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MOBILE COMMERCE – WHO ARE THE POTENTIAL CUSTOMERS?

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ABSTRACT

The paper focuses on owner of WAP-phones and services among Norwegian mobile phone subscribers. A number of representative national surveys are used in order to get relevant market data. The study of the WAP-phone owners is primarily based on cluster analysis of these data-sets. The owners of WAP-phones are typically frequent users of Internet and e-commerce services. A sub group of WAP-phone owners, with the following characteristics are identified; they are male, young, better educated, urban and belong to the high-income part of the population. High frequency of Internet use and willingness to spend considerable amounts online, seems to be a prerequisite for m-commerce.

INTRODUCTION - WHY STUDY THE WAP-PHONE OWNERS?

This paper is about mobile commerce (m-commerce). M-commerce is in this paper defined as purchase of goods and/or services from handsets or mobile phones. Most advanced handsets or mobile phones today are equipped with the so-called Wireless Application Protocol (WAP), which makes it possible for the telecommunication companies and the service providers to create Internet like user-experience for the owners of mobile phones with WAP-functionality (WAP-phones). This paper presents the results from a number of surveys in Norway with emphasis on the Norwegian WAP-phone owners' use of Internet and their use of WAP-phones for m-commerce purposes. Some of the findings from the surveys are contrasted with findings from Japan about the Japanese' use of DoCoMo's I-mode, a competing technology to WAP. Norway is a small and wealthy country in the upper northwest corner of Europe, with 4,5 millions inhabitants. The Internet-penetration and the mobile phone penetration is very high. The infrastructure is also good and the population can be considered as technologically quite advanced, especially with regards to mobile telephone technology. The future expectation to m-commerce is high. Japan, USA and the Nordic countries are expected to be among the forerunners in m-commerce. Thus our findings about the Norwegian WAP-phone owners might be of general interest.

The international mobile telephone market is booming, even if the market has calmed down a bit since the fall 2000. The current estimates (May 2001) for the global mobile telephone market (handsets or mobile phones) for 2001 is 489 million units, which is down from 506 millions units in October 2000. The current estimate of the number of WAP-phone users in Western Europe for 2003 is 17% of an estimated population of 401 millions (Marcussen 2001). There may with other words be approximately 68 millions potential WAP-phone users in Western Europe in 2003. This is a significant number, and the characteristics of the WAP-phone owners, and particularly those of them with e-commerce and m-commerce experience, are of great interest for everyone who plans future m-commerce initiatives. DoCoMo's I-mode services in Japan, which is the most successful mobile Internet service so far, has, as a comparison 16.5 mill subscribers per Desember 2000, according to the Tokyo based consulting firm Eurotechnology (2001). The use of WAP services and m-commerce services In Norway is quite small (Tjøstheim and Heier 2001). However, it is still interesting to look at the early owners of WAP-phones. The members of this market segment will most likely be among the first to use the future mobile Internet services, the m-commerce services.

Our initial hypothesis the fall 2000 was based on inferences from former studies of the Norwegian Internet-population from 1998, 1999 and 2000 (Tjøstheim and Solheim 2001). Our hypothesis, prior to this study, was; *the typical Norwegian user of WAP-phones and m-commerce services is a frequent user of online banking services and online purchasing*. However, the first analysis of the data set presented in this paper weakened the initial hypothesis. The typical user of WAP-phones and m-commerce services turned out *not* to be the frequent e-shoppers or persons who balance her bank accounts via Internet. The early WAP-phone and m-commerce users seems to be the daily users of e-mail, online newspapers and news-services. In other words, they were frequent Internet users, but not eager e-shoppers or Internet bank users. This finding gave us an incentive to study the data more thoroughly.

Business to consumer (B2C) e-commerce has become quite common among a substantial part of the Internet-users. There are a number of reasons to believe that much of the future B2C e-commerce will change platform, from PCs to new mobile devices (mobile phones, PDAs with communication capability, etc) (Rask and Dholakia 2000). M-commerce and mobility demands "a radical shift in thinking" and how corporations communicate with their customers (Nohria and Leestma 2001). The advantages of expanding the B2C e-commerce to mobile devices are several. The most obvious advantage is probably that the consumers do not have a location-limitation - a certain transaction can be performed no matter of time or the location.

THE SURVEYS AND METHODOLOGICAL QUESTIONS

The studies in this paper is based on a representative national CATI survey from Norway November 2000 (N = 1997), and a representative national postal survey from Norway, a panel-survey starting November 2000 and ending February 2001 (N = 5402). In addition results from a smaller survey, conducted by the Norwegian telecom operator Telenor Mobile Communications in October and November 2000, is used. This survey was targeted directly at some of Telenor Mobile's WAP-users (N = 316) (Stegavik 2000).

A cluster analysis, as described by Huang (1998), was performed on the first two data-sets in order to identify different segments of Internet users and WAP-phone owners.

