=login&ref=technology&pagewanted=print
[54] E. Horvitz, P. Koch, R. Sarin, J. Apacible, and M. Subramani (2005). Bayesphone: Precomputation of Context-Sensitive Policies for Inquiry and Action in Mobile Devices, User Modeling 2005, Edinburgh, Scotland, July 2005, http://research.microsoft.com/~horvitz/bayesphone.pdf

at the same time fully mobile service provision. The concept “Web 3.0” has sometimes been used to refer to this vision[55].

Visual tags: Increasing penetration of camera equipped hand held terminals, e.g. mobile camera phones, makes simple visual tags with encoded information attractive solution for many near range ubiquitous services. As RFID tags use short range radio communication, visual tags are read with camera and then decoded with the dedicated software. The most well-known visual tag is Barcode that was developed already in 1948 by two graduate students at Drexel Institute of Technology, Bernard Silver and Norman Joseph Woodland[56]. After the patent was granted 1952 it took almost 30 years to reach commercial success. Later on, needs to pack more information lead to the development of matrix tags from which QR Code, Semacode and Datamatrix are well-known examples. In Finland, it is worth to mention UpCode[57], an optical code reader for mobile terminals that retrieves and presents additional electronic information to printed products.

2.1.7 Data mining: handling of large data masses

When data mass grows very large, as it often does when consumer-related transaction data and various other personal information and events are collected, highly complex processing is required to extract the essential elements and relations. Data and text mining are the concepts usually involved here. And as personal privacy is very important to consumers, the privacy preserving in the data mining process is essential. This of course makes the process much more challenging, especially when both customer data collection and customer loyalty benefits should be delivered privacy-protected. The topic is currently a subject of research.

2.2 Pilots & trials

This sub-chapter refers to trials and test arrangements in which ubiquitous customer services or related enabling technologies are piloted.

In Den Bosch, The Netherlands, Asian food brand “Go-Tan” ran an experiment of Bluetooth marketing in a supermarket in September 2006. Customers shopping in the

[55] Web 3.0 reveals evertyhing about you. Talouselämä Magazine 18 Dec 2006 (in Finnish)
[56] Barcode, http://en.wikipedia.org/wiki/Barcode
[57] UpCode Solutions Ltd., http://www.upcode.fi/

supermarket with a Bluetooth connection were given a contact request from the Go-Tan device. The messages informed the customers of the discounts available.[58]

A number of brands including Land Rover, Coca-Cola and Unilever participated in an advertising-funded mobile content trial run by Rhythm NewMedia in (July) 2006. 3G Vodafone and T-Mobile users received free mobile content by watching a 20-second preceding advertisement. The main goal was to collect data on consumer reactions to advertising-funded mobile content.[59]

Nokia started its public Unlicensed Mobile Access (UMA) pilot in Oulu in July 2006. The pilot was a joint project between Nokia, the DNA/Finnet group and the City of Oulu.[60]

TeliaSonera, TietoEnator and Nokia have started an NFC trial on Tampere City public transport ticket system.[61]

MasterCard, Nokia and 7-Eleven are running a mobile commerce trial in Dallas, Texas, using NFC to PayPass payments.[62]

In Tokyo's Roppongi Hills the use of RFID tags is expanding, based on the successful trial of NTT DoCoMo's "R-click" service in 2003 and 2004[63].

In UK, ITV intends to launch a trial to help advertisers identify business opportunities. Advertisers will be able to test branded content and rich media on ITV broadband[64].

2.3 Research

This sub-chapter is a review of research activities concerning our current subject.

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[58] adverblog September 25, 2006. http://www.adverblog.com/archives/002827.htm#more
[59] New Media Age, 27 Jul 2006
[60] Nokia press release July 27, 2006, http://www.nokia.com/A4136002?newsid=1066083
[61] Mobile phone to be tested as travel card in Tampere, Finland. Nokia press release October 05, 2006, http://www.nokia.com/A4136002?newsid=1079569
[62] European Card Review, Nov/Dec 2006
[63] Shaping the future mobile information society, ITU, http://www.itu.int/futuremobile/
[64] Marketing, 24 Jan 2007

2.3.1 Scientific documents

- Challenges in Ubiquitous Data Management

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EECS Computer Science Division
University of California, Berkeley, CA 94720, USA

The article describes an approach how to *"identify and organize the key aspects of ubiquitous computing applications and environments from a data management perspective and outline the data management challenges that they engender"*.[65]

- Ubitem: a framework for interactive marketing in location-based gaming environment

Sang-Yeal Han (Sch. of IT Bus., Inf. & Commun. Univ., Daejeon, South Korea); Moon-Kyo Cho; Mun-Kee Choi. Source: International Conference on Mobile Business, 2005; Conference: International Conference on Mobile Business, 11–13 July 2005, Sydney, NSW, Australia. Publisher: IEEE Computer Society, Los Alamitos, CA, USA

"This paper proposes a framework, called Ubitem, which addresses many of the issues that are characteristic of mobile gaming and advertising. Ubitem facilitates time and location-sensitive, interactive marketing by enabling users with the location-aware technology capability to collect nearby items such as m-coupons and redeem the items in the close participating stores."[66]

- ENcentive: A Framework for Intelligent Marketing in Mobile Peer-To-Peer Environments

Ratsimor, O.; Finin, T.; Joshi, A.; Yesha, Y.
(Maryland Univ. at Baltimore. Dept. of Computer Science and Electrical Engineering.), 2005, 9 p.

"eNcentive facilitates peer-to-peer electronic marketing in mobile ad hoc environments."[67]

[65] http://www.cs.berkeley.edu/~franklin/Papers/DAGUbiq.pdf
[66] http://ieeexplore.ieee.org/iel5/9999/32116/01493595.pdf
[67] http://ebiquity.umbc.edu/paper/html/id/71/eNcentive-A-Framework-for-Intelligent-Marketing-in-Mobile-Peer-To-Peer-Environments

- Integrated ambient services as enhancement to physical marketplaces

Loke, S.W. (Sch. of Comput. Sci. & Software Eng., Monash Univ., Caulfield East, Vic., Australia); Zaslavsky, A. Source: Proceedings of the 37th Annual Hawaii International Conference on System Sciences, 2004, 8 p. Publisher: IEEE Comput. Soc, Los Alamitos, CA, USA

"This paper proposes a conceptual framework of how a set of locally useful ambient services can be meaningfully organized based on the user's physical location and intended tasks to enhance a physical marketplace such as a shopping street or a shopping mall."[68]

- Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers

Brynjolfsson, Erik (Sloan School of Management, Massachusetts Institute of Technology); Smith, Michael D. (Sloan School of Management, Massachusetts Institute of Technology); Hu, Yu (Jeffrey) (The Heinz School of Public Policy and Management, Carnegie Mellon University). November 2003.

"We present a framework and empirical estimates that quantify the economic impact of increased product variety made available through electronic markets. While efficiency gains from increased competition significantly enhance consumer surplus, for instance, by leading to lower average selling prices, our present research shows that increased product variety made available through electronic markets can be a significantly larger source of consumer surplus gains."

- MRM server: A context-aware and location-based mobile E-commerce server

Jin, Lai (Tokyo Research Laboratory, IBM); Miyazawa, Tatsuo. Source: Proceedings of the ACM International Workshop on Mobile Commerce, 2002 Conference: Proceedings of the Second ACM International Workshop on Mobile Commerce (WMC'02), Sep 28 2002, Atlanta, GA, United States Sponsor: ACM/SIGMOBILE. Publisher: Association for Computing Machinery

[68] http://csdl2.computer.org/comp/proceedings/hicss/2004/2056/09/205690284c.pdf

This paper is an Introduction of *"a Mobile Resource Management (MRM) system for mobile E-commerce developed last year, mainly focusing on the server's implementation"*.[69]

- Collaborative filtering research (list of papers)

Research papers on collaborative filtering have been listed by JamesThornton.com[70].

2.3.2 VTT's research relevant to ubiquitous services

VTT is working on large number of research activities with contents related to our current scope. The projects or initiatives are not itemised here, but the subject groups can be seen in Table 3 below.

Table 3. Research topics and projects, managed by VTT or with VTT's considerable participation, having relevance to ubiquitous customer services and marketing.

Main topic	**Subtopics and project core ideas**
Context technologies	• Content processing • Context-aware services for mobile users • Semantic web technologies • Semantic business interoperability • Ontologies for home services • Quality ontologies • Open context-aware service packages for mobile users • Context-aware open mobile multimedia conference frameworks and applications
Human-tech interfacing	• Novel user interfaces • User interaction with services (travel, health care) • DigiTV application to ubiquitous collaboration for special groups • Ambient Intelligence for special groups
Human: social	• Food and health information management • Social media applications and technologies • Requirements and design for mobile community platform and supporting functionality • Wellness solutions and exergaming: games, competition, play and leisure-time interests as motivators for human action, use of location technologies, application prototypes, business models, hundreds of ideas

[69] http://delivery.acm.org/10.1145/580000/570712/p33-jin.pdf?key1=570712&key2=3424331611&coll=GUIDE&dl=GUIDE&CFID=2648925&CFTOKEN=96803490

[70] http://jamesthornton.com/cf/

Main topic	Subtopics and project core ideas
	• Social media in the crossroads of physical, digital and virtual worlds • Social media business opportunities • Hybrid service provision model combining commercial and user-generated content in context-aware settings • Wireless support virtual communities • Quality for life in ubiquitous environment • Interaction between the technology supported urban living environment and people in different roles; models, methods, technology, applications, concepts and business needed for ubiquitous support for natural interaction for different needs • Theory, concepts, service design, business model, platform and terminal applications for socio-spatial interaction in mobile and ubiquitous environment
Information transfer	• Integration of short-range network system • Industry value network logistics development with the help of ubiquitous and mobility technologies
Human: leisure	• Wireless multimedia for football audiences and car services • Interactive services for digital television
Location and navigation	• Cell phone location method using database correlation • Positioning service framework • RFID positioning and positioning technology • Seamless navigation trials (e.g. Large shopping centre)
Marketing and advertising	• Scenarios (e.g., shopping centre as well as free-time), concepts, ideas, expertise from prototyping in mobile environment for business scenarios • System dynamics in product creation and development • Personalized mobile advertising services • Future mobile market solutions • Mobile payment with near field communication technology • Design and development of services and their quality for sustainable business, applying ubiquitous technologies • Analytical CRM campaign planning and management • CRM database correction and unification • Augmenting advertisement service with domain knowledge and qualitative reasoning • Information extraction for business intelligence • Information extraction from scientific publications
Mobility support	• Designing advanced network interfaces for location independent, optimised personal services • Middleware platform for developing and deploying advanced mobile services • Tampere City Centre WLAN-test environment • Personal area networks with portable devices • WAP adaptation for Usenet news • Collection of mobile service ideas (collected via public questionnaire) • Personal navigation service architectures and metadata

Main topic	Subtopics and project core ideas
	• Consumer applications in sensor networks • Agile approaches for the efficient development of mobile applications • Mobile information services for travellers (guides, maps, videoclips, real-time videos, panorama views & videos) • Interoperability in converging networks • Mobile SOA • Data processing and classification for mobile distributed environments • Collection of mobile service ideas (collected via public questionnaire)
Modelling	• Reference models of mobile service applications • Modelling and simulation of the processes of strategy management • Modelling and simulation of the trade-offs between the production of standard, custom, tailored and bespoke products • Reference architecture for public space services
Transport	• Personalised public transport information services
Visual	• Augmented reality (AR) solutions, related to product marketing • Feature tracking and 3d on camera phones • Mobile AR utilizing novel display devices • Video content management platform • Video streaming based applications

2.3.3 Related projects

This chapter lists a number of projects having relevance to ubiquitous services.

