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CONSUMPTION RESEARCH NORWAY (SIFO)

Smart technologies in connected homes – A 2019 Norwegian consumer survey

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OSLO METROPOLITAN UNIVERSITY
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Summary

This report presents the results of a national representative survey, conducted in Norway, which focuses on consumers' access to smart/connected products/systems at home. The survey also explores consumers' experiences with these products and their opinions about the smart/connected future

Keywords

Smart homes, connected products, Internet of things, IoT, consumers

Preface

This report is part of the RELINK project, financed by the Norwegian Research Council. In the report, we go through a preliminary national survey conducted in Norway, mapping smart/connected products and systems in Norwegian homes, in addition to consumers' experiences and opinions about smart/connected products and the Internet of things (IoT). The project is managed by Consumption Research Norway (SIFO) at OsloMet (Oslo Metropolitan University).

Oslo, December 2019

Consumption Research Norway (SIFO)

OsloMet – Oslo Metropolitan University

Content

Introduction

This report aims to map smart/connected home products in Norwegian households. The data stems from a representative survey conducted among Norwegian consumers in May 2019. The study is part of the SIFO-led research project RELINK[1], financed by the Norwegian Research Council under the IKTPLUSS-programme. RELINK aims to develop frameworks, tools and scenarios that address current and future risks and safety issues related to the Internet of Things (IoT) in connected households.

In 2007 SIFO started addressing how consumer objects in the mass market were being "tagged" with communicating chips by producers, service-providers and retailers. RFID- and NFC-tags were becoming popular, and this technology set the stage for the later development of the concept IoT (Slettemeås 2009, Storm-Mathisen 2014, Slettemeås et al. 2014). It is now increasingly more common that products in the mass market have computing and communicating capabilities *integrated* in them, rather than being *tagged* on them (Slettemeås et al. 2017, Kjørstad et al. 2017).

Today, then, digitalization, big data and IoT are turning the home into a "hub" for digital activities and services. This constitutes households as a central link in the chain of digital value creation and vulnerabilities in society. Responsibility for digital maintenance, security routines and for building the competence required to evaluate and handle various security and privacy risks, are largely given to consumers who live everyday lives in increasingly smart/connected homes. But, digital risk evaluation and management is a complex matter and presently there is a lack of awareness and adequate tools and resources that can support households in such tasks. Consumers and households are therefore often considered to be the "weak link" in the digital chain. The RELINK project will build knowledge about digital vulnerabilities in households and develop awareness and tools that can support households in making everyday digital risk evaluations. The ambition is to contribute to a future where households are "re-linked" and where vulnerabilities in the digital chain are reduced.

1.1 Background

This survey provides and early glimpse of what types of smart/connected products Norwegian consumers avail themselves of in their homes, their experiences with these products, and their opinions about the opportunities and challenges of smart/connected products – and future prospects. At a later stage, when the RELINK-project has gained more insight into how Norwegian households deal with smart/connected products, a new survey will be conducted.

In addition to mapping the number of things and connections in Norwegian homes, the study explores how consumers (that have access to smart/connected products) feel they master this technology, how safe/secure they feel when using such technology, how useful it is perceived to be in everyday life, and whether consumers have a sense

[1] Ref: https://blogg.hioa.no/relink

of control or overview of their products. In addition, the study explores whether consumers feel that increased connectedness leads to an augmented sense of vulnerability and dependency, and whether they feel they lack tools or relevant competence to deal with their smart/connected products in everyday life.

We also look more generally at this development, to see if consumers find the smart/IoT-development sensible, what they believe the primary drivers for this development are, and their general readiness to participate in the coming smart/connected future.

1.2 Data and method

The study reported here is based on a nationwide representative survey conducted by Norstat. The web-survey was performed in the period from May 13 to May 31, 2019. Respondents were recruited from a probability panel and were invited throughout the active period, with more invitations in the beginning. Respondents were drawn randomly from the panel, with quotas to ensure national representativity. A total of 1001 respondents answered the questions and the age range was from 18 to 80 years.

2. Technology access

To begin with, the survey provides an overview of “traditional” digital devices with internet-connection that Norwegian consumers have access to in their homes. Norway is in the “global lead” when it comes to Internet-connectedness and access to digital devices. This will naturally affect the further adoption of Internet of things (IoT) devices, as most of the population already are familiar with being “constantly” connected.

2.1 Access to internet-connected devices at home

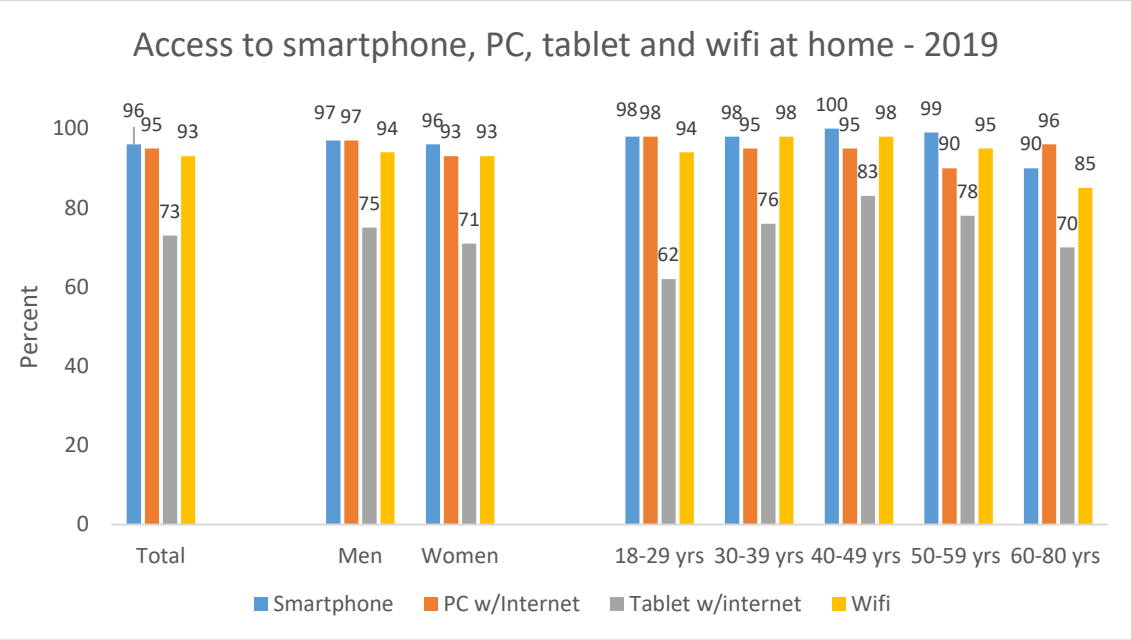

Figure 2-1: Question – do you have access to the following technologies in your household? Among all respondents. Total, and by gender and age. Percentages, 2019 (N=1001).

In the figure, we see that most Norwegians have internet access through several devices. A total of 96% of the respondents have smartphones (with internet), 95% have computers (with internet), and 73% have tablets (with internet). We also see that 93% have Wi-Fi in their homes, which is central for connecting most IoT-devices at home to the internet.

There are no clear gender differences in access to any of these connected devices. For age, we see that all age groups have a high access rate to smartphones (slightly lower for the 60-80 years age group). Also, Wi-Fi connectivity is somewhat lower in this latter group. On the other hand, we see that tablet access is lower among the youngest group (63%), while it is the highest among the 40-49 years old (83%).

