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Properties and Gratifications of Mobile Data Services: An Explorative Investigation

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ABSTRACT

We identify, explore and categorize mobile service qualities (properties) and their valuations as gratifications based on a longitudinal field study of mobile data service use. Different properties – *instrumental, aesthetic, and expressive* – *and* service gratifications – *content, process, and social* – *salient for various data services are identified* during users' *mobile service experience. Service properties and gratifications offer a means to track, garner and organize multiple accounts of a mobile service and its value from a user's point of view. The findings complement current technology acceptance theory by showing how artifact's properties and its use gratifications shape and influence either continuation and expansion, or discontinuation of mobile data service use.*

Key-words: Properties, Gratifications, Mobile data service, Typology.

RÉSUMÉ

En se basant sur une étude de terrain longitudinal concernant l'utilisation des services mobiles, nous avons identifié, exploré et catégorisé les qualités (propriétés) des services mobiles et leur valeur en termes de gratification. Différentes propriétés – instrumentale, esthétique et expressive – et grativications – contenu, processus et social – sont identifiés durant l'expérience d'utilisation. Ces deux éléments offrent un moyen de suivre, collecter et organiser les multiples perceptions des services mobiles et leur valeur du point de vue de l'utilisateur. Les enseignements tirés de notre recherche complètent la théorie d'acceptation des technologies en montrant comment les propriétés de l'artefact et les gratifications obtenues lors de son utilisation forment et influencent soit la continuation et l'augmentation, soit la cessation de l'utilisation des services mobiles.

Mots-clés : Propriétés, Gratifications, Services mobiles, Typologie.

1. INTRODUCTION

Information systems and marketing researchers alike have for some time shared a concern for how technology is adopted and used. After the phenomenal success of short messaging (SMS) services in many parts of the world we recognize a heightened interest in understanding the adoption and use[1] of new mobile data services. However, as witnessed by a host of research (e.g. De Marez & Verleye, 2004; Elliott & Tang, 2004; Funk, 2001; Hung, Ku, & Chang, 2003; Juul & Jørgensen, 2003; Kitada & Scuka, 2001; Sharma & Nakamura, 2003) the new and more advanced mobile data services have not generated expected value for users to warrant their use. While current theory has rigorously solicited social and technological factors that predict innovation adoption and diffusion prior to actual service use, ramifications of service properties and their valuation in explaining actual mobile service use have remained embryonic.

Technology acceptance models (Venkatesh *et al.*, 2003) frame adoption primarily by predicting *intention to use* in terms of *usefulness*, *relative advantage* and *ease of use* prior to the actual use of a service (e.g. Bruner II & Kumar, 2005; Hung *et al.*, 2003; Khalifa & Cheng, 2002; Teo & Pok, 2003). Unfortunately, as only broad and generic service adoption drivers are recognized, the specific properties and value of a mobile service experienced during their adoption and use remain hidden. In addition, due to the focus on *intentions that precede actual use* they do not explain sustained and expansive use, or decreasing use. In line with this some studies have used predictive measures with samples where a majority of respondents did not have any actual experience with the service or set of services investigated[2]. This naturally results in low reliability measures. Besides, users' experience based learning of qualities and value bound to socio-technical use contexts, e.g. other people, location and urgency (Mennecke & Strader, 2003), are not captured.

In light of the growing diversity of mobile services we need to move beyond the broad categories used to *predict* intentions to use and specifically theorize around the features and value of technology that *explain* the use of the artifacts and their socio-technical shaping (see e.g. Markus, 2005; Orlikowski & Iacono, 2001). As Markus accentuates: "researchers will need to develop ways to characterize features, to cluster variations into manageable categories and to be explicit about the dynamic nature and temporal boundedness of their subject matter. Similarly, researchers will need new approaches for analyzing technology-use patterns and social outcomes" (2005:19).

Our prior investigation (Knutsen & Lyytinen, 2006)[3] articulates a tripartite framework to explain mobile data ser-

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1. See for instance www.m-lit.org.
2. See for instance Hung *et al.* (2003) where only 18.7 percent of the users in the sample were actually WAP users. In Teo and Pok's (2003) study the share of actual WAP users or people with experience of WAP is not mentioned. A notable exception which used tailored surveys for different services for particular and took measures to secure that actual users were surveyed is Nysveen *et al.'s* (2005) study of text messaging, contact, payment and gaming services.
3. An earlier version (Knutsen & Lyytinen, 2005) was presented at the 2005 MOBIS IFIP 8.6 Conference in Leeds, UK.

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vice use patterns and outcomes. Using the framework we analyzed mobile *messaging* as generative interplay between technical specifications, community ascribed properties, and experience based gratifications. We showed how distinct interactions generate alternative mobile service ecologies in Japan and Scandinavia. These categories helped discern qualities and valuations of mobile *messaging service use* in detail not possible with technology acceptance models. The present paper will further expand this research by exploring how service properties and gratifications emerge during users' encounters with a range of mobile data services. Our key question is: *What properties and gratifications emerge with different mobile data services use?*

To answer this question we analyze mobile data service use over a fourteen week period among nearly forty users. The analysis seeks to reveal users' sense-making of service properties and to garner thick descriptions of their gratifications. SMS, MMS, e-mail, News, Infotainment, Content Downloads, and Search & Find will cover the families of services investigated. For each family of services we delineate the salient service qualities that enable and constrain user gratifications.

The remainder of the paper is organized as follows. We start by defining service properties and gratifications. Next, we describe data collection and analysis methods. In section 4 we report empirical findings with regard to qualities and gratifications attributed to various mobile data services. We conclude by summarizing findings and discussing their implications for explaining mobile service adoption.

2. SERVICE PROPERTIES AND GRATIFICATIONS

Technology acceptance models (TAM) informed by marketing theory and theories of individual action constitute the main theoretical body for predicting technology adoption in the IS research (Venkatesh *et al.*, 2003). TAM models have been recently adapted and modified to explain mobile data service adoption (Bruner II & Kumar, 2005; Hung *et al.*, 2003; Nysveen, Pedersen, & Thorbjørnsen, 2005; Teo & Pok, 2003) by incorporating factors associated with gratification and domestication (Nysveen *et al.*, 2005; Pedersen & Ling, 2003). Yet, this stream largely ignores temporal and contextual shaping of user understanding of technology use. Underlying measures assume that people have a clear perception of the quality and value of the service and thereby are able to rate accurately its usefulness, ease of use and relative advantage. However, this "perception view" (Orlikowski & Iacono, 2001) remains insensitive to service qualities, user's experiences with them, and gratifications learned during their contextual adoption. Scant attention is paid to what makes a service or a set of services distinct, and how users assess its value in a context. In essence, technology specific factors that shape contextually the use of mobile service remain largely unexplained. This compromises understanding how service qualities and user value become taken for granted over sustained use – how they institutionalize – and thereby co-create a socio-technical environment that shapes technology use.

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The primacy given to generic adoption factors hinders also formulation of mobile service typologies that recognize subtle, yet important, variance in technical quality of services, and what additional value each service configuration renders (Markus, 2005; Orlikowski & Iacono, 2001). To overcome this weakness we need to examine in context how users make sense of services in the presence of both enabling and constraining service properties. This will help identify critical properties of mobile services that promote sustained and expanded mobile service use. We concur with Orlikowski and Iacono (2001: 133) that IS theories need to focus on "the meanings, capabilities, and uses of IT artifacts, their multiple, emergent and dynamic properties, as well as the recursive transformations occurring in the various social worlds in which they are embedded".