- OXYGEN

Pervasive, human-centred computing project at MIT Computer Science and Artificial Intelligence Laboratory. *"Bringing abundant computation and communication, as pervasive and free as air, naturally into people's lives."*[71]

- IMAP: An innovative Interactive Mobile Advertising Platform

The main aim of the IMAP project is to boost the creation of next generation user-centred, cost-effective and interoperable, mobile (3G) interactive advertising tools in order to properly address the emerging large market of mobile advertising[72].

[71] http://oxygen.csail.mit.edu/Overview.html

- M-To-Guide: MOBILE TOURIST GUIDE

Project Reference IST-2001-36004

The m-ToGuide project offers tourists information and services. All information and services delivered to the tourist will be location-based and profiled for the end-user[73].

- AMBIESENSE

Title: Ambient, personalised, and context-sensitive information systems for mobile users.

The idea is to develop a system architecture that enables ubiquitous, personalised, context-aware ambient information services for mobile citizens[74].

- IMAGE (Intelligent Mobility Agent for complex Geographic Environments)

The IMAGE system receives end users' requests and provides customised transport and tourism information based on user profiling and adaptation of personal needs. User localisation, navigation and e-commerce complement the services[75].

- ELBA (European Location Based Advertising)

The ELBA project (2002–2004) aimed at developing and validating an innovative approach (including content aggregation and technology integration) for location based advertising[76].

- PROJECT VOYAGER

Project Voyager seeks to build compelling web services for a ubiquitously networked world, where people, places, and things have an Internet presence. *"Bringing Web Services into Your Local Supermarket."*[77]

- CAPNET: Context-aware Pervasive Networking

CAPNET is a research program aiming to create a foundation for new information and communications technologies and for business in the field. The focus is on context-

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[72] http://cordis.europa.eu/search/index.cfm?fuseaction=proj.simpledocument&PJ_RCN=5565377&CFID=10859981&CFTOKEN=65085794
[73] http://www.mtoguide.org/
[74] http://www.ambiesense.com/
[75] http://www.sedoparking.com/showparking.php4?domain=image-project.com&rel_key=image+project
[76] http://www.e-lba.com/
[77] http://www.media.mit.edu/pia/voyager/about.html

aware mobile technologies for ubiquitous computing[78]. The first three-year period of the CAPNET program included two projects:

- Spearhead
- CAPNET Technology Enablers (CTE).

During the Spearhead and CTE projects several prototype demonstrations were created, the distributed component architecture was developed, and several scientific publications and theses were made. University of Oulu, 1/2005–12/2007.

- Rotuaari

The project was aimed at developing and testing technologies and earning models for context-aware mobile multimedia services of the future. The services and technology were tested in a real end user environment. University of Oulu, 6/2003–5/2006[79].

- PNP2008

PNP2008 project is part of the Freeband Communication programme, which aims at the generation of public knowledge in advanced telecommunication (technology and applications). Freeband is based on the vision of 4G networks and services[80].

- Telegraph project

"We're studying technologies for adaptive dataflow, which lend themselves to a number of new applications, including an engine for web facts and figures and an infrastructure for querying streaming data from sensors, logs, and peer-to-peer systems."[81]

- KDubiq (Knowledge Discovery in Ubiquitous Environments) CA

"KDubiq (Knowledge Discovery in Ubiquitous Environments) is the first Coordination Action (CA) for Ubiquitous Knowledge Discovery, 100% funded by the European Union under IST (Information Society Technology), FET Open (Future and Emerging Technologies) in the 6th Framework Programme."[82]

[78] http://www.mediateam.oulu.fi/projects/capnet2/?lang=en
[79] http://www.mediateam.oulu.fi/projects/rotuaari/?lang=en
[80] https://doc.freeband.nl/dscgi/ds.py/Get/File-65020
[81] http://telegraph.cs.berkeley.edu/
[82] http://www.kdubiq.org/kdubiq/control/index

- KDNet (Knowledge Discovery Network of Excellence) NoE

"The KDNet (= Knowledge Discovery Network of Excellence) is an open Network of participants from science, industry and the public sector."[83]

- GeoPKDD: Geographic Privacy-aware Knowledge Discovery and Delivery

EU project, 2005–2008. *"Goal is to develop theory, techniques and systems for geographic knowledge discovery, based on new privacy-preserving methods for extracting knowledge from large amounts of raw data referenced in space and time."*[84]

- MobiLife

EU IST FP6 project, Nokia, Ericsson, HP, Motorola, Siemens… *"MobiLife Integrated Project in IST-FP6 is to bring advances in mobile applications and services within the reach of users in their everyday life by innovating and deploying new applications and services based on the evolving capabilities of the 3G systems and beyond."*[85]

- SPICE (Service Platform for Innovative Communication Environment)

"EU project SPICE (IP) is addressing the still unsolved problem of designing, developing and putting into operation efficient and innovative mobile Service creation/execution platforms for networks beyond 3G."

"WP4 (Intelligent Service Enablers) aims at providing intelligent service platform solutions for user profile and context information management and for pro-active service adaptation (anticipatory and attentive middleware functionality)."[86]

- IST-DAIDALOS II (Designing Advanced network Interfaces for the Delivery and Administration of Location independent, Optimised personal Services)

"The Daidalos vision is to seamlessly integrate heterogeneous network technologies that allow network operators and service providers to offer new and profitable services, giving users access to a wide range of personalised voice, data, and multimedia services. 46 partners from industry and academia are ambitiously working to achieve this vision."[87]

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[83] http://www.kdnet.org/kdnet/control/index
[84] http://www.geopkdd.eu
[85] http://www.ist-mobilife.org/
[86] http://www.ist-spice.org/
[87] http://www.ist-daidalos.org/

- IST-MIDAS (Middleware Platform for Developing and Deploying Advanced Mobile Services)

The project (2006–2008) belongs to the program focussing on *"Mobile and Wireless Systems and Platforms beyond 3G" and it will help to realise the vision of being "Optimally Connected Anywhere, Anytime"*.

MIDAS will define and implement a platform to simplify and speed up the task of developing and deploying mobile applications and services[88].

2.3.4 Conferences

Below are some examples of conferences related to our current subject. Current activity level in relevant conference papers and presentations can be seen as an indicator of the research intensity on these topics.

Below is a short list of data mining and ubiquitous computing related international conferences.

- The International Workshop on Privacy-Aware Location-based Mobile Services (PALMS) May 11, 2007, Mannheim, Germany[89]
- Third International Workshop on Privacy Data Management. In conjunction with 23rd International Conference on Data Engineering (ICDE 2007), April 16, 2007, Istanbul, Turkey[90]
- ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) 2007[91]
- International Conference on Ubiquitous Computing (Ubicomp) 2007[92]
- International Conference on Pervasive Computing (Pervasive 2007)[93]
- Mobile HCI 2007[94]
- IEEE International Conference on Pervasive Computing and Communications (PerCom 2007)[95]

[88] http://www.ist-midas.org/
[89] http://www-users.cs.umn.edu/~cchow/palms07/
[90] http://www.ceebi.curtin.edu.au/PDM2007/
[91] http://www.acm.org/sigs/sigkdd/kdd2007/
[92] http://www.ubicomp2007.org/
[93] http://www.dgp.toronto.edu/conferences/pervasive2007/index.phtml
[94] http://www.mobilehci2007.org/
[95] http://www.percom.org/

- International Conference on Pervasive Computing (Pervasive 2006)[96]
- ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) 2006[97]
- IEEE International Conference on Data Mining (ICDM) 2006[98]
- European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD) / European Conference on Machine Learning (ECML) 2006[99]
- First International Workshop on Web Privacy Intelligence WPI'06, 18–22.12.2006, Hong Kong[100]
- PADM 2006: International Workshop on Privacy Aspects of Data Mining; in IEEE International Conference on Data Mining (ICDM'06)[101]
- International Conference on Machine Learning (ICML 2006)[102]
- International World Wide Web Conference 2006[103]
- IEEE International Conference on Pervasive Services (ICPS) 2006[104]
- International Conference on Mobile Business 2006[105]
- International Workshop on Privacy Data Management. In conjunction with 21st International Conference on Data Engineering (ICDE 2005)[106]
- DIMACS/PORTIA Workshop on Privacy-Preserving Data Mining. March 15–16, 2004[107]
- Workshop on Privacy Preserving Data Mining (PPDM) in conjunction with the 4th SIAM International Conference on Data Mining, Lake Buena Vista, Florida, USA, April 22–24, 2004.[108]
- International Workshop on Privacy and Security Issues in Data Mining in conjunction with the 15th European Conference on Machine Learning (ECML)

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[96] http://www.pervasive2006.org/
[97] http://www.kdd2006.com/
[98] http://www.comp.hkbu.edu.hk/~wii06/icdm/
[99] http://www.ecmlpkdd2006.org/
[100] http://cusp.smu.ca/Workshop/
[101] http://www-kdd.isti.cnr.it/padm06/
[102] www.icml2006.org
[103] http://www2006.org/
[104] http://www.ens-lyon.fr/LIP/RESO/icps2006/
[105] http://csdl2.computer.org/persagen/DLAbsToc.jsp?resourcePath=/dl/proceedings/icmb/&toc=comp/proceedings/icmb/2006/2595/00/2595toc.xml
[106] http://www.db.soc.i.kyoto-u.ac.jp/PDM2005/
[107] http://dimacs.rutgers.edu/Workshops/Privacy/
[108] http://www.siam.org/meetings/sdm04/

and the 8th European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD), Pisa, Italy, September 20, 2004.[109]

- ICDM'03: The Third IEEE International Conference on Data Mining 2003; 2nd Workshop on Privacy Preserving Data Mining (PPDM), Melbourne, Florida, USA, November 19, 2003[110]
- Workshop on Privacy, Security, and Data Mining (PSDM). In conjunction with the 2nd IEEE International Conference on Data Mining (ICDM'02), Maebashi City, Japan, December 9, 2002.[111]
- KDD-2001 Tutorial: Data Mining "To Go": Ubiquitous KDD for Mobile and Distributed Environments 2001.[112]
- Joint 12th European Conference on Machine Learning (ECML'01) and 5th European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD'01). Workshop Title: Ubiquitous Data Mining for Mobile and Distributed Environments. September 3–7, 2001, Freiburg, Germany[113, 114]

▪ Conference lists

More conferences can be found from e.g. the following conference list sites:

- BI, KDD and Data Mining Conferences / Workshops[115]
- Wireless and Mobile Communications conferences[116]

2.4 Patents

Patents mentioned in this document do not contain newest titles, as the applications do not become public until 18 months after filing. Any exceptions are due to the applicant's own decision to publish the application or patent. Table 4 lists the titles found, and gives a crude categorization for each title.

[109] http://people.sabanciuniv.edu/%7Eysaygin/psdm/index.html
[110] http://www.cs.uvm.edu/~xwu/icdm-03.html
[111] http://www.cs.purdue.edu/homes/clifton/psdm.html
[112] http://www.acm.org/sigs/sigkdd/kdd2001/Tutorials/kdd2001_T3.html
[113] http://www.informatik.uni-freiburg.de/~ml/ecmlpkdd/
[114] http://www.cs.umbc.edu/~hillol/pkdd2001/udm.html
[115] http://www.kmining.com/info_conferences.html
[116] http://www.nas.its.tudelft.nl/~alex/CFP/

Table 4. Patent search results. Full texts can be accessed through network by clicking the icons in the rightmost column.

PLEASE NOTE! There is a PDF reader/browser-related issue related with URL's: **full text links may fail** with some PDF viewer/Web browser combinations. If necessary, the links can be copied from the Appendix, where they are written out in full.

