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**Interactions with and through mobile phones: what about the
elderly population?**

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Abstract

We explore the distinctive characteristics of mobile telephone use among the elderly population. We analyze the last available European country-level data on individual use of mobile telephony and advanced mobile services. Results are interpreted in the light of the available knowledge in the field. As a result, we are able to propose an analytical explanation about the role that mobile telephony has in the elderly personal system of communication in a developed context like Europe.

Keywords: Elderly population, Mobile telephony, Europe.

1. Introduction

The age factor plays differently regarding adoption and uses of mobile telephony. This evidence has been discussed since the first stages of popularization of this technology (see for instance, Ling, 2002; or Castells *et al.*, 2006). As we have argued elsewhere, there is a general trend “toward the general diffusion of mobile communication within the whole population, with age continuing to specify the type of use rather than the use itself” (Castells *et al.*, *ibid.*, p. 41).

It seems that elderly persons are less inclined to use mobile communication; however, they are “catching up to the levels of mainstream innovation, but largely lag behind in the use of new services integrated into the technology” (Karnowski *et al.*, 2008; p.191). Recent statistics on the use of mobile phones and the use of advanced mobile services from Eurostat confirm this trend (Eurostat, 2010).

Despite lower acceptance rates of mobile telephony among the elderly population, which indeed are quite high compared to other ICTs, we do consider that seniors must be carefully studied when it comes to understanding the use and appropriation of mobile communication. It must be kept in mind that ageing is a key characteristic in European societies (Giannakouris, 2008), as in 2008 17% of the total population in EU27 was aged 65 years old or over; while this proportion will increase to 20% in 2020, and up to 30% in 2060. Therefore, it is of great interest to study the current situation and the future evolution of adoption and use in the golden age. Future studies, as well, should take into account the evolution of mobile use as those that became mobile users during their youth get older. At present, however, we are focused on individuals who have been introduced to mobile communication late in their lives; among whom, the pressure to have a phone often comes from their social interactions (Ling, 2008).

We will link our results based on 2008 Eurostat data to the literature that studies how the elderly interact with and through mobile phones. To achieve this goal, the next section will examine the most relevant current knowledge on the field. It will be followed by a descriptive analysis of mobile adoption among elderly users in Europe compared to other age segments. Finally, in the concluding section we will propose an

analytical explanation that gathers the available evidence regarding the elderly population in a developed context like Europe.

2. Mobile phones and the elderly: what do we know?

Personal communication is affected by age, and so are the information and communication technologies (ICT) mediating these communications (Charness *et al.* eds., 2001). Aging is related to socio-cultural aspects; thus personal values and interests change over one's lifetime. Moreover, aging shapes physical characteristics as well: from cognition or reading capacity, to more basic abilities, like handling small featured devices. As argued by Charness and Boot (2009), "in a very literal sense, older adults may perceive technology differently than younger adults do."

In this sense, one main concern regarding elderly users is ergonomics and usability. Since the early launch of the Japanese *raku-raku* (or "easy-easy") in 2001 by Docomo the market has seen a clear increase in the offer of mobile handsets specifically designed for the elderly. A number of different operators and handset producers have introduced "non-frill" mobile phones in the market: for instance, the "Vodafone Simply" handset appeared in 2005; while in 2006 Jitterbug Wireless was created, a USA company focused on "easy-to-use" services and mobile phones. An increasing number of studies are devoted to the identification of features and characteristics a mobile device should have to properly fit elderly attitudes and aptitudes (for instance, Duh *et al.*, 2010; Kurniawan, 2008; Kurniawan *et al.*, 2006; Mohd *et al.*, 2008). Ergonomic issues are discussed and proposed while an interesting result comes up: few elderly people buy "non-frill" handsets (Karnowki *et al.*, 2008) because they are not interested in mobile phones targeted to aged people (Oskman, 2006).

