IANVS

FOCUS WORK GROUP

D5.2 FOCUS WORK GROUP

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1.0 Introduction

The terzStiftung has chosen four different but complementary approaches to carry out a comprehensive market analysis and to investigate and evaluate the socio-economic effects:

1. Online survey with end-users
2. Interviews with real-estate and nursing homes
3. Studies on external literature / state of the art
4. End-user workshops

2.0 Online survey with end-users

The survey was titled: ***Age-appropriate living in your own four walls - equipment, support and the role of modern technologies***. The online survey was conducted between 7th of May 2019 and 20th of May 2019 with 1274 participants and was completed with an enormous response rate of 33.5%. 89% of the participants are in the age group between 65 – 85 years.

2.1 Questionnaire and response options

How old are you?

<65
65-70
71-75
76-80
81-85
86-90
>90

gender

female
male

living form

ordinary apartment / house
nursing home
retirement flat
others

I am living….

alone
with another person
with several people

How do you assess your physical health?

better than the average of my age
like the average of my age
worse than the average of my age

How do you access your mental fitness?

better than the average of my age
like the average of my age
worse than the average of my age

I am …

largely independent
partially dependent on caregivers
strongly dependent on caregivers

I use a smartphone, smartwatch or tablet at least once a week

yes
no

In which of the following aspects do you feel inadequately informed about existing solutions?
(Multiple answer possible)

accessibility of access (e.g thresholds, access aids for bed or shower)
open spaces and passage width for wheelchair / walking aids
connection to better infrastructure (e.g. moving near bus, shopping, doctors)
connection to friends / family (e.g. moving in their vicinity)
infrastructure for health monitoring (e.g. crash sensors)
information and communication infrastructure (e.g. Wlan for Internet telephony, telemedicine)
fall prevention (e.g. handrails, lighting, slip resistance of the floors)
stairs comfort (e.g. stairs lift, elevator)
home automation and remote control (e.g. electric blinds, light sensors, door opener, automatic timer)
seat height of furniture, sanitary facilities
emergency access (Unlocking doors from the outside, external secondary keys, access codes)
burglary (Cameras, security against burglary, alarm systems)
living environment (e.g. Temperature control and programming, humidity control)
gripping heights of operating elements (e.g.window handles, switches, fittings)
assistive technologies (e.g. Assistant robots, language assistants like Alexa or Amazon Echo)
others

How many times in the past six months have you seriously thought about preparing yourself for age-appropriate living in the future?

never
once

twice
more than twice
not applicable / I am already fully prepared

When did you first dealt with the topic of age-appropriate living?

with the onset of a specific illness or age-related ailments
in the course of a change of residence, which was independent of the age requirement
after losing friends / relatives who could take care of me (later)
as a preventive measure, even before a concrete need was imminent
others

How great is your desire to grow old in your existing home / house instead of moving to an age-appropriate home / nursing home?

that's not my desire
low
large
very large
I did not worry about that
that's not true / I already live in an age-appropriate apartment / nursing home

In which of the following aspects have you already taken action (or ever have considered this) to prepare for age-appropriate living in the future?

accessibility of access (e.g thresholds, access aids for bed or shower)
open spaces and passage width for wheelchair / walking aids
connection to better infrastructure (e.g. moving near bus, shopping, doctors)
connection to friends / family (e.g. moving in their vicinity)
infrastructure for health monitoring (e.g. crash sensors)
information and communication infrastructure (e.g. Wlan for Internet telephony, telemedicine)
fall prevention (e.g. handrails, lighting, slip resistance of the floors)
stairs comfort (e.g. stairs lift, elevator)
home automation and remote control (e.g. electric blinds, light sensors, door opener, automatic timer)
seat height of furniture, sanitary facilities
emergency access (Unlocking doors from the outside, external secondary keys, access codes)
burglary (Cameras, security against burglary, alarm systems)
living environment (e.g. Temperature control and programming, humidity control)
gripping heights of operating elements (e.g.window handles, switches, fittings)
assistive technologies (e.g. Assistant robots, language assistants like Alexa or Amazon Echo)
others

If you have to decide today to move to an age-appropriate home what would you expect the most about the level of equipment?

The apartment must meet my current needs. I am not following future age restrictions.
The apartment must be barrier-free in order to be at least fundamentally prepared for possible future age restrictions.
The apartment must be equipped for every form of long-term care until the end of life.

The equipment should meet my current needs but be fully convertible in case of possible age restrictions.

What emotions do you associate with the age-appropriate conversion of your home or moving to an age-appropriate apartment? (Multiple answer possible)

peace of mind
shame
satisfaction
fear
anticipation
regret
release
frustration
happiness
worry
relief
disappointment
loneliness
safeness
detestation
competence

What emotions do you associate with the use of home automation and age-appropriate assistance technologies in your household? (Multiple answer possible)

peace of mind
shame
satisfaction
fear
anticipation
regret
release
frustration
worry
relief
disappointment
loneliness
safeness
detestation
competence
others

Have you ever felt uncomfortable when in your environment sensors have taken control of equipment (e.g. automatically switch on the light, automatic door lock)

yes
no

What was the main reason why you felt uncomfortable?

concerns about reliability
concerns that the technology decreases its own capabilities (e.g. own thinking, physical activity)
emissions (e.g. radiation)
concern that data could be collected
electricity costs
I did not feel any discomfort
others

Did you have concerns about electro smog in your household at least once during the last month (electrical or magnetical emission using electronics)?

yes
no

Which of the following statements about modern technical devices / medias (ticket machine, tablet, navigation device) do you most likely agree with?

When I use it, I am more often afraid that I could do something wrong
When using it, I am more often afraid that I could do something wrong and therefore do not use it
I prefer to leave it to other people and therefore do not care about it
I do not feel like thinking about technology or to deal with it
I prefer to use technology that works on its own and does not have to be operated by me
None of the statements

In which situations would you like sensors to document your fitness status / activities at home and sound an alarm when needed? (Multiple answer possible)

At any time, for prevention, motivation and / or fitness purposes
In case of illness or physical frailty
When I am alone for a long time
If I can help others care for me better
In no situation
others

What kind of emotions did you experience the last time someone asked you about your current body weight?

discomfort
indifference
happiness
anguish
satisfaction
pride
shame
vulnerability
distress
fury
joy
relief

How did you feel the last time you told someone that you were cold?

uncomfortable
indifferent
happy
embarrassed
satisfied
proud
ashamed
hurt
oppressed
angry
glad
relieved
others

What type of support / assistance do you receive?