Recently, Knutsen and Lyytinen (2006) developed a tripartite institutional framework to explain how user's understanding of mobile service properties is shaped by their technical specifications. These properties, in turn, both enable and constrain obtainment of use gratifications. By separating technical specifications, user's service properties and gratifications it identifies three interacting layers that affect service use and adoption. These separate abstractions replace TAM models "flat" causal explanations of adoption and use with a multi-level social and institutional analysis of socially constructed service properties and their use valuations. Service properties and gratifications constitute part of a users' technological frames (Orlikows-

ki & Gash, 1994) and are thus subject to recurrent social construction whilst old services are enacted and new ones encountered. In this way service properties reflect user's ongoing socially constructed understanding of service capabilities; i.e., what Orlikowski and Gash (1994) call the "Nature of Technology". The multi-layered analysis of service use thus connects any mobile service to its social and institutional context and narrates how service properties and gratifications become over time socially entrenched, and institutionally implicated. Moreover, it extends service adoption explanations to higher abstractions by connecting individual's use and its motivation to the ongoing institutionalization of service properties and valuations.

As noted service properties constitute always a subset of a person's interpretative frames which Orlikowski (2000) defines as being embodied in practice and having material and symbolic qualities. We augment these with the *virtual* quality of mobile service as most mobile services have mainly digital rather than material substance (Knutsen & Lyytinen, 2006). Service qualities include among others material properties like transmission speed or service latency; symbolic properties like graphical layout, rendering quality, the meaning attached to the phone, or its stylistic design; and virtual properties like its service portfolio and service functions associated with specific mobile services like mobile e-mail.

Knutsen and Lyytinen (*ibid.*), in addition, distinguish between *instrumental, aesthetic* and *expressive* properties.

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Instrumental properties refer to the qualities associated with how a particular service operates as an instrument during human and computing interactions and exchanges. They reflect mobile service qualities which, in the eyes of the user, are implicated in determining its functions and function*ing* such as speed, navigation, accessibility etc. *Aesthetic properties* encompass the service qualities evoking an appealing experience (e.g. stimulation of visual and audible sensation) and/or enhancing the aestheticism of other artifacts (e.g. decoration of artifact with pictures, logos etc.). Such qualities include, for instance, the graphical quality and audio fidelity of a service. Finally, *expressive properties* represent qualities which enable and constrain the use of content for expressive communication. This encompasses qualities such as richness[4] (i.e. capacity to express text and multimedia) and degree of synchronicity (synchronous vs. asynchronous communication capability) and the expressive reach (pervasiveness) of a service within and across networks. Thus, expressive properties pertain not only to technical features, but also to socio-technical conditions produced when other people use the service (e.g. network effects). We will use next mainly this classification of properties to analyze how properties are socially constructed.

Properties are analytically distinct from what a person gains while using a mobile service. The valuations people may attribute to service use are coined here as *gratifications* (Blumler & Katz, 1974; Höflich & Rössler, 2001; Leung & Wei, 2000; McQuail, 1987). These constitute the second element of our service abstraction. Gratifications denote *pleasures, delights, and fulfillments users imagine or experience during the activation of a technology property, or a set of properties.* Examples of mobile technology gratifications include relaxation, status/fashion (Leung & Wei, 2000), sociability (Höflich & Rössler, 2001; Leung & Wei, 2000), reassurance (*ibid.*), immediacy (*ibid.*), mobility (Höflich & Rössler, 2001) and enjoyment/fun (Leung & Wei, 2000; Nysveen *et al.*, 2005).

We adapt here Stafford *et al.*'s (2004) categories of content, process and social gratifications to typify gratifications. *Content gratifications* refer to pleasures, delights and fulfillments sought and obtained from content – e.g. text, audio, and video – use and re-use. *Process gratifications* relate to pleasures, delights and fulfillments directly attributable to the process (itself) of engaging with a particular service (e.g. Cutler & Danowski, 1980; Stafford *et al.*, 2004). Finally, *social gratifications* are emerge from interactions during the mobile service use with physically or virtually co-present people[5].

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4. Richness in the above refers to the properties of an m-service to express instantiations and should not be confounded with the organizational definition of (media) richness; "the ability of information and media to change human understanding, overcome differing conceptual frames of reference, or clarify ambiguous issues in a timely manner" (Markus, 1994:505).
5. Virtual co-presence (see Ito, 2004) is particularly important for instant messaging and interactive gaming where online services provide only the virtual context – the word 'a game room' is illustrative here – as a virtual place of communication and interaction around which rules of interaction and belonging are established.

	Content gratifications	Process gratifications	Social gratifications
Utilitarian	Gratifications obtained from information content contributing to solving/ fulfilling a task and/or objective	Gratifications from the process of purposefully learning how to utilize a mobile service	Gratifications from mobile service due to instrumental exchanges with other people – i.e. getting things done
Hedonic	Gratifications of pleasure and delight achieved from the 'consumption' of content	Gratifications derived during the use process found to entertain, delight and please	Gratifications from mobile service due to social exchanges which contribute to social bonding – i.e. generating feelings of affect, love or belonging

Table 1: Definitions of Utilitarian and Hedonic Gratification Types.

Analysis of gratifications goes beyond utilitarian calculus as normally implicated in constructs such as relative advantage, usefulness etc. (Rogers, 2003; Venkatesh *et al.*, 2003). Using marketing theory (Babin, Darden, & Griffin, 1994; Mathwick, Malhotra, & Rigdon, 2001) we also observe orthogonal dimensions of utilitarian and hedonic value to classify further content, process and social gratifications. Utilitarian gratifications orient towards goals and purposes – to reach a state or obtain a goal – while hedonic gratifications orient towards "mode of being": joy, entertainment and pleasure. The resulting six gratification types are presented in Table 1.

Properties and gratifications constitute thus two consecutive frames we will use to characterize users' understanding of what a mobile service is, and what she or he gains from its use. The proposed categories are thus suited to address the following question: *what* types of properties and gratifications emerge during mobile data service adoption and use for each family of mobile services? By answering this question for set of mobile services – SMS, MMS, mobile e-mail, News, Info-

tainment, Downloads and Search & Find- we can derive more fine grained service typologies. This can improve our explanations of mobile service adoption and, in particular, teach us how properties and gratifications affect adoption and use and how ongoing use shapes properties and gratifications. We next describe the research methodology followed for analyzing service properties and gratifications.

3. RESEARCH METHODOLOGY

3.1. Research Setting and Data Collection

We conducted a longitudinal field study to address the above research question: how users perceive mobile service properties and gratifications during their use. We are interested in *theory generation and development*, rather than testing. Both qualitative and quantitative data was gathered using a mixed method procedure (Creswell, 2003) to tap into user's ongoing reports of service use. A rich corpus of both quantitative and qualitative data was obtained. Qualitative

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data included users' self-reports of their service use, how they perceived those uses, contributions those uses to their everyday life, what motivated their repeated use, and under what conditions. Quantitative data included logs of use and multiple measurements of user perceptions of use and services.

The data collection was carried out between March and July 2004. The sample comprised 38 participants who were recruited from early adopters of mobile technologies; i.e. students and young professionals (Constantiou *et al.*, 2006; Ishii, 2004; Ling, 2004; Aarnio *et al.*, 2002)[6]. The participant's average age was 30 and the sample included 16 females[7]. Most participants made calls less than 15 minutes each day. Although most were proficient users of text messaging (SMS), they had only marginal experience of other mobile services prior joining the study. A handful had tried WAP services, but none was a frequent user. Use of multimedia messaging (MMS) was close to nil, and only two participants had occasionally used mobile e-mail. The participants consisted of students of business-IT courses at the IT University[8] and members of a work team at the Consumer Information Agency, both located in the Ørestad area of Copen-

hagen. The participants within these groups frequently interacted and could learn from others and shape expectations and interpretations of use. We focused on early adopters and their interaction to ensure that we would (1) investigate relevant participants, (2) be sensitive to learning from interactions, and (3) obtain access to "virgin" users with little understanding of advanced services.