The effective use of mobile devices is not only related to technical issues but also to communicative habits, which among the elderly are mainly centered on the maintenance of family relationships (Oskman, 2006; Kurniawan, 2008; Kurniawan *et al.*, 2006). Regarding paths of use, older people would most likely use mobile phones only in emergencies, unexpected or micro-coordination situations (Hashizume, *et al.*, 2008; Kurniawan, 2008; Kurniawan *et al.*, 2006; Mohd *et al.*, 2008) in which they consider that it is the most efficient tool to communicate with. They usually do not use their

mobile phones for casual conversations, except when they need to call to another mobile phone and the cheapest way to establish contact is by using a mobile (Kurniawan *et al.*, 2006). Thus, even though other means of communication seem to be preferred among this age cohort, older people will tend to use a mobile phone when it is perceived as necessary. For elderly people, as well as for teenagers, mobile phones need to be useful, social and enjoyable in order to be adopted (Conci *et al.*, 2009). However, despite the common supporting logic explaining the adoption process of this ICT, the final result is not the same in each age cohort because intensity and patterns of use differ. “It seems that the elderly are always behind [regarding innovative services] while the younger are always ahead, already using the latest technologies when the elderly are still trying to catch up on yesterday’s innovation” (Karnowski *et al.*, 2008, p.189). It is evident that the significance of the mobile phone is different for an adolescent than for a senior citizen (Oskman, 2006).

The most important service for elderly people is voice calls, with very little acceptance of SMS (Ling 2002, 2004, 2008; Lenhart, 2010; Kurniawan *et al.*, 2006). “Initial use is characterized by caution” (Oskman, 2006, p.14), as in the first stages of mobile ownership the mobile phone is only carried in special circumstances. Once the elderly person is used to it, the device is more incorporated in all activities of everyday life. However, very often the members of the elderly person’s personal network are the proactive part of the communication (Ling, 2008; Mohd *et al.*, 2008). This is true at least in the first stages of adoption, while some differences in the pattern of use have been described for different countries. In northern Italy (Conci *et al.*, 2009) or in England (Kurniawan, 2008), reported uses by the elderly are more basic than those reported in Finland (Oksman, 2006). From the elderly perspective, use depends on personal willingness as well as on the expectations that others put on them to use mobile features. However, reluctance could turn into acceptance if the service meets the needs of the person (Ling, 2008).

3. Mobile adoption in Europe: what does the data say about elderly users?

In 2008, our year of interest, there were 121.7 active mobile subscriptions per 100 inhabitants in EU27, while in 2009 the penetration rate increased to 124.6 (ITU, 2010). Does that mean that every European citizen is a mobile phone user? Statistics from the industry fail to give details on the socio-demographic distribution of mobile telephony. Household statistics enable us to answer this question and to better understand the distribution of this general purpose technology (Jovanovic and Rousseau, 2005) among different segments of the population. Finally, not all the mobile subscriptions in a country correspond to those living there, as any non-resident, for instance a tourist, can easily buy a prepaid mobile. However, there is one remaining question these surveys do not address: whether mobile users have more than one mobile subscription.

European Union (EU27): an aggregate description

In 2008, 87% of the UE27 population between 16 and 74 years old declared to be mobile users (Table 1). Indeed, almost every young person (16-24 years old) and adult (25-54 years old) use mobile telephony (97% and 93%, respectively). In this landscape of very high diffusion, the senior population shows a sizeable difference as only 79% of those between 55 and 64 years old declare being mobile users, while the figure falls to 62% for elderly seniors (65-74 years old).

Table 1. Use of mobile phone, by age cohort. European Union (EU27), year 2008.

Age cohort	All	Youth	Adults	Seniors		
	16-74	16-24	25-54	55-74	55-64	65-74
Mobile user (% individuals)	87	97	93	72	79	62
Male	88	96	93	75	-	-
Female	86	97	92	69	-	-
Low education	79	94	87	63	-	-
Medium formal education	91	98	93	77	-	-
High formal education	95	100	97	87	-	-

-: not available.

Source: Eurostat (2010).