No care
Only assistance from friends / relatives (e.g. housekeeping)
Professional help (e.g. Spitex, housekeeping, meal service), possibly in conjunction with help from friends / family

How satisfied are you with the timespans your caregivers do have for you?

dissatisfied
Rather dissatisfied
Rather satisfied
satisfied
Not applicable / I do not want any conversation partners

How satisfied are you with the way your different caregivers / service providers coordinate with one another?

dissatisfied
Rather dissatisfied
Rather satisfied
satisfied
Not applicable / arrangements are not necessary

How satisfied are you concerning the flexibility in making an appointment / schedule change?

dissatisfied
Rather dissatisfied
Rather satisfied
satisfied
Not applicable / I do not need flexibility

How satisfied are you concerning how your caregivers are informed about your daily updated constitution / needs in advance?

dissatisfied
Rather dissatisfied
Rather satisfied
satisfied
Not applicable / they are always the same needs

Did you sometimes have had the feeling of being oversupplied?

yes
no

Which of the following statements do you agree with? (Multiple answer possible)

The caregiver could do a better job of being better informed about my current state of health or the need for household chores before each visit.
Care could be better if there were more collusion between different caregivers.
The caregivers would have more time for me personally if they had less administrative responsibilities.
I often have to spend part of the short time I have to instruct the caregivers about necessary tasks.
From time to time, I would like appointments with caregivers to be more flexible / demand based.
From time to time, I wish that I could reach caregivers easier / more spontaneous.
I would like to be able to easily record my health data (vital signs, movement profiles, etc.) or my own household activities, so that supervisors have a better overview of their entire visit.

How many times in the last 6 months have you had the feeling that the quality of your relationships with relatives / friends suffers because they support you?

Never
Rare
Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months have you had the feeling that friends / family did care more for you than needed?

Never
Rare
Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months would you have liked that certain friends / family members would have known better about your health condition?

Never
Rare

Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months have you had the feeling that through supporting you others took away your individual responsibility?

Never
Rare
Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months have you avoided targeted activities fearing that you will end up in a situation you cannot handle on your own (e.g. not going for a walk because of the fear of falling on stairs)?

Never
Rare
Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months have you had the feeling that your relatives / friends would have been relieved of time for supporting you if they previously would have had more information about your personal needs?

Never
Rare
Sometimes
Often
Almost always
Not applicable

How many times in the last 6 months have you had the feeling that your relatives / friends are more worried about you than needed?

Never
Rare
Sometimes
Often
Almost always
Not applicable

2.2 Main findings and main results

At this point we will highlight some of the main findings and results of this online survey.

Main findings and main results:

- It is astonishing that 85% of the participants are very regularly using some smart devices at least once a week.
- A lack of information concerning existing solutions is especially present in the areas of emergency access, home automation and remote control, burglary (security systems) such as infrastructure for health monitoring and assistive technologies.
- 61% more than once over the past six months seriously thought about preparing themselves for age-appropriate living in the future. Additional 13% express that they are already fully prepared and «ready for the future».
- Nearly 50% of the participants dealt with the topic of age-appropriate living as a preventive measure. Another 15% did this in the context of a change of residence. It stands out that about 14% do not have dealt with the topic yet and have given no answer.
- 77% do have a desire to grow old in their existing living environment. Nearly 80% of them do have a large or very large desire to grow old in their existing homes. Only around 10% of all participants do not have that kind of desire.
- Two expectations do have clear priority for the seniors. The equipment in the age-appropriate home should meet current needs but be fully convertible for future requirements (38%) - and the home must be barrier-free but at least fundamentally prepared for future needs concerning to the seniors possible future age restrictions (31%).
- There are five emotions which are mainly associated with the age-appropriate conversion of the home or moving to an age-appropriate apartment: release, satisfaction, relief, safeness and peace of mind. With a big gap these five emotions are the most succinct ones.
- Seniors got used to the implementation of sensors in their environment. More than ¾ of the consulted participants do feel comfortable when sensors take over control of equipment. At least 16% are undecided and have given no answer.
- Nearly ¾ of the seniors are not worrying about electrical or magnetic emission (electro smog) in their personal households using electronics. Only ¼ of them do have concerns or have no opinion about that topic.
- Only ¼ of the seniors do not agree that sensors might document their fitness status / activities at home. Exactly ¾ of them are open for an implementation of sensors for documenting reasons. Especially in case of illness or physical frailty (45%) and if that helps others to take care of them (22%) they are willing to use sensors. Another 17% are open for the use of sensors at any time.

The complete results to all questions of the survey pleased see **APPENDIX A as separate document to that deliverable.**

3.0 Interviews with real-estate and nursing homes

Based on the action plan of the kick-off meeting in Hasselt the next step was tackled by terzStiftung: Interviews with the target group REAL ESTATE and NURSES / NURSING HOMES based on the research agendas that were compiled at the Kick-Off meeting:

Research agenda target group « REAL ESTATE »

- Can we implant CORY (the system) as revenue source?
- Is there added value in having care institutions as a partner?
- Are there current logics of technology integration? Use of apps > service model?
- How much do buyers / renters influence the design of apartments?
- Do landlords also have interest in managing the services?
- Are there collaborations with service providers / health care? Trusted partners?
- Are there any incentives (especially public incentives) for private landlords to implant the system?
- What are the possibilities for integration in smart home infrastructure (e.g. key cards) + standards, APIs etc.?
- Can the system be integrated in the house increasing rent value?
- Should the system work independently or completely integrated in your (real estate) software solutions?

Research agenda target group « NURSES / NURSING HOMES »

- Because of all the current paperwork: Will they commit and how will they commit to the processes?
- How do they assess "the pain" of patient screenings on visits?
- What activities (IANVS System is able to track) are they interested in tracking for the purpose of gaining time through that information?
- What current technology, software (time tracking, planning) are they already using?
- Do they already have any experiences in activity tracking? Is that a posteriori?
- Are they allowed and willing to trust the tracked info?
- Are there differences and accordance's of activities between nurses and household services?
- What are the differences and accordance's?

To reach the goal terzStiftung first filtered out the main stakeholders and did a very extensive research on what the most important and profitable contacts will be. Concerning the target group REAL ESTATE, the main stakeholders terzStiftung focused on are **real estate companies, builders and property developers** both privately and municipal. In the target group of NURSES / NURSING HOMES the main stakeholders are **nursing homes, reha clinics and nursing services**. These are only the stakeholders where terzStiftung put the main focus on.

As a by-product out of that research a complete and very extensive **list of stakeholders** was put together:

- **Real estate companies privately + municipal**
- architects
- **reha clinics**
- **builders / builders representatives**
- builders in building barrier-free
- **nursing services**
- **nursing homes privately + municipal**
- seniors' residences privately + municipal
- **property developers**
- electrical trades companies
- security system companies
- sanitary houses
- hospitals
- Municipal construction companies
- housing advice centers / residential counseling centers
- smart home providers
- municipal appartment business
- cooperative appartment business
- church appartment business
- privately appartment business
- state-owned apartment business

recommended action:
These stakeholders could directly or indirectly benefit from the implementation and use of IANVS. In the context of validating the business viability of IANVS it will be important to make a special research on the complete list of stakeholders.

TerzStiftung contacted several highly competent experts and organisations in Switzerland and Germany. Especially those experts in Germany have a very deep insight and a sound and recognized expertise in the area of smart home and AAL-Projects. One of the experts is working for German government authorities with the background in whole Europe and responsibilities for nearly all AAL-Projects. TerzStiftung also is in contact with the leading German real estate organization in Berlin.