AN OVERVIEW OF THE NORWEGIAN INTERNET AND NON-INTERNET POPULATION

An overview over the Norwegian Internet and non-Internet population is given in Table 1 and table 2 provide. Table 1 presents the results of the CATI survey, while table 2 present similar results from the postal survey.

Table 1 – An overview of the Norwegian Internet and non-Internet population (The CATI survey)

November 2000	The Norwegian Internet population	The Norwegian non-Internet population	Grand total (N)
Owners of WAP phones	142 (81%)	34 (19%)	176 (100%)
Summarised vertically	11%	5%	9%
Do not own a WAP phone	1101 (60%)	720 (40%)	1821 (100%)
Summarised vertically	89%	95%	91%
Grand total N (%)	1243 (62%)	754 (38%)	1997 (100%)
Summarised vertically	100%	100%	100%

There are some small but interesting differences between the two surveys. The questions are formulated somewhat different, but most of the questions are directly comparable.

Table 2 - An overview of the Norwegian Internet and non-Internet population (The postal survey)

November 2000 to February 2001	The Norwegian Internet population	The Norwegian non-Internet population	Grand total (N)
Owners of WAP-phones	385 (11%)	80 (4%)	465 (9%)
Is planning to buy a WAP-phone the next 12 months	255 (7%)	59 (3%)	304 (6%)
Do not own a WAP-phone or plan to buy one	2843 (79%)	1482 (82%)	4325 (80%)
Un-answered	115 (3%)	193 (11%)	308 (6%)
Grand total N (%)	3588 (100%) 66%	1814 (100%) 34%	5402 (100%) 100%

The number of respondents (N) in the CATI survey is 1997 - see table 1. The Internet population is 62% of the survey's grand total, while the non-Internet population is 38%. The average figures for ownership and non-ownership of WAP-phones in the total sample are respectively 9% and 91%. If the Internet and non-Internet population is compared with regard to ownership of WAP-phones, a significant difference is revealed. 11% of the Internet population are owners of WAP-phones, while only 5% of the non-Internet population are owners of WAP-phones. There is a difference of 6 percent points between the two populations concerning ownership of WAP-phones. This difference is significant, even if we talk about relatively small numbers of respondents.

The number of respondents (N) of the postal survey starting November 2000 and ending February 2001 is 5402 - see table 2. The figures from table 1 are quite similar to the figures in table 2. The percentage of WAP-phone owners is the same in the total sample in table 2 as in the CATI survey in table 1. 9% of the total sample in table 2 owns WAP-phones. 11% of the Internet population in table 2 owns WAP-phones, while 4% of the non-Internet population owns WAP-phones. The latest figures are 1% less than in the CATI survey in table 1, but this difference is not significant. Table 2 contains some additional data regarding buying WAP-phones in the future. 7% of the Norwegian Internet population who doesn't own a WAP-phone has such plans. The similar figures for the Norwegian non-Internet population is 3%, less than half the figures of the Norwegian Internet population. It seems that there is a positive correlation between use of Internet and the desire to buy a WAP-phone.

The majority of the non WAP-phone owners don't plan to buy a WAP-phone, respectively 79% for the Internet population and 82% for the non-Internet population belong to this segment. Hence it seems WAP so far has had a limited success in the Norwegian market. Explanations for why WAP hasn't become a success so far can be found in Marcussen's (2001) list of key elements for mobile Internet commerce. The important prerequisites for m-commerce, are according to Marcussen:

- Content
- Ease of use
- Portals and search engines
- GPRS and UMTS networks
- Security and payment
- Location based services
- Low cost of use
- Timeliness (fresh and updated information)
- High quality handsets
- Personalization of the content

Rossen (2000) describes WAP as "a bar without drinks" [our translation]. Most likely the telecom industry and the service providers in this market are well aware of these problems and challenges. Hence our findings regarding a low WAP-phone penetration in Norway were expected.

SEGMENTING THE NORWEGIAN INTERNET POPULATION

The results of the cluster analyses are presented in table 3 and table 4. The basis for the clustering is the respondents use of the Internet-services. The clustering-method is described by Huang (1998).

Table 3 - The different segments' use of Internet.

November 2000	Segment A Seldom users	Segment B Daily mail	Segment C Weekly users	Segment D Frequent online bankers and e-shoppers	Average/ Grand total
E-mail	42%	99%	94%	98%	81%
Read news	22%	91%	83%	48%	66%
Contact public institutions	7%	50%	23%	43%	29%
Use online bank - services	15%	76%	24%	90%	45%
Use of search services & databases	24%	93%	86%	87%	72%
Games	15%	41%	36%	38%	33%
Education	15%	35%	32%	33%	29%
Travel information	23%	90%	52%	88%	60%
Has purchased online	14%	85%	29%	86%	49%
Grand total	N = 367	N = 408	N = 356	N=112	N= 1253