On the other hand, the allocation of users between genders is quite balanced (88% of men and 86% of women) while, again, the most uneven situation is observed among senior citizens. In the 55-74 age cohort there are 6 percent points of difference between men (75%) and women (69%), giving an odds ratio of 1.09 men over women. In addition, educational level shows a slightly greater imbalance, most pronounced among

seniors (55-74), as in this age cohort mobile users are 87% among those with high formal education and 63% among those with low education (odds ratio equals to 1.4). Finally, it should be noted that socio-demographic differences among youth are markedly low because this age cohort is reaching the point of saturation, with practically every person from 16 to 24 years old using mobile telephony.

Table 2. Type of subscription to mobile telephony, by age cohort. European Union (EU27), year 2008.

Age cohort	All 16-74	Youth 16-24	Adults 25-54	Seniors 55-64 65-74	
Subscription (% of users)					
Pre-payment	39	42	35	45	55
Post-payment	47	47	52	41	29
Post-payment with flat rate for Internet access via mobile phone	4	5	5	2	-

Note: in the original, figures do not add 100.

-: not available.

Source: Eurostat (2010).

Regarding the billing plan (Table 2), it can be seen that more than one third of the users have prepaid subscriptions (39%). Youth (42%) are slightly over the average, as when first introduced, the mobile phone tends to be a prepaid one. The young population would turn to postpaid plans when they grow up, as the latter are associated with higher consumption capacity levels (Castells *et al.*, 2006). The senior population ranks even higher than youth, with 45% of subscriptions being prepaid among the 55-64 cohort and 55% in the 65-74 cohort. Elderly people are later adopters of mobile telephony, and this technology tends to be a complement of the fixed telephone, as discussed in the previous section. Therefore, as in the case of children and teenagers, it is more likely that the first mobile phone will be a postpaid one. In the future, it will be of great interest to study the evolution of billing plans, when those adults that used to have prepaid plans enter their golden age. Finally, postpaid bills with flat rate for Internet access, on the other hand, are just taking off (4% on average), with seniors being less prone to this kind of subscription (2% in the 55-64 cohort).

From ITU (2010) data we also know that in 2008, 56% of all active mobile subscriptions were prepaid in the European Union.¹ This figure would suggest that more than one half of the users would have prepaid plans. However, figures from Eurostat do

¹ EU27 data, without Latvia.

not seem to support that hypothesis. However, we do understand that these two indicators are not contradictory as they measure different aspects of the same phenomenon. One possible interpretation is that second or third lines that some individuals may use should be prepaid, although not reported in the household survey (which only gathers the use of at least one mobile telephone). Moreover, the survey is addressed to the population living in private households between 16 and 74 years of age. This leaves children up to 15 years old out of the picture, who are heavy users of prepaid mobile phones;² as well as those persons trapped in the economic margins, such as homeless or nomadic persons, who can access only prepaid mobiles.

Table 3. Use of mobile phone advanced services in the previous 3 months, percentage of individuals in each age cohort. European Union (EU27), year 2008.

Age cohort	All 16-74	Youth 16-24	Adults 25-54	Seniors 55-64 65-74	
Sending (photos, video...)	20	41	20	7	3
Internet browsing	7	13	7	1	0
e-mail	5	8	6	3	1
Uploading (photos, video...)	4	11	3	1	1
Receiving subscription-paid information (news, weather forecast, sports results...)	4	6	4	2	1
Personal navigation, use of location-aware services (receiving nearby travel, shopping and event information)	3	4	3	1	1
Watching/downloading TV or video	1	3	1	0	0
Payments (instead of credit card or cash)	1	2	2	1	0

Source: Eurostat (2010).

Basic uses, voice calls and SMS, are widespread among the whole population, with the elderly preferring voice communication (as discussed above). However, the use of advanced services in the European Union seems to be more restricted.³ Table 3 shows that sending pictures or videos is the most popular advanced service, as some 20% of mobile users have shared these kinds of files in the previous three months. This activity is followed by Internet browsing (7% of mobile users) and e-mail (5%), while the rest are practiced by less than 5% of users. Age differences are now more pronounced, as youth double the average regarding some services (for instance, 41% photo or video sending, or 13% Internet browsing) while seniors hardly show users in the 55-64 cohort,

² For instance, in Catalonia 66% of children between 10 and 15 years old had a mobile phone in 2008. Source: INE (2008).