3.1 List of interview partners "real estate"

HSB Bauträger & Immobilien GmbH
Nassauische Strasse 9
56470 Bad Marienberg
Dr. Harry Schmidt-Bovendeert (Executive director)

GdW Bundesverband deutscher Wohnungs- und Immobilienunternehmen e.V.

Klingelhöferstr. 5
10785 Berlin
Dr. Claus Wedemeier (Head of Unit Studies AAL)

GSW Gesellschaft für Siedlungs- und Wohnungsbau
Baden-Württemberg mbH
Leopoldplatz 1
72488 Sigmaringen
Birgid Eberhardt (Head of Unit Smart Home / AAL)

Baugenossenschaft WIA Wohnen im Alter
Weinfelderstrasse 6
9542 Münchwilen
Bruno Wick (President)

Baugenossenschaft Azur / Prorealis AG
Im Grossherweg 9
8902 Urdorf
Kurt Balmer (Executive director)

Xaver Abenstein GmbH & Co.KG
Von-Stain-Strasse 9
89335 Ichenhausen
Lothar Haas (authorized officer / technical manager project development)

Baugenossenschaft Grüningen / Wolf Treuhand AG
Stedligass 2
8627 Grüningen
Walter Pfister (Construction Committee President)

3.2 Questions to interview partners “real estate”

- ✓ Do you provide smart home infrastructure for your age-appropriate apartments?
- ✓ If you did provide, please let us know which smart home infrastructure you use?
- ✓ What offers are there for this on the market?
- ✓ Concerning this what are the trends in modern construction?
- ✓ Does the equipment also include AAL technologies?
- ✓ Which and how are those AAL technologies used?
- ✓ Which stakeholders are involved?

- ✓ Who runs those AAL systems and who generates profit out of this?
- ✓ How do the demands of buyers or tenants for such infrastructure influence your planning of the infrastructure?
- ✓ Are the buyers or tenants well informed about the possible technologies?
- ✓ Do you also implement security and health monitoring infrastructure?
- ✓ Which infrastructure for security and health monitoring do you use?
- ✓ What added value do you see in the implementation of such infrastructure?
- ✓ Are you interested in taking care of the possible services associated with this infrastructure by yourself? Please explain.
- ✓ What do you think about to rent the infrastructure or sensors to external app-service providers?
- ✓ What is your interest in providing service packages from external service providers?
- ✓ How do you want to generate profit out of this?
- ✓ Should such a system be integrated into your existing IT-system or better be operated independently?
- ✓ How do you handle this with existing security systems, e.g. video pictures?
- ✓ What are your expectations in terms of an increase in value and a better saleability or lettability based on such an infrastructure?
- ✓ Do you see a potential and does that have a future for you?
- ✓ What possible problems or challenges do you see for an integration of such systems in your age-appropriate residential units?
- ✓ What opportunities of public funding for implementing such a system are you acquainted with?
- ✓ Do you see an added value for your housing units in case of the inclusion of care services into this infrastructure? What kind of added value do you see?
- ✓ Do you already have existing cooperation and partnerships for such kind of services?

3.3 List of interview partners “nursing homes”

Alterswohnheim Büttenberg (nursing home and senior residence)
Geyisriedweg 63
2504 Biel / Bienne
Linard Vital (executive director / head of nursing home)

Alters- und Pflegeheim Stäglen
Stäglenweg 15
4208 Nunningen
Simon Rambusch (Head of nursing)
Marlene Hänggi (Head of physical activation)

Alters- und Pflegeheim Holbeinhof
Leimenstrasse 67
4051 Basel
Eeva Bulpitt (Head of physical activation)

Zentrum Leuenmatt
Allmendgasse 20
4512 Bellach
Pascal Hilpert (Head of nursing home)

Stiftung Lohner Adelboden (nursing home and senior residence)
Ausserschwandstrasse 1
3715 Adelboden
Beat Santschi (executive director / head of nursing home)

Alters- und Pflegeheim Scheidegg (nursing home and senior residence)
Bernstrasse 45
3360 Herzogenbuchsee
Hubert Schibli (executive director / head of nursing home)

Alterssiedlung Wibrandishaus (seniors residence)
Allschwilerplatz 9 + 73
4055 Basel
Ursula Mendelin (Head of senior residence)

3.4 Questions to interview partners “nursing homes”

- ✓ Did you already provide AAL-infrastructure in your facilities?
- ✓ Are you already familiar with the use of AAL-infrastructure?
- ✓ If you do, please let us know which AAL-infrastructure you use or are you familiar with?

- ✓ Who runs those AAL-systems and who generates profit out of this?
- ✓ Do you also implement security and health monitoring infrastructure?
- ✓ Which infrastructure for security and health monitoring do you use or are you familiar with?
- ✓ What added value do you see in the implementation of such infrastructure?
- ✓ Are the residents, relatives and employees well informed about possible technologies?
- ✓ Are you taking care of the services associated with this infrastructure by yourself?
- ✓ What is your interest in providing service packages from external service providers?
- ✓ What do you think about to rent the infrastructure or sensors to external app-service providers?
- ✓ Should such a system be integrated into your existing IT-system or better be operated independently?
- ✓ What possible problems or challenges do you see for an integration of such systems in your facilities?
- ✓ What opportunities of public funding for implementing such a system are you acquainted with?
- ✓ Do you already have existing cooperation and partnerships for running the services?
- ✓ What effects do the systems you are familiar with have on your daily routine?
- ✓ Are those systems helpful for you to fulfil your daily routines?
- ✓ Would it out of your perspective be possible to have more benefit from those systems? What do you think are the additional benefits?
- ✓ Are you familiar with implemented infrastructure for security and health monitoring?
- ✓ Do those systems give you release in your daily routines and time scheduling?
- ✓ What are your observations concerning how the residents and relatives deal with those systems?

The interviews with the interview partners in the area of «real estate» were all done by telephone. The questions for this target group were put together in a question form and were filled in by the interviewer during the phone calls.

Concerning the interviews with the interview partners in the area of «nurses / nursing homes» the interviews carried out in the form that the questions for that target group were asked during personal appointments which were done in combination with acquisition for nursing home surveys.

The questions in both areas of interviews were answered different in detail. All the interviewed persons were very willing to give their answers concerning to their experiences and their practical, empirical knowledge. terzStiftung had the privilege to have a very good and well-chosen selection of interview partners. Several of them had a very foundational, extensive and profound insight and experience to the AAL-systems and their use not only with a view to Switzerland or Germany but also with insight in whole Europe. That guarantees a very high quality of the answers and statements.