2.2 Access to smart/connected systems/products at home

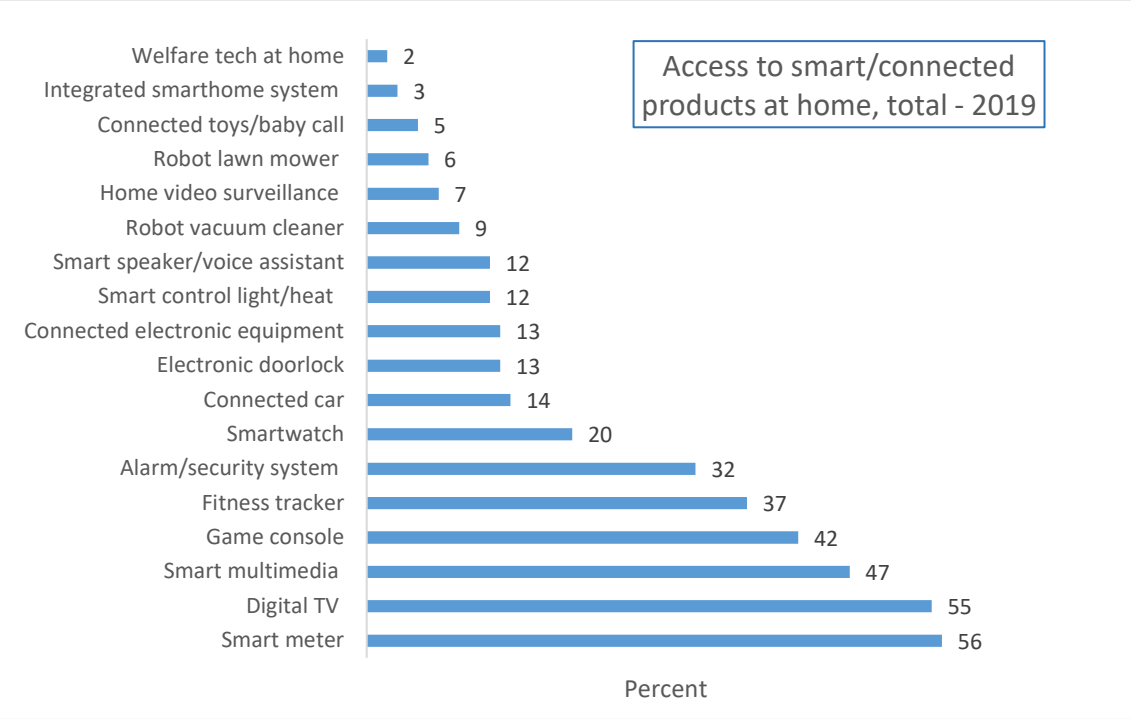

Figure 2-2: Question – do you have access to the following connected products or systems in your household? Among all respondents. Percentages, 2019 (N=1001)

In the figure above, we present an overview of connected products that Norwegian consumers claim to have access to in their homes. In the questionnaire we separated the questions into two; first we asked about access to "systems" and then about access to "single products". However, we found it more convenient to present these all together in the figure above.

If we look at the connected "systems" first, we see that relatively few have access to integrated smart home systems (3%) and to welfare technology at home (2%). However, as many as 32% have access to connected alarm/security systems with link to a staffed central.

When it comes to single connected "products", the first thing to notice is that "only" 56% claim to have access to smart meters at home. The survey was conducted in May 2019, and by the beginning of 2019 all Norwegian household were supposed to have new digital smart meters (AMS) installed. Hence, the accurate answer should be 100% (or more correctly around 97%)[2]. However, although the information provided to households states that the meters are supposed to be "smart", it only sends real time information about electricity consumption automatically to the power company. This information is not accessible to the household/consumer unless the HAN[3]-gate is activated on the meter, and additional "smart" equipment/services are connected to the HAN. Taking this into account, the automatic reading and lack of actual smart

[2] Some have refused to get AMS installed for different reasons

[3] Home Area Network

functionality can partly explain why nearly half of the respondents are unaware of their "smart meter" access at home. Its seems that many consumers do not experience any "smartness" from their smart meters in daily life.

Furthermore, we see that 55% have access to internet-connected digital television, and 47% have access to smart multimedia, while 42% have access to internet-connected game consoles. Next on the list are personal "smart" devices, which we consider in a "household context" in this study, although they are used individually. As many as 37% have fitness trackers and 20% have smartwatches. There are also quite a few that have connected cars (14%) and connected electronic door locks (13%). In terms of typical home automation products, 13% have smart/connected electronic equipment at home, such as fridges or washing machines, while 12% have smart controls for lighting, heating or other functions.

There are also many (12%) that have equipped their homes with voice-controlled smart speakers. When it comes to "robots", 9% have robot vacuum cleaners at home, while 6% have robot lawn mowers. Around 7% have home video surveillance products (that are not part of alarm/security system subscriptions). Finally, around 5% have access to products that are meant for children, either connected baby calls or smart toys.

Examples of smart/connected "systems" were:

- ***Alarm/security system*** *(alarms connected to a staffed central, with e.g. automatic alerts to the central via internet/mobile network, incl. fire alarms, burglar sensors, cameras, etc)*
- ***Integrated smart home system*** *(from a professional supplier, not alarm company)*
- ***Welfare technology system*** *(e.g. safety alarms, fall sensor, medicine dispenser, or other connected products/services with support from municipality or "hjelpemiddelsentral")*

Examples of smart/connected "products" (controlled with digital/mobile devices and/or connected to the internet) were:

- ***Digital TV***
- ***Game console*** *(e.g. Xbox, Playstation, Nintendo)*
- ***Smart multimedia*** *(f.eks Apple TV, Chromecast, Google Nest hub)*
- ***Connected car*** *(with internet, WLAN, etc.)*
- ***Home video surveillance*** *(with transmission via internet/mobile network, not alarm company)*
- ***Smart meter*** *(installed by energy supplier)*
- ***Electronic door lock*** *(with code, chip, app or other for opening/locking, not from alarm company)*
- ***Robot vacuum cleaner*** *(controlled by app or other)*
- ***Robot lawn mower*** *(controlled by app or other)*
- ***Connected toys or baby call*** *(e.g. with wireless access via Bluetooth, app or other)*

- ***Connected electronic equipment*** *(e.g. fridge, washing machine, etc for example using Samsung Family Hub)*
- ***Smart control of lighting/heating*** *(e.g. regulating temperature, lights, sunblinds, turning on/off coffee maker, etc.)*
- ***Smart speaker with voice assistant*** *(e.g. Amazon Echo, Google Home, Apple HomePod, Sonos One)*
- ***Smart watch*** *(for personal use)*
- ***Activity tracker*** *(for personal use, such as heart rate monitor [e.g. Fitbit] that can be connect to the internet/mobile network)*

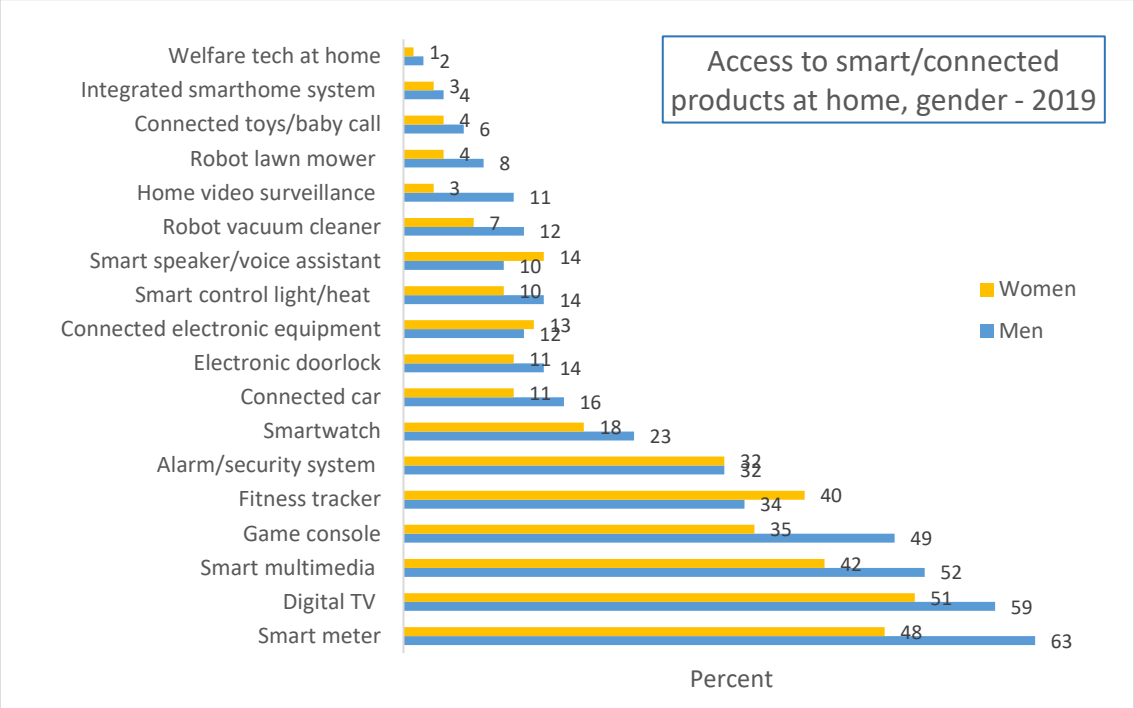

Figure 2-3: Question – do you have access to the following connected products or systems in your household? By gender. Among all respondents. Percentages, 2019 (N=1001)

In the figure above, we look at gender differences. These numbers are indications and can be somewhat misleading if interpreted strictly, in particular when it comes to some of the household technologies. We would expect the percentages to be fairly similar across gender for technologies such as digital TV, and typical domotics that have a collective purpose. Again, the smart meter is an interesting case; the answers should be close to 100% for both men and women, but only 48% of women compared to 63% of men claim to have smart meters at home.