All participants signed agreements to (1) use the SIM card[9] offered by the mobile network operator as the *only* SIM card during the 14 week trial period; (2) provide the researchers unconditional access to all traffic data registered – excluding interpersonal messages[10]; and (3) participate by answering questionnaires and being available for group interviews. Upon signing the contract with these terms and answering two questionnaires each participant was provided with a new (Nokia) mobile phone equipped with a pre-charged SIM card. The phone provided access to SMS, MMS, mobile e-mail and a range of mobile services available on a Danish mobile operators' service portal. An overview of the services reported upon in this paper and their use is provided in Table 2.

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6. These groups were also the main segments targeted in marketing campaigns by the 3G service provider '3' at that time in Denmark.
7. The variety of mobile data services available to the participants was sufficiently broad to cater to multiple user segments – from young to the more mature and men as well as women. Therefore, social group affiliation and interaction weighted more strongly than a person's age and gender for the recruitment and selection of participants.
8. The students had a variety of educational backgrounds, e.g. business, IT and sociology, but were all taking classes offered by the IT University of Copenhagen in collaboration with Copenhagen Business School.
9. SIM is an abbreviation for subscriber identity module (SIM) – an application running on a smartcard which secures identification of a subscriber and his/her transmissions on a cellular network.
10. Use of interpersonal messaging services (e.g. SMS and MMS) was not monitored to preserve privacy and thereby obtain trust among participants.

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Service Category and Description	Service Use							
Short messaging service (SMS) Sending of short text messages and ordering of value added content.	Use now and then: 6 Up to 5 times per week: 3 6-20 times per week: 12 More than 20 times per week: 13 (n=34)							
Multimedia messaging service (MMS) Sending and receiving text, pictures and video.	Not tried: 4 Tried a few times: 12 Use now and then: 15 Up to 5 times per week: 3 More than 6 times per week: 0 (n=34)							
Mobile e-mail E-mail service utilizing a GPRS connection for sending and receiving normal e-mail.	Not tried: 12 Tried a few times: 9 Use now and then: 6 Up to 5 times per week: 5 More than 6 times per week: 2 (n=34)							

Mobile Portal Services		Field Study Weeks							Total
		1-2	3-4	4-5	6-7	8-9	10-11	12-14	
News Text and multimedia contents on world and local affairs.	PSA	158	162	102	95	37	68	13	635
	Users	14	14	11	13	7	8	4	26
Infotainment Text and multimedia contents on entertainment and show-business	PSA	71	64	66	74	49	66	27	417
	Users	8	10	10	9	8	5	2	20
Content Downloads Ringtones, backgrounds, logos, screensavers and games which can be ordered and downloaded on the phone. Backgrounds, logos, screensavers	PSA	108	27	45	28	6	0	2	216
	Users	11	5	3	2	1	0	1	14
Games	PSA	57	104	0	7	3	1	12	184
	Users	5	7	0	2	1	1	2	10
Ringtones	PSA	66	31	0	5	14	5	43	164
	Users	11	4	1	0	1	2	2	11
Search & Find Search for maps, locations and directions, phone numbers, and addresses	PSA	68	171	68	97	80	207	42	753
	Users	5	11	8	10	7	4	4	22

Table 2: Mobile data services and service use in the field study[11].

The monthly disposable amount pre-charged to each participant's SIM card was set to 250 DKK[12]. This amount was calculated by using a pre-survey that revealed that three out of four participants had an average mobile expenditure (voice and data) less than 225 DKK per month[13].

The participants were presented with questions about technology adoption and use such as technology acceptance predictors, diffusion of innovation predictors, domestication characteristics and uses, and gratifications (Pedersen & Ling, 2003; Sarker & Wells, 2003) in 7 individual surveys and 2 group interview sessions conducted. Links to online questionnaires[14] with open ended and closed questions were distributed via e-mail. At the same time the mobile operator collected log files

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11. SMS, MMS and mobile e-mail use is self-reported use at the end of the field study where 34 out of the 38 participants answered. Two of the respondents have been excluded as they failed to answer one of the inquiries during the study. PSA is an abbreviation used for Portal Service Accession. It represents an entry in the backlog data file where a user has accessed a certain mobile internet portal page. Out of the 4,327 backlog records the 1531 PSA of navigation pages (e.g. accessing of a portal menu page and other navigation pages) have been removed. Also PSA for services which obtained relatively little use have been excluded. Out of the 38 participants a total of 32 participants accessed the portal services during the period.
12. € 33.60 / US $ 41.20 with exchange rates of March 20th, 2004
13. At the end of the field study only three participants answered that they had reached this budget constraint during the project.
14. The online survey tool SurveyMonkey (www.surveymonkey.com) was found to work excellently for the purposes as we could easily craft and distribute questions, see immediate patterns in quantitative responses and thereby use the insights to craft subsequent questions, and we could also easily monitor and secure that responses were given by our participants within the time limit given.

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that registered each mobile portal service accessed (PSA). An overview of the focus of different inquiries, the type of inquiry and a description of central issues targeted during the inquiry are presented in Table 3. The concurrent data gathering procedure ensured not only that we could document what services were used, but we could also tap into participant's articulations of their experiences. We also wanted to make certain that participants reported their actual experiences as data was collected in the context of use in contrast that they relied on juxtaposed or imagined conceptions ease of use.[15]

As seen in Table 3, 34 participants offered complete response sets and the sample does not offer much room for statistical analysis. The corpus of qualitative data generated, however, was substantial for our purpose of exploring user's understandings of mobile services and their use. The qualitative data consisted of 988 open ended responses to questions and 15 hours of focus group interviews. The responses were augmented with the 4,327 records of mobile portal access distributed over 711 sessions recorded on 38 participants' SIM-cards.

3.2. Data analysis

Data analysis was carried out in two steps. Initially we identified important themes concurrently with data collection. Descriptive statistics of use and drivers of use indicated congruence or incongruence in the degree of service

use or causes of use: e.g. statements from participants were assessed for relative agreement/disagreement. These initial analyses helped frame germane questions and define additional study targets for data collection and analysis.

During the next step we carried out coding and content analysis as exemplified in Table 4. Each participant's open-ended responses and statements were first organized chronologically, and were subsequently coded following grounded theory procedures. Our goal was to ensure openness to emerging categories and that our insights were grounded in user experience. Coding based upon the list of the property and gratification types was followed by selective coding (Miles & Huberman, 1994; Strauss & Corbin, 1990). The initial coding ensured that service similarities and idiosyncrasies were revealed in form of *in vivo* codes (Strauss & Corbin, 1990). For instance, *send and receive, message* [verb], and *share* were recurring *in vivo* codes of messaging which, when interpreted relative to the definitions of property and gratification types, were categorized as representing expressive properties – i.e. they reflect expressive reach and richness. In a similar fashion, break-downs, as noted with *in vivo* codes such as *slow* and *fast* characterizing the speed of service helped observe incongruence in *instrumental properties* relative to the service. In this manner analysis categories and associated statements were selectively linked for each service. The procedures allowed for interpretation and ordering

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15. Cf. footnote 2.