3.5 Main findings and main results

- The aspect of having more safety is important for real estate, buyers, tenants and for residents and relatives but until now there is nearly no implementation of health monitoring systems based on sensors.
- There is no real implementation of complex monitoring systems yet.
- Already existing complex monitoring systems are often only used for demonstration purposes.
- There is no real interest of the real estate companies to bear responsibility to carry out the services of implemented AAL-systems by themselves.
- There are no empirical values concerning the interest of real estate companies for service packages of external providers.
- The implementation of monitoring systems into building projects very often failed because of high operating service costs and running costs. Especially high electricity costs for sensor-based products were criticized (e.g. sens@home).
- For both target groups the permanent operational readiness of the AAL-Systems must be totally guaranteed (electricity, maintenance, support). The non-existence of this permanent operational readiness was very often a « knock out » for projects / products in the past.
- Real estate companies and operators do not want to implant the data base of new implanted monitoring systems into their already existing IT-systems.
- Buyers and tenants often think that landlords collect all the data of all implemented systems for their own interest and because of that they assume that the landlords « know everything » (like big brother is watching you). This is a wrong assumption.
- Normally all providers of the different services collect their own data and use it for the purposes of «their» system / product.
- In both target groups the end-users of the systems / products may not have any reservations about privacy and use of data. Its only them who are open to make use of the systems / products without any reservation and benefit from it.

- Concerning the interests and demands of buyers and tenants related to using Smart home / AAL-infrastructure there is a distinction visible between applicants for nursing homes and assisted living in senior residences.
- Trends in the market regarding to changes and rethinking construction planning for both target groups are very difficult to estimate. Often there is a kind of hope connected with a generational change.
- In building design and construction planning for age-appropriate buildings most of the time simple AAL-technologies are demanded.
- systems with sensors are not scheduled or used. High-quality technologies are almost not used.
- For more safety concerning fall prevention in nursing homes there is only a demand for simple technologies e.g. by additional use of already present call systems which can only rudimentarily give safety in fall prevention.
- Real estate and planers observe that buyers are often well informed about products and possible applications.
- On the other hand, they realize there is often a lack of interest in technical solutions and their possible applications due to lack of technical interest. When this is the case that very often prevents and blocks the use of the systems.
- The implementation of high-quality systems for security and health monitoring in nursing homes often fail due to the costs especially the follow-up costs. As already pointed out more simple technologies and systems are used. Very often only already existing systems are expanded for additional use.
- Property developers and planers of nursing homes and age-appropriate living facilities shrink back for the costs to implement high-quality systems for security and health monitoring.

4.0 Studies on external literature / state of the art

Caused in the research for the preparation of the online survey and the interviews with the two target groups «real estate» and «nurses and nursing homes» and out of the personal interviews terzStiftung became attentive to different external studies. Three of those studies were examined by terzStiftung in more detail. All three studies examine the topics and backgrounds of « the use and implementation of AAL-systems / smart home technologies in the real estate and housing industry» and give an important insight into the real estate sector against the background of the extended orientation and objectives of IANVS.

4.1 Feierabend-Studie March 2017

Feierabend-Studie March 2017
“Ambient Assisted Living: Zuhause 4.0 statt Altersheim”

“Feierabend.de” is the most known online community for the generation 50plus. The online portal has more than 180.000 registered members who regularly meet in 131 regional

groups. The website is visited by 700.000 visitors monthly and mainly gives support for health and leisure time topics.

Feierabend Online Dienste für Senioren AG
Kaiserstrasse 65
60329 Frankfurt
Phone: +49.69.25628-0
www.feierabend.de
Alexander Wild (CEO)

Background of the study:

- 1.540 members were asked in whole Germany
- the members were asked in an online survey
- timespan of the survey: 03rd – 24th of February 2017
- 93% of the participants were in the age of 60 – 90 years

These are the key findings:

- ✓ Home sweet home: best agers (69,42%) would stay in their familiar living environment if possible – only 15% of them with use of technical assistance technologies.
- ✓ Greater satisfaction with AAL-systems: Seniors are interested in Ambient Assisted living and agree that digital technologies increase the quality of their lives.
- ✓ No fear of technology: Generation 60plus move with the times. Only 9% do are afraid of digital technologies – only every 10th senior. The biggest concern is data protection.
- ✓ Ready to invest: Almost 2/3 of the seniors are willing to spend up to 100 € monthly for the use of smart home technology.
- ✓ Big potential: The seniors think that technical equipment and assistance systems for health and safety issues are useful. But they hardly use those technologies yet.
- ✓ Top 5 of the most useful devices: mobile emergency call, motion detector and presence simulation, alarm system, automatic control of the heating system and medical assistance systems.
- ✓ Top 5 of the most useful apps: heating control, smart TV, shutter control, security camera and smart metering (control of energy consumption).

Some additional results:

What kind of digital equipment do seniors own?

- 96,36% own a computer or laptop
- 72,92% own a smartphone
- 49,16% own a tablet
- 41,75% own a smart TV

(These numbers were representative for members of the "Feierabend"-community. They were not at all representative for all seniors in Germany.)

How do they deal with digital technologies?

- 88,18% express that they get along well with digital technology
- 10.52% avoid the use of digital technology

How much money are seniors willing to pay monthly for supporting digital technologies?

- 64,22% up to 100€
- 6,88% more than 100€
- 28,90% nothing

Purchase & use: What are the most important purchase criteria?

- 50,71% safe and reliable
- 39,68% easy to use
- 9,61% cheap

Two very meaningful findings concerning the type of devices and services:

Which kind of devices do seniors already own or which services do they use?

- 41,3% smart TV
- 34,2% motion detector
- 33,4% automatic control of the heating system
- 5,6% mobile emergency call
- 5,5% medical assistance systems
- 3,7% support systems for taking medication
- 2,3% telemedicine / tele diagnosis
- 1,8% vital monitoring in the apartment
- 0,6% crash sensors / fall prevention

Which kind of devices and services do seniors find useful?

- 79,3% mobile emergency call
- 66,4% motion detector
- 56,8% crash sensors / fall prevention
- 44,1% medical assistance systems
- 33,8% support systems for taking medication
- 31,5% telemedicine / tele diagnosis
- 28,0% vital monitoring in the apartment

Conclusions:

There is a big difference between the number and the kind of technologies and services the seniors already use and their idea of which technologies and services they find useful and

would love to use. The seniors put their main emphasis on the area of health and safety. There is an extensive potential which is unexploited.

4.2 SmartHome Initiative Deutschland e.V. Studie 2015

Studie 2015
«Smart Home- und AAL-Technologien in der Immobilien- und Wohnungswirtschaft»

Initiators of the study are the “SmartHome Initiative Deutschland e.V.” in cooperation with “mm1 Consulting” and “GdW Bundesverband deutscher Wohnungs- und Immobilienunternehmen e.V.» in Berlin.

Contact:
Mm1 Consulting & Management Partnergesellschaft
Bolzstrasse 6
70173 Stuttgart
+49.711.184210-0
www.mm1.de

Background of the study:
500 participants took part. 60% out of the area of “co-operative housing companies”, 32% out of the area of “municipal and public housing companies” and 8% from the area of “private and ecclesiastical housing companies”. 80% of all participants manage more than 500 residential units and about 2/3 of the companies manage more than 1.000 residential units.