We also see that 59% of men claim to have a digital connected TV compared to 51% for women. For connected game consoles, more men (49%) than women (35%) have such access, which possibly is explained by differences in gaming interest. For personal devices, like smartwatches and fitness trackers, a higher percentage among men (23%) tend to have smartwatches compared to women (18%), while women (40%) are more inclined to have fitness trackers compared to men (34%). Home video surveillance is another interesting category; a higher proportion among men (11%) than among women (3%) claim to have connected surveillance cameras at home.

Table 2-1: Question – do you have access to the following connected products or systems in your household? By age. Among all respondents. Percentage, 2019 (N=1001)

Access to smart/connected products at home, age - 2019	18-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	60-80 yrs
Smart meter	39	53	62	69	58
Digital TV	60	57	62	64	40
Smart multimedia	61	63	54	48	19
Game console	68	53	55	38	6
Fitness tracker	45	44	45	37	19
Alarm/security system	26	29	35	25	41
Smartwatch	29	21	27	22	8
Connected car	16	10	17	16	9
Electronic doorlock	17	14	20	10	6
Connected electronic equipment	20	11	17	9	6
Smart control light/heat	18	13	15	11	4
Smart speaker/voice assistant	14	15	18	9	5
Robot vacuum cleaner	11	14	13	8	4
Home video surveillance	8	10	10	5	4
Robot lawn mower	4	8	8	6	5
Connected toys/baby call	9	12	4	0	0
Integrated smarthome system	4	1	5	2	3
Welfare tech at home	3	1	2	2	2

In the table above, we look at some age differences in the answers. Again, these are just indications, as the number of respondents varies for each category answered. The yellow fields indicate the lowest access rate and green the highest. We see that the oldest group has the lowest access rate for most of the smart/connected products, except for connected alarm/security system, for which they have the highest rate. The youngest group have the highest access rate for game consoles, fitness trackers and smartwatches, as well as smart controls and connected electronic equipment. Interestingly, for smart meters, the “awareness” rate is the lowest among the young; only 39% in the age group 18-29 years know that they have smart meters at home, while this awareness is highest among the 50-59 years old (69%).

3. Experience with own smart technology

In this chapter, we address how consumers perceive the relationship to smart/ connected products based on their own experiences with them. Hence, we only address those that actually have access to such products. We look at how they feel they master the products they presently engage with, if they feel the products are safe to use, and whether the products are perceived to be useful in everyday life. We also look at whether consumers feel that engagement with IoT-products leads to a sense of vulnerability or dependency, and if they have control/overview over their products and services. Finally, we ask if consumers feel they need more knowledge, support or tools to deal with the IoT-products they presently have at home.

3.1 Mastering of smart/connected products

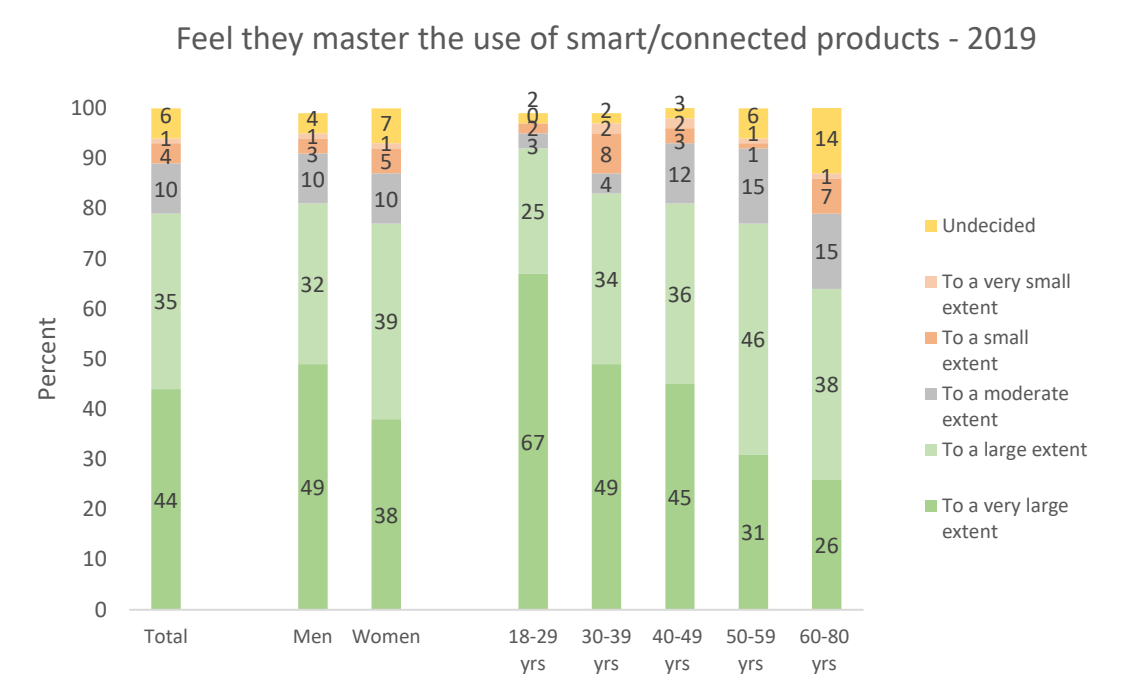

Figure 3-1: Question – to what extent would you say that you master the use of the smart/ connected products/ systems at home? (Not PC, tablet or smartphone). Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

The figure indicates that most Norwegian consumers feel they master their own connected products at home (PC, tablet and smartphone excluded). Almost 8 out of 10 (79%) feel that the master their home products to a large or very large extent.

There seems to be a slight gender difference, where more men (49%) than women (38%) claim to master home-IoTs to a “very large extent”. As for most surveys that address digital competence, we see an age distinction. Although the rate of perceived mastery is fairly high for all age groups, it is highest among the young and the rate drops with age. While 92% of 18-29 years old feel they master home-IoTs to a large/very large extent, “only” 64% of 60-80 years old feel the same.

3.2 Safety of smart/connected products

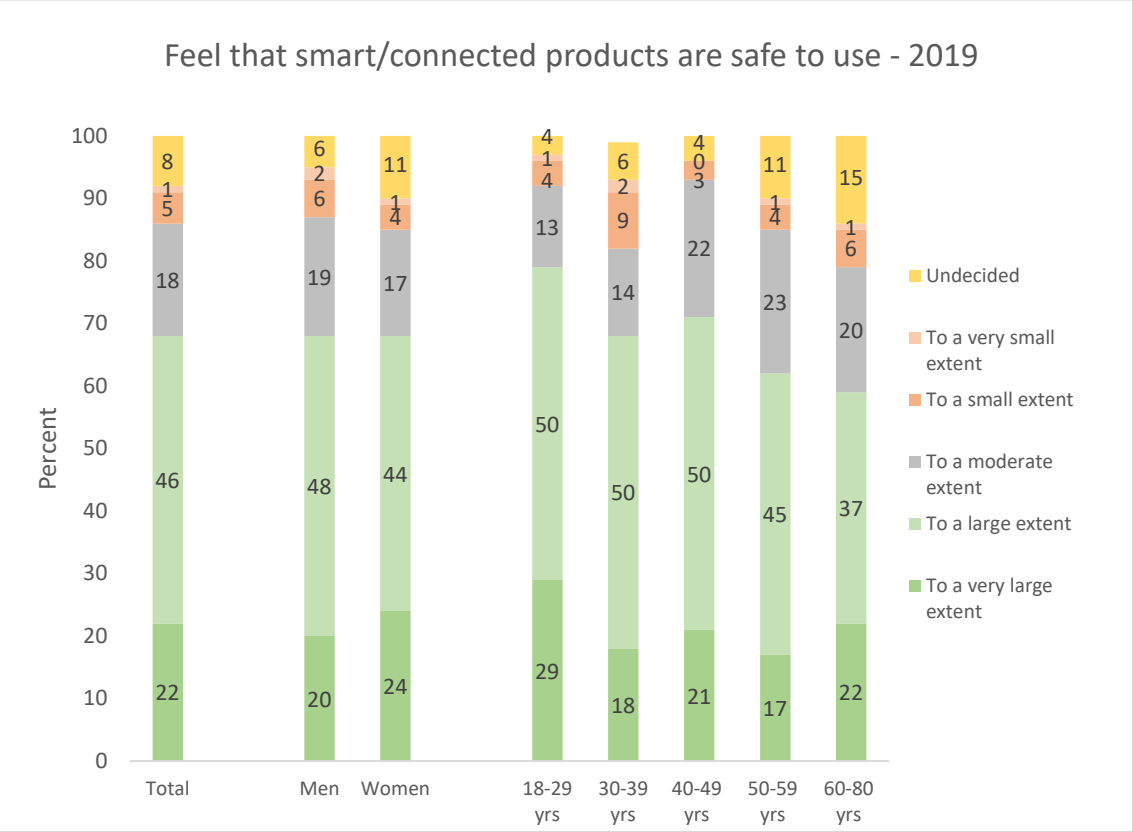

Figure 3-2: Question – to what extent would you say that you experience connected products/systems at home to be safe to use? (e.g. in terms of security, hacking, surveillance, viruses, privacy, etc). Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

In the figure above, we see that most consumers feel that their smart/connected products are safe to use on a general basis. Close to 7 out of 10 (68%) feel that connected home product are safe to use to a large/very large extent.