³ Despite the low values of these figures, we were not able to find other international sources to compare them in an appropriate way. For instance, 22% of mobile users in the USA access the Internet (Pew Research Center, 2009; data referred to population aged 18 and over). In this case, the question did not refer to the previous three months but asked if the user had ever accessed the Internet through their mobile phone.

with a notable exception being the 7% of mobile users that send photos or videos, and almost no users in the 65-74 cohort.

Scandinavian countries lead in the adoption of mobile phones by the elderly

Once the average situation in the European Union has been briefly described the next issue that arises is: Can we identify any country specificity regarding the level of mobile telephony use among the elderly population? To answer this question we performed a cluster analysis that included all the country-level data available from the household survey we employed, which includes 30 countries (Eurostat, 2010; see Table A.1 in the Annex). We considered two variables: share of mobile users in the 55-64 and 65-74 age cohorts. Both are quantitative variables with similar range width, so there is no need to standardize the data. The selected method is average linkage between groups, with squared Euclidean distance as distance measure. The resulting dendrogram helped to identify four clusters.

Table 4. Mobile subscriptions and percentage of mobile users in the indicated age cohort. 30 European countries, year 2008.

Age cohort	Subscriptions per 100 hab. [^]	All 16-74*	Seniors 55-64*	Seniors 65-74*
Cluster 1: markedly over the average N= 5 countries	122.2	96.6	94.6	86.6
Cluster 2: over the average N= 11 countries	131.3	91.5	486.3	71.3
Cluster 3: below the average N= 8 countries	113.7	87.5	78.1	56.3
Cluster 4: markedly below the average N = 6 countries	124.6	78.7	62.5	35.0
Total sample N = 30 countries	123.7	88.7	80.7	62.5

Reported figures are simple averages in each group.

Statistical significant differences between groups at 1% level: *; at 5% level: **; at 10% level: ***. ^: Differences are not statistical significant at usual levels.

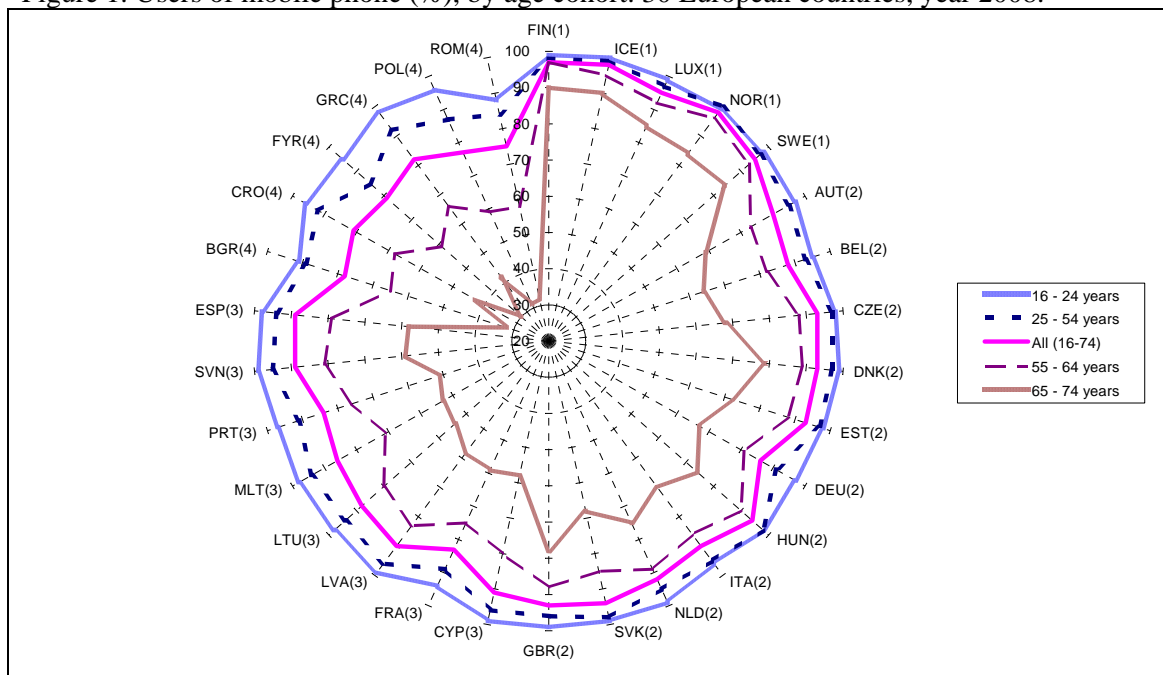
See Table A.1 for country-level detailed data and sources.