These are the key findings:

- ✓ 50% of the companies already implanted at least one Smart home/AAL-system
- ✓ 2/3 of the companies are convinced about the efficiency of the available systems
- ✓ More than 50% express criticism concerning the price-performance ratio
- ✓ 40% wanted to implant Smart home / AAL-technologies until the end of 2017
- ✓ easy operation and low maintenance are the main criteria for investment
- ✓ more than ¾ of the companies would implant smart home/AAL-technology in connection with new constructions or renovations
- ✓ only 12% consider smart home/AAL-technology in planning of new buildings
- ✓ 60% do not consider the implementation of smart home/AAL-technologies in their planning
- ✓ Almost 60% of the companies do not feel adequately informed

- ✓ 80% are not planning to build up an inhouse smart home/AAL-competence. They prefer external partners. More than 60% see these partners in architects, planners and specialized consulting companies

- ✓ Most of the companies want to tie tenants and buyers to themselves by investing in smart home/AAL-technology. For 85% of the companies this is the primary motive.

- ✓ the willingness to invest is low. ¾ of the companies are willing to invest 20€ per square meter

- ✓ in the coming years the companies expect that up to 30% of the tenants will ask for age-appropriate living

- ✓ the companies see the biggest challenge in the development of sustainable business models, in a lack of technology acceptance of the tenants and the selection of suitable partners for the implementation of smart home/AAL-technologies

Some additional results:

- 88% of the participants say that the ease of use is very important
- 76% also say that low maintenance is of high importance for investment decisions
- for 37% of the companies the modular extension of smart home/AAL-technologies in an apartment is very important. 49% say that it is important and only 14% say that this is less important or not important for their investment decisions
- the most preferred partners for smart home/AAL-technology are architects/planners and specialized consulting companies or consultants. Concerning planning and installation 58% prefer architects/planners and 46% prefer specialized consulting companies or consultants. In regard of market research and election of products 49% of the companies prefer specialized consulting companies or consultants and 44% prefer architects/planners.
- the maximum investment per square meter is 10€ (40%), 11-20€ (35%) and 21-30€ (17%)

Conclusions:

“Big potential but also great need for qualified information”. The planers in real estate business have recognized the potential of networked and smart home/AAL-technologies. In the future the companies will implant more modern technologies to save energy, to solve climatic problems in apartments and to increase the safety of the residents. On the other hand, there is a lack of qualified information givers. This is a chance for specialized consultants and consulting companies. Prior to the implementation of smart home/AAL-technology sustainable business models are to be developed and the acceptance of technology by the tenants/buyers must be increased. These concerns are to be pronounced and cleared with real estate companies. Real estate companies do need those solutions to

tie tenants and buyers to themselves by investing in smart home/AAL-technology – their primary motive for investment in smart home/AAL-technology.

Three success factors are derived from those conclusions:

Win – win business models
Real estate companies want to tie tenants and buyers to themselves through offering age-appropriate apartments. Sustainable business models are needed. Refinancing also will play an important role in those business models. Business models of real estate companies normally are based on net rent. This must be considered in the further development of the new business models.

service concepts
The new business concepts necessarily must include the installation and maintenance of the smart home/AAL-technology. Real estate businesses do not have the resources to manage this. Providers of smart home/AAL-technology make use of this by including such services in their business models or cooperate with appropriate partners.

Chance for experts
There is a lack of qualified information givers and qualified information. Real estate business will have a growing need for external consultants and consulting companies that will offer holistic solutions and concepts including qualified consulting regarding selection of products, selection of the right technologies, planning and conception besides the already mentioned solutions for the installation and maintenance.

4.3 GdW Branchenbericht 6 – Wohntrends 2030 Studie 2013

Studie 2013
«GdW Branchenbericht 6 – Wohntrends 2030»

Initiator and customer of the study is
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The key findings and results in many areas of the study match with the results of the other two studies. Because of that in this study we mainly set our focus on the additional aspects, findings and conclusions. Only in some respects we repeat some confirming findings.

These are the key findings and results:
People will make use of technical progressions more effective and intense. Based on a high-performance infrastructure for data transmission information will be generated and networked automatically. Smart home/AAL-technologies will work with that for supporting people in daily life. More technology integrated services for life support, care and health will be used. For real estate business there is bigger a chance for customer loyalty and to create new business areas. To offer service and network services directly on the company homepage is recommended. Because of the change in classical health services new digital technologies will be used. Services for monitoring of vital data, telemedicine / tele diagnosis and medical assistance systems. Active health management for residents and prevention of dangerous situations and their impact are required. The income situation of seniors is changing and entails a greater risk of impoverishment. Long-term and market-oriented business models must consider those low-income seniors. Most of the seniors will stay in their familiar living environment. More seniors are willing to change their residential location especially because of a better social integration and security of supply. By reason of the change in national care systems care residential communities and age-appropriate living will increase in number as alternative to inpatient care. Solutions which adapt to the changes of health needs of the residents are required. Real estate companies will become central providers of services. The cooperation with external service providers will expand. Supply contracts for lifelong living become the alternative to ordinary rental contracts. The living environment then grows with the need of support. The residents will pay for a basic package that can be adjusted. Across from the group of low-income seniors there will be another group of seniors who are financially strong. In form of a “service provider for living” or “residential partner” housing companies will be “the” central contact person. The responsible handling of “Big data” will open new business areas and will help to extend customer loyalty and customer satisfaction.

5.0 End-user workshops

5.1 Preparatory end-user workshops November 2019

In previous end-user workshops on 28th of November 2019 at the terzStiftung in Berlingen, Switzerland, most of the participants of the following end-user workshops on 4th and 5th

December 2019 were prepared. In these preparatory workshops the end-users worked out the daily activities and daily routines to be recognized by IANVS. At the same time, they assigned these daily activities and routines to the individual premises regarding their execution. This was an excellent starting point for the two workshops on 4th and 5th December 2019.

figure 1 - This photo of the whiteboard shows an overview of the daily activities and routines developed in the preparatory workshops in relation to the course of the day.

5.2 End-user workshops December 2019

The two End-user workshops were held at terzStiftung, Berlingen, Switzerland on the 4th and 5th of December 2019. In both workshops 6 participants took part each. Nearly all participants were long terzExperten (end-users) from terzStiftung. Those terzExperten (end-users) are trained and qualified seniors, aged between 50 and 85 years, took part in their role as mature end-users and critical, informed customers.

The main goals of these workshops can be summarized as follows:

Workshop UNIT 1 (4th of December 2019)

1. General assessment of the 3-phase concept for the implementation of IANVS
2. Validation of the 3-phase concept - smart home / comfort, monitoring and security
3. Validation of the value proposition in the IANVS introductory video

Workshop UNIT 2 (5th of December 2019)

4. Detailed analysis of phases 2 + 3 (monitoring and security)
5. Data collection and data transfer on individual problems that should be recognized and solved by IANVS

The whole workshop was split into two units. The participants of both units were different. No participant took part in both units. The participants of the first unit (4th of December 2019) were very well “prepared” and sensitized to the main topics because they also took part in another end-user workshop on 28th of November 2019. That preparatory workshop mainly was about the daily activities and daily routines of the same target group as in IANVS. These are the activities and routines that will be monitored by IANVS-system.