#	Patent or application title	context aware devices	context aware systems/services	eBusiness devices	eBusiness systems/services	multimedia/content devices	multimedia/content systems/services	social/community devices	social/community systems/services	CLICK for FULL TEXT
1	Context-Aware and Location-Aware Cellular Phones and Methods	x	x							
2	Context aware computing devices having a common interface and related methods	x	x							
3	Method and apparatus for enabling context awareness in a wireless system	x	x							
4	Method for controlling operation of a mobile device by detecting usage situations	x	x							
5	Method, apparatus and system for enabling context aware notification in mobile devices	x	x							
6	Methods and apparatus for integration of interactive toys with interactive television and cellular communication systems	x								
7	Covers having RFID functionality for portable electronic devices	x								
8	CONTEXT-AWARE DEVICE	x								
9	A METHOD FOR CONTROLLING OPERATION OF A MOBILE DEVICE BY DETECTING USAGE SITUATIONS	x								
10	Beacon update mechanism	x	x							
11	Beacon infrastructure	x								
12	METHOD AND APPARATUS FOR CONTROLLING A COMPUTING OR ELECTRONIC DEVICE	x								
13	Dispatch system to remote devices	x	x	x	x					
14	Portable communications device and method of use	x	x	x	x					
15	System and method for anonymous location based services		x							
16	Method of locating a mobile terminal with its position being displayed on another mobile terminal		x							
17	SCHEDULING OF RENDERING OF LOCATION-BASED CONTENT		x							
18	Contextually aware network announcements of people		x							
19	Methods for determining the approximate location of a device from ambient signals		x							

#	Patent or application title	context aware devices	context aware systems/services	eBusiness devices	eBusiness systems/services	multimedia/content devices	multimedia/content systems/services	social/community devices	social/community systems/services	CLICK for FULL TEXT
20	Tags for location-based services in wireless networks		x							
21	Contextual information management in wireless communications devices and methods therefor		x							
22	Method and system for pushing services to mobile devices in smart environments using a context-aware recommender		x							
23	Method and apparatus for fusing context data		x							
24	Context-aware client system		x							
25	Personalization in a wireless portal server		x							
26	System and method for providing information services to cellular roamers		x							
27	Secure location-based services system and method		x							
28	Subscriber delivered location-based services		x							
29	POSITION-BASED CONTEXT AWARENESS FOR MOBILE TERMINAL DEVICE		x							
30	LOCATION BASED SERVICES FOR MOBILE COMMUNICATION TERMINALS		x							
31	Mobile communication system using push to talk scheme for supplying location based service and method therefor		x							
32	METHOD AND APPARATUS FOR MONITORING USAGE PATTERNS OF A WIRELESS DEVICE		x							
33	Method and system for generating context-aware content from source content associated with a computing device		x							
34	Location based service (LBS) system and method for targeted advertising		x		x					
35	System and method for targeted advertising		x		x					
36	Personalized profile based advertising system and method with integration of physical location using GPS		x		x					
37	LOCATION BASED DELIVERY OF COMMERCIAL SERVICE DATA TO THE USER OF A PORTABLE COMMUNICATIONS DEVICE		x		x					
38	A METHOD AND SYSTEM FOR BROADCASTING MESSAGES INCLUDING LOCATION DEPENDANT TARGETED ADVERTISEMENT IN A CELLULAR NETWORK		x		x					
39	OPT IN MODEL SERVICE PROVIDING SYSTEM BASED POSITION OF A MOBILE PHONE		x		x					
40	Method and system for adding advertisements over streaming audio based upon a user profile over a world wide area network of computers		x		x		x			

#	Patent or application title	context aware devices	context aware systems/services	eBusiness devices	eBusiness systems/services	multimedia/content devices	multimedia/content systems/services	social/community devices	social/community systems/services	CLICK for FULL TEXT
41	REMOTELY CONFIGURABLE MULTIMEDIA ENTERTAINMENT AND INFORMATION SYSTEM WITH LOCATION BASED ADVERTISING		x		x		x			
42	INTELLIGENT MEDIA TARGETING SYSTEM AND METHOD		x		x		x			
43	ELECTRONIC ADVERTISING DEVICE AND METHOD OF USING THE SAME			x	x					
44	E-appliance for mobile online retailing			x						
45	METHOD AND APPARATUS FOR REQUESTING SERVICE USING ACCESS CODE			x	x					
46	Apparatus, systems and methods for compensating broadcast sources			x	x	x	x			
47	E-coupon service for location-aware mobile commerce which determines whether to supply requested e-coupons based on the number of requests received in a processing cycle, and a threshold number of requests required to make expected returns from redeemed coupons greater than advertising fees				x					
48	Passive mining of usage information in a location-based services system				x					
49	Targeted advertising system and method				x					
50	Electronic ticketing system and method				x					
51	Systems and methods of interfacing an advertisement with a message presentation client				x					
52	System and method for pushing personalized content to small footprint devices				x					
53	Method and system for serving advertisements				x					
54	Sponsored media content				x					
55	System for automatically selling and purchasing highly targeted and dynamic advertising impressions using a mixture of price metrics				x					
56	System and method using adaptive learning components to enhance target advertising and customize system behavior				x					
57	In-store (on premises) targeted marketing services for wireless customers				x					
58	Method and system for customizing the content of targeted advertising				x					
59	Advertisement delivery systems, advertising content and advertisement delivery apparatus, and advertisement delivery methods				x					
60	Method and system for mobile commerce advertising				x					

#	Patent or application title	context aware devices	context aware systems/services	eBusiness devices	eBusiness systems/services	multimedia/content devices	multimedia/content systems/services	social/community devices	social/community systems/services	CLICK for FULL TEXT
61	Method and system for providing targeted advertising and personalized customer services				x					
62	Method for personalizing messages delivered to a communication terminal that preserves the privacy of the recipient of the message				x					
63	Remote purchasing system and method				x					
64	Method and system for simulating the distribution of targeted advertising				x					
65	Method and system for distributing targeted advertising				x					
66	A SYSTEM AND METHOD FOR INTERACTIVE MARKETING				x					
67	INFORMATION ACCESS WITH TARGETED MARKETING CAPABILITY				x					
68	Conditional e-coupon service for location-aware mobile commerce				x					
69	Method for passive mining of usage information in a location-based services system				x					
70	Remotely configurable multimedia entertainment and information system for vehicles				x					
71	APPARATUSES, METHODS AND SYSTEMS TO IDENTIFY, GENERATE, AND AGGREGATE QUALIFIED SALES AND MARKETING LEADS FOR DISTRIBUTION VIA AN ONLINE COMPETITIVE BIDDING SYSTEM				x					
72	Methods, systems, and products for demographic discounting				x					
73	System and method for providing usage metrics of digital content					x	x			
74	System and method for aggregating , delivering and sharing audio content						x			
75	Personalized marketing architecture						x			
76	Personalized content application						x			
77	Methods and apparatus for connecting an intimate group by exchanging awareness cues and text, voice instant messages, and two-way voice communications							x	x	

In addition to the full patent or application contents available through the links above, their abstracts can be found in the Appendix (a separate file).

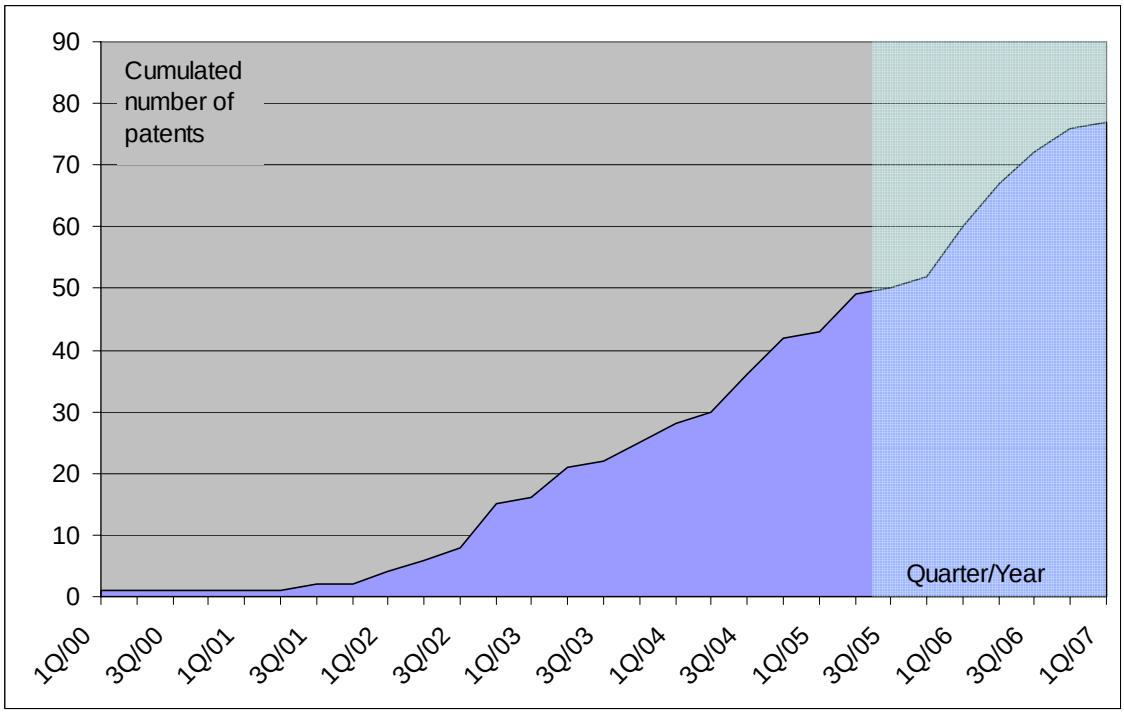

Figure 3. Accumulation of the patents and patent applications included in the search results. The greyed area covers the 18 months guard period when the applications do not automatically become public. During this time the actual patent/application count is probably underestimated in this chart.

It can be seen in Table 4 that a considerable part of the patents found in the search deal with eBusiness devices, systems or services, and context-aware systems and services form another prominent group.

Patent activity inside our current scope started around year 2002, and the patent count has grown steadily ever since, even slightly accelerating, as shown in the graph of Figure 3.

3. Business developments

This section reviews business aspects, events and forecasts found in the search and from other sources. The section in organised in three main categories: Loyalty Programs, Public Services, and Community Services and Social Media. Preceding these, a number of findings common or non-specific to all these are collected under the General chapter.

3.1 General

A lot of business elements, especially the ones concerning generic technology and services, are non-specific to business sectors inside our current scope. The business aspects of these items are collected in this sub-chapter.

3.1.1 Business models

This chapter lists business models encountered in ubiquitous customer services.

- Subscription

Business is based on service subscription. In many cases the entry level service is free of charge, additional features being subject to a fee, usually monthly or annually, or transaction-based.

- Ad-based

This very usual business model is based on selling advertisements in the service media. The model is similar to free newspapers and commercial TV channels, i.e. selling of advertisements. The largest ad channels in the Internet are Google and Yahoo. The model is also suitable to other environments, like mobile marketing.

Google's CEO Eric Schmidt envisions that in the future cell phones can be free if the user agrees to watch targeted ads. While Google has no specific plans to give away phones, Schmidt anticipates such moves in the future[117].

- Shopkeeper

A conventional business model is to sell products, virtual or physical.

[117] Slashdot, 13 Nov 2006

- Risk financing

Service providers, especially in social media, have accumulated considerable sums from risk funds. E.g. from July 2005 to June 2006 the sum of risk financing, company acquisitions and mergers was about 550 M€, and in the autumn 2006 the acquisition of YouTube by Google alone reached 1300 M€.