The main characteristics of the different segments in table 3 are; Segment A consists of those who use Internet less than weekly ('Seldom users'). Segment C is the typically weekly users of e-mail and online news-services ('Weekly users'). Segment B is the typical daily users of services like e-mail, online newspapers and news-services ('Daily mail'). Segment D is the most frequent users of online bank-services and online retailing/shopping ('Frequent online bankers and e-shoppers'). The first percentages inside the table are the vertical percentages for each segment. The second percentages are the horizontal percentages for the WAP-phone and the non WAP-phone owners within each segment. The segments A to B are approximately of the same size. Segment A is 30%, segment C is 29% and segment B is 33% of the grand total, while segment D, the frequent users of online bank-services and online retailing, is only 9% of the grand total of the Internet population in the survey. The owner structure for WAP-phones among the segments is interesting - only 7% and 8% of segment A and C own WAP-phones. This figure increases to 17% and 15% for segment B and D, the frequent and active users of the Internet.

Table 3 shows the respective segments' use of Internet. All percentages for the segments in the table are calculated with basis in the total number of respondents in each segment. The right hand column shows the average percentages for the Norwegian Internet population in the survey. The use of e-mail increases strongly as soon you move from segment A and over to the other segments. Only 42% of the respondents in segment A use e-mail, while the similar figures are in the nineties for the other segments. The most frequent e-mail users are in segment B (99%), but the difference is not significant from segment D (98%). This is well above the average, which is 81%.

The difference is even greater if we look at the segment's use of news groups. Only 7% of segment A reads news, while the number is 91% for segment B and 83% for segment C. The interesting thing here is that only 48% of segment D, the eager online bank and e-commerce users, read news. This is well below the average of 66%. There seems to be an important difference between segment C and B and D concerning the use of news-services.

There is also a significant difference between the segments when it comes to contact public institutions through the Internet. Only 7% of segment A has been in contact with public institutions via Internet, while this figure is 50% for segment B and 43% for segment D. Segment C seems to be in the middle with 23%, just below the average of 29%. Segment B contains a very high number of frequent Internet-users.

There are significant differences in the use of online bank services. An average of 45% of the Internet population uses online bank services. Only 15% and 24% of segment A and C uses such services. The use of online bank services increases to respectively 76% and 90% when we look at segment B and D. There is a significant difference of 14 percent point's between segment B and D in the use of online bank services.

The use of search services and databases do also reveal differences between the segments. The average use of such services is almost as high as the use of e-mail. An average of 76% of the Internet population uses such services. There is a large jump from the 24% use of such services in segment A to the 86%, 93% and 87% use of such services in segment C, B and D. Segment B is again the most active user of Internet.

The use of games on Internet vary from 15% in segment A to 41% in segment B. The average is only 33%, which is rather low compared to the use of e-mail and search services.

The use of Internet for education is similarly low as games. The average use is only 29%, and vary from 15% in segment A to 35% in segment B. Segment B is also here the most active.

The use of Internet as a source for travel information is quite common – 60% has used the Internet for this purpose. The most frequent users are in segment B (90%) and segment D (88%). This use is also fairly common for the low frequency users of the Internet. 23% and 52% of the users in segment A and C uses Internet as sources for travel related information.

Online purchases are not very common among the members of segment A - only 14% of has purchased something online. The average percentage is 49. For segment C the percentage is 29 and is soars to 85% and 86% for segment B and D.

To summarize, there seems to be a rather strong positive correlation between a frequent use of Internet in general and a frequent use of nearly all the different online services. For the more “advanced” services on Internet like for instance online bank services and e-commerce, this correlation seems to be even stronger. These findings are the starting point for studying differences between the members of the segments with regard to demography.

Table 4 – The different segments’ frequency of use of some Internet services

November 2000	Segment A	Segment B	Segment C	Segment D	The Norwegian Internet-population
Frequent (F) – Seldom (S) – Never (N)	“Seldom users” F – S - N	“Daily mail” F - S - N	“Weekly users” F - S - N	“Frequent online bankers and e-shoppers” F - S - N	F - S - N
E-mail	29 - 13 - 58	87 - 12 - 1	15 - 78 - 6	36 - 63 - 2	45 - 36 - 19
Read news	11 - 11 - 78	63 - 28 - 9	5 - 75 - 17	7 - 41 - 52	26 - 39 - 34
Contact public institutions	5 - 2 - 93	34 - 15 - 50	16 - 7 - 77	32 - 11 - 57	20 - 9 - 71
Use online bank-service	8 - 7 - 85	59 - 17 - 24	15 - 9 - 76	79 - 12 - 10	33 - 11 - 55
Use of search services & databases	8 - 16 - 76	32 - 62 - 7	10 - 76 - 14	18 - 69 - 13	17 - 53 - 28
Games	7 - 8 - 85	21 - 20 - 59	21 - 15 - 64	20 - 19 - 62	17 - 15 - 67
Education	8 - 7 - 85	20 - 14 - 65	18 - 14 - 68	17 - 16 - 67	16 - 12 - 71
Travel information	11 - 13 - 77	40 - 50 - 10	24 - 28 - 48	81 - 7 - 12	30 - 29 - 40
Has purchased online	5 - 9 - 86	39 - 47 - 15	10 - 19 - 71	74 - 12 - 14	24 - 24 - 51
	N = 367	N = 408	N = 356	N=112	N= 1253

Table 4 contains information about how frequent the services are used. The following three categories are used; frequent (F), seldom (S) and never (N).¹ If we look at e-mail, then we discover that 58% of segment A never uses e-mail, while 87% of segment B are frequent users of e-mail. 78% and 63% of segment C and D are seldom users of e-mail. 45% of the total Norwegian Internet population are frequent e-mail users. E-mail is the most popular service in the Norwegian Internet population.