The first cluster brings together the European societies in which senior citizens show higher use of mobile telephony and is mainly comprised of Scandinavian countries: Finland, Iceland, Luxembourg, Norway and Sweden. They have an average of 94.6% mobile users among younger seniors (55-64) and 86.6% among older seniors (65-74). Table 4 shows that the cluster also stays markedly over the average in terms of the whole population, which reaches 96.6% in cluster 1, above the 88.7% of the total sample. Cluster 2 shows values above the total sample average, with 86.3% of users in

the 55-64 cohort and 71.3% in the 65-74 cohort. This cluster includes 11 countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Germany, Hungary, Italy, The Netherlands, Slovakia and United Kingdom). In terms of the whole population, cluster 2 is the second one in terms of diffusion (91.5% users).

Cluster 3, on the other hand, is below the sample average but close to it, with 78.1% users among young seniors and 56.3% among older seniors. The eight countries in the cluster are Cyprus, France, Latvia, Lithuania, Malta, Portugal, Slovenia and Spain, and the average of mobile users in the whole population is 87.5%. Finally, cluster 4 is markedly below the average with 62.5% users in the 55-64 cohort and just one third (35.0%) in the 65-75 cohort. Its six countries (Bulgaria, Croatia, Former Yugoslav Republic of Macedonia, Greece, Poland and Romania) have an average share of 78.7% users in the whole population.

Figure 1. Users of mobile phone (%), by age cohort. 30 European countries, year 2008.



In parenthesis: assigned cluster.
See Table A.1 for data and sources.

These results evidence that the higher the average diffusion of mobile telephony at an individual level, the higher it is among the elderly population. Cluster 1 has almost reached a situation of saturation, and this is the path followed by seniors despite the fact that the most aged in the sample (65-74 years old) still show notable differences compared to the young senior cohort (55-64). These differences increase when diffusion

drops, as can be seen in cluster 4. Moreover, Figure 1 shows that youth (16-24) and adults (25-54) are always above the total population average, while seniors (55-64 and 65-74) are always below it.

However, penetration rates do not shape the same general trend described for mobile users. On the contrary, Cluster 1 ranks below the total sample average (122.2 *vis-à-vis* 123.7 mobile subscriptions per 100 inhabitants) and has lower penetration than cluster 4 (124.6, see Table 4). Therefore, we can state that penetration rates are not good predictors of effective individual access despite the fact that in a couple of years it seems that throughout Europe every person between 16 and 75 years old will use a mobile phone.