There was a “third unit” that was build-in between the two units with the end-user. The third unit was a very intense exchange between terzStiftung (presented by deputy general

manager Mr. Stefan Kroll and project manager Mr. Jörg Niessen) and the technical staff of the other consortium members which simultaneously met in Steckborn. That exchange of the results of the first unit of the workshop took place in the afternoon of 4th of December 2019. The results of that exchange were integrated into the second unit of the workshop on 5th of December 2019. There was a constant "flow" of putting together results and evaluations of the main goals of the whole end-user workshop.

DAY 1 – Unit 1 (4th of December 2019)

Background

Because nearly all present participants also took part in the end-user workshop on 28th of November 2019 (see above) the workshop started with a short recap of the previous workshop. That was very helpful to the participants "to quickly be back" in the main topics.

Method / Procedure PART 1 - Complete run "IANVS introductory video"

Right afterwards the participants directly watched the "IANVS introductory video" – first time without interruption. The "IANVS introductory video" shows applications of IANVS-system divided in the different application phases. At the same time those three application phases are directly interconnected with three age groups:

Phase 1 – Smart home / comfort (age group 50-65 years)
Phase 2 – Monitoring (age group 70-80 years)
Phase 3 – safety (age group 80+ years).

Directly after watching the "IANVS introductory video" the participants were asked to give their first unfiltered overall impressions and to have an open discussion about that. That unfiltered first impressions are particularly desirable and valuable because as mentioned nearly all participants took part in the end-user workshop on 28th of November 2019. Most of the worked-out end-user requirements and solving approaches of that former workshop are covered with the possibilities of IANVS system.

Overall impressions and open discussion - results

- The system must be flexible
- The question of cost is decisive
- High starting price for installation of the basic infrastructure
- Long lead time from project phase to concrete implementation
- Total user dependency in phase 1 – danger of incapacitation!
- What is perceived as negative in phase 1 can be positive in phases 2 + 3
- Fast pace of technology / sensors - «Keep up» from development to implementation
- Paternalism = no go!
- "User" absolutely has to want to do it himself - not «to put it on the "user" »
- Too little future-oriented and independently thinking – danger!
- Danger of relying unhealthily on the system
- What is necessary - what do I need now
- Only implement what is necessary, not implement what is feasible!
- Raising awareness of actual needs – system always tailored to current needs
- Competitor products already on the market? Reference to other AAL products / projects
- Surveillance - what level of surveillance for which emergency
- System should only act in emergency situations, otherwise run in the "background"

Method / Procedure PART 2 - Single phase run "IANVS introductory video"

Phase 1 – Hans und Vera (pseudonyms)
Smart home / comfort (age group 50-65 years)
Comfort functions: light control, heating control; TV Control

After watching the phase 1 video sequence (partially repeated) the participants had an open discussion concerning the exceptional aspects and presented solutions of that sequence.

Impressions and open discussion – results

- To have more interested parties with the basic package “comfort” the costs must be kept low
- Is perceived by most of the participants as superfluous to negative - Could also be omitted!

Phase 2 – Gyp (pseudonym)
Monitoring (age group 70-80 years)
Activity tracking, information transfer to caregiver / doctor / nursing staff

After watching the phase 2 video sequence (partially repeated) the participants had an open discussion concerning the exceptional aspects and presented solutions of that sequence.

Impressions and open discussion – results

- Make sure to include health measurements
- Include more monitoring functions
- Target group-oriented individuality in the monitored activities
- Main approach also fall prevention
- Focus on monitoring - of the 3 phases, phase 2 is considered the most pronounced. See also Clustering Whiteboard (see *figure 10*)

Phase 3 – Piet and Michel (pseudonyms)
Safety (age group 80+ years)
Fall monitoring, correction of false alarms, registration of nursing staff and aids

Impressions and open discussion – results

- Nursing staff may not be completely replaced due to the reporting obligation - legal reasons (objection of a nursing service management)
- Systems / sensors must be waterproof to monitor the risk of falling shower, tub
- Use / adaption according to the disability or restriction of the user
- Modular design of the system - must be individually applicable / adaptable
- Subsequent implementation in existing apartments should be possible
- Retrofitting in old buildings possible
- Costs must be affordable - everyone who wants should have it / can afford it
- Foreign control should be avoided
- Cost absorption by health insurance companies etc. possible? - especially in case of subsequent implementation
- Acceptance by target group - the person concerned must absolutely be willing
- In old age more withdraw from technology, could be contrary to openness to system
- Assessment for target persons - Needs analysis
- Support must also be personal - it is important who informs and educates about the possibilities of the system (trust)
- Communication between the suppliers of the individual product components is important

- Education in society must be much stronger - still too little
- The system must be made accessible to all those in need
- Security (Phase 3) most important - most important reason for implementation!

Method / Clustering the daily activities into the three phases of "IANVS introductory video"

Complementary background

In the preceding end-user workshop on 28th of November 2019 the participants elaborated and analysed the daily activities and daily routines of the IANVS target groups that will be monitored by IANVS-system.

figure 1: activities of daily living of the participants

Flexibility of activities (must be considered in addition especially in connection with the differentiation of alarms and false alarms)

- **Individuality** "every day is different, for example I don't get up at the same time every day. Anytime between 6:30 and 10:30. There are nights when I sleep well and nights I don't sleep well and so I get up doing something."
- **personal routines and habits** (rinsing out the cup before putting it under the coffee machine)
- **daily** activities (toothbrushing) vs. **periodically recurring** activities (doing the housework)
- Activities within a **loop**
  - "Is the loop completed?" The user should be informed about the actual status of the loop → "which activities are still missing?"
  - E.g., Do the laundry: sort the laundry > wash the laundry > hang out the laundry > take the laundry off the line > iron > put the clothes into the wardrobe > wear clothes > sort the clothes for washing
- **time-dependent** (morning toilet) and **time-independent** activities (doing the laundry) The system should consider that even time-dependent activities are not always carried out exactly at the same time, but have a certain flexibility
- applicable for **room-dependent** (cooking, showering) as well as **room-independent** activities (drinking, turning off the lights)

In this context the end-user in the preceding workshop not only elaborated those daily activities and daily routines but as the next step they assigned these daily activities and daily routines to the individual living areas .

Assignment of daily activities and daily routines to the individual living areas – Where are these activities primarily relevant?