- Pay for content

Consumer-generated content can be a central part of "real-time" news services like the You Witness News service by Reuters and Yahoo[118]. The next step, and a new business model, is to pay for (non-professional) content media contributions. An example of this is the Scoopt service[119].

- Non-commercial tools into commercial products or processes

User applications often develop tools and methods that can be taken to commercial use, either as tools or as development targets. The ways of thinking are very often radically different from conventional, which requires adaptation, but usually the price level is very low.

- No business model

A large part of services have no clear business model, even though the basic service idea can be very good. These free services are a suitable entry point that inspires users to produce content of their own. Aided by large mass of users, this has been a fertile ground for new success stories like YouTube. And in many cases conventional business models are not even applicable, which has eventually led to a number of new models.

- Mash-up

Mash-up, i.e. combination of various existing services, is another interesting form that can also be applied to business. As a mash-up can often increase the demand of the sub-services, a revenue share model could be used, even though it is challenging.

- Examples of implemented or intended models

Huawei has formed a new business model with aggressive pricing in China[120].

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[118] http://news.yahoo.com/you-witness-news
[119] http://www.scoopt.com/
[120] MSNBC/Newsweek http://www.msnbc.msn.com/id/10756804/site/newsweek/

Hutchison, more commonly known as 3 in the UK, has announced a partnership with Skype, Sling Media, Yahoo, Nokia, Google, eBay, Microsoft, Orb and Sony Ericsson, with the idea to bring their services to mobile for a flat rate, with a system called "X-Series"[121].

Nokia has been developing CPO (click-to-call, click-to-sms, click-to-url etc.) charging models, in which the charges would be transaction based[122].

Itella intends to use bills as a new profiled marketing channel. In Itella's concept is to add personified messages to e.g. bills or account statements. Statistical analysis is used to find the right profile, according to e.g. address or social status[123].

Google has published a video and audio presentation of their AdSense service, by Narayanan (Shiva) Shivakumarof who is Google Distinguished Entrepreneur and Director of Google's Seattle-Kirkland R&D centre. The recording was made in October 12, 2006 in University of Washington, Seattle[124].

3.1.2 Enterprises

AvantGo provides mobile enterprise software to automate business processes and information exchange between companies. It also offers mobile advertising and customer information solutions, with graphical interactive user interfaces[125].

Samsung was the company that took the largest WiMAX equipment revenue share in 2006, followed by Airspan and Alvarion[126].

Nokia expects to grow in the Internet business in the future. Their vision is that on developing markets new Internet connections will more often be opened to wireless terminals than fixed lines. Nokia has updated its Internet tablet to N800[127].

Philips, Smart System Technologies and 3united announced an alliance to deliver mobile entertainment applications as well as loyalty and reward programs using NFC[128, 129].

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[121] Crave 16 Nov 2006. http://crave.cnet.co.uk/mobiles/0,39029453,49285322,00.htm
[122] Tietokone, 25 Sep 2006 http://www.tietokone.fi/uutta/uutinen.asp?news_id=28160&tyyppi=1
[123] Kauppalehti, 17 Jan 2007
[124] http://norfolk.cs.washington.edu/htbin-post/unrestricted/colloq/details.cgi?id=543
[125] http://www.avantgo.com/frontdoor/index_uk.html
[126] New Media Age, 7 Dec 2006
[127] Prosessori magazine 1/2007

3.1.3 Market reviews and forecasts

Below is a summary of a number of market forecasts and reviews from the ubiquitous customer service point of view.

- General

Gartner predicts for 2007 and beyond[130] that

- as mobile technology advances, national safety and protection are building pressure against some privacy limitations;
- the mobile world is creating what Gartner calls "follow-me Internet" as location technology and other sensors become commonplace in mobile terminals;
- by 2010, 60% of cellular population will be trackable; most of them are willing to accept this in exchange for convenience, 20% are more or less forced;
- Web 2.0 will take advantage of user communities;
- wearable embedded location technologies will spread in toys;
- governments will feel a pressure to deal with the implications of user tracking.

In Finland, Mainosbarometri indicates rising advertising activity. Most weight is now on network and email, but also mobile advertising draws advertisers' attention. Mainosbarometri is a review by the Association of Finnish Advertisers (Mainostajien Liitto), a co-operation forum of advertisers in Finland[131].

Large advertisers are expected to take over most of personalised marketing services using search engines as the advertising channel[132].

Richard K. Miller & Associates sees that conventional mass marketing is quickly losing its effect, especially among younger consumers. Personal, targeted, location-aware marketing is expected to be more acceptable and effective to them[133].

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[128] Business News From Philips, 09 Feb 2005
[129] http://www.SmartSystemTech.com
[130] Gartner 1 Dec 2006
[131] Kauppalehti Online, 17 Jan 2007
http://www.kauppalehti.fi/4/0x1000907ac/uutiset/etusivu/juttu.jsp?oid=2007/01/17/2211743
[132] BusinessWeek Online, 22 Jan 2007
http://www.businessweek.com/print/magazine/content/07_04/b4018076.htm?chan=gl
[133] Richard K. Miller, 17 Jan 2007, New Media Markets

In the US, the number of mobile video and TV subscribers has doubled to 5.1mn (2.3% of users) between the beginning of 2006 and Q3/2006, and this alternative digital media is expected to boom in 2007[134].

Tandberg Marketing survey expects the total spending in Denmark on mobile advertising to grow by more than 90% in 2007. The market has been slow until now, and the starting level is accordingly low[135].

The mobile ad and online industries in the UK are suffering from shortage of digital skills. The lack of skilled developers is already considered a serious inhibitor to growth[136].

- Platforms and operating systems

Europe's mobile market penetration was forecast to reach 100% in 2006 or early 2007[137].

Texas Instruments' new eCosto chip is expected to help reduce the price to mobile carriers of multimedia mobile phones from their current level of around US$ 90 (EUR 70.53) to US$ 100, down to between US$ 50 and US$ 70[138].

Mobile phone sales were forecast to peak in 2007, at 162 million, with more than half of them third-generation phones. Beyond 2007 the sales would decline due to less demand of new phones[139].

Analysts have divided views on the future of market sharing between the leading mobile OS vendors. By IDC, Microsoft would eventually pass Linux, by leveraging its OS products for both mobile phones and PDAs. Other analysts have reached varying results, depending on whether or not phone-enabled PDAs have been included. Gartner does not include them, and sees Linux surpassing Windows. IDG does include them, and has reported Linux trailing Windows.

TDG (The Diffusion Group) forecasts that Linux and Windows will both overtake Symbian in the advanced mobile phone OS market by 2010. TDG appears to be the first to suggest that Linux is currently ahead of Windows on mobile phones, even if phone-enabled PDAs powered by Pocket PC are counted.

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[134] Radio Ink, 30 Jan 2007
[135] Børsen, 10 Jan 2007
[136] New Media Age, 18 Jan 2007
[137] Business Wire 22 Nov 2005
[138] Wall Street Journal, 10 Nov 2006
[139] Gartner; Carolina Milanesi, Ben Wood. 2 June 2005

In Europe, according to IDC, Microsoft is also increasing its weight on the mobile phone market. It is expected to gain one third, while Symbian would be able to keep two thirds of the market[140].

PDA and Smartphone sales growth are declining in Europe, according to IDC[141]. Canalys has seen the same tendency Worldwide in 2005.

Symbian believes that smartphones will take PC's position in the near future. This would seem most likely on developing markets, e.g. in India[142].

In Finland, total household electronics sales went up by 18% in 2006. Mobile phones increased by 25%, to 417M€, and the growth was highest in smart phones[143].

- RFID, NFC

Philips has outlined NFC specification to be in use on most high-medium end phones in 2007 and in 50% of all phones by 2010 (latter forecast from ABI research)[144].

ABI Research has downgraded its forecast for NFC enabled handsets September 2006 by 10%, to 450m units, representing 30 per cent of all handsets in 2011. Their explanation is the inability of network operators to provide a working business model. Another problem is that NFC lacks a killer application.

According to IDTechEx, the global sales of active RFID systems will grow from $0.55bn (€0.43bn) in 2006 to $6.78bn (€5.33bn) in 2016. At present the largest use is in logistics, but air industry and automotive industry and healthcare are worth mentioning, too[145].

- WLAN and WiMAX

Infonetics expects sales of WiMAX equipment to take off in three years' time. Sales of WiMAX-enabled equipment were up 23% to EUR 130m in the past year, probably due to consumer demand for mobility. About 35% of equipment was sold in Asia Pacific, 30% in followed by EMEA[146].

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[140] IDC Mobile Device Operating System Forecast 2006
[141] Tietokone 3 Aug 2006 http://www.tietokone.fi/uutta/uutinen.asp?news_id=27558
[142] MikroPC.net 18 Oct 2006
[143] Kauppalehti, 05 Feb 2007
[144] Philips presentation, 7 Jun 2006
http://www.globalcomm2006.com/speakers/presentations/David_Holmes_presentation.pdf
[145] PRW.com/David Eldridge, 30 October 2006
[146] New Media Age, 7 Dec 2006

According to In-Stat's conservative scenario, the WiMAX subscriber base in China will reach 1,234,120 by 2010. The corresponding aggressive scenario is 3,525,070. The contenders are expected to be 3G and 802.16e[147].

In-Stat believes that WiMAX sales will reach $3 billion in 2010, if the terminal prices sink below 100 dollars from their current 500 dollars[148].

Gartner has suggested European service providers to focus their WiMAX offerings on niches like broadband fill-in, enterprise E1 and mobile backhaul, until 2009 and avoid attempts to create ubiquitous services until then[149].

Gartner predicts that 14 million employees will work remotely through a cellular connection and slightly more than 4.9 million through a WiMAX connection. By 2010, devices/software are able to roam between different methods to access corporate networks remotely[150].

The US telecom operator Sprint Nextel is building a WiMAX network that covers nearly all US by the end of 2007. The required investments are approximately 3 billion dollars. Intel has invested 600 million to the WiMAX developer Clearwire. Intel's goal is to have WiMAX in every portable PC in a few years[151].

- Zigbee and Bluetooth

IMS Research report "The World Market for Bluetooth – 2006 Edition" estimated that Bluetooth technology had grown tenfold in three years, to 250 million units in 2005. They predicted shipments to double in 2006 and to exceed 1 billion units in 2008 and 1.5 billion in 2010. Handsets and audio headsets will keep dominating the shipments during this period. Other uses, e.g. PC peripherals, may find more competition by other wireless technologies, at least WUSB[152].

Gartner has predicted Annual sales of Bluetooth phones to top near 583 million in 2009, as Bluetooth becomes a standard part of new handsets, and the cost of adding it to a mobile phone will be less than $2. Western Europe will remain the largest market for them, followed by North America. In Japan, infrared communications is largely used

[147] Business Wire, 18 Dec 2006
[148] Digitoday, 2 Jan 2007
[149] Gartner/Scott Morrison Susan Richardson, 8 March 2006
[150] Gartner, 8 November 2005
[151] Tekniikka&Talous, 17 Aug 2006
[152] IMS Research, 30 Oct 2006

instead of Bluetooth. At the same time, Bluetooth will find a use as a social tool and an advertising vehicle in mobile marketing[153].

- Location

ABI Research estimates that 2007 will be the year of adoption of GPS into mobile phones. By the end of 2008 a quarter of new WCDMA handsets and a quarter of all 3G handsets will have GPS integrated, and the ASP of the chipset will be under $3[154].

Nokia also expects GPS-enabled mobile phones to become more common in 2007. They expect GPS mobile phone sales to exceed sales of separate GPS devices in the summer 2007[155].

IMS Research reports as its opinion that software GPS in not yet ready for mass market. Hardware implementations will dominate until 2010[156].