Reading news online is the second most popular service. In segment A 78% never read news online 63% in segment B reads news frequently. 75% of the members in segment C reads news on the Internet seldom, while 52% of the members of segment D never reads news online - 39% of the total Internet population reads news online seldom.

Contact with public institutions through Internet is not very common among Norwegian Internet users. 93% of the members of segment A has never contacted a public institution. The similar figure for the members of the segment B, C and D are respectively 50%, 77% and 57%.

There are also large differences in the use of Internet banking among the members of the different segments. 59% and 79% are frequent users of online bank-services in segment B and D, while 85% and 76% in segment A and C have never used online bank-services. 55% of the total Internet population has never used online bank-services.

Search services and databases are quite popular among most of the Internet users. However, 76% of the members of segment A has never used a search service or a database, while 62%, 76% and 69% of segment B, C and D are seldom users of such services. 53% of the total Internet population are seldom users of databases and search services.

The majority of the Norwegian Internet users are not users of online game and entertainment-services. 85% of segment A has never used an Internet game. The similar figures for segment B, C and D vary between 59% to 64%. 67% of the total Internet population has never used such services.

The figures regarding educational services are about the same as for Internet games, where the figures for 'not used such services' vary from 85% for segment A to 65% for segment B. 71% of the total Internet population has never used educational services though Internet.

¹ The *frequent* use of the Internet services was defined in the following ways: E-mail daily, read news daily, contact public institutions weekly, the use of search services and databases daily, use of online bank services weekly, use of games weekly, use of education services weekly, search for travel information monthly, and purchase online monthly.

Online travel information seems to be quite popular. 90% of the members of segment B, 52% of the members of segment C and 88% of the members of segment D search for travel related information online if frequent and seldom are add up.

With regard to e-commerce or online purchasing, the differences are quite significant. A large majority of the members of segment B and D has purchased something online while a large majority of the members of segment A and C has not purchased something online.

THE WAP-PHONE OWNERS' INTERNET USE

This section contains a study of the owner of WAP-phones. In order to study the Internet-behavior of the owners of WAP-phone the four clusters presented in table 3 and 4 is also made use of in this section. The profile of the owner of WAP-phones is presented in table 5.

Table 5 - The WAP-phone owners in the Internet population and their Internet-use

November 2000	Segment A	Segment B	Segment C	Segment D	Grand total
	Seldom users	Daily mail	Weekly users	Frequent online bankers and shoppers	
Owner of WAP-phones	27 (19%)	70 (49%)	28 (20%)	17 (12%)	142 (100%)
Summarized vertically	7%	17%	8%	15%	11%
Do not own a WAP-phone	340 (31%)	338 (31%)	328 (30%)	95 (9%)	1101 (100%)
Summarized vertically	93%	83%	92%	85%	89%
Grand total	367 (30%)	408 (33%)	356 (29%)	112 (9%)	1243 (100%)
N (%)	100%	100%	100%	100%	100%

Table 5 describes the owners of WAP-phones in relation to the different Internet-segments. 49% of the respondents in segment B, the 'Daily mail'-users own a WAP-phones. The difference between segment B and the other segment is quite significant - the percentages for the other segments are 19% (A), 20% (C) and 12% (D). Hence, the differences in percent points are receptively 30, 29 and 37. Based on this result, segment B is studied in more detail in the next section. There are 408 respondents out of 1243 that belong to segment B.

WHO ARE THE WAP-PHONE OWNERS IN SEGMENT B ('DAILY MAIL')?

It seems that the most interesting group for further analysis is the WAP-phone owners in segment B. As mentioned 49% of the members of this cluster owns a WAP-phone. What are the characteristics of these individuals for instance with regard to demography? For those interested in m-commerce this is a relevant question.

Table 6 – The demography of segment B.