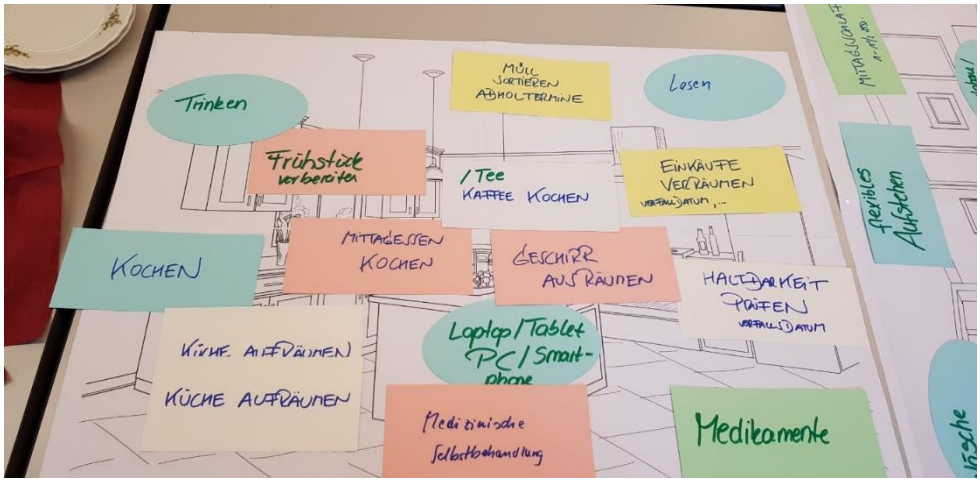

figure 2: primary activities in the kitchen

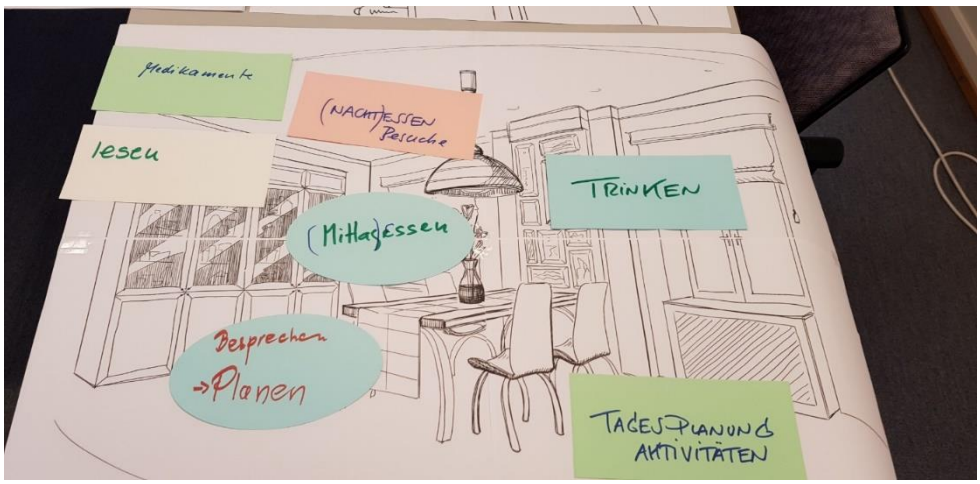

figure 3: primary activities in the dining room

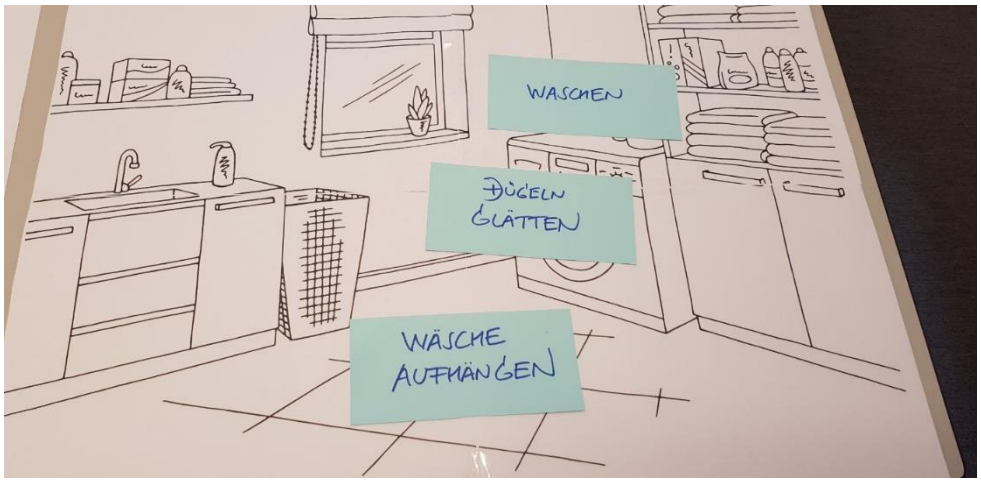

figure 4: primary activities in the washroom

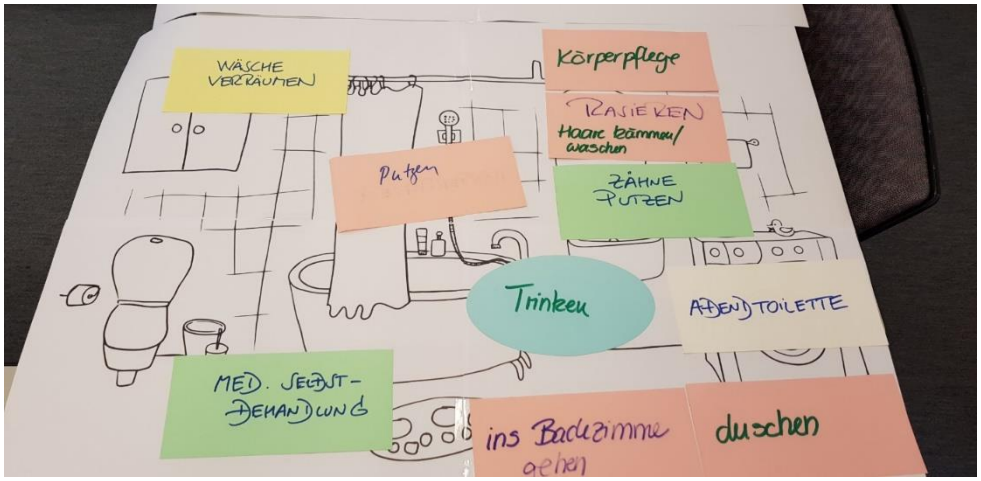

figure 5: primary activities in the bathroom

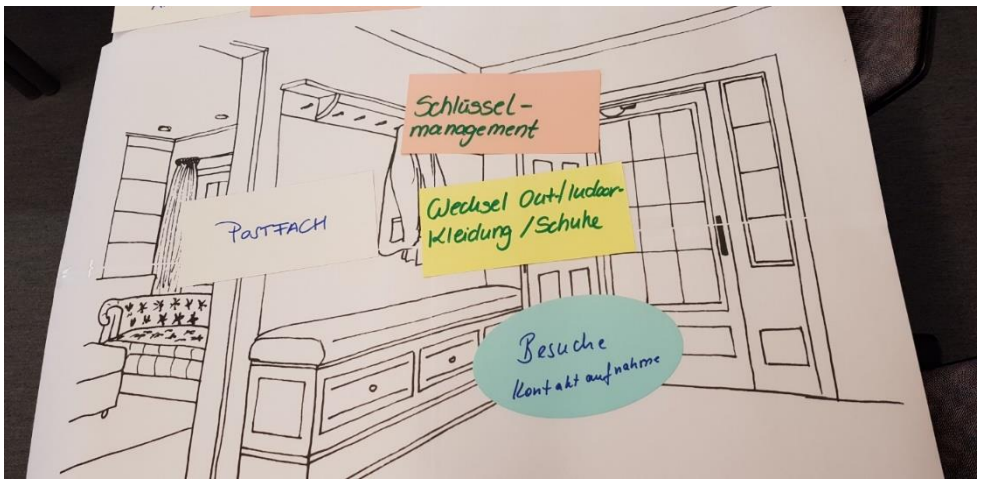

figure 6: primary activities in the corridor / hall

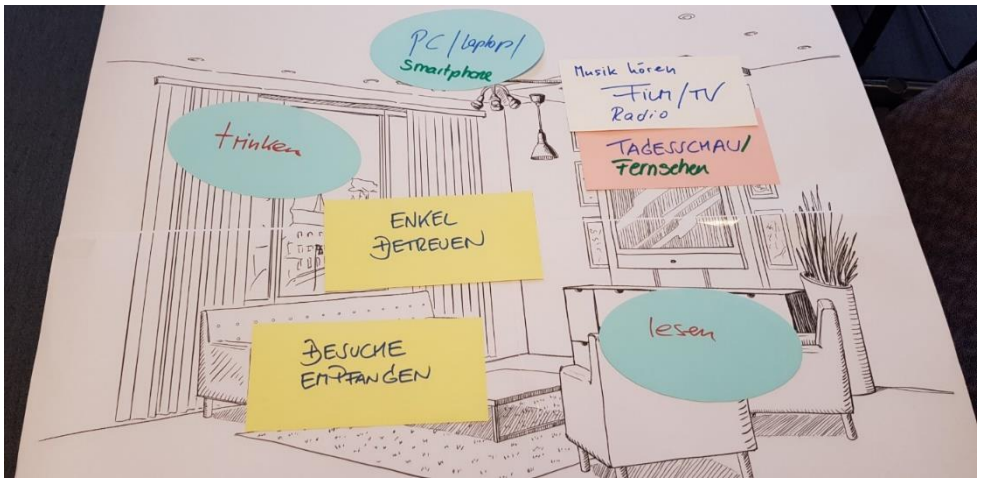

figure 7: primary activities in the living room

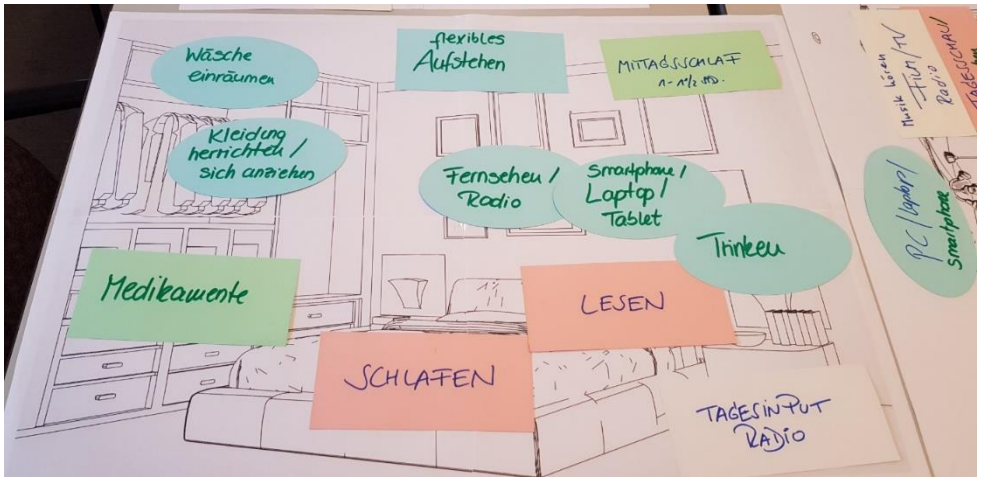

figure 8: primary activities in the sleeping room

figure 9: room-independent activities

Clustering the daily activities into the three phases of "IANVS introductory video"

As final step of this part of unit 1 of the workshop the participants assigned these daily activities and daily routines to the three phases of "IANVS introductory video": Smart home, Monitoring and Safety.

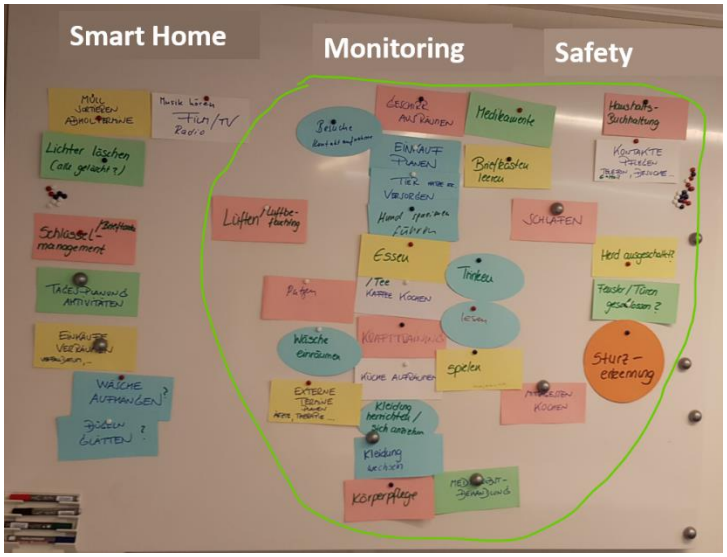

figure 10: Clustering the daily activities into the three phases of "IANVS introductory video"

Final discussion – key findings and main results of unit 1

To finalize unit 1 the participants had a final and very intense discussion and analysis of the already elaborated impressions, findings and results. They contemplate on all the elaborated facts so that besides the detailed results (see above) the following key findings were carved out:

- Security (Phase 3) most important - most important reason for implementation!
- Focus on monitoring - of the 3 phases, phase 2 is considered the most pronounced. See also Clustering Whiteboard (figure 10)