- MP3, radio and TV

IDC sees that music charging into mobile phones is a potential rival to dedicated MP3 players[157]. MP3 mobile phones appeared in 2006 from BenQ and others[158].

The Chinese digital radio systems Gota and GT800 have been launched, and the aggregate revenues are forecast to reach $19 million by 2010, about 18% of total digital radio revenues in China[159].

Nokia expects mobile TV to be volume business in five years. According to Informa, 70 million DVB-H phones will be sold by 2010[160].

- Cameras

Gartner predicts that sales of camera phones would reach 395.50mn units by 2010, meaning an average yearly growth of 38.7% from 2006[161]. This also tends to limit the market growth of digital still cameras to 10%[162].

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[153] Gartner/Carolina Milanesi, Stanley Bruederle, Hugues J. De La Vergne, Ann Liang, Nahoko Mitsuyama, Tuong Huy Nguyen, 4 November 2005
[154] Technology News, Wed 2006-10-11
[155] IT Viikko, 25 Jan 2007
[156] Cellular News, 3 Nov 2006
[157] Electronic Devices, July 14 2006
[158] DigiTimes, 06 Apr 2006
[159] IMS Research, 03 August 2006
[160] Arvopaperi 6 Oct 2006

- Services

Personal GPS locator services user base in North America is expected to grow from the 500 000 in 2006 to more than 20 million in 2011, and in Asia-Pacific it is predicted to reach 34 million[163].

In Taiwan, the Ministry of Economic Affairs has set a target for digital content industry to increase its output to NT$ 600bn (14.23bn €) by 2011, with exports counting for 30% of it[164].

A majority of mobile users are either unaware of or uninterested in additional data applications available for their phones. Among those using the services, news, weather and sports services dominate[165].

3.2 Loyalty programs

This chapter introduces loyalty programs and their enablers implemented or planned.

3.2.1 Loyalty program enablers

New types of search engines have started to appear, dedicated to consumers' aid in finding out which local supplies have what they want in store. Examples of these are NearbyNow in Arizona and California (using text messages), GPShopper's Slifter, Yokel, Shoplocal.com and BrandHabit.com. Wal-Mart, Target, Barnes & Noble and Best Buy collaborate with Google to give same kind of accessibility to their stock information[166].

Various recommendation machines have been implemented in online retail services. The most rudimentary ones are unidirectional, just matching basic purchase information with history. The next step is to collect real users' opinions and make them available to customers, possibly further filtered using the new customer's profile. Interactivity offers a wide field for new ideas and operating models for discussion, evaluation and recommendation of products and services. The problems involved are not trivial though.

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[161] Bisnis Indonesia, 14 Nov 2006
[162] Gartner Dataquest, 15 December 2005
[163] ABI-Research, 29 Nov 2006
[164] DigiTimes, 20 Dec 2006
[165] Telephia / K. Agarwal; http://www.mobilemonday.us/wp-content/uploads/2006/10/Telephia%20Mobile%20Monday%20100906-pdf.pdf
[166] Wall Street Journal, 21 Dec 2006

Bango has developed a mobile sponsored search in the US, UK and Japan. The search marketplace is separate from Web sponsored search and content match[167].

Benefon has started a location based advertising service that has already found attention from Heineken[168].

Enpocket, with its Enpocket Mobile Marketing Engine (EME) provides mobile marketing technology to Vodafone, Sprint, Alltel, Singtel, Nokia, Samsung, Panasonic, BenQ-Siemens, Trinity Mirror, TNT, Pepsi and Nike. Airtel uses its technology to give advertisers a channel to reach a considerable part of the US population[169, 170].

iJack™ is a wireless service for distributing content to mobile phones locally, using high speed wireless networks[171].

Jellingspot Platform by Midletsoft is a customer relations tool to facilitate relationships between customers and businesses. Their location-based point server utilises Bluetooth to transmit data to wireless devices: electronic coupons, informational text, audio, video, corporate information, etc. The client terminal requires installation of specific software.[172]

MobileLime offers its mobile shopping and rewards platform to assist retailers to start and run mobile phone based loyalty programs. The communication started with SMS, but RFID is now also supported[173, 174].

Mophap offers online and mobile advertising services[175].

Nellymoser and Third Screen Media offers MADX mobile advertising platform to increase the efficiency and time-to-market for the buying and selling of mobile advertising. MADX also provides analytical tools and inventory management[176].

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[167] October 19, 2006 http://event.on24.com/event/28722/1/documents/slidepdf/web_marketing_meets_mobile.pdf
[168] Taloussanomat 15 Nov 2006 http://www.taloussanomat.fi/page.php?page_id=32&nnws_id=6671614
[169] Knight Ridder Tribune Business News. Washington May 25, 2006
[170] Wireless News. Coventry Sep 12, 2006
[171] http://www.i-jack.com/page3031.phtml
[172] http://www.jellingspot.com/products.htm
[173] MobileVillage, 23 Feb 2006
[174] The Pondering Primate, 12 Apr 2005 http://theponderingprimate.blogspot.com/2005/04/mobilelime-offers-payment-and-loyalty.html
[175] http://www.mophap.com/
[176] http://www.nellymoser.com/news/news-091206.html

Proximity services for customer relations management systems are available from Hypertag, BlueCasting or FuturLink[177, 178, 179].

ViVOtech offers contactless payment technology to replace cash, checks and swipe cards[180].

Yahoo published details about its "Panama" ad system upgrade in spring 2006, to be launched later in the year. The upgrade was expected to bring Yahoo's system in par with Google[181].

3.2.2 Implemented loyalty programs

Ad Infuse and Mondo Media have announced an advertising platform for video podcasting. Advertisers can insert 15–30 second pre-roll video commercials prior to each animated short in the Mondo Mini Shows Podcast Network[182].

Add2Phone is to cooperate in mobile marketing with the BeWeb Interactive Agency in Russia and Kazakhstan. Add2Phone's Mobile Advertising Server is connected to major mobile phone operators Megafone, VimpelCom's brand Beeline, and MTS in Russia, and K-Cell and K-Mobile in Kazakhstan[183].

Air France, together with its SkyTeam partners (Aéromexico, Air France, Aeroflot, Alitalia, Continental Airlines, CSA Czech Airlines, Delta, KLM, Korean Air and Northwest Airlines), offers its frequent fliers benefits based on their flying activity. The benefits can be discounts or upgrades of flights, hotels, car rentals, or other services more or less connected with their business[184, 185]. The scheme is the same with many other airlines.

Best Buy Co. Inc. in US has the nationwide Reward Zone loyalty program. Loyalty points are granted with offline purchases, not with online purchases, but the customer

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[177] http://www.hypertag.com/
[178] http://www.bluecasting.com/
[179] http://www.futurlink.com/
[180] http://www.vivotech.com/
[181] SearchEngineWatch, May 2006 http://blog.searchenginewatch.com/blog/060508-093509
[182] by Newstex, 04 Oct 2006
[183] Esmerk 2006
[184] http://www.airfrance.fr/FR/fr/local/toutsurairfrance/partenaires/partenaires_fidelisation.htm?BV_SessionID=@@@@0447452890.1169811942@@@@&BV_EngineID=ccccaddjmikgellcefecekedfnfdfnk.0
[185] http://www.airfrance.us/US/en/local/toutsurairfrance/partenaires/partenaires_fidelisation.htm?BV_SessionID=@@@@0280744856.1169811776@@@@&BV_EngineID=cccdaddjmiimiigcefecekedfnfdfol.0

can see the account status on the web. The solution was created by Frequency Marketing Inc., using their Loyalty Solutions Platform[186, 187].

Blyk is offering ad-supported mobile phone calls in Finland. Their target consumer group are people of age 16–24[188].

Chevy Chase Supermarket in the Washington DC metro offers its customers rewards and instant savings. The service runs on Mobile Rewards platform from MobileLime. The system is able to communicate with the customers before, during and after each transaction, which is expected to impact buying behaviours at the point of sale[189].

Chunghwa Telecom in Taiwan and Google develop location-based service (LBS) and mobile advertising businesses in Taiwan[190].

Dennis Publishing is using the Qwikker Pub Network to deliver a mobile video clip to consumers for free via Bluetooth. The campaign ran during the launch month of the web-based men's lifestyle magazine 'Monkey'. Brands could deliver content-based marketing campaigns directly to consumers' mobile phones at no cost to the end users[191, 192].

Dunkin' Donuts and McDonald's have begun using cell phones for connecting with their customers. They are encouraging people periodically to purchase from them at a discount. Assumedly, they have collected significant customer data about these individuals[193]. Earlier, in October 2004, Dunkin' Donuts ran a drive-in hot lattes campaign for high school/college age students in the Boston area. The WAP and SMS messaging coupled with radio resulted in 21% increase in store traffic[194].

EMI Music and Rhythm NewMedia, a mobile advertising company headquartered in Silicon Valley, have introduced ad-supported mobile video trials with mobile carriers in the US. The trials have been carried out through the end of 2006[195].

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[186] http://www.bestbuy.com/site/olspage.jsp?id=pcmcat44800050004&type=category
[187] http://www.epsilon.com/solutions-technology_f.html
[188] International Herald Tribune, 1 Nov 2006 http://www.iht.com/bin/print.php?id=3360731
[189] http://www.chevychasesupermarket.com/home.html
[190] Commercial Times, 22 Dec 2006
[191] Mobile Alley, 15 Nov 2006 http://mobilealley.wordpress.com/tag/bluetooth/
[192] http://www.qwikker.com
[193] Dunkin Donuts Talk, 4 Aug 2005 http://www.dunkindonutstalk.com/2005/08/04/the-future-of-advertising-is-here/
[194] MMA Case studies, 05 Dec 2004 http://mmaglobal.com/modules/wfsection/article.php?articleid=19
[195] EMI press release, 4 April 2006 http://www.emigroup.com/Press/2006/press+16.htm

The French Groupe Carrefour's Pass card, serving more than 8 million card holders through 13,000 point-of-sale terminals, is also valid in three other of the group's chains: Boostore, Ooshop and Champion. The system is based on Retalix Loyalty and Promotions from Ra'anana, and was developed to provide promotion and loyalty integration[196, 197].

Heineken's mobile marketing program in Thailand in 2004 was successful. The sales-linked loyalty rewards application got a participation rate in access of 17%. The concept based on unique code on each 6-pack, and the consumer would SMS the code to get the reward points.

Ideapark, opened in December 2006, has adopted a double-function loyalty card, basically a Visa card with an integrated RFID chip. The latter is used to hold tickets to various services, and it also collects experience points that entitle the user to discounts[198].

In Finland, Kesko told in October 2006 about its plans to collect information on customers' purchasing habits. Kesko is limiting the process to product and customer groups, and does not intend to extend it to product level or personal identification. They are going to use the collected information to improve their advertising focus. Customers are given an opt-out possibility[199, 200, 201].

McDonald's also rolled out other direct response marketing campaigns in 2006. The mobile coupon campaign promotes McDonald's late night deals in the New York metropolitan area. The campaign will be supported by mobile advertising banners. One goal of the campaign is to strengthen customer loyalty. The marketing services are provided by the mobile marketing company Enpocket[202].

Metro Group in Germany had a hidden RFID loyalty card monitoring running in February 2004. They had soon to cease this activity, as it raised strong criticism among consumers and activists like FoeBuD[203, 204].