November 2000	The 70 with WAP-phones in segment B	Segment B	The WAP phone owners in general	The total population
Male - female	81% - 19%	62% - 38%	69% - 31%	50% - 50%
Age				
15- 19 years old	7%	6%	13%	8%
20 – 29	29%	22%	19%	13%
30 – 39	17%	29%	20%	20%
40 – 49	29%	25%	26%	19%
50 – 59	14%	15%	13%	18%
60 +	4%	3%	9%	21%
Education				
- primary school	11%	9%	6%	8%
- senior high school & technical school	29%	33%	52%	57%
- College 1 – 4 years	33%	37%	26%	24%
- College or university 5 years or more	27%	21%	16%	10%
Monthly net income				
< 1000 Euro	9%	14%	17%	23%
1000 – 1999 Euro	17%	33%	28%	40%
2000 – 2749 Euro	30%	26%	23%	16%
2750 Euro +	33%	20%	21%	8%
un-answered	11%	7%	10%	12%
Urban & rural	50% - 50%	42% - 58%	40% - 60%	32% - 68%
Grand total N (%)	70 (100%)	408 (100%)	176 (100%)	2007 (100%)

Table 6 contains information about the 70 in segment B who owns WAP-phones, segment B as such, the WAP-phone owners in general (WAP-phone owners in the total population) and the total population. If we look at the distribution among the males and females in the different categories, then we discover that it is 81%/19%, 62%/38%, 69%/31% and 50%/50% in the different categories. The men are in majority in all the categories, except for the total population. As expected the survey, the grand total contained 50% men and 50% women. However, among the 70 WAP-phone owners in segment B 81% are men. The difference between the sexes is smaller in segment B in general.

The age distribution among the 70 WAP-phone owners in segment B are shaped like ‘a camels back’, with two peaks in the age groups from 20-29 (29%) and 40-49 (29%) years, and a hump in the middle, with only 17% in the age group from 30-39 years. Segment B, however, has a more bell-shaped distribution with respectively 22%, 29% and 25% in the age groups from 20-29, 30-39 and 40-49 years. The WAP-phone owners in general have a more skewed age distribution, and there is a peak in the age group from 40-49 years in this category. The total population has a rather even distribution among the age groups from 30-39, 40-49 and 50-59 years.

If we study the relations among education, monthly net income and where they live (urban or rural areas), then we discover some interesting facts about the different categories. The 70 WAP-phone owners in segment B are highly educated, earn well and live in the urban areas of Norway. This seems to be the young, male, urban professionals everybody is looking for. The members of Segment B as such are also well educated, but there are not as many with 5 years or more of college or university degree as among the WAP-phone owners in general. Only a third of the Norwegian total population lives in urban areas while 40% percent of the members of segment B live in urban areas.

If we look at the WAP-phone owners in general, then there is quite a few with a professional training like a degree from a technical school. This result combined with the fact that a high percent belong to the age group 40-49 years old, might be an indication that WAP-phones are popular among managers. (Tjøstheim & Heier, 2001) The level of income is similar to the level of income of the members of segment B as such. Moreover, somewhat fewer of these persons live in urban areas. The figures are approximately the same as for segment B as such. If we look at the total population, there is also here an overweight of persons with technical schools. The total populations’ incomes are substantially below the other three categories.

The main finding from table 6 is that the WAP-phone owners in segment B seems to be the young, male, well educated and high earning urban professionals. This is one of the most interesting groups for the marketers. These young, urban, male professionals with good income are often regarded as “forerunners” or early adopters when it comes to the use of new gadgets and services.

What is the relationship between e-commerce and m-commerce? In the next section this question is addressed. In table 7, the four segments from table 6 are with regard to m-commerce and e-commerce experience.

Table 7 - The WAP-phone owners' m-commerce and e-commerce activity

November 2000	The 70 with WAP-phone in segment B	The WAP phone owners in general	Segment B	The Internet-population
Have ordered goods or services from the WAP-phone	10%	6%	2%	
Has e-commerce experience (has ordered something online at least once)	93%	56%	85%	48%
Has ordered something online the least month	53%	28%	41%	22%
Median amount for goods or services bought on the Internet the last month (EURO)	250	145	125	125
Grand total N (%)	70 (100%)	176 (100%)	408 (100%)	1253 (100%)

Table 7 gives an overview of the m-commerce and the e-commerce activities for the four different segments in table 6. 10% of the 70 persons who own WAP-phones in segment B has ordered goods or services from the WAP phone. The similar figure among the WAP-phone owners in general is 6%. There is in other words a 4 percent point difference between the WAP-phone owners in general and the WAP-phone owners in segment B. The difference between the WAP-phone owners in segment B and the WAP-phone owners in general is significant. The difference between the WAP-phone owners in segment B and segment B as such, is 8 percent points. This is also a significant difference.

The fact that 93% of the WAP-phone owners in segment B has e-commerce experience is quite interesting. The similar figure for segment B as such is 85%. This is also a high number. Another interesting discovery is that only 56% of the WAP-phone owners in general and only 48% of the total Internet population have e-commerce experience. There is a difference of 37 percent point between the WAP-phone owners in segment B and the WAP-phone owners in general. The difference between the WAP-phone owners in

general and segment B as such is 29 percent points. The difference between the 70 WAP-phone owners in segment B and the Internet population in general is 45 percent points.

Hence, the relationship between e-commerce and the use of mobile services seems to be a very interesting area for further studies.