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#	Pre launch		
1*	Expectancies towards new mobile services, imagery of use vis-à-vis currently valued services	Group In-terviews (4) (n=20)	Explore current use and emerging expectancies/imageries of m-services. Record initial imagery when presented new m-services. Observe initial sense-making.
2	Current use of mobile phone and services, role of phone and services in everyday life. Desired features and functions. (W1 – prior)	Online data collection (n=38)	Obtain quantitative data on user participants (aligned with the MUSE I survey of 1,100 respondents conducted in Denmark) to guide qualitative inquiries. See Constantiou et al. (2006)
3	Perception measures of mobile service expectancies (W: 1 prior)	Online data collection (n=38)	Obtain measures on intentions to use and central latent constructs (e.g. performance, efforts, and social conditions) posited to influence attitudes and intentions to use new mobile data services.
	During		
4*	Qualitative inquiry on experiences, gains, influencing factors and the contributions of various services. (W:3-4)	Online data collection (n=36)	Technology adoption and use constructs operationalized to obtain essay answers reflecting experience and interpretations of m-services; what experiences has been made, what is gained from services, what type of efforts are associated with use, how do services function, who influences and what influences etc.
5*	Service and portal specific experiences; performances, efforts, qualities, and gratifications (W:6-7)	Online data collection (n=36)	Identify participants experience with particular services and obtain qualitative inputs on their interpretations concerning qualities (esp. functioning) and gratifications / contributions.
6*	Mobile service learning during use. How new use became learned and what influenced initial and recurring use (W:9-10)	Online data collection (n=36)	Essay answers to questions aimed at obtaining detailed descriptions of the m-service experience and the process of learning new uses.
7*	Reflections over experiences and process (W:10-13)	Group in-terviews (6) (n=23)	Exploration of key themes; discussions of m-service performances, contributions, properties and gratifications experienced.
	During		
8*	Current use and experiences gained (W:14 +)	Online data collection (n=34)	Explore developments in use – new uses; changes vis-à-vis prior mobile services use; new discoveries; properties and gratifications experienced and valued.
9*	Perception measures; experience based (W:14+)	Online data collection (n=34)	Obtain measures on intentions to use and central latent constructs set to influence intention to use/use.

Table 3: Data Sets Collected During the Field Study.

* Data used in this study.

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Recorded response (*in vivo* code in bold)	FS week /participant	Interpretation and selective codes relative to start list
I use SMS for **contact** with friends and family. It is great for **catching up** on what is going on and to **get info** on where to meet up. It offers **contact with anyone** in **any place**.	Week 3; xxxx8568	1. SMS used for *social contact* 2. Primary emphasis on friends and family (closest social circle) 3. Used to express and receive user originated content → *content gratification* of *bedonic/pleasure* and *utilitarian/purpose* character. 4. Wide *expressive reach* → *expressive properties* 5. *Social contact* is key gratification sought → *social gratification*.
The mobile [portal] services are so **heavy to use** and so **slow** that they are fully useless. Besides SMS, MMS is the only decent and **usable** service. But except from being **fun** it is **seldom that it can benefit** you in any ways.	Week 3; xxxx9365	1. Poor *ease of use* and *usefulness* due to poor functioning and too many efforts → *instrumental properties* 2. Properties *distort/disrupt** use process – slowness and navigation 3. Experienced *during use process* and hinder/jeopardize other gratifications 4. MMS (in relation to SMS) perceived positively and to provide *bedonic gratifications* (enjoyment & fun) but *not utilitarian* gratifications (benefit & efficiency)
Before the project started my sole use of my phone was text **messaging** and **dialing**. The improved image quality makes me now use the **camera** a lot. I also **check my emails**, get **updated** on the latest news and occasionally use the search and find service when I need directions or a **phone number**.	Week 12; xxxx7681	1. Incorporation of new services to service repertoire – *recurring use/engagement* 2. Primary services used are for interpersonal communication → *social gratification* 3. Content advanced with new *aesthetic properties* – picture and graphics – from simple text in SMS to use of camera and pictures; user originated content → *content gratifications* 4. Check e-mail, obtain news and use of Search & Find point to content gratification 5. Latest news imply some sort of *immediacy* 6. Search and Find used on occasional basis seem to suggest content or *utilitarian gratifications* sought

Table 4: Excerpts exemplifying the coding procedure.

* Emerging category.

of the properties and gratifications *as* services were enacted and experienced.

Overall, our methodology was not designed to meet rigorous validity and reliability criteria associated with positivistic case studies as it primarily sought to align and "read" empirical observations in light of our tripartite framework. In this sense we strove for what Strauss and Corbin (1990) called substantive theory. Armed with an interpretive stance we sought to systematically yield readings of uses which interpreted articulations of reported behaviors. We next present the interpretive reading reached from the data.

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4. RESEARCH FINDINGS

While understandings of both properties and gratifications are constructed simultaneously as use experience is gained, we found it easier to start with the analysis of properties because this informs us what a service is about, and what value aspects they enable and constrain. After discussing properties we can more carefully discuss hedonic and utilitarian variations of content, process and social gratifications.

4.1. Properties

Articulations of *instrumental properties, aesthetic properties* and *expressive properties* reflect user's interpretations of mobile service[16] and thus reveal ongoing construction of properties based upon use experience.

Instrumental properties

When service use diverges from the expected service experience it often reveals assumed instrumental properties. Salient among these were transmission speed, service compatibility, text entry and navigational functions, download/upload time, synchronicity, and latency. All these aspects were implicated in users' understanding of how a service would function:

> "The services work OK and are quite interesting but they are really too slow and demanding. Some services require a login and password every time I want to use them. That's too cumbersome. While graphics are nice, it takes time to download. I would gladly compromise graphics to the benefit of speed. Search and Find worked OK, but it had a problem with [the letters] æ, ø, å – which is not good in Denmark." Rasmus, Male, 27, Week 9

While the above statement accentuates clearly service properties, user's understanding seldom distinguished between service properties and the symbolic or material properties of the device. For instance, small screen and complex navigation in both the menu of the phone and in the menu of a portal service were instrumental properties which became implicated in the judgment of portal services.

> "The portal services are not so useful – mainly due to the slow interface and small screen. It is annoying that you cannot access the services directly from the main menu of the phone but need to connect and download a separate menu. Several clicks into subdirectories are needed. It would be better to organize them in a main menu or let the user customize it." Bjarne, Male, 37, Week 12

Instrumental properties such as speed, navigation, and rendering, were primarily highlighted with respect to News, Infotainment, Content Downloads and Search & Find services. These aspects were not identified with respect to SMS and MMS. Yet, the speed at which mobile e-mail was downloaded was expressed as a critical instrumental property. In fact, while the speed of SMS and MMS was perceived to operate in the back-

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16. Properties should not be confused with latent constructs, e.g. usefulness, ease of use and relative advantage in TAM and DoI research (e.g. Davis, 1989, Rogers, 2003). These constructs are at a level of abstraction higher than properties, as properties detail the qualities implied in a person's judgment of whether a service is useful, easy to use or holds relative advantage.

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ground, the speed of mobile e-mail and the other services were perceived to function in the foreground. The latter were thereby more directly experienced and perceivable.

Instrumental properties were generally implied in users' judgments of usefulness and ease of use. Yet, their salience altered *while more experience was gained*. By analyzing user's comments it was possible to observe how judgments of portal services were quickly revised when instrumental properties were experienced. Most common were expressions of a negative experience which illuminated insufficiencies in instrumental functions. As echoed by one respondent after two portal sessions involving use of Search & Find and Infotainment but also visits to Content Downloads and News (total PSA week 1-3: 90, PSA week 4-14: 60):

> "I have tried the portal services and was very disappointed. They are too slow and heavy on graphics and the only feature I could picture myself using is the track and find map [Search & Find]." Niels, Male, 28, Week 3

Articulations of instrumental properties, in particular how well a service functions with respect to access speed and navigation, point out that service properties are constantly re-interpreted in light of related technologies. Most accentuated were reports of experiences that drew upon how tethered Internet services and computers function. Material properties of non-computing proxies were also sometimes invoked:

> "I think that the navigation is much too slow. I have to make a lot of choices before I get any information. Somehow the connection seems very slow – it takes time for each step I make. Whenever I am home or at work I am always near a computer connected to the internet. The speed and information load here is so much better that I don't want to offer the extra time on the mobile information. Besides, I always have newspapers nearby that I use for reading news, to check events etc." Mette T., Female, 40, Week 6

From these observations we can draw the following conjectures of instrumental properties. They are: (1) fundamental for mobile service functioning but their salience vary to the extent to which are fore-grounded during service use; (2) more in the foreground with portal services than with messaging services; (3) revised in light of knowledge about substitutive artifacts and; (4) densely entwined with the properties of the device.