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[196] LSA, 28 Sep 2006
[197] Emballages Magazine, Oct 2006, supplément au No 810
[198] Kauppalehti, 15 Nov 2006 http://www.kauppalehti.fi/4/0x1001907ac/uutiset/plehti/juttu.jsp?oid=2006/11/15/2131831&request_ahaa_info=true
[199] Ilta-Sanomat, 04 Oct 2006
[200] K-Plus attachment in Pirkka magazine 10/2006
[201] Talouselämä newsletter 26 Oct 2006
[202] Enpocket press release, 08 Aug, 2006 http://www.enpocket.com/news/press-releases/mcdonald2019s-selects-enpocket-to-drive-late-night-store-traffic
[203] RFIDbuzz.com, 19 Feb 2004

Starting in July 2006, Nielsen Entertainment began using cell phone text messages to collect data on consumers' opinions, first from moviegoers, with cell phone text messages sent during trips to the movies. Nielsen is working with Enpocket[205].

Orange has its own concept of ad-supported mobile phone service. The service is to start in 2007[206].

Qwikker had its service installed at 2006 Virgin Mobile V-Festival. Bluetooth and the proximity-based mobile content distribution model were very successful with mobile consumers[207].

The real estate site RealEstate.com uses Quova's GeoPoint™ service to help determine the impact of their geographically-targeted advertising campaigns. Customer's location helps to target the advertising to meet their needs and cultural preferences[208].

The Roppongi Hills area in Tokyo has expanded its RFID tag use to retail shopping. The "R-Click" service delivers information specific to user's location. DoCoMo has issued about 4500 RFID tags to be attached to users' mobile phones. Subscribers can inform the network of their wish to be located by pushing a button[209].

Sainsbury's in the UK has decided to call back its ShopSaveScan mobile coupon scheme after a trial. The pilot system used text messages, and Sainsbury's is considering other digital sales activities[210].

Tesco has its card-based loyalty program, the Tesco Clubcard, to collect loyalty points and then use them to receive customer benefits in exchange. Tesco aims to full service packets, e.g. for family events, and even gives customers a possibility to long-time collecting and saving of their loyalty points for a pre-defined purpose[211, 212]. Certain retailers and market analysts are questioning the effectiveness of loyalty schemes of this type[213].

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[204] RFIDbuzz.com, 28 Feb 2004
[205] New York Times (Late Edition [East Coast]), New York, N.Y. May 15, 2006
[206] New Media Age, 25 May 2006
[207] Mobile Alley, 14 Nov 2006
[208] eMediaWire, 9 Jan 2007 http://www.emediawire.com/releases/2007/1/emw496136.htm
[209] Adapted from ITU Japan case study on "Shaping the F re Mobile Information Society", available from http://www.itu.int/futuremobile/
[210] Marketing, 07 Feb 2007
[211] Tesco Clubcard http://www.tesco.com/clubcard/clubcard/
[212] Daily Mail, 19 May 2005
[213] Marketing, 02 Mar 2005

The first MMS marketing campaign by Samsung Mobile was a success. The campaign, developed by Enpocket, gave the users a possibility to see a preview of the mobile game "Skipping Stone" and to download a free demo over WAP. After the free demo they could then buy the full product from a dedicated WAP site.

The US National Retail Federation's annual convention has displayed new retail technologies combining mobile communication, Internet networking and traditional merchandise. They call this approach "social retailing", and with it they hope to blur the line between traditional stores and online retailers. The convention had a prototype store for consumers 17–24 years of age. The shoppers could get product information and pay by mobile phones, and then pick up the items from local shops. Retailers and friends could also give the customers opinions and advice via a video link[214].

The US network operator Verizon is allowing advertising on its mobile phones[215].

Virgin Music with Mobileway ran a campaign in 2003 for the launch of the latest singles from pop groups. The instant win competition allowed fans to win prizes, and send in their details and preferences to join a new Virgin Music fan club[216].

Vodafone is starting its own 100% ad-supported mobile phone service in Britain. The advertising technology comes from Yahoo[217].

Wal-Mart does not have a loyalty card policy. Instead, it uses other ways to collect customer-related information, e.g. checkout recording, and then mapping and updating by store, by state, and by region. They have a very large database and they can obviously process it statistically, in relation to e.g. trends and events in economy and society, giving a cross-section of various consumer groups and their habits. Wal-Mart has defined three customer groups: Loyalists, Selectives, and Skeptics, according to their shopping frequency and scope of their shopping categories[218, 219].

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[214] Washington Post, 16 Jan 2007
[215] New York Times, 26 Dec 2006 http://www.nytimes.com/2006/12/26/business/media/26adco.html?_r=3&oref=slogin&ref=technology&pagewanted=print
[216] Mobileway press release, 1 Jul 2003
[217] Kauppalehti 15 Nov 2006 http://www.kauppalehti.fi/4/0x1001907ac/uutiset/plehti/juttu.jsp?oid=2006/11/15/2132488&request_ahaa_info=true
[218] Wal-Mart Promo magazine, 26 Apr 2006 http://promomagazine.com/news/wal-mart_loyaltydrive_042606/
[219] New York Times Business, 14 Nov 2004 http://www.nytimes.com/2004/11/14/business/yourmoney/14wal.html?ei=5090&en=0605d1fc88b8ab98&ex=1258088400&pagewanted=all&position=

It has been suggested that the Wal-Mart approach would be suitable in Finland as well. One justification would be lower prices due to saved loyalty system costs[220].

Yahoo has announced Go for Mobile 2.0, just as Google announced a partnership to put its own mobile software on Samsung cell phones. The Yahoo software allows the user to move among various online services: news, sports scores, maps, weather, movies, photos and e-mail. The services are ad-supported and can be tailored to the user's settings. The software includes a search service, oneSearch, that can interpret the user's intents[221].

3.2.3 Enterprises offering loyalty services

Axicom provides platforms that integrate data, services and technology to create innovative, real-time solutions for customer relationships management. Headquartered in the US, it has other locations in the UK, France, Australia, and Japan[222].

Brilliant Blue offers to implement automated programs, like customer databases and CRM to help to consolidate data, improve customer information and aid marketing campaigns[223].

Catalina Marketing Retail Services offers behaviour-based loyalty marketing products and services to help retailers manage customer relationships and accomplish marketing objectives. Current clients consist primarily of grocery store chains, with an increasing number of drugstore and specialty retail chains[224].

Dunnhumby is a UK based marketing firm that runs services for more than 150 companies, e.g. the Tesco Clubcard. It keeps offices in the UK, Ireland and the USA, employs over 400 people worldwide, and is generating revenue in excess of £75m[225].

Echelon Marketing Group provides strategic marketing solutions and customized analyses of consumer purchasing power and behaviour[226].

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[220] Taloussanomat, 13 Nov 2003
[221] The New York Times, http://www.nytimes.com/2007/01/09/technology/09yahoo.html?_r=1&ref=business&pagewanted=print&oref=slogin
[222] http://www.acxiom.com
[223] http://www.brilliantblue.com/
[224] http://www.catalinamarketing.com/about_us/index.html
[225] http://www.dunnhumby.com/index.htm
[226] http://www.echelontargeting.com

Epsilon (formerly Frequency Marketing) offers a combination of client-centric marketing solutions to help companies understand, manage, measure and optimise their customer relationships. Epsilon provides database and email marketing services.[227]

Guest Technologies, LLC provides solutions for guest oriented services, e.g. hotels, cruise ships, ski resorts, theme parks, and shopping malls[228].

ILOG offers software and services to empower customers to make better decisions faster and manage change and complexity. Over 2,500 global corporations and more than 465 leading software vendors rely on ILOG's business rule management system (BRMS), optimization and visualization software[229].

Maritz Inc. offers integrated performance improvement, incentive travel, and market research services. Maritz Loyalty Marketing can e.g. design, launch, and operate customer rewards and loyalty programs, communications-based[230].

MobileLime offers service platforms for turning the mobile phone into a marketing, loyalty and payment device. It claims to be the first U.S.-based company to achieve this[231].

PW Markets has taken Catalina Marketing's database management services as the basis of their card program[232].

Xtract offers customer analytics, community and mobile marketing software. They provide analytics automation and solutions for real-time environments, analytics for high volume transactions, and customer network analytics consulting[233].

3.2.4 Loyalty programs market reviews and forecasts

This chapter summarises market forecasts and reviews specific to loyalty programs. More generic summaries can be found in Chapter 3.1.2.

ABI-Research predicted that by the end of 2006 advertising through mobile phones would reach a $1.9 billion turnover worldwide. Users are ready to accept the mobile

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[227] http://www.epsilon.com/solutions-technology_f.html
[228] http://www.guesttechnologies.com/
[229] http://www.ilog.com
[230] http://www.maritz.com
[231] http://www.mobilelime.com
[232] http://www.pwmarkets.com
[233] http://www.xtract.fi/

phone for advertising, as a mobile device is usually unique to the end-user, allowing customization. For the advertisers it is desirable because the typical click-through rate for a regular Internet banner ad is about 0.2%, while the rate for mobile banner ads is in the range of 2–3%[234].

Purchasing and paying of services and products by SMS messages is popular among young people in Finland. Majority of the 160 000 users are under 30 years of age, and 2/3 of the purchases are under 20 €. Most popular are contents for mobile phones and transport tickets, but also more conventional products like books and magazines[235].

3.2.5 Government initiatives

Japan's Internal Affairs and Communications Ministry is changing regulations so that GPS is required on Japan's mobile phones from April 2007[236]. This will no doubt boost location-aware application development in Japan.

3.3 Public services

This chapter introduces public ubiquitous services and their enablers implemented or planned worldwide.

3.3.1 Enabling technologies

- eJapan

In Japan, NEC has taken activities concerning the ubiquitous service aspect in the e-Japan strategy. They have formed a vision of both ubiquitous society service infrastructure and the supporting technologies[237]. They also have described two service examples, E-Ticket and E-Membership, using a technology called LightHolder[238].

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[234] ABI-Research, 29 Nov 2006
[235] Iltalehti Online, 29 Nov 2006 http://www.iltalehti.fi/uutiset/200611295427803_uu.shtml
[236] eurotechnology.japan.blog, 29 Oct 2005 http://eurotechnology.com/blog/2005/10/gps-required-for-mobile-phones-in.html
[237] NEC's Activities for Developing Business Solutions and Technology Needed for a Ubiquitous Society (eJapan). NEC J. of Adv. Tech., Summer 2004. http://www.nec.co.jp/techrep/en/r_and_d/a04/a04-no3/a167.pdf
[238] Mobile E-Ticket and E-Membership Services. NEC J. of Adv. Tech., Summer 2004. http://www.nec.co.jp/techrep/en/r_and_d/a04/a04-no3/a184.pdf

- Mobile Broadband in Helsinki City Transport Vehicles

Helsinki City Transport has started to install a mobile broadband network based on Flash-OFDM technology in its vehicles. One of the main goals with the broadband network is to speed up the public transport by providing a traffic signal priority to the vehicles connected to the system. In addition, the WLAN connection in the buses and trams offers the passengers updated public transport information during the trip and also free access to the Internet. Through the mobile broadband connections of buses and trams, it will be possible in the future to carry out many services benefiting both the drivers and the passengers. It can be utilized, for example, to build a traffic information system for the drivers and a camera surveillance system for the safety of both the drivers and the passengers.[239]

[239] A mobile broadband in vehicles speeds up travelling, Helsinki City transport, Current and News, 22.01.2007. http://www.hel.fi/wps/portal/HKL_en/Artikkeli?WCM_GLOBAL_CONTEXT=/en/Helsinki+City+Transport/Current+and+News/A+mobile+broadband+in+vehicles+speeds+up+travelling

3.3.2 Implemented public ubiquitous services

Japan's national ICT strategy, e-Japan, in the beginning of the millennium was driven by the fact that Japan was lagging behind the leading countries in the broadband infrastructure. After that they further developed their strategy to e-Japan II that concentrated to services utilising the broadband. Currently, the strategy is updated to realise Ubiquitous Network Society. See Figure 4 below.