There is also a positive correlation between being in segment B and having ordered something online the last month. 53% of the WAP-phone owners and 41% of segment B in general have ordered something online the last month. The similar figures for the WAP-phone owners as such, and the total population, is respectively 28% and 22%. The difference between the WAP-phone owners in segment B and the WAP-phone owners in general is 25 percent points. The difference between the WAP-phone owners in segment B and the Internet population as such is 31 percent points. The sub-segment, the 70, seems to contain individuals that are spending much more money online than the individuals in the other segments. This is supported by the figures in table 7 about the median amount for the online purchases on Internet for the last month. The WAP-phone owners in segment B has bought for a median value of 250 Euro, while the WAP-phone owners in general has bought goods for a median value of 145 Euro. This is a difference of 105 Euro. The equivalent figures for segment B as such and the total population is a median purchase of 125 Euro for both categories. The differences between the WAP-phone owners in segment B and the WAP-phone owners as such are respectively 125 and 20 Euro. E-commerce experience and willingness to spend large amounts online could be a condition or a predictor for mobile consume, or m-commerce in the future.

E-COMMERCE SEGMENTATION

In the 2000/01 winter-survey (November 2000 to February 2001) 3094 respondents of a grand total of 5402 answered that they had access to the Internet and 1620 had e-commerce experience. Moreover, 1544 of 1620 or 95% of the respondents answered that they had ordered or bought at least one of 12 most popular e-commerce categories in the survey (table 10). In the clustering analysis only these 12 categories were used. The 12 product categories were tabulated as “has not ordered (No)”, has ordered 1 to 3 times (Se)” and “has ordered more than 3 times (Fr).”

Table 8 – The basis for the clustering

November 2000 to February 2001		
1. Books (399) 2. Air tickets (397) 3. Holiday packages (396) 4. Other (390) 5. Music/CD (389) 6. Accommodation (348)	7. Information services (327) 8. Tickets (ex. air tickets) (328) 9. Software (267) 10. Electric articles (235) 11. Apparels & shoes (200) 12. Hardware (191)	13. Shares and bonds (161) 14. Flowers & gifts (159) 15. Entertainment (154) 16. Sports & leisure products (142) 17. Food & liquor (49) 18. Cars (38) 19. Furniture (25) 20. Real estate (24)
Number of respondents in parenthesis N= 1620		

Table 8 shows the 20 product categories from the survey. The number of respondents for each of the 12 chosen categories varies from 399 to 191. The clustering gave 5 different segments of Internet users with e-commerce experience – see table 9.

Table 9 – The profile of the segments

November 2000 to February 2001 Frequent (Fr) – Seldom (Se) – Never (No)	Segment 1 Fr - Se – No The music buyers	Segment 2 Fr - Se – No The culturals	Segment 3 Fr - Se – No The seldom e-shoppers	Segment 4 Fr - Se – No The frequent e-shoppers	Segment 5 Fr - Se – No The travellers
Books (7 - 17 - 75)	11 - 19 - 70	13 - 57 - 30	5 - 14 - 81	39 - 42 - 19	8 - 6 - 86
CDs/music (8 - 16 - 76)	24 - 76 - 0	11 - 5 - 84	0 - 0 - 100	77 - 12 - 12	6 - 5 - 89
Air tickets (5 - 19 - 76)	4 - 11 - 85	9 - 28 - 63	5 - 11 - 83	15 - 15 - 69	5 - 79 - 16
Holiday packages (2 - 22 - 76)	3 - 12 - 85	4 - 68 - 27	1 - 9 - 90	12 - 21 - 67	3 - 82 - 15
Accommodation (2 - 19 - 79)	2 - 9 - 89	6 - 34 - 60	1 - 10 - 88	12 - 52 - 36	3 - 78 - 19
Information services (6 - 14 - 79)	6 - 14 - 80	8 - 23 - 69	7 - 13 - 80	4 - 44 - 52	12 - 16 - 72
Tickets (not air tickets) (4 - 16 - 80)	4 - 13 - 83	10 - 77 - 13	2 - 11 - 87	12 - 16 - 72	7 - 16 - 77
Software (3 - 13 - 84)	5 - 17 - 78	2 - 16 - 82	2 - 13 - 85	35 - 19 - 46	4 - 16 - 80
Hardware (4 - 8 - 88)	7 - 10 - 83	5 - 5 - 90	3 - 8 - 89	19 - 54 - 27	3 - 8 - 89
Electronic articles (2 - 12 - 86)	5 - 19 - 76	0 - 13 - 87	1 - 11 - 88	20 - 68 - 12	1 - 9 - 90
Apparel & shoes (2 - 10 - 88)	4 - 11 - 85	5 - 8 - 87	2 - 13 - 85	4 - 16 - 80	1 - 6 - 93
Other (6 - 18 - 76)	9 - 18 - 73	6 - 12 - 82	5 - 23 - 72	28 - 48 - 24	7 - 20 - 73
	N = 325	N = 136	N = 869	N=26	N= 188

Based on the out-put from the clustering the segments we have labeled the segments as follows; *the music buyers* (segment 1), *the culturals* (segment 2), *the seldom e-shoppers* (segment 3), *the frequent e-shoppers* (segment 4) and *the travelers* (segment 5).