Aesthetic Properties

These properties evoke visual and audible sensations[17]. Some services, especially Content Downloads – ringtones, picture backgrounds, logos and screensavers- enhance also the device's appearance and individual appeal as users decorate devices to ascribe them a personal identity. These qualities are formative to how a service appeals to a user's sensual experience. Important aesthetic properties include visual service quality and clarity, quality of sound, and the personalization qualities and options.

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17. Some services may also evoke physical sensation, e.g. through vibration.

"In comparison to my old phone it [the 'project' phone] can handle ringtones with really good sound quality. I have therefore downloaded some polyphonic ringtones to find one that I like. I have also personalized my display with a background image I found on the portal." Mikael, Male, 25, Week 6

Participants revealed that multimedia would bring about new experiences and enhance the appearance of their device. At the same time aesthetic qualities were intertwined with functional properties attributed to the handset. This concerned in particular the quality of the camera, the display and its graphical rendering which all enable multimedia experience. These qualities were observed particularly for multimedia messaging:

"I am amazed by how good the picture quality is. It is no longer a problem to see video and pictures. Sending and receiving pictures and video to and from others via MMS becomes much more appealing when the quality is that good." Hanne, Female, 36, Week 3

Enhanced aesthetic properties were emphasized with respect to personalization, where intertwinement of service properties with the phone was also evident.

"In the beginning I downloaded a few ringtones to find 'my song'. I also use the camera to take pictures of people and add it as picture of my contact persons." Sune, Male, 30, Week 11

Aesthetic properties were often highlighted with respect to pictures and video in conjunction with MMS, infotainment services offering multimedia, and downloads including ringtones and backgrounds used to decorate devices. However, the aesthetic properties associated with sound and video were often compared with similar properties of computers, MP3 players and digital cameras.

"It is nice to get sports results and see images of goals on TV2 sports. But still the sound and video quality is much better on the Internet".

Mie, Female, 24, Week 12

We conjecture from these observations that aesthetic properties: (1) stimulate and enhance audible and visual service sensations; (2) are most salient for multimedia services; (3) are central for decorating devices, which, as seen from the backlog, mostly took place at the beginning of new mobile phone use; (4) are intertwined with and dependent upon material, symbol and virtual properties of the device.

Expressive properties

Mobile services may vary in the degree to which people find them suitable "for expressing their emotions and social or personal identity" (Nysveen et al., 2005:332). Among the study participants, however, it was more a matter of whether mobile services had properties which enabled and constrained content mediation necessary for expressive communication[18]. Advanced properties provided expressive richness beyond laconic alphanumerical communication. They

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18. Expressive communication refers to written, visual, and audible communication contents used to convey thought, feelings, and observations. It can vary from simple textual expressions to expressions of nonverbal signals (e.g. bodily gesticulation, tone of voice, etc.) as well as expressions involving affective signals of audiovisual media (e.g. sound/music, color, motion and animations in video and graphics etc.). See Carey (2004) and Gillies, Crabtree and Ballin (2004) for studies on expressive communication and behavior in broadband computing environments.

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also provided extended reach by supporting symbols (e.g. emoticons), graphics/images, audio and video in messages *across* mobile and other electronic user networks. In essence, expressive properties enabled communicative interchanges within a virtual world to *approximate* the expressive richness of face-to-face communication.

Variations in expressive properties could be traced to user's understanding of how services differed in their expressive reach (pervasiveness) within and across networks, their degree of richness[19] (i.e. capacity to communicate rich text and multimedia), their degree of synchronicity (synchronous vs. asynchronous mediums), and their connectivity (Knutsen & Lyytinen, 2006). Most salient were responses reflecting variations in expressive richness and reach with SMS, MMS, and mobile e-mail. At the same time, expressive properties were not associated with News, Infotainment, Content Downloads or Search & Find[20]. This is no surprise since these services target to receptive communication (e.g. consumption of content from a commercial third party) rather than expressive communication.

Among SMS, MMS, and mobile e-mail we observed significant variance in how expressive aspects were mediated. This pertains particularly to variation in *expressive richness* and *expressive reach*. The participants acknowledged that MMS and mobile e-mail had richer expressive properties than SMS as they permitted multimedia and extended alphanumerical messaging.

> "SMS is simple but it is the mobile service I use the most. It is perfect for short and frequent everyday exchanges. MMS is good for pictures and e-mail is good for longer messages." Søren D., Male, 54, Week 11

Richer expressive properties were clearly associated with how sending and receiving of pictures and video supports expressive communication.

> "Seeing the other person gives a sense of being closer than what you get when you just speak and hear a voice." Signe, Female, 31, Week 6

The capacity of a service to mediate content in expressive communication, however, was not only a matter of richness, but also a matter of differences in expressive reach. Whereas expressive richness is concerned with what can be digitally expressed, expressive reach pertains to how pervasively digital content can be dispersed within and across digital networks. Concerns about whether advanced content could be received by others revealed central differences in expressive properties among messaging. These differences were particularly apparent with expressive reach when users compared SMS with MMS.

> "SMS can be sent to anyone. MMS is more problematic because you don't know who has a camera or MMS enabled phone and whether or not the phone is compatible and if the other person's network supports MMS." Lone, 31, Female, Week 10

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19. Cf. footnote 4.
20. This does not mean that portal services cannot have expressive properties. As witnessed in Japan (see Knutsen & Lyytinen, 2005, 2006), technical specifications enabling hyperlink exchanges (e.g. send to, web to, phone to) and inclusion of mobile web-contents in messaging opens the opportunity that some expressive properties can be attributed to these services.

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Expressive reach is understood not merely in terms of instrumental aspects of the service, but also in terms of a use environment where users have or do not have the capability to use a certain service. Whereas the use environment of SMS allows pervasive expressing of simple digital content, the environment surrounding MMS was found to constrain its expressive reach.

> "In the beginning it was fun and amusing to take and send pictures. But after a while it kind of lost its news-value and it is not something that I use particularly much anymore. A main reason is that not too many can receive all these good pictures [irony] that I take. If everyone had a mobile phone that could receive the pictures it would possibly have been different." Line, Female, 26, Week 11

Mobile e-mail users attributed enhanced expressive richness to mobile e-mail relative to SMS. It was seen to offer expressive reach across complementary networks. In contrast, the superior reach of SMS within mobile user networks served both as a property constraining the use of alternative, richer messaging services while at the same time enabling it to maintain its dominance as a messaging technology[21]. This shows how expressive properties propagate in salience as they become socially entrenched among user networks i.e. when they exhibit network effects.

> "E-mail I can use for almost all of my communication since it can handle text, pictures and attachments and can be sent to PCs as well. But since everyone uses SMS it is what I use on the mobile". Morten, Male, 28, Week 11

We conjecture from the above that expressive properties: (1) are salient for interpersonal messaging but not for the portal services, (2) enable and constrain expressive communication; (3) distinguish services particularly with respect to their expressive richness and reach; and (4) create through social enactment network effects that reinforce media selection.

4.2. Gratifications

We identified a rich array of gratifications that characterized mobile services. During content analysis we found that both utilitarian and hedonic gratifications types were recognized but that they were associated idiosyncratically with different services.