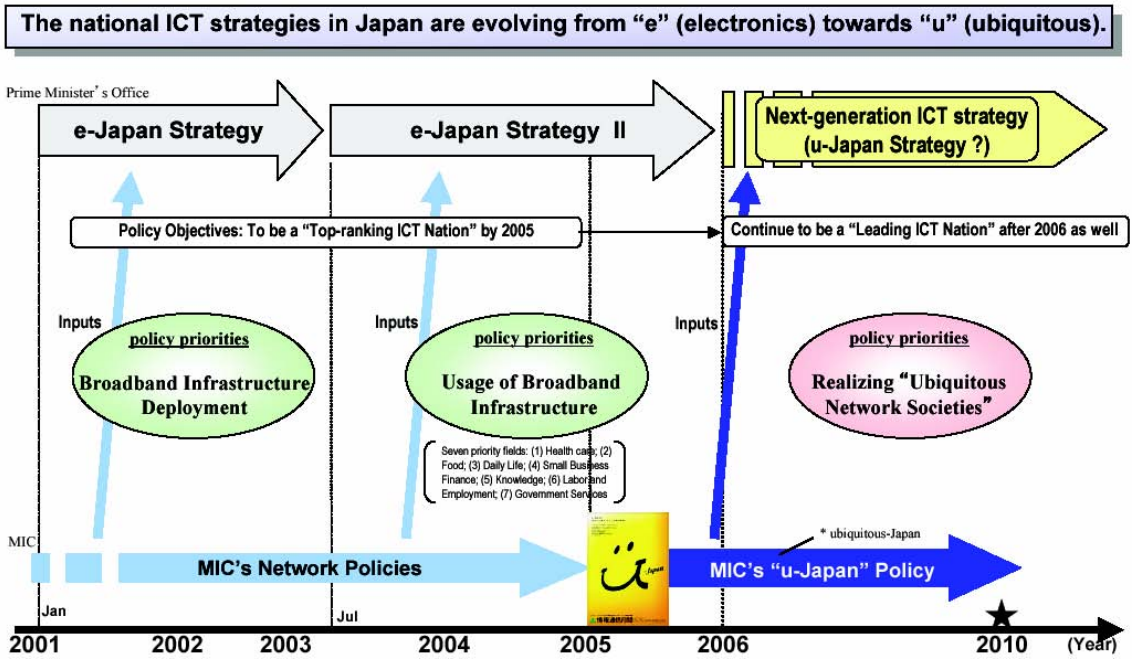

Figure 4. Japan's road towards ubiquitous network society[240].

Helsinki City Transport launched a new timetable service Omat lähdöt in June 2005. The idea of the service is that the user can find stop-specific timetables quickly and easily, independent of time and place. Omat lähdöt also provides the opportunity to create a personalized view into the information. It consists of:

- an internet service, for use e.g. at work or at home
- a mobile telephone service, for finding the information in real time and in any place
- a digital TV service, for use as a monitor in public spaces (travel centres, cafés, libraries etc.)[241]

[240] Takuo Imagawa, Japan's Policy Initiatives toward Ubiquitous Network Societies, http://www.itu.int/osg/spu/ni/ubiquitous/Presentations/5_imagawa_japan.pdf

[241] Omat lähdöt -palvelu, http://www.omatlahdot.fi/omatlahdot/web sekä Omat lähdöt -palvelu eri medioissa – HKL:n uuden aikataulupalvelun käytettävyys ja kehittämisehdotukset, AINO-julkaisuja 16/2005, http://www.aino.info/julkaisut/1_jlinfo/aino16_2005.pdf

The service has now extended to cover the public Transportation in the whole Helsinki Metropolitan Area. The service is under further development as Helsinki City Transport and Seasam House (the developer of the system) are participating in the RFID-project led by VTT. The aim of the project is to study and pilot the use of RFID-technology as part of the mobile phone based information service.

- RFID-supported mobile phones are becoming more and more popular
- Tag prices are going down, making it possible to install large number of tags to the bus stops and vehicles[242]

3.4 Community services and social media

This chapter describes services and concepts having a specific relevance to ubiquitous social media and community dimension.

3.4.1 Community service enablers

The Nokia Presence Server enables operators to offer various applications and services that exploit users' presence information. The Nokia Presence Server controls the Presence subscription, and stores and distributes the Presence information between the mobile subscribers. Presence information is exchanged between devices and servers, according to the open-standard OMA IMPS Specifications and SIP/SIMPLE. Support for both the OMA IMPS 1.1 and 1.2 specifications in the Nokia Presence Server ensures backward compatibility. Mobile users can subscribe to Presence updates regarding the changing status of other users. Alternatively, users can do a one-time fetch of the Presence information. Users can also set permissions to restrict access to their own Presence information. They have full control of the information they are sharing with other users.[243] Although the newest Nokia mobile phones have pre-installed presence functionality, there are not many operators that support presence services. Therefore, also other applications using standard solutions are lacking.

Plazes[244], first introduced in 2004, detects the physical location of the user using the computer network or in the more recent mobile version (in closed beta testing) by

[242] Omat lähdöt (My Departures) – real time passenger information service, Seasam House Oy, 2006. http://www.informnorden.org/Stockholm_2006/Tis%2016%20Mobil%20service/Esitys%200619%20InformNorden_Stockholm.ppt

[243] Nokia Presence Server, Forum Nokia, http://forum.nokia.com/document/Forum_Nokia_Technical_Library_v1_35/contents/FNTL/Nokia_Presence_Server.htm

[244] Plazes, http://beta.plazes.com/

cellular positioning. It allows users to share their geographic locations with others, and see who is near you, or where interesting locations are around you. They have been building on the concept continuously.

Jaiku[245] takes presence a step further than Plazes. Where Plazes focuses on geographic location and presenting information on net access, contacts, and photos around that, Jaiku aims to generate a continuous presence stream. It takes user's different RSS feeds, accepts SMS messages, and blurbs you enter on the site, and combines them into one stream. This allows your contacts to be peripherally aware of what the users are up to, and estimate the chance and desirability of hooking up.

Imity[246], instead, builds the presence with Bluetooth signature detection. It allows seeing who is in the area, or if a friend perhaps just passed through the same location. The Pocket Radar, as Imity calls it, allows the user also to see alerts that someone in user's social network platforms (such as Xing, Linkedin etc.) is near him, enabling chance meetings. It can also be used to 'log' who was on an event, and thus build a list of participants for later on-line interaction after the event took place.[247]

3.4.2 Implemented community services and social media

Blogger is a free blogging service for anyone[248].

del.icio.us is a Web page finding and sorting service, based on the work by other users. It keeps links to users' favourites, allows sharing of them and discovering of new content[249].

Epinions[250] collects opinions and evaluations of products through its Web pages and makes these available to users, to help them to make right buying decisions.

FeedBurner is an auxiliary service for feeding media content to various services in a common way[251].

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[245] Jaiku, http://www.jaiku.com/
[246] Imity, http://www.imity.com/
[247] Introduction to Plazes, jaiku and Imity is based on: Ton Zijlstra, Presence Means Combining Cyberspace with Meatspace, Interdependent Thoughts, December 3, 2006 02:41 PM http://www.zylstra.org/blog/archives/2006/12/presence_means.html
[248] http://www.blogger.com
[249] http://del.icio.us
[250] http://www.epinions.com/
[251] http://www.feedburner.com

Flickr is an easy way to publish one's photographs on the Internet for free. Sorting, tagging, grouping and geotagging are available[252].

FON is a low-cost wireless network access, available throughout the world. The network is built by the users themselves[253].

Google video is a video uploading and sharing service for consumers and professionals[254].

Habbo hotel is a virtual world on the Internet. The users create their own environment and form communities[255].

HousingMaps gives house selling advertisements on Google map[256].

iStockPhoto is a photo agency on the Internet. Photographers can sell their pictures with low cost[257].

Keltainen pörssi publishes advertisements in parallel on the Internet and in print[258].

Linkedin is a contact network sharing tool, allowing users to publish their contacts and call new users[259].

MySpace is an online community. It supports creation of private communities to share contents of shared interest, e.g. photos, journals and exchange of opinions[260].

ODEO offers a toolset for creating users' own Podcasts. Lists, tagging and sorting are available[261].

Planzo is a shareable calendar service on the Internet[262].

Rollyo is a pinpointed search service allowing a predefined set of sites[263].

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[252] http://www.flickr.com
[253] http://www.fon.com
[254] http://video.google.com
[255] http://www.habbo.com
[256] http://www.housingmaps.com/
[257] http://www.istockphoto.com
[258] http://www.keltainenporssi.fi
[259] http://www.linkedin.com/
[260] http://www.myspace.com/
[261] http://odeo.com
[262] http://www.planzo.com/

Second Life is a virtual world created by the users. The users also own the IPR's of their accomplishments, and may sell them inside or outside the game. It has also found some importance in the real world, e.g. news agencies have opened their offices, and Sweden intends to open a diplomatic mission or embassy in Second Life[264, 265].

Semapedia[266] users can hyperlink their physical world with knowledge in Wikipedia. To do this users create small Semapedia Tags, cell-phone readable 2D visual tags, encoded from Wikipedia URL with the dedicated web application. After that they print the tag and with permission attach the tag to the target. In this way, real world object can be linked to digital community-based information in Wikipedia and accessed with mobile phone furnished with 2D Barcode reader and internet connection.

threadless offers T-shirts designed by the users. The T-shirts taken for sale are selected by voting[267].

wetpaint is a publishing system for groups creating content to WiKi together[268].

Wikipedia is a free, multilingual, Web-based encyclopaedia, written collaboratively by volunteers and editable by anyone directly through the Web site[269].

YouTube is an online community mainly for sharing of videos[270].

Zune is a music service with monthly fee. Users may share the content wirelessly[271].

3.4.3 Government initiatives

The Taiwanese government is promoting an advanced mobile communication network by 2008 in the M-Taiwan project. NT$7 billion has been reserved for the establishment of public WLAN and application services, NT$30 billion to build 6,000 kilometres of broadband fixed Internet links and 10 "mobile cities" plus 15 "special mobile districts" around Taiwan by 2008.

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[263] http://www.rollyo.com/
[264] http://secondlife.com/
[265] Tietokone, 31 Jan 2007 http://www.tietokone.fi/uutta/uutinen.asp?news_id=29529&tyyppi=1
[266] Semapedia.org, http://www.semapedia.org/
[267] http://www.threadless.com
[268] http://www.wetpaint.com/
[269] http://en.wikipedia.org/wiki/Wikipedia
[270] http://www.youtube.com/
[271] http://www.zune.net

The Japanese Ministry of Internal Affairs and Communications has a policy framework, uJapan, for Ubiquitous Network Society in Japan[272, 273].

[272] http://www.oecd.org/dataoecd/43/28/36275193.pdf
[273] http://www.soumu.go.jp/menu_02/ict/u-japan_en/index2.html

4. Discussion and conclusions

Ubiquitous services like this rest heavily on the basis of technology. Technology provides the tools and methods to cumulate the mass of raw information and refine it into the required knowledge. The technology backbone is in mobile communications in its many forms. The newest of these allow easy and low-cost local communication between the customer and the service, and among customers. This seems to be the development trend anyway, so it should be relatively straightforward to apply the technologies in customer services and targeted marketing as well.

At the time of writing, the mass of wireless communication is based on conventional telecom networks, but WLAN-type access has already got a firm foothold. This phenomenon also shows in the long-awaited convergence of networks: wireless communication has spread to IP-based WLAN-type networks, and now even to short-range and ad hoc networks. At the same time it has become possible to use mixed networks in a seamless way, based on availability, capability, pricing, or other criteria. This improves cost-effectiveness, again furthering new application and service inventions.