There are no gender differences, while the percentages indicate that the younger to a larger extent than the older population experience smart products to be safe (79% among 18-29 years old, 59% among 60-80 years old).

3.3 Usefulness of smart/connected products

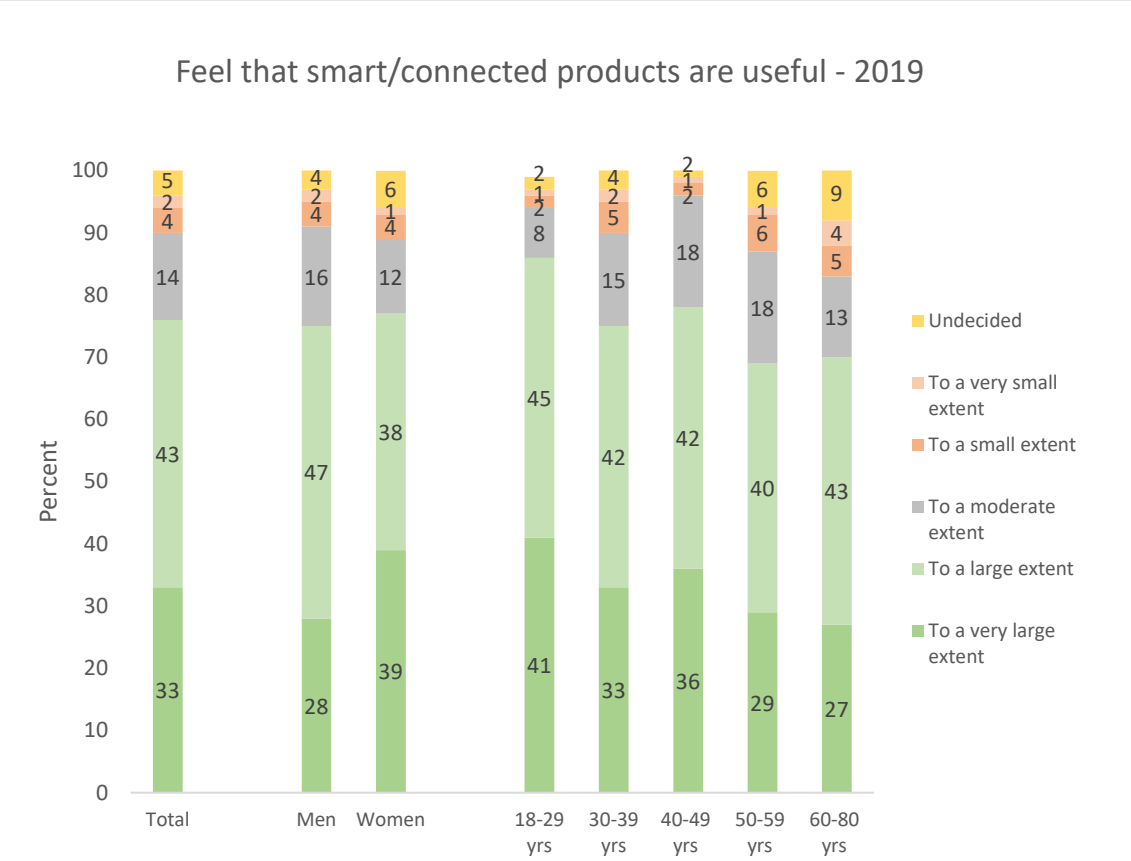

Figure 3-3: Question – to what extent would you say that the connected products/systems at home are useful in your everyday life? Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

In terms of perceived usefulness, it seems from the figure above that most consumers engage with smart/connected products that provide some kind of meaningful function to them in their daily lives. On a general basis, 76% of home-IoT users say that their connected products are useful.

If we look at gender, there are few differences. However, it seems that a larger proportion among women (39%) find home-IoTs useful “to a very large extent” compared to men (28%). Perceived usefulness seems to drop slightly with increased age, and the youngest group have the highest rate of satisfied users.

3.4 Vulnerability and dependency of smart/connected products

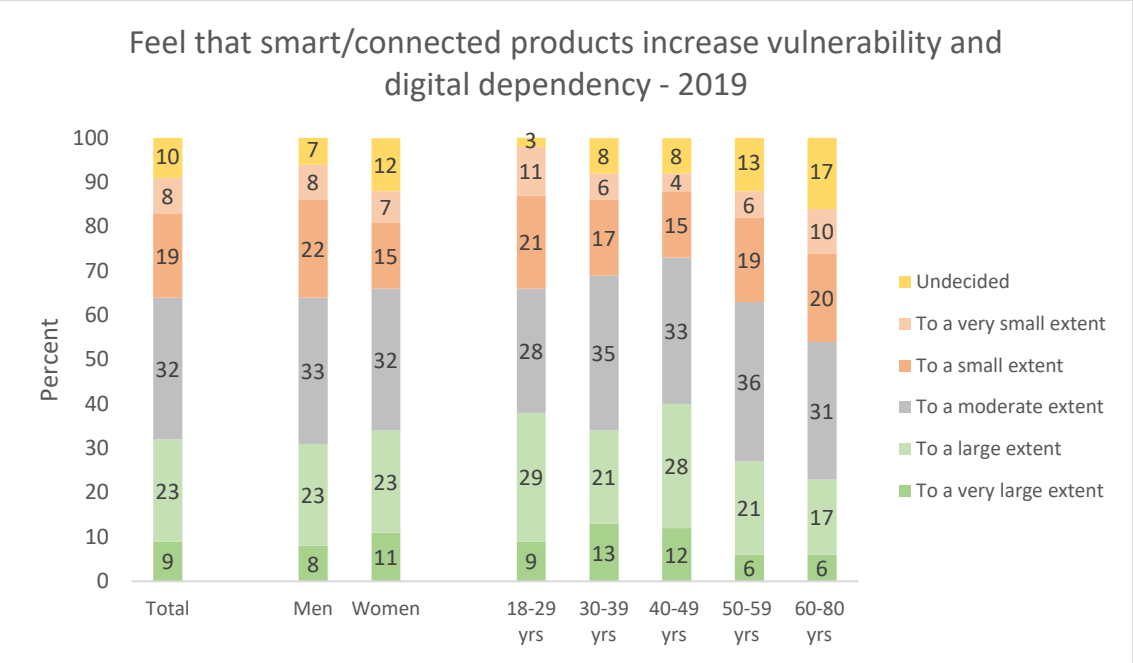

Figure 3-4: Question - to what extent would you say that connected products make you/your household more vulnerable and digitally dependent, as you are constantly connected to the internet through a range of products/services? Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

In the figure above, we try to get a sense of how consumers feel in terms of general vulnerability and dependency on digital products/services. We see that, in general, around one third (32%) feel a sense of vulnerability/dependency to a large/very large extent, while an equal proportion (32%) feel the same to a moderate extent. There is also quite a few (27%) that only feel vulnerable/dependent to a small/very small extent, while 10% are undecided.

There is no clear gender difference here, while for age there are indications of difference. Actually, it is the two oldest age groups that feel the least vulnerable compared to the younger ones. In the age group 60-80 years, “only” 23% feel vulnerable/dependable to a large/very large extent, while for the youngest group, 38% feel vulnerable/dependable to a large/very large extent. This could be explained by the fact that the elderly have fewer digital devices and connections compared to the younger ones, and in general are less online than the young, and hence find this situation more manageable. This concurs with Berg (2015) who finds that elderly are less digitally vulnerable because they are less on the internet.