Content gratifications

Content gratifications of both utilitarian and hedonic nature arise when people consume digital content. In our study these gratifications emerged during participants' enactment of mobile services that originated from commercial service providers, e.g. news, infotainment, maps, directions etc. Surprisingly, they emerged even more so with the content crafted and dispersed by other users. Content gratifications encompassed thus mainly gratifications related to use and (re-use) of text and multimedia content originating from users.

We found content gratifications to typically relate to on-going information

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21. With reference to technology-in-practice (see Orlikowski, 2000) one may argue that the expressive reach of SMS, due to its strong institutionalization, is the dominant mobile messaging technology-in-practice.

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obtainment such as 'updated information while on the go', 'increased knowledge of things around me', 'help find way if I'm lost' and 'find a phone number for a person or a company'. Gratifications associated with News and Infotainment services were tilted towards hedonic dimension. They were oriented towards *becoming* informed, updated or entertained as opposed to obtain content for the purpose of achieving a goal or completing a task:

> "The news sections, like TV2, provide me information, entertainment and pleasure." Kristoffer, Male, 26, Week 3

The content gratifications resemble those obtainable from services on the tethered Internet, but allowed them to be enjoyed ubiquitously.

> "I like to have easy access to information, primarily news, no matter where I am." Mette T., Female, 40, Week 7

> "I used the CNN live service to keep me updated on world affairs when I was in China. ... I really like that you can get the latest news on the mobile." Steen, Male, 28, Week 8

Content Downloads offered gratifications of purely hedonic character. Particularly, for ringtones and backgrounds we found content gratifications that personalized and enhanced *the aesthetic appearance of the device.* As illustrated by the quotes above the downloadable content was used to decorate the device and to give it a personal identity. What is special about this form is how users experienced it first on the portal but thereafter, as the service came to be embedded on the device, they would experience the gratification every time they received a phone call, or looked at the display. The relative importance

of such gratifications from digital content 'residing' or 'living' on devices is not, however, reflected in log statistics.

Utilitarian content gratifications were also visible. This was particularly noticed with respect to the Search & Find services. Users of these services emphasized that these services fulfilled their needs for location relevant information when they were mobile.

> "Some of the services like Search & Find can provide me valuable information on directions, routes and transport information which is useful when I'm on the go". Ulrik, Male, 27, Week 12

In contrast to the hedonic gratifications associated with News, Infotainment and Content Downloads we found utilitarian content gratifications from Search & Find which were derived from information access under particular conditions of mobility.

> "I like that I can find information about company/persons and do route planning and navigation while moving around." Bjarne, Male, 37, Week 7

With respect to short messaging, however, content gratifications were not strongly associated with media consumption and re-use from commercial service providers. Rather they were attributed to the communications needed for maintaining social contacts. They were also attributed to content used in what Ling and Haddon (Ling, 2004; Ling & Haddon, 2001) call micro-coordination; communications needed to organize, inform about activities and appointments (leisure and professional). The content here originated, was crafted, and distributed by users, and it offered gratifications of both hedonic

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and utilitarian character.

> "With SMS I can easily get in touch with my friends and find out where they are and what they are doing. It makes it easy to arrange where to meet and to get info[rmation] on delays. In this way you don't need to plan too long ahead." Johanne, Female, 26, Week 9

User originated content was also pertinent in content gratifications derived from multimedia messaging. In contrast to SMS the content gratifications of MMS had a pure hedonic character. In particular, crafting and distributing entertaining video clips and pictures among friends and peers provided the strongest content gratifications:

> "In settings where you are with friends MMS can be entertaining. It can be fun to take pictures of things going on and send them off to others." Line, Female, 26, Week 14

For mobile e-mail content gratifications were derived from sending and, particularly, receiving text and multimedia content. Most prevalent was text based e-mail from friends, family and colleagues. As with SMS, content gratifications of mobile e-mail were both hedonic and utilitarian. However, we tended to find a bias towards utilitarian use as mobile e-mail most often was associated with task execution, scheduling and appointments.

> "Mobile e-mail is practical. It can keep you up to date on work matters, let you schedule meetings and follow what is going on wherever you are." Peter, Male, 27, Week 12

In sum, the participants' service experience reveals differences among services with respect to hedonic and utilitarian gratifications. We conjecture

that: (1) interpersonal messaging offers both utilitarian and hedonic content gratifications, and (2) portal services are more dichotomously perceived to offer either hedonic or utilitarian content gratifications.

Process gratifications

Process gratifications emanate from experiences of using a service. This may, for instance, be gratifications arising from the discovery of new services, becoming service literate, mastering technology, or personalizing a device or service. We noticed many times how playing, experimenting, learning, navigating and exploring a service could be gratifying for its own sake. Rather than learning how a service can be utilized as a tool for a purpose (cf. Table 1: utilitarian process gratification), however, the process gratifications were focused on the fun of learning, discovering, experimenting, exploring and trying. For the portal services we found process gratifications to be of hedonic nature.

> "It is fun to explore the WAP/GPRS function and there are many more possibilities than I first expected. The connection was quick and it was easy to navigate." Mette, Female, 37, Week 3

> "In the beginning I downloaded a few games and checked out some services. It was fun to explore and I was curious to find out what was available." Usman, Male, 26, Week 11

We have previously suggested that process gratifications with SMS, MMS and mobile e-mail can emanate from the process of composing a message – e.g. writing, creating symbols, and incorporating emoticons, pictures, audio

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and video, etc. (Knutsen & Lyytinen, 2006). There are, however, few clues in participant's responses illuminating such process gratifications while using SMS or mobile e-mail. Beyond a few comments indicating hedonic gratifications attributable to the process of *taking* pictures and video and *sending/sharing*, our data also for MMS are inconclusive.

The data reveal, however, how using a service may *not* be gratifying. As with instrumental properties process gratifications were often discovered when the participants encountered problems during the use. These efforts disrupted and plagued process gratifications:

> "Some services can have value, but generally the value is too small compared to the efforts one must put into utilizing them." Søren H., 27, Male, Week, 12

These disrupted process gratifications were triggered most often due to poor instrumental design such as configuration complexity and navigation. This was clearly noticeable during the process of configuring mobile e-mail, which was deemed 'troublesome', 'annoying', and 'hard', but even more apparent for MMS:

> "I had a really hard time getting to send an MMS message and I think I really tried to make serious efforts. However it did not say anywhere that I needed to enter the MNOs homepage and get registered as a user in order to utilize this service. That I first found out about when one of my colleagues informed me about it." Signe, Female, 31, Week 3

An important observation is how disruptions to process gratifications jeopardized other gratifications. This was more salient for complex mobile communications where the process itself (e.g. servi-ce navigation and speed) was set in the foreground during the service use:

> "I don't find any of them important enough to spend the time attaining them. Just the clicking that it takes to get a service can keep me from trying other services. ... I have found that they [portal services] do not work very well and that it is too time consuming to try to learn how to use." Lone K., Female, 28, Week 4

These disruptions were deemed unacceptable in light of the expectation about the always-on service people enjoyed with their computers. Rather than being as gratifying as using Internet on computers, the process of engaging with mobile portals was perceived to be at most on a par using a dial-up-modem:

> "It's annoying that it still works like a modem on the computer that you need to establish a connection every time."

> "At times you really need to click through a lot to get to what you want. It is quite funny. Some time ago you were willing to wait two minutes for a page to download. But if you now need to click seven times on the mobile phone you just go 'aaaa-rhggh', right! It's simply nothing more annoying. It can in fact be quite irritating. There is too much 'clickery' to get to it." Lone, 31, Female, Week 10

Process gratifications thus highlight not only how pleasure, enjoyment and fulfillment arise *during* a service use, but they reveal how important it is for use process not being plagued by disruptions.

We conjecture that process gratifications: (1) are encountered during exploration and engagement with services; (2) increase in salience as the use process becomes more complex and is set in the foreground; (3) are easily compromised by functional failures and

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disruptions; and (4) are assessed relative to the process gratifications experienced with computers.