A few years ago, geographic information systems (GIS) and location-based services were expected to make a massive breakthrough into the consumer market. Very soon it became obvious that the networks were not capable of supporting these services. Basic location equipment development started several years ago with dedicated handheld GPS navigators. In mobile phones, location services started cell-based, with operators providing the actual location. Now location technology is in everyday use, e.g. in vehicle navigation by satellite. Integrated satellite location is now also finding its way into mobile phones all over the world. At the same time, the required bandwidth is quite easily available, and location-based services are back on the agenda.

Terminal features are at very different levels in different parts of the world. Japan is leading the way, but the rest of the world is approaching. In addition to the location services mentioned above, various short-range communication features, proximity sensing and identification are appearing in mobile terminals, even outside Japan. New features like high-quality TV services integrated into mobile phones (DVB-H and other mobile TV standards) offer a new channel for targeted marketing. TV over IP, or Web TV, is also growing rapidly, but so far only in fixed networks. It remains to be seen if it will find its way to mobile terminals as well, in competition with the broadcast-type services.

Information handling and processing is another major element in the ubiquitous service infrastructure. The vast mass of information and its rapid growth, and the increase of

processing power in network nodes, as well as consumers' new attitudes towards data sharing and utilisation are driving development towards totally new service concepts, more and more often supported or even totally built and maintained by the users themselves. The size of the raw data requires advanced processing and intelligent application of the results. Data mining is the known term for this activity, and it is currently in vivid development worldwide.

One of the essential challenges in collecting and processing customer data is personal privacy. This applies equally to the information acquired by the system using its own processes and the content created by the consumer, at the discretion of the customer him/herself. This is a challenging question in data mining research. The European Union has issued a directive for privacy legislation in the EU countries[274].

The yearly number of UBICS-related patents has slightly grown during the last four years, at least until 18 months ago (i.e. as far in time as all patents are publicly available), and there is no reason to believe this development will slow down. This is a clear indication of active research and service development concerning our scope.

Even though the availability of technology can be seen as an essential enabler of ubiquitous services, it is not the only factor by far. The success of technology-assisted customer services is as much dependent on non-technical issues. Here we could quote Professor Thomas H. Davenport who has suggested that *neither the information revolution, nor the latest technology have brought or is going to bring the information revolution. It will be brought by companies who learn how to compete with knowledge*. According to Davenport, companies like this are few. He has consulted for Wal-Mart and Tesco, and has been developing optimised prices for each time of the day for hotel Marriott, and also helped to find suitable customers for the Royal Bank of Canada. From his observations from Tesco, he summarises that as essential as it is to talk to the customers, is it to know what to say to each of them[275].

A basic element of commercial activity itself, advertising, is generally known to have multi-faceted effects in business and those involved. The main challenge, inside our scope, is the targeting of advertising to any given customer. And in a wider sense, this includes the customer loyalty services and benefits offered to the customer as well. In successful ubiquitous targeting, the customer receives relevant and only the relevant marketing information and services, taking into account both the customer's long-time interests and momentary situation, including momentary technology environment and facilities; in short: his/her current context. At the same time, this part of the customer

[274] Directive on privacy and electronic communications 2002/58/EC, 31 Jul 2002. http://europa.eu.int/eur-lex/pri/en/oj/dat/2002/l_201/l_20120020731en00370047.pdf

[275] Talouselämä, 25 Oct 2006

service must be technically and economically feasible and observe legislation. To find the mechanisms and enablers to satisfy these conditions is not trivial, but the business influence can be strong when succeeding. Successful new advertising concepts have recently emerged (e.g. Google), but the ubiquitous dimension still needs much development.

User experience can make a big difference in service success[276]. If the users don't feel comfortable with the services, it will take considerable extra effort to persuade them to start and continue using them – unless the benefits are high enough to overcome the uneasiness. Users tend to have a more positive attitude towards marketing if they can themselves define its content and choose its method of delivery. The feeling of privacy and data protection are important elements in the total experience[277], and they are constantly challenged by advances in mobile technology[278]. Trust is another manifestation of this challenge, as relevant to the service-trading parties as to the end user. The former can usually base their trust networks on technical systems, while end users' genuine trust is hard to win and maintain, and easy to lose. As a way to establish the trust, it may even be desirable to allow the consumer to assume virtual personalities, as can be done in informal online medial and games.

Inter-customer activities, e.g. social media, may turn out to be a crucial element in ubiquitous customer services, as social networks can help in forming the basic shared trust foundation that is essential to the services for consumers. The same networks can also become an essential part of the marketing process itself, offering a natural forum for the propagation of information about new products and services, and for exchanging opinions about them. This is an issue wider than just a set of technologies. An example is *Web 2.0*, a concept that builds on the activity of its members or users, not really on the technology, even though the latter is an essential enabling element.

Intellectual property rights (IPR's) are in many cases a difficult problem that may slow down or even prevent a service from handling or storing IPR'd material. This is not made any easier by the very different legislations in different parts of the world. One can expect leisure-type content to remain freely available to all, without IPR restrictions beyond basic copyright, but as soon as the content has to be paid for, commercial restrictions enter into effect, requiring careful handling.

Government policies can have a major influence on the direction that customer services are taking – this is true with any services of course. Japan started a national e-Japan

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[276] Reducing fear is the killer app.
http://headrush.typepad.com/creating_passionate_users/2006/10/reducing_fear_i.html
[277] http://www.itu.int/osg/spu/ni/ubiquitous/Consumers_Privacy/index.html
[278] MSNBC, 9 Nov 2006 http://www.msnbc.msn.com/id/15157222

strategy programme in 2003 and inside it an IT acceleration strategy in 2004[279]. The Japanese Ministry of Internal Affairs and Communications also has a policy framework, uJapan, for Ubiquitous Network Society in Japan[280, 281]. The British government is planning to move people's personal information from all government departments into a single database, to improve public services. This will call for modifications in privacy regulations[282].

[279] NEC's Activities for Developing Business Solutions and Technology Needed for a Ubiquitous Society (eJapan). http://www.nec.co.jp/techrep/en/r_and_d/a04/a04-no3/a167.pdf
[280] http://www.oecd.org/dataoecd/43/28/36275193.pdf
[281] http://www.soumu.go.jp/menu_02/ict/u-japan_en/index2.html
[282] BBC NEWS, 14 Jan 2007

5. Summary

The services inside the scope of our current topic: analytical, context-aware and ubiquitous customer services in loyalty programmes, rest heavily on the knowledge about and activation of customers. To be able to offer genuinely personal services, they must build on knowledge about the user. This knowledge consists of descriptive attributes like personal preferences, situation in life, history, future plans, habits as a consumer, leisure activities, peer networks, and of situation information like current activity, intentions, location, etc. This type of information is already available and in use in current customer loyalty services, but a true personal, focused approach still needs a lot of development.

To summarise, most of the basic technology required to enable ubiquitous customer loyalty services is or is becoming available. What needs further research and development is a way to bring all these technologies together in a systematic way, to enable consistent service development and application. This would be an integrating layer of technology that maps the various technology elements onto a commonly agreed interface, thus isolating the actual services and service components from the technology behind them. In addition to the technology integration layer, a framework is needed to define the communication and cooperation between service elements inside a service, and inter-service liaison. How these concepts should be laid out and implemented, and what should be integrated into the framework instead of forming a service, and how the business can be built on top of the services, are questions to be answered in research and development projects.

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Literature and other sources

Chris Anderson: The Long Tail
more info: amazon.

Kolari et al.: Context-Aware Services for Mobile Users | Technology and User Experiences
VTT PUBLICATIONS 539
Kolari, Juha; Laakko, Timo; Hiltunen, Tapio; Ikonen, Veikko; Kulju, Minna; Suihkonen, Raisa; Toivonen, Santtu; Virtanen, Tytti
2004. VTT Information Technology, Espoo. 167 p. + app. 3 p.
Keywords: context-awareness, mobile applications, mobile Internet, context adaptation, user evaluation, user-centred design, service providers.
http://www.vtt.fi/inf/pdf/publications/2004/P539.pdf

Privacy Preserving Data Mining
by Jaideep Vaidya, Christopher W. Clifton, Yu Michael Zhu
2006, Springer

Branding Unbound: The future of advertising, sales, and the brand experience in the wireless age
by Rick Mathieson
2006, Amacom

Item-to-Item Collaborative Filtering. Amazon.com Recommendations
Greg Linden, Brent Smith, Jeremy York (Amazon.com).
IEEE Internet Computing, January-February 2003.
http://www.cs.helsinki.fi/u/gionis/linden03amazon.pdf

Consumer Data and Privacy in Ubiquitous Computing
Mutanen, Teemu
VTT Research Report (2007, to be published)

News sources

mocoNews.net
Mobile Adv & Mktg

Startup Review – Analyzing web success
http://www.startup-review.com/blog/case-study-index/

Links to link lists, blogs & Wikis

adverblog: advertising & online marketing
http://www.adverblog.com/

eurotechnology.japan.blog
http://www.eurotechnology.com/blog/

Branding Unbound
http://www.maverix.typepad.com/
Blog by the author of the book: “Branding unbound: The future of advertising, sales, and the brand experience in the wireless age” (Rick Mathieson)

Data Mining: Text Mining, Visualization and Social Media
http://datamining.typepad.com/

FierceMobileContent
http://www.fiercemobilecontent.com/
“FierceMobileContent is a daily update covering mobile content and mobile marketing.”

The Mobile Weblog
http://www.mobile-weblog.com/

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Author(s)
Tallgren, Markus, Pihlajamaa, Olli & Törönen, Juha

Title

Ubiquitous Customer Loyalty Services
Technology and Market Outlook

Abstract

An information search was performed on analytical, context-aware and ubiquitous customer services in loyalty programmes, with a dimension of entertainment and games. The results are summarised individually for enabling technologies research and development, and for business development. This is a snapshot of the current and foreseeable business and technology status, meant to help development projects set their goals. Based on the information found, much of the basic technology required for the services seems to be available or will become available soon. Further development is needed in the methods and tools to aggregate these technologies into an open, flexible and sufficiently powerful framework or platform for ubiquitous customer loyalty services. Deeper analyses, e.g. business plan recommendations are beyond the scope of this document.

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Nimeke

Jokapaikan kanta-asiakaspalvelut
Teknologia- ja markkinakatsaus

Tiivistelmä

Tämä UBICS-projektin teknologia- ja liiketoimintakatsaus tiivistää eri lähteistä kootut, personoituja markkinointi- ja kanta-asiakaspalveluja koskevat tiedot toisaalta palvelut mahdollistavaa teknologiaa, toisaalta liiketoiminnan kehitystä kuvaaviksi osuuksiksi. Katsaus kohdistuu nykyiseen ja nähtävissä olevaan liiketoiminnan ja teknologian tilaan, tarkoituksenaan avustaa alkavia kehityshankkeita tavoitteiden asettamisessa. Selvityksen perusteella on nähtävissä, että valtaosa tarvittavasta perusteknologiasta on jo saatavilla tai lähiaikoina tulossa saataville. Tutkimusta ja kehitystä tarvitaan tavoissa ja menetelmissä, joilla näistä teknologioista voitaisiin muodostaa avoin toimintakehikko, jolle jokapaikan kanta-asiakaspalvelut joustavasti ja tehokkaasti rakentuisivat. Syvemmät analyysit, kuten liiketoimintasuositukset, ovat tämän dokumentin tavoitemäärittelyn ulkopuolella ja jäävät näiden kehityshankkeiden tehtäviksi.

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