3.5 Control and overview of smart/connected products

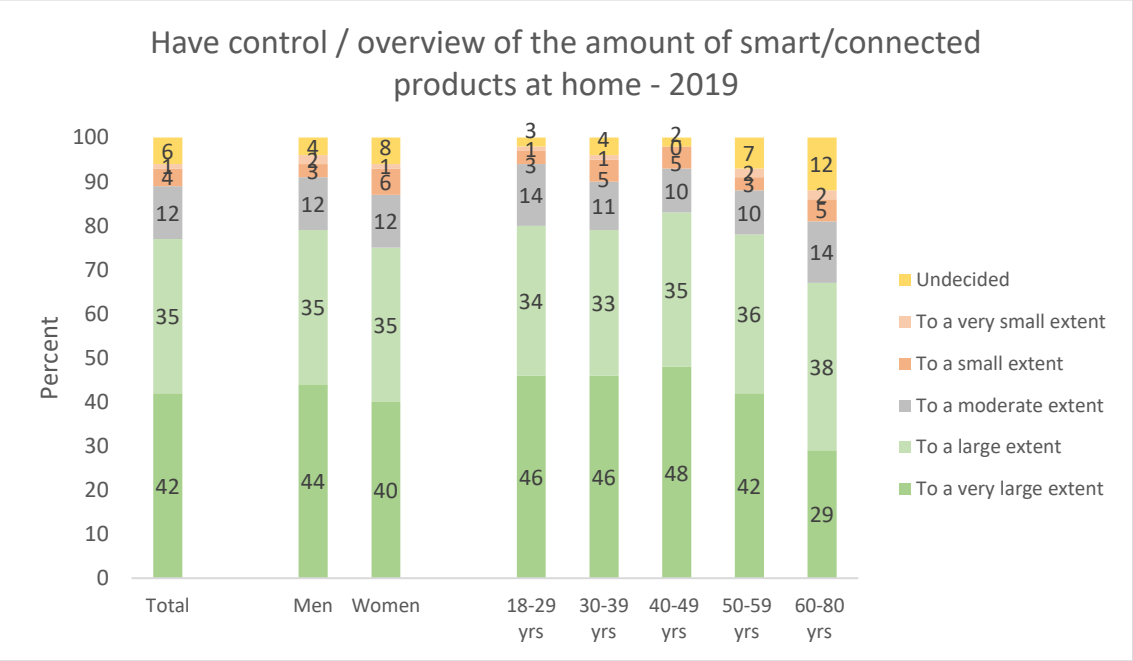

Figure 3-5: Question – to what extent would you say that you have control and overview of the amount of connected products/systems at home? Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

Above, we address the sense of control and overview that consumers feel they have in terms of the amount of smart/ connected products at home. In general, it seems that people presently feel they have control over their IoT-products – 77% claim this to a large/very large extent.

There is no clear gender or age differences, even though the oldest group (60-80 years) have a slightly lower proportion of respondents than other groups with a very large extent of control (29%).

3.6 Knowledge and tools to manage smart/connected products

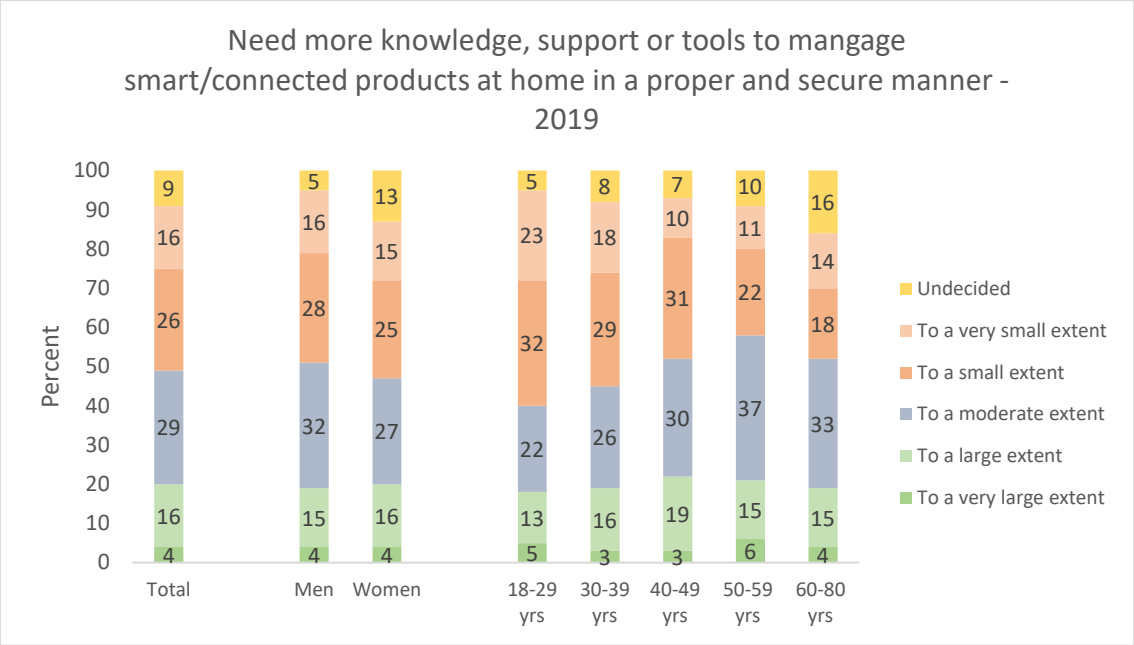

Figure 3-6: Question - to what extent would you say that you need more knowledge, support or tools to manage the connected products/systems you have at home in a secure manner? Among those with connected products. Total, and by gender and age. Percentages, 2019 (N=911).

Finally, we wanted the owners of home-IoT products to evaluate whether they, on a general basis, felt they needed more knowledge, tools or support to manage their connected products in a safe manner. From the figure, we see that most IoT-consumers are satisfied with their present level of awareness – “only” 20% feel they need more support to a large/very large extent, while 29% feel this to a moderate extent. More than 4 out of 10 (42%) feel that they need additional competence to a small/very small extent.

Again, there are neither any clear gender nor age differences. We see that the youngest, however, feel they need little assistance; 55% of the 18-29 years old claim that they need extra support to a small/very small extent.

4. Opinions of the development of the smart society and the Internet of things

In this chapter we go back to all respondent, also those that do not have any home-IoTs (even though "all" should be connected by smart meters, and most of the respondents also have access to connected PCs, tablets and smartphones). We wanted their opinion on the present development of the Internet of things (IoT) and the "smart" society, and how well equipped they feel in terms of future participation in a society where homes are becoming smart and fully connected.

4.1 Development where things and homes become smart and connected

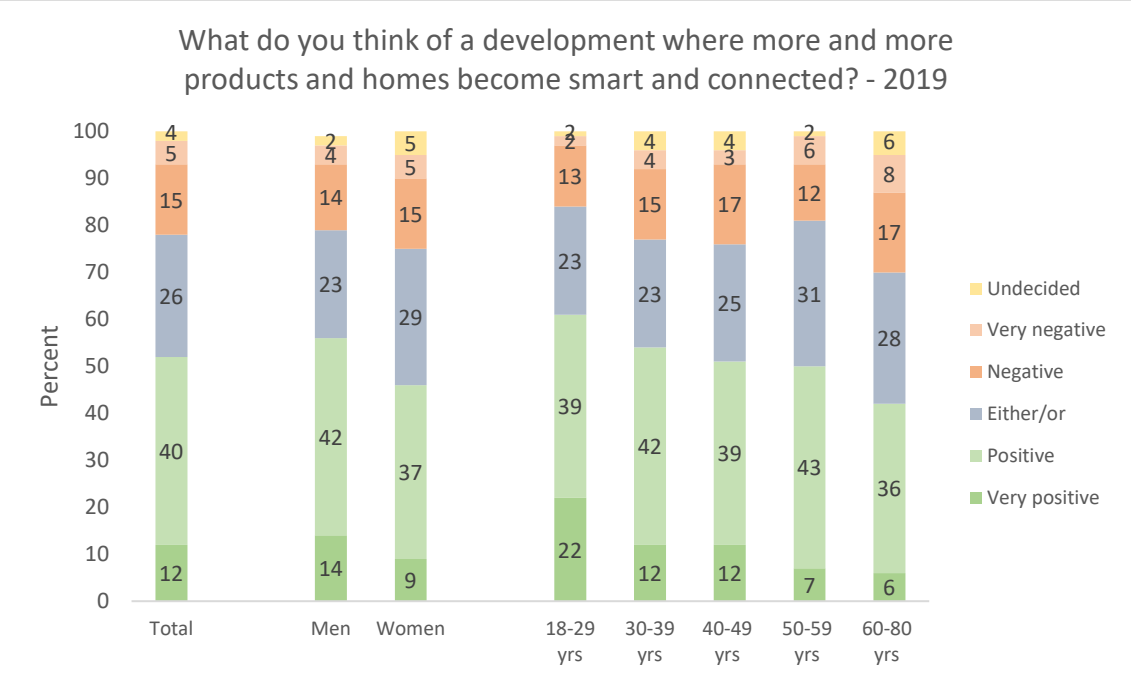

Figure 4-1: Question – what do you think of a development where ordinary products and homes become more and more connected (to the internet) and "smart" (more autonomous)? Among all. Total, and by gender and age. Percentages, 2019 (N=1001).

In the figure above, we see that around half of the respondents (52%) are positive (12% very positive) to a development where ordinary products and homes become smarter and more connected. On the other hand, 20% are negative to this development, while 26% say either/or, while 4% are undecided[4].