Social gratifications

Earlier research (Höflich & Rössler, 2001; Leung & Wei, 2000; Ling, 2004; Nysveen *et al.*, 2005; Stafford *et al.*, 2004) has already shown that both mobile and Internet services offer social gratifications. In particular, messaging services attributed strong expressive properties convey social gratifications as they enable people to nurture social relations, micro-coordinate, express their identity, and mediate social contacts. These services offer a virtual extension to pleasures, delights and fulfillments obtainable from physical interactions. For instance, anywhere and anytime text and multimedia messaging frees time and space bound communications from physical constraints. These services allow for communication patterns which contribute to feelings of social belonging, new beliefs about social identity, and expanded modes of interaction.

We found SMS to be the most important among the messaging services as it was largely seen to provide communications to maintain and nurture contacts with friends, family and peers. The widespread access to SMS made it the most essential mobile service to create and maintain social contacts. Most commonly mentioned was how SMS offered social gratifications in the everyday communications with familiar people.

"Texting [use of SMS] is really important to fulfill my needs of communication with others (family and friends)." Sadia, Female, 24, Week 3

The universality of SMS with respect to both utilitarian and hedonic social communications was also frequently mentioned. The gratifications ranged here from simple communications to achieve task oriented goals such as agreeing where to meet, when to meet, what to do etc.

"SMS is really good for getting short updates on things going on and to inform others if you are late to an appointment or a meeting." Signe, 31, Female, Week 11

Social gratifications from the use of MMS, on the other hand, appeared to be oriented towards pleasures associated with interpersonal interactions. Rather than bringing utilitarian benefits, gratifications emanating from multimedia messaging exchanges were associated with 'joy', 'fun', 'entertainment' and 'pleasure'.

"Besides SMS, MMS is the only decent and usable service. But apart from being fun, it is seldom that it can benefit you in any ways." John, Male, 54, Week 3

In our responses social gratifications were found to be tightly connected with content gratifications. Hedonic gratifications from asynchronous content messaging, e.g. sending of pictures, seemed to be enhanced by synchronous social contact:

"Being able to share images while talking about them is nice." Ole, Male, 32, Week 6

"I enjoy taking video and pictures and sending them to my friends. It is fun to share moments and experiences in this way." Nina, Female, 30, Week 8

This was noted to happen during virtual and physical co-presence[22]:

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22. Cf. footnote 5.

"It is fun to send messages to each other in the cantina. Then you can see the reaction of the person receiving it". Johanne, Female, 26, Week 9

Social gratifications obtained from mobile e-mail, in contrast, did not have the same hedonic dominance. They were to a large extent recognized to emanate from social exchanges of both hedonic and utilitarian character. The universality of gratifications from mobile e-mail resembled therefore more that of SMS than MMS. While it was observed that mobile e-mail offered hedonic gratifications for sharing images, it was, however, 'work' and 'colleagues' which was most frequently mentioned in articulations of social gratifications associated with e-mail.

"Checking my mail on the mobile gives me the opportunity to both keep in touch with people and get updates on things going on among friends and at work." Morten, Male, 28, Week 11

We were unable to discern social gratifications of News, Infotainment, Content Downloads and Search & Find. One should, however, be careful to conclude that portal services can not offer social gratifications. Given that social gratifications have been identified for Internet services associated with social bonding e.g. instant messaging, chat and dating[23] services etc. (see e.g. Flanagin, 2005; Leung, 2002; Stafford *et al.*, 2004) it is plausible to assume that this can be the case for similar mobile services.

We can conjecture that: (1) social gratifications are most salient among services with strong expressive properties; (2) SMS and mobile e-mail offer both hedonic and utilitarian social gratifications; (3) MMS is perceived to offer strictly hedonic social gratifications; (4) News, Infotainment, Content Downloads and Search & Find are not associated with social gratifications.

4.3. Summary and Discussion

Table 5 summarizes our main findings. We use this table to discuss how our findings align with and extend current theory of mobile use and its expansion.

The table shows how expressive properties and social gratifications are nearly exclusively attributed to messaging i.e. SMS, MMS, and mobile e-mail. These services offer gratifications that increase social contacts, nurture social relations and generate opportunities for micro-coordination. At the same time they also provide content gratifications. But rather than relying on commercial content, these gratifications derive from the content crafted by other people producing messages. Our findings about the critical role of social gratifications align well with earlier research which has recognized the significance of social dimensions in messaging (e.g. Höflich & Rössler, 2001; Ishii, 2004; Ito & Okabe, 2003; Ito, Okabe, & Matsuda, 2005; Ling, 2004; Ling & Haddon, 2001). In light of

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23. Chat and dating was offered among the portal services we investigated. However, use of these services was so miniscule that we could not discern properties and gratifications for these services.

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Service and description	Primary Properties	Primary Gratifications
SMS -short messaging -text only -one to one, one to many	Expressive	Social Content -hedonic and utilitarian
MMS -text and multimedia messaging -one to one, one to many	Expressive Aesthetic Instrumental	Social Content -hedonic
Mobile e-mail -text and multimedia messaging -one to one, one to many	Expressive Instrumental	Content Social -utilitarian and hedonic
Infotainment -information and entertainment content -personal 'consumption'	Instrumental Aesthetic	Content -hedonic
News -information -personal 'consumption'	Instrumental	Content -hedonic
Content Downloads -personal 'consumption'	Aesthetic Instrumental	Content -hedonic
Search & Find -map, location and route information -personal 'consumption'	Instrumental	Content -utilitarian

Table 5: Summary of findings.

the service use reported in Table 2 we also observe how expressive properties and user originated content are most frequently implicated in the user's mobile service use. For portal services, which received diminishing use during the study, we repeatedly observed how content gratifications are jeopardized by poor instrumental properties.

Analysis of gratifications with the hedonic-utilitarian distinction (Babin *et al.*, 1994; Mathwick *et al.*, 2001) adds nuances to gratifications earned from mobile services. SMS and mobile e-mail provide social and content gratifications of both hedonic and utilitarian character, whilst only the former is associated with MMS. News, Infotainment and Content Downloads were

strongly associated with hedonic gratifications while Search & Find was oriented towards utilitarian fulfillment. A particular finding for Content Downloads is how aesthetic properties played a role in providing hedonic gratifications from the use of ringtones and backgrounds. This form of gratification was mostly sought in the beginning of the field study when users had just been provided with a new mobile phone.

We believe that the finer detail offered by the hedonic-utilitarian distinction of gratifications is critical for future studies, if IS research is to grasp the evolution of multi-purpose mobile services where users increasingly shift continually between work and leisure. Differences between messaging ser-

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vices and portal services accentuate this. Overall, messaging offers gratifications in relation to a large range of activities that fill our everyday life, while portal services are more narrow and specialized. SMS was used most frequently and universally. This is largely attributed to its strong expressive properties, particularly its expressive reach and deep social entrenchment, which generate network effects and reinforce media selection. While mobile e-mail and MMS share superior expressive richness, the pervasive user base of SMS "equips" it with an unparalleled expressive reach. We conjecture that the uncertainty regarding the reach of MMS and mobile e-mail forms an expressive property aspect constraining their use. In light of technology acceptance theory our finding adds new detail to the idea of perceived service expressiveness (Nysveen *et al.*, 2005) as we specify how particular service characteristics both enable and constrain content mediation in expressive communications among users.