The members of the first segment, the music buyers, have all bought CDs/music online. To some extent they also buy books, software and electronic articles online. This is the second largest segment with 325 respondents. The next segment, the culturals, they have ordered books, holiday packages and other tickets on the Internet. The tickets are most likely tickets for cultural events, concerts etc. This segment is rather small. The third segment, the seldom e-shoppers, is by far the largest segment, consisting of 869 respondents. This segment of seldom e-shoppers is larger than the other segments together. Non of the members of this segment has bought CDs/music on the Internet, and the only category that is popular is “other” products or services. The fourth and smallest segment is the frequent e-shoppers. This segment has only 26 respondents. They members of this segment are frequent buyers of books, CDs/music, accommodations, software, hardware, electronic articles and other products or services. Since this cluster is very different from the other segment it is included in the analysis below even though it is a very small cluster. The fifth segment, the travelers, consists of 188 respondents. Airline tickets, holiday packages and accommodations are popular services among the members of this segment.

Table 10 – Owner of WAP-phones and the five segments

November 2000 to February 2001	Total	The music buyers	The culturalists	The seldom e-shoppers	The frequent e-shoppers	The travelers
Has a WAP-phone (208)	208	47 (15%)	22 (17%)	97 (12%)	9 (36%)	33 (18%)
Summarized horizontally	14%	23%	11%	47%	4%	16%
Is planning to buy a WAP-phone	136	31 (10%)	11 (8%)	68 (8%)	2 (8%)	24 (13%)
Summarized horizontally	9%	23%	8%	50%	1%	18%
Do not own a WAP-phone or plan to buy one	1148	240 (75%)	100 (75%)	669 (80%)	14 (58%)	125 (69%)
Summarised horizontally	77%					
Grand total N	1492	318	133	834	25	182

About 50% of the owner of wap-phones belong to Internet Segment B, *the daily mail segment*, and the wap-phone penetration varied from 7% to 15%. (see table 5). The table 10 shows that 47% of the WAP-phone owners belong to the e-commerce segment *the seldom e-shoppers* and the WAP-phone penetration varies from 12% to 36%. Moreover, even though most of the owners of WAP-phones are in the segment with seldom e-shoppers, the relative share with WAP-phone is higher in the other e-commerce segments – 12% vis-à-vis 15% to 36%. The result was the opposite in the Internet-segments, the *daily mail* segment also had the highest relative share with WAP-phones.

The WAP-phone penetration in general seems to be somewhat higher among those with e-commerce experience compared to those with access to Internet – 14% vs 11%.

A clustering analysis of Internet-users and individual with e-commerce experience give insight into what might be important prerequisite for m-commerce behavior in the future. We have studied e-commerce experience as one such prerequisite. The members of the segment *daily mail* seem to be a little bit ahead of the other segments since they have both e-commerce experience and some m-commerce experience. However, wap has not been a success story and when better mobile services, more acceptable payment model etc are introduced into the market, m-commerce will start to grow.

NORWEGIAN WAP-PHONE OWNERS VS JAPANESE I-MODE USERS

In this section the Norwegian WAP-phone owners are compared with the Japanese I-mode – see table 11.

Table 11 - Norwegian WAP-phone owners compared with Japanese I-mode users

November 2000/ September and December 2000	The Norwegian WAP phone owners Male	The Norwegian WAP phone owners Female	Japanese I-mode users Male	Japanese I-mode users Female
Age				
15- 19 years old	7%	5%	6%	7%
20 – 29	14%	5%	21%	19%
30 – 39	14%	6%	15%	9%
40 – 49	18%	9%	11%	4%
50 +	15%	7%	7%	2%
Sex / N	69% (121)	31% (55)	59% (352)	41% (243)

Source: Cattell 2001

Table 11 contains data about the age and sex profiles of the Norwegian WAP-phone owners from the November 2000 CATI survey compared to similar data for Japanese I-mode users from September and December 2000 (Cattell 2001). The figures are not 100% directly comparable. The Norwegian data contains information about the *WAP-phone owners*, while the Japanese data contains information about the *I-mode user*. But the data are close enough to give an idea about some interesting differences between Norway and Japan.

If we look at the youngest age group from 15-19 years, the figures are about the same, but the figures are in reverse. There is more male WAP-phone owners in Norway in this age group, while there are more female I-mode users in the youngest age group. If we look at the age group from 20-29 years, there are almost three times as many male as female WAP-phone owners in Norway, while there are about an equal percentage of male and female I-mode users in Japan. There are almost 50% more male I-mode users in Japan, than there are male WAP-phone owners in Norway in this age group from 20-29 years. The figures are almost 4 to 1 if we compare the Japanese female I-mode users and Norwegian female WAP-phone owners in the age group from 20-29 years.