Table 5. Use of mobile phone advanced services in the previous 3 months, percentage of individuals. European countries, by cluster. Year 2008.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	All
Sending (photos, video...)**	28.6	18.7	18.6	16.3	19.9
55-64 years old*	15.4	6.6	4.9	3.0	7.0
65-74 years old*	8.3	2.9	1.1	0.3	2.8
Internet browsing*	14.8	5.9	7.5	3.7	7.4
55-64 years old*	6.0	1.9	0.7	0.3	2.1
65-74 years old***	1.0	0.4	0.0	0.0	0.3
e-mail*	10.2	5.8	5.6	3.5	6.0
55-64 years old*	6.8	3.3	2.0	1.0	3.1
65-74 years old**	2.8	1.1	0.5	0.0	1.1
Uploading (photos, video...)^	4.0	5.3	5.6	4.0	4.9
55-64 years old**	2.5	1.7	0.7	1.0	1.4
65-74 years old**	1.0	0.6	0.0	0.0	0.4
Receiving subscription-paid information (news, weather forecast, sports results...)^	5.4	2.9	4.1	2.5	3.6
55-64 years old^	3.0	1.4	1.0	1.0	1.5
65-74 years old^	0.8	0.4	0.6	0.3	0.5
Personal navigation, use of location-aware services (receiving nearby travel, shopping and event information)*	9.2	2.4	1.9	1.4	3.3
55-64 years old*	4.0	1.1	0.3	0.3	1.5
65-74 years old**	1.0	0.1	0.2	0.0	0.3
Watching/downloading TV or video^	1.8	1.0	1.4	1.0	1.3
55-64 years old*	1.0	0.1	0.2	0.0	0.3
65-74 years old^	0.3	0.2	0.0	0.0	0.1
Payments (instead of credit card or cash)*	5.4	2.1	1.4	2.3	2.6
55-64 years old*	2.8	1.0	0.0	0.5	0.9
65-74 years old^	0.5	0.3	0.0	0.0	0.2

Source: Eurostat (2010).

Reported figures are simple averages in each group.

Statistical significant differences between groups at 1% level: *; at 5% level: **; at 10% level: ***.

^: Differences are not statistical significant at usual levels.

The analysis of the use of advanced mobile services captures these differences as well (see Table 5). Cluster 1 ranks first among the two cohorts of senior population, always clearly above the sample average. However, for the whole population (16-74 years), uploading photos or videos to Internet is the only service that is not over the average in cluster 1. On the opposite extreme we find that cluster 4 lies below the average with lower levels of users in all service categories, especially among the senior population. Cluster 2 usually ranks higher than cluster 3 with values closer to the sample average. Finally, in each of the four clusters the use of advanced services markedly decreases among the senior population.

We can conclude that the four clusters, exclusively built on data of elderly users, are associated with the diffusion in different age cohorts and in the whole population under study. In consequence, we can state that identified clusters are homogeneous and provide information on the situation at a country level.

The reach of the present analysis, however, is conditioned by two limitations. First, Eurostat individual statistics on advanced mobile uses is based on research that covers only one year, therefore only cross-section analysis is possible. Furthermore, 74 years old is set as the standard upper limit, so there is a lack of information regarding the oldest European population, which prevents us from obtaining more in-depth knowledge of the issue under study.

4. Conclusion

Three main issues arise from the analysis of Eurostat data on mobile adoption and use by individuals aged between 16 and 74. First, elderly people can be considered to be the last adopters of mobile telephony in aggregate terms, while they are likely to become users. Young seniors (55-64 years old) show a faster path adoption than older seniors (65-74 years old). They always constitute the age group in which penetration is lower but seem to reach saturation (that is, almost all of the individuals are mobile users) once the younger cohorts do. Therefore, in countries where diffusion is comparatively lower in average (below 80% of users), senior mobile users have a smaller presence (around 30% in the 65-74 cohort, and around 65% in the 55-64 age group). In those countries

where an average of 95% of the population are mobile users, diffusion in the 65-74 cohort is above 80%, and above 90% in the case of the 55-64 group. This is confirmed as well by the cluster analysis.

Second, the three most popular advanced mobile services in Europe are sending pictures or videos, Internet browsing and e-mail. However, their use remains low and shows a high correlation with mobile use rate. In such context, senior mobile users show distinctly lower percentages of advanced services use. And lastly, penetration of mobile telephony, the indicator that accounts for the active mobile subscriptions per 100 inhabitants, is not associated with the percentage of users among individuals and, therefore, is not a valid predictor of the effective importance of mobile telephony among different age segments.