In terms of gender, men seem to be slightly more positive (56%) than women (46%), while the younger generation are more favorable to this development than the elderly.

[4] Rounded percentages

Among the 18-29 years old, 61% are positive (22% very positive), while only 42% among the 60-80 years old are positive (6% very positive).

4.2 Sensibility of ordinary products becoming smart and connected

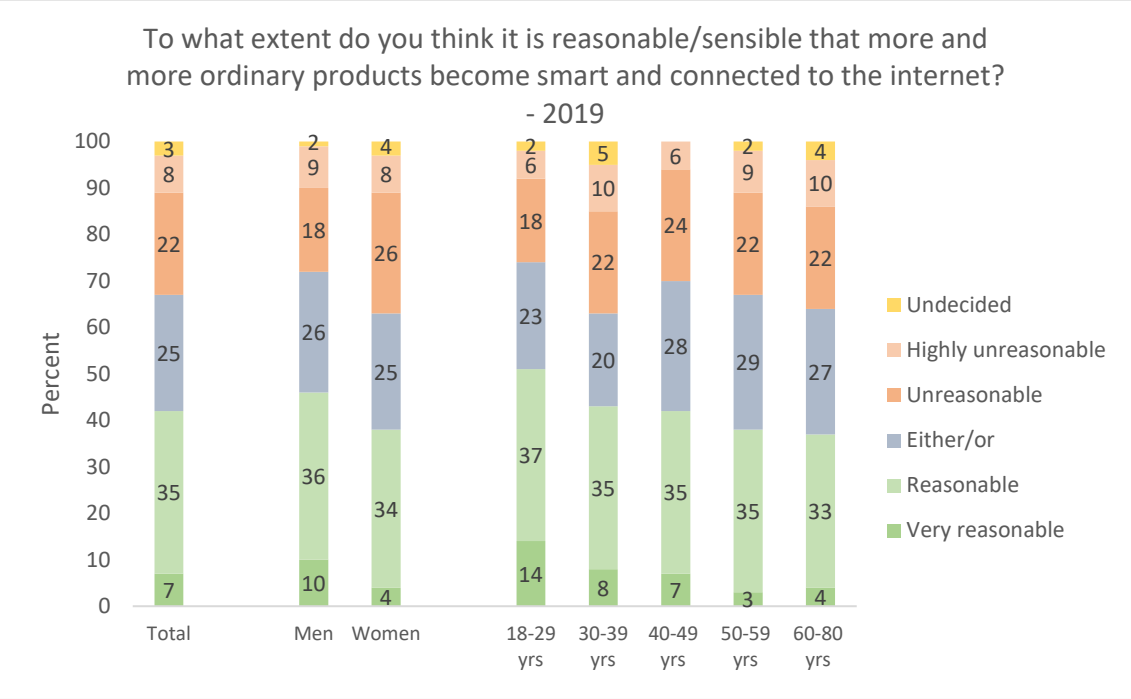

Figure 4-2: Question – to what extent do you find it reasonable/sensible (fornuftig) that more and more "regular" products become smart and connected to the internet. Among all. Total, and by gender and age. Percentage, 2019 (N=1001).

Above, we seek to find out whether consumers find it sensible that more products, also regular products that previously were not smart or connected, now become so. There are still more respondents that find this to be a reasonable/sensible development (42%) compared to those that find it unreasonable/unsensible (30%). In addition, 25% answer either/or, while 3% are undecided.

There is a slight gender difference, where 46% among men find this development reasonable/sensible, compared to 38% among women. Again, there is an age difference. The younger tend to find the increased tendency of dumb products becoming smart a reasonable thing, compared to the older generation (51% among 18-29 years old find it reasonable/very reasonable, compared to 37% among 60-80 years old).

4.3 Primary drivers of the smart/connected development

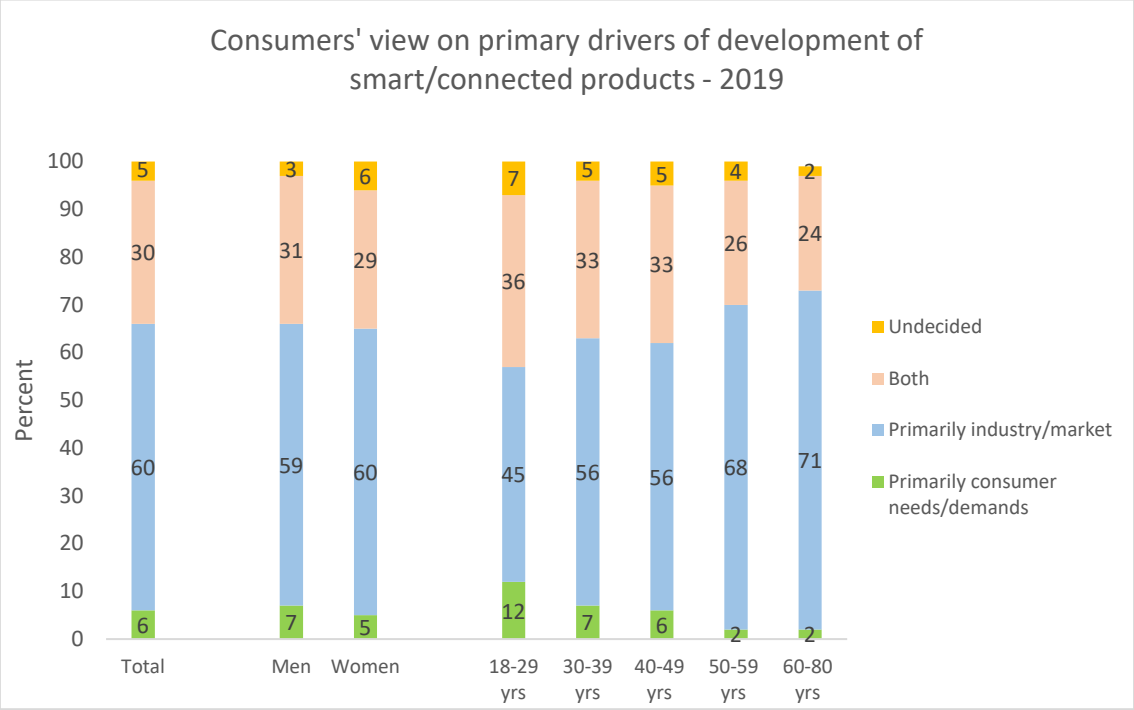

Figure 4-3: Question – Do you believe that the development of smart/connected products and services (i.e. the Internet of things) is primarily driven by consumer demands or by the industry? Among all. Total, and by gender and age. Percentage, 2019 (N=1001).

We often hear that new products supplied to the market are driven by consumer demand. We wanted to check with consumers themselves what they thought where the primary drivers of mass market IoT-products. From the figure above, we see that most consumers (60%) believe that this development is primarily driven by the industry. There are quite a few that state both consumer and the industry as primary drivers (30%), while only 6% see consumers as the primary drivers of this development.

There are no gender differences here, but we see that age differentiates. While “only” 45% of the youngest (18-29 years old) see the industry as the primary driver of development, as many as 71% among the oldest (60-80 years) claim the industry to be the primary driver. For the youngest group, there is a total of 48% that consider consumers to be somewhat involved in IoT development. This could be explained by a generational effect, as the younger generation are considered to be “digital natives”. They only have experience with a life that includes the social, participatory and collaborative internet (web 2.0 and web 3.0).