There are more than twice as many male Norwegian WAP-phone owners as females (14% vs. 6%) in the age group 30-39 years. The similar figures in the age group from 30-39 years in Japan, among the I-mode users, are 15% vs. 9%. The percentage of female I-mode users are with other words decreasing with age, while there is a slight increase in Norway. The percentage of male Norwegian WAP-phone owners and male Japanese I-mode users are among equal, while there is a third more female I-mode users in Japan than there are female WAP-phone owners in Norway in this age group.

If we look at the age group from 40-49 years, then the Norwegians leave the Japanese behind. There is more male Norwegian WAP-phone owners in this age group, than there are male I-mode users in Japan (18% vs. 11%). There is almost a similar ratio among the females (9% vs. 4%). There is an interesting observation that I-mode seems to be a youth phenomenon, while WAP-phone ownership in Norway is not limited to the youngsters. There is an increase in the ownership of WAP-phones with age for both sexes in Norway, while the tendency is the opposite in Japan.

If we look at the group aged 50 or more, then the tendency in the age group from 40-49 is amplified. There is more WAP-phone owners in Norway than there are I-mode users in Japan (relatively). I-mode seems to be a youth phenomenon, while WAP seems to be more evenly distributed among the ages in Norway, especially among the somewhat elderly part of the population. The WAP-phone owner ratio increases with age in Norway. There are also more elderly female WAP-phone owners in Norway than there are elderly female I-mode users in Japan.

WHAT IS THE RELATION BETWEEN KNOWLEDGE OF AN M-COMMERCE SERVICE AND THE USE?

One of the big questions when studying WAP and m-commerce is of course the relation between knowledge of a service and use of a service. Stegavik's (2000) study provides some answers to this question, and is of great interest together with our findings.

Table 12 – The knowledge and use of WAP-services

October & November 2000	Knowledge of WAP-services	Use of WAP services
News & weather	69%	66%
E-mail/messages	35%	25%
Search & browsing	30%	22%
Bank & finance	28%	18%
Phone services	16%	9%
Market place	15%	6%
Travel	12%	6%
Other	29%	22%
Don't know / can't remember	9%	9%
Grand total N (%) Source: Stegavik (2000)	316 (100%)	316 (100%)

Source: Stegavik 2000

The source for this table is Stegavik's survey from October and November 2000. The study was done for Telenor Mobile Communications, Norway's leading mobile operator. The study is based on answers from 316 respondents, who are customers of Telenor Mobile Communications.

There are several interesting things in this table. First, there is the absolute level of knowledge and use. Second, there are the percent differences between the knowledge and the actual use. Third there are the differences between the different services. Table 9 is ordered according to the popularity of the different WAP-services. Most WAP-services are paid for through the telephone companies billing systems. This is one of the most significant differences between Internet and the WAP services. The Internet are used to that almost all of the services are for free, while the mobile phone and WAP-phone users are used to pay for all of the services.

If we look at the absolute levels, then news and weather is the number one WAP-service in Norway (66% use). Number two is e-mail and messages (SMS) (25% use). Number three is search and browsing (22% use) and number four is bank and finance services (18% use). The other services like phone services, market place and travels are small. This use pattern is distinctly different from Internet, where our CATI survey from November 2000 found that e-mail, news, online banking, search services and travel information are the most popular Internet services. There are with other words important distinctions between the preferred services among the Internet users and the WAP-service users.

The percent differences between the knowledge of and the actual use of the WAP-services are interesting reading. There is a 3 percent point's difference for the news and weather services. This indicates a high penetration for new and weather services. There is a 10 percent point's difference for e-mail and message services. The penetration is definitely lower. There is similarly an 8 percent point's difference for search and browsing services. Also here seems there to be a lower degree of penetration than for the news and weather services. There is also a 10 percent point's difference for bank and finance services. Are the users skeptical to the security? There are also 6-9 percent point's differences for the smaller WAP-services like phone services, market place and travel.

The conclusions from table 12 are with other words that the demands for WAP-services are different from the demands for Internet services. There are different degrees of penetration, measured as the difference between knowledge of and actual use of a service.

CONCLUDING REMARKS

The use of WAP-services in Norway is very limited so far, but a small percentage of the population has bought a WAP-phone. These owners and users of WAP-phones and services are typically frequent users of Internet. A sub group of WAP-phone owners, with the following characteristics are identified; they are male, young, better educated, urban and belong to the high-income part of the population. Their Internet behavior is significantly different, not only from the typical Internet users as such, but also from most of the other individuals with e-commerce experience. High frequency of Internet use and willingness to spend considerable amounts online, seems to be a prerequisite for m-commerce, since it's only in this segment we have found use of m-commerce services of some significance. Some differences between the Norwegian WAP-phone owners and the Japanese I-mode users are also documented. The Norwegian WAP-phone owners are older than the Japanese I-mode users. Even though WAP has not been a success, it is relevant to study WAP-services and the owners of WAP phones in the market at this stage. Some stages are not important per se, but should be studied as part of the ongoing research activity in this area.

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