In analytical terms, taking into account the obtained results together with the works discussed above, we can state the following hypothesis: Within the personal system of communication channels of the European elderly population, the mobile telephone occupies a peripheral position.

The personal system of communication channels can be defined as the set of media – devices or services, as fixed and mobile telephony, computer, or Internet; that each person would identify as being part of their everyday life. The set of media is framed by individual attitudes and aptitudes, as well as by personal interests and socially imposed interests (pressures). While among teenagers the mobile telephone plays a central role, for the elderly population this is not the case. The senior population is quite likely to dispose of a fixed line at home, which would occupy a central position in the system. Adults having a fixed line at home would prefer it to a mobile phone as the cost of communication is less. Cost, in this case, should be considered in two facets: monetary cost, and cost of use. Regarding monetary cost, we have seen that elderly persons only call with a mobile phone when it is necessary (emergencies or last minute coordination) or when calling another mobile phone. Regarding cost of use, we have seen that ergonomics is important and fixed phones tend to be more user-friendly for elderly people than mobile devices, in part because seniors are more accustomed to the former.

The peripheral situation of mobile telephony would justify, as well, the higher rates of prepaid billing among the elderly population. Mobiles tend to be introduced for safety/security reasons but they do not tend to be used extensively but only on limited occasions, as an extra layer in the communication system that is perceived as a distant device. Thus, it seems that there is not an economic reason for changing to postpaid billing, as younger users do once the budget devoted to mobile telephony increases.

All in all, interactions through and with mobile phones among the elderly population in Europe show a different pattern than other age cohorts due to the peripheral position that the mobile telephone has in the personal system of communication channels.

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Annex

Table A.1. Penetration of mobile telephony and users of mobile telephony by age cohort. 30 European countries, classified by cluster. Year 2008.

Cluster	Country	Penetration	Users (% in each age cohort)				
		Subscript. per 100 hab.	All pop. 16 - 74	Youth 16 - 24	Adults 25 - 54	Senior 55 - 64 65 - 74	
1	Finland (FIN)	128,76	97	99	98	97	90
1	Iceland (ICE)	106,80	98	100	99	95	90
1	Luxembourg (LUX)	147,11	95	99	97	92	85
1	Norway (NOR)	110,16	98	99	100	96	84
1	Sweden (SWE)	118,33	95	98	97	93	84
2	Austria (AUT)	129,73	90	97	95	83	69
2	Belgium (BEL)	111,63	88	95	93	82	64
2	Czech Republic (CZE)	133,54	93	98	97	88	68
2	Denmark (DNK)	125,72	93	99	97	89	79
2	Estonia (EST)	188,2	93	98	97	88	72
2	Germany (DEU)	128,27	86	97	91	81	67
2	Hungary (HUN)	122,09	94	98	98	90	74
2	Italy (ITA)	151,57	90	96	95	86	70
2	Netherlands (NLD)	124,8	92	99	95	89	75
2	Slovakia (SVK)	102,23	94	99	98	85	68
2	United Kingdom (GBR)	126,34	93	99	96	88	78
3	Cyprus (CYP)	117,89	91	99	96	80	58
3	France (FRA)	93,45	83	94	89	75	59
3	Latvia (LVA)	98,90	90	99	96	83	58
3	Lithuania (LTU)	151,24	88	98	94	80	54
3	Malta (MLT)	94,64	86	98	94	71	53
3	Portugal (PRT)	139,64	84	97	91	76	51
3	Slovenia (SVN)	101,97	89	99	95	81	59
3	Spain (ESP)	111,67	89	98	94	79	58
4	Bulgaria (BRG)	138,3	78	91	89	65	32
4	Croatia (CRO)	132,95	81	96	92	68	43
4	Former Yugoslav Republic of Macedonia (FYR)	122,56	79	95	85	59	30
4	Greece (GRC)	123,90	82	98	92	66	42
4	Poland (POL)	115,28	77	96	87	59	31
4	Romania (ROM)	114,54	75	88	84	58	32

Sources: ITU (2010) for penetration data; and Eurostat (2010) for data on users by age cohort.