4.4 Readiness to participate in a smart/connected world

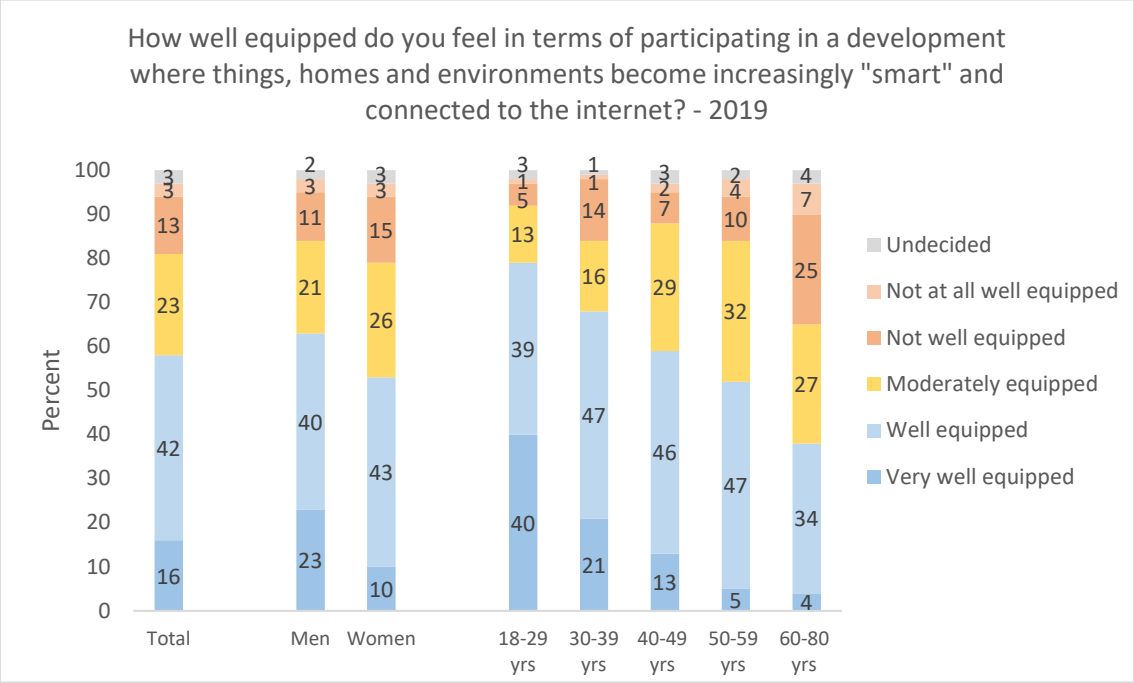

Figure 4-4: Question – to what degree do you feel equipped to participate in a development where things, homes and environments gradually become "smarter" and more connected to the internet? Among all. Total, and by gender and age. Percentage, 2019 (N=1001).

Finally, we wanted to know how well equipped Norwegian consumers feel in terms of participating in a world where things, homes and environments gradually become "smarter" and more connected to the internet. The question looks similar to the one in the previous chapter, but there we only asked people with IoT-things at home – and their present-day evaluation. Here, we ask all respondents and attempt to make them evaluate their future IoT-readiness.

From the figure above, we see that most consumers feel well equipped to participate in an increasingly smart/connected society. Almost 6 out of 10 feel well/very well equipped, 23% moderately equipped, while 16% feel do not feel well equipped. Around 3% are undecided.

If we look at gender, there are some differences. A higher percentage among men (63%) than among women (53%) feel competent enough to participate in the IoT-society. There are also 23% among men who feel "very well" equipped to paritcipate. For age, the differences are even more prominent. The sense of competence is reduced with increasing age; 79% among 18-29 years old feel well/very well equipped to participate in a smart/connected society, compared to 68% for the 30-39 years old, 59% for the 40-49 years old, 52% for the 50-59 years old, and finally 38% for the 60-80 years old. If we compare those that feel "very well" equipped, they account for 40% in the youngest group and only 4% in the oldest group. In the latter age group, 32% do not feel well equipped to participate in this development.

5. Perception of smart home TV-commercials

As part of the preliminary work of the RELINK project, we also wanted to check the public perception of some mass-mediated commercials focusing on “smart homes”. In 2019, there have been two prominent TV commercials addressing the smart home. The first commercial is by a major grocery chain, REMA 1000. In short, the commercial has a funny twist to a smart house that does not work as anticipated for the dweller, an apparently tech-savvy man. It focuses on voice recognition and how commands can be misinterpreted by the “smart” home, and the main slogan of the grocery chain is to keep things simple. The second commercial is by Telenor, a major telecom company. The commercial portrays an elderly woman in a home-cozy environment, with smart technology aiding her in everyday situations. Telenor is a supplier of smart home connectivity and products.

The two commercials represent a “positive” and a “negative” portrayal of the smart home, and we wanted to check how Norwegian consumers perceived these. In the survey, we first selected those that had actually seen the commercials before we went on asking about their perceptions of them:

“Lately, two commercial videos have been shown on national television portraying “smart” homes. One of them, by Telenor, concerns an elderly woman, and the other, by REMA 1000, concerns a younger man. They both live in technological/smart homes. Have you seen these commercials?”

The survey shows that 64% of the respondents have seen the REMA 1000 commercial, while 61% have seen the Telenor commercial.

5.1 The REMA 1000 commercial

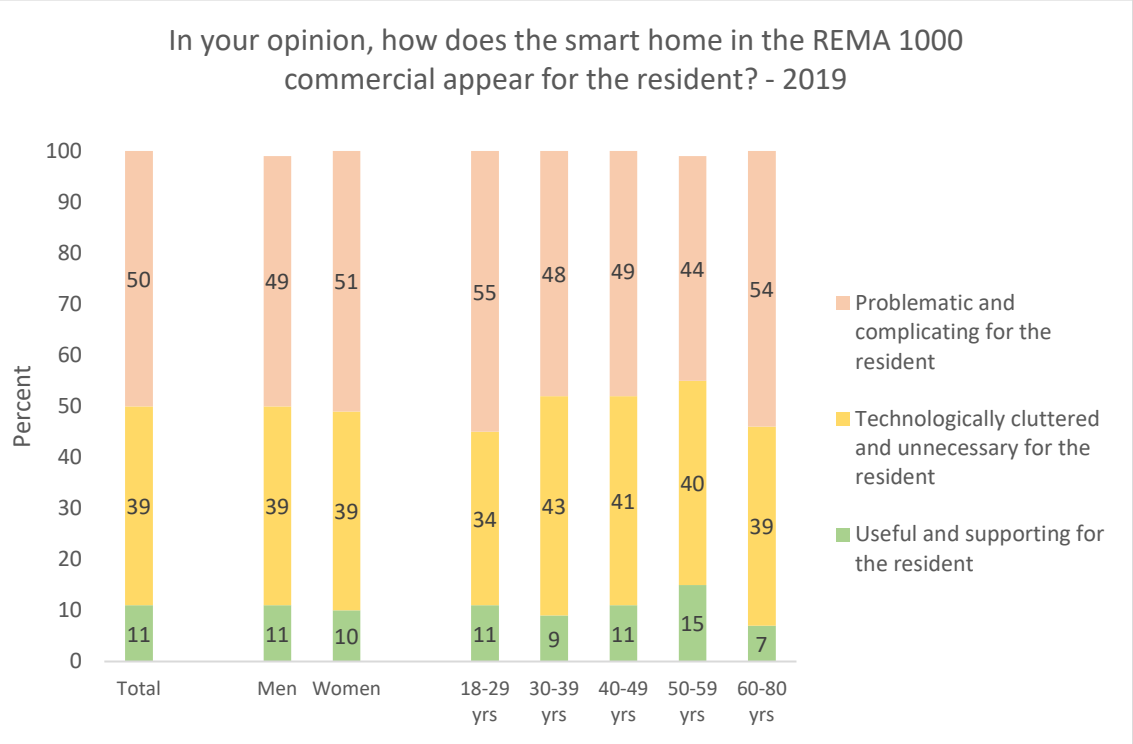

Figure 5-1: Question – In your opinion, how does the smart home appear for the resident? Among those that have seen the REMA 1000 commercial. Fixed answer categories. Total, and by gender and age. Percentages, 2019 (N=643).

From the figure above, we see that even though the REMA 1000 commercial is in some way "mocking" the smart home user and in particular the limitations of the voice recognition system, 11% still find the smart home "useful and supporting for the resident". However, most respondents (89%) find the smart home less useful; half of the respondents (50%) think the smart home is "problematic and complicating for the resident", while 39% find the home "technologically cluttered and unnecessary for the resident".

The perception of the commercial is fairly similar across variables such as gender and age.