Portal services were found to be strongly dependent on instrumental properties. This was detected when disruptions were brought to foreground during service use; i.e., when a particular service became deficient, annoying, inferior, or defective. These aspects had not been uncovered, had our observations not been made *while* participants used services or immediately after that. Neither the different instrumental properties of MMS and mobile e-mail versus that of SMS, nor differences between expressive reach and expressive richness could have been observed, had the static "perception view" of technology (Orlikowski

& Iacono, 2001) been assumed. Our observations of the critical role of instrumental properties during actual service use helped us also reveal aspects which caused disruptions in service beyond what could be derived based on technology acceptance models (e.g. Davis, 1989; Venkatesh *et al.*, 2003).

Our findings extend prior research by identifying how a users' understanding of technical properties not only *enable* but also *constrain* their service use and gratifications. This was highlighted in particular with respect to process gratifications and instrumental properties. As participants constructed their understanding about mobile service properties we found that disruptions to this process jeopardized not only process gratifications but also content and social gratifications. Particularly among News, Infotainment, and Search & Find we observed how poor instrumental functions of a service (e.g. speed and navigation) dampened the earning of gratifications. Similarly, but to a lesser extent, we found that the complexity of configuring MMS and mobile e-mail obstructed their content and social gratifications. In light of the view that properties embody and inscribe aspects of technology (Orlikowski, 2000) our findings suggest that properties are not fixed, but constructed and re-constructed while more experience is gained. It is in the ongoing dynamics between users and mobile service use where typified understandings of properties and gratifications transpire and where their enabling and constraining aspects can over time reach a "closure" (Bijker, Hughes, & Pinch, 1987) if manifested in institutional forms. We argue there-

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fore that the derived typology of properties and gratifications offers necessary detail about the artifacts to comprehend well their use and diffusion. Typologies of properties and gratifications constitute thus a basis for understanding how a particular property of technology, when incorporated into practice. The suggested theoretical lens thereby complements predictive acceptance research by enabling a richer multi-layered (from individuel to institutional) perspective of use and its expansion.

5. CONCLUSIONS AND IMPLICATIONS

Prominent IS researchers (Markus, 2005; Orlikowski & Iacono, 2001) have emphasized the need to theorize carefully about the IT artifact. We have addressed this call by seeking to delineate salient characteristics which characterize various mobile data services. In particular we have tried to answer: *what particular properties and gratifications emerge with different mobile data services use?* By applying the concept of user attributed properties and gratifications (Knutsen's and Lyytinen's 2006) we have identified and explored service qualities and value aspects users deemed salient during mobile service use. These properties and gratifications associated with mobile services have several implications for theories explaining mobile service use and expansion.

Current research investigates often "mobile services" or "WAP services" in generic terms as a "proxy" artifact, and pay little attention to critical technolo-

gical aspects of the service (Markus, 2005; Orlikowski & Iacono, 2001). This causes significant problems in generalizing findings and increasing their accuracy. By specifying and typifying a range of service properties and gratifications we identify specific characteristics of services which can be used to discern causes of variations in service use and its outcomes in different service environments and populations of users. Such typologies provide a firmer foundation for garnering theoretical and empirical insights about different artifacts. We argue that our dual focus on properties and gratifications ensures a crisper notion of mobile service than can be provided by focusing on 'services' as generalized artifacts. This may, in turn, improve comparability across studies and help triangulate within and between methods (Jick, 1979, 1983; Lincoln & Guba, 2000). By not solely focusing on perceptions of technology such as ease of use, usefulness, relative advantage, etc. the followed approach sets focus on the aspects of technology use around which social structures and institutions are established. Thus, the proposed perspective enables to extend analysis from the individual use to the structural and institutional levels. Our observations teach us: mobile service use cannot easily be confined to a singular level of analysis.

For practitioners, especially marketing scholars, properties and gratifications constitute classification categories whereby mobile data services can be typified, ordered and scrutinized. They can help frame inquiries about mobile consumers and markets and specify and prioritize marketing initiatives. As

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we noted, some mobile services directly or indirectly are seen as substitutes for other computing services (e.g. 'regular' wired Internet services) and users constantly compare these properties and gratifications in contexts of use. As failures of WAP and early 3G services suggest, more detailed market intelligence is imperative for effective market creation (De Marez & Verleye, 2004). Today's increasing diversity of mobile services further underlines the need for generation of market intelligence on specific user segments in terms of their constructed properties and gratifications. We believe that a systematic analysis of properties and gratifications contributes not only to unveiling similarities in service properties and value but also help in discovering interdependencies. For instance, our findings suggest that to be gratifying News, Infotainment, Downloads and Search & Find services need to draw upon several instrumental properties while messaging rests on strong expressive properties. Some of these properties are attributable to the service itself while others are enabled and constrained by technical specifications of handsets and networks. Common property interdependences and disruptions identified in this study suggests that alignments in the value system around critical properties may improve the overall value propositions of mobile services and position services more competitively relative to substitutes. With efficient segmentation our model can help managers prioritize service development and focus marketing initiatives, especially, when the success of the offering assumes collaboration among multiple firms (see

e.g. Bohlin *et al.,* 2003; Knutsen & Overby, 2004).

Properties and gratifications are not fixed but constructed and re-constructed during interactions between users and mobile services. By studying cognition and adoption behaviors longitudinally we can build more realistic views of users' understanding of services and their value. In the introduction we warned that perception measures obtained *prior* to mobile experience are fragile, and can easily change. Parallel investigations of cognition and behavior suggest that we obtain additional insights into user behaviors when grounded in true use experience, but these are sensitive to context dynamics and accommodate user learning. While repeated calls have been made to go beyond generic and early acceptance and adoption decisions (Ahuja & Thatcher, 2005; Black, 1983; Gallivan, 2001; Gatignon & Robertson, 1985; Mick & Fournier, 1998; Rogers, 2003) only few empirical investigations have adopted a longitudinal approach. As IT artifacts increasingly follow our movement across environments IS research needs to be increasingly concerned with the evolution of computing use that is contextualized. We need to engage in the ongoing sense-making of technology sense-making and its use *in vivo.* Longitudinal investigations of properties and gratification form one alternative for understanding mobile service use that takes into account: (1) situated contexts of use, i.e. impacts of social, technological and commercial factors and beliefs, (2) users' reflexive monitoring of communications, i.e. how people learn, mimic and adapt based

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on their communications (e.g. dispersion of newness due to messaging), and (3) dimensions of use, i.e. whether the use is explorative, recurring, or terminating.

Our study also has limitations. While the corpus of data is substantial and enables an in-depth interpretive analysis, the sample size is relatively small and covers only early adopters. We have therefore remained cautious to generalize beyond the sample and the services investigated. In the analysis we have compared our findings with prior findings to review whether our results conform or deviate from past findings. Some of the novel aspects of our study – particularly process gratifications and aesthetic properties – have received scant attention in the past, though some studies of playfulness have been carried out (e.g. Sherry & Lucas, 2003). This limits grounds for comparison and extrapolation. Consequently, we call for deeper investigations so that the diachronic aspects of use and virtual aesthetics can be better captured. We do not claim that properties and gratifications explored in this study are exhaustive. The growing diversity of mobile data services, e.g. mobile payment, instant messaging, chat and dating, location based services and advertising, may well introduce additional properties and gratifications to mobile service use. Future research should therefore be open to additional categories.

Due to the limitations we have also been careful in not positing stringent causal inferences that go beyond characterizations of 'enable/constrain'. Yet, we acknowledge the potential for

causal inference between properties, gratifications and performance/outcome related variables such as user value and relative advantage. Thus, we hope the typology of properties and gratifications encourage research to produce causal inferences that are possible within some institutionalized use contexts. Open questions include: What properties cause mobile service gratifications? How do properties and gratifications affect relative value/advantage of mobile services? And what is the impact of properties and gratifications on the frequency of use, the duration of use and the variation in use?

Given the increasingly complex service ecology shaped by increasingly networked technologies and new use patterns we hope our findings will inspire practitioners and scholars to investigate properties and value of mobile data services in vivo and longitudinally.

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