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5.2 The Telenor commercial

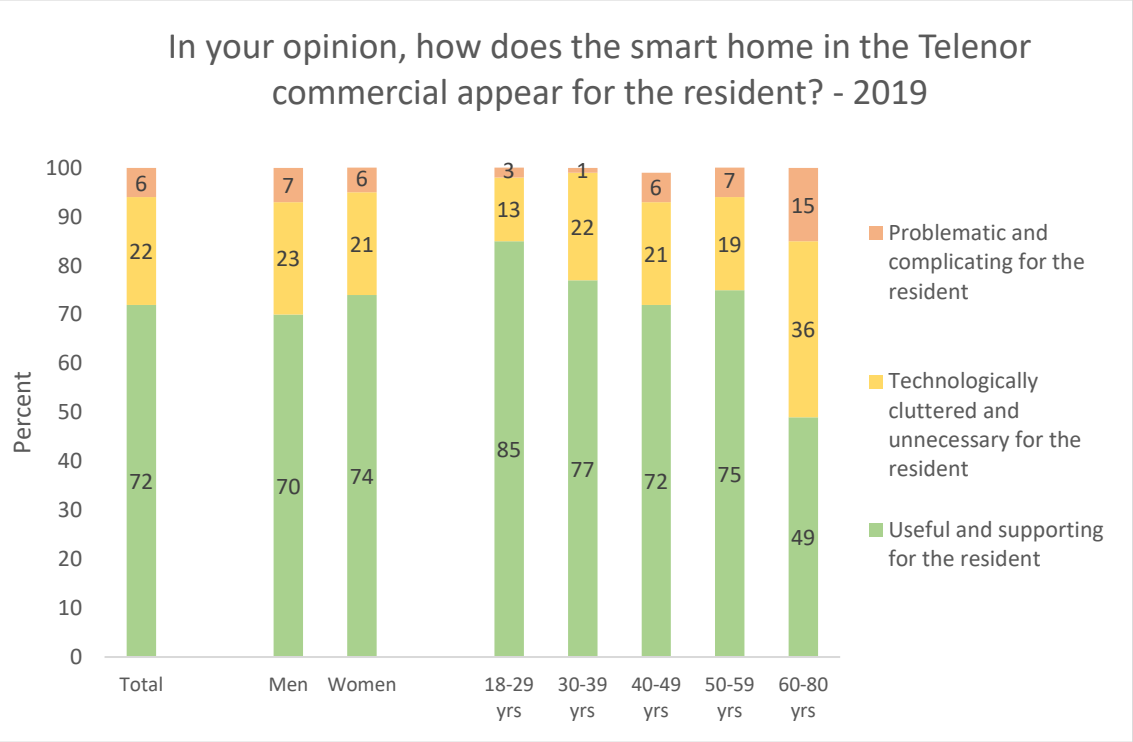

Figure 5-2: Question – In your opinion, how does the smart home appear for the resident? Among those that have seen the Telenor commercial. Fixed answer categories. Total, and by gender and age. Percentages, 2019 (N=613).

The Telenor commercial is, as expected, perceived by respondents to be more useful for the resident than the REMA 1000 commercial. We see that most respondents (72%) think the smart home portrayed appears to be “useful and supporting for the resident”. However, there are still some that think it is “technologically cluttered and unnecessary for the resident” (22%), and “problematic and complicating for the resident” (6%).

If we look at gender, there is no clear difference, although more women (74%) find the smart home useful than men (70%). For age, however, there are some interesting results. While the middle age categories show fairly similar results, the youngest and oldest category stand out. Among the young (18-29 years old), a high percentage rate find the smart home useful for the old lady (85%). Among the oldest group, “only” 49% find the smart home useful, while 51% actually challenge how useful the smart home is for the woman. Most of the eldery respondents with a negative perception find the home “technologically cluttered and unnecessary for the resident” (36%), while 15% find it “problematic and complicating for the resident. This is an interesting case of reception, and how a “message” can be interpreted, or decoded, differently by different social groups.

We do not have a follow-up question that can explain this age difference in perception. But, one interpretation could be that the answers are an act of resistance from the elderly. They are the ones addressed in the commercial, and we know from previous studies of elderly and technology/digital engagement, that many are anxious about the

new and rapid technological/digital development. For example, in a SIFO-study from 2018[5] (Slettemeås et al. 2018), we find that among elderly non-users of internet, many feel too old to learn about the internet (39%), while others are against the technological development and the digitalization of everything (21%).

[5] Age group 61 to 100 years.

Conclusion

Over the last years, consumer products have increasingly become equipped with computing and communicating power. As smart and connected devices have reached the mass market, global tech companies have become interested in the “smart homes”. This has led to a revival of the smart house/home market, which have existed for decades, but mostly for the tech-savvy part of the population (e.g. home automation) or for actors interested in welfare technology. As many new actors have entered the market on the supply side, prices have dropped and devices and services have become both easily accessible, more interoperable and with easy to use interfaces (such as voice activation).

From the Norwegian survey, we see that consumers already have access to a range of smart/connected products at home. The most common products/services are digital TV’s, smart multimedia, connected game consoles and connected alarm/security systems. Personal items, such as fitness trackers and smart watches, are also popular. Up and coming are connected cars, electronic door-locks, smart control of lighting and heating, connected electronic equipment, as well as voice-activated smart speakers. Quite a few households also have robot vacuum cleaners and lawn mowers.

However, it is still not clear what we should call “smart”, “connected” or “IoT” devices or services, and what defines these products/services. We also see some confusion in the population, i.e. when it comes to “smart meters”, which have been marketed as smart and which have recently been installed in almost every Norwegian home. Still, only 56% claim to have a smart meter at home.

When people relate to their own connected devices, there is a general tendency that consumers feel they master this technology well (79%), that they are safe to use (68%), that they are useful (76%), and that consumers feel they have control over the amount of products they have (77%). Presently, few feel that their smart/connected products lead to increased vulnerability or digital dependency to a large extent (32%), or that they need more tools or competence to manage their smart products (20%).

In the general public, there is also positivity when it comes to the general smart/IoT revolution at home (52% are positive while 20% are negative), although the elderly are somewhat more negative than the younger ones. In general, consumers feel that they are well equipped to meet the coming smart/IoT development (58%). But the young claim to be more prepared than the elderly; 79% of the 18-29 years old feel well equipped compared to 38% among the 60-80 years old. It is however clear that consumers do not see themselves as the primary drivers of the smart/connected development; 60% see the industry as the primary driver, 6% see consumers as the primary driver, while 30% see both as driving the consumer-IoT development together.

Other surveys, i.e. from the Norwegian Consumer Council (2019)[6], also find that Norwegian consumers are positively inclined to the smart home development (40%), although men and the young are more positive than others. At the same time, 51% claim to have some concerns about living in a smart/connected home. A British survey (2017)[7] finds that 76% of brits are fearful of the concept of the smart home; 51% are concerned about hacking and 43% are concerned that viruses will render smart gadgets unusable. Another global survey by Accenture (2017)[8] finds that 73% of consumers are worried about the privacy of smart homes, while 63% are worried about the reliability of smart technologies.

As the smart home mass market is fairly new and developing quickly, the challenges related to constant connectedness, autonomous technology and cloud-based IoT-services, might not be tangible enough for consumers to evaluate. So far, people mostly rely on mass media exposure (including “moral panics”) that accompany every major tech development. What is new is also the tendency of major global tech companies entering the smart home market, and privacy in particular becomes a contentious issue as most of these companies rely on massive data extraction, subscriptions and cloud-services that tie consumers to their ecosystems.

The RELINK project will follow this development closely in the coming years and address both the opportunities and the challenges for consumers and households, and how to generate awareness, fruitful cost-benefit scenarios and everyday coping mechanisms for households in the smart/connected future[9].

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[6] Ref: https://fil.forbrukerradet.no/wp-content/uploads/2019/03/rapport-forbrukerbekymringer-iot-skrivebeskyttet.pdf

[7] Ref: https://www.which.co.uk/news/2017/10/76-of-brits-are-scared-of-the-smart-home/

[8] Ref: https://www.accenture.com/_acnmedia/pdf-50/accenture-race-to-the-smart-home.pdf

[9] Cf: https://blogg.hioa.no/relink/

References

Berg, L. (2015). Consumer vulnerability: Are elderly people more vulnerable as consumers than others? *International journal of Consumer Studies, 39*, 284-294.

Kjørstad, I., T. G. Rosenberg, A. Storm-Mathisen & D. Slettemeås (2017). Barn og internettkoblede leker og teknologier – IoT. SIFO oppdragsrapport nr. 8, 2017. Oslo: SIFO

Slettemeås, D. (2009). RFID – the «next step» in consumer-product relations or Orwellian nightmare? Challenges for research and policy. *Journal of Consumer policy, 32,* 3, 219-244.

Slettemeås, D., B. Evjemo &S. Akselsen (2014). Connecting and communicating with the near field: How NFC-services for smartphones may benefit consumers/citizens through social media integration and augmentation. In: P. Kommers, P. Isaias, T. Issa. *Perspectives on social media: A yearbook*. Routledge, New York, 141-147.

Slettemeås, D., A. Storm-Mathisen & J. Helle-Valle (2017). RFID in Society – preparing for the internet of things. Final report & summary. SIFO professional report nr. 5, 2017. Oslo: SIFO.

Slettemeås, D., H. Mainsah & L. Berg (2018). Eldres digitale hverdag. En landsdekkende undersøkelse om tilgang, mestring og utfordringer i informasjonssamfunnet. SIFO oppdragsrapport nr.18, 2018. Oslo: SIFO

Storm-Mathisen, A. (2014). RFID in toll/ticketing – a user-centric approach. *Info – the journal of policy, regulation and strategy for telecommunications, information and media, 16*, 6.

Consumption Research Norway (SIFO) is a non-profit, transdisciplinary research institute at OsloMet – Oslo Metropolitan University. SIFOs research aims to understand the role of consumption and consumers in society and to provide the knowledge basis for public consumer policy in Norway.

SIFOs core research areas are:

- Sustainable consumption
- Digitalization of everyday life
- Marked based welfare
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