- Costs must be affordable - everyone who wants should have it / can afford it
- Acceptance by target group - the person concerned must absolutely be willing
- Focus on people, not on the technical possibilities
- System must adapt to the user and not the user to the system
- Modular design of the system - must be individually applicable / adaptable
- System must "grow" with the personal needs
- Only implement what is necessary, not implement what is feasible!
- "As much as necessary, but not as much as possible"
- Fast pace of technology / sensors - «Keep up» from development to implementation
- Life span of technology / sensors
- Subsequent implementation in existing apartments should be possible
- Retrofitting in old buildings possible
- Support of skills instead of complete assumption of tasks

Additional results

Prioritization of daily activities and daily routines

DAY 2 – Unit 2 (5th of December 2019)

Background

As already mentioned, a "third unit" was build-in between DAY 1 – Unit 1 (4th of December 2019) and DAY 2 – Unit 2 (5th of December 2019). That "third unit" was a very intense exchange between terzStiftung and the technical staff of the other consortium members. The results of that exchange were integrated into this unit 2.

Supplemented with the results from this exchange the unit 2 had a focus on two questions:

- Because phase 2 and phase 3 in "IANVS introductory video" were considered the most pronounced (see *figure 10*) the participating end-user did detail analysis and evaluation on those two phases.
- The participants also did detailed analysis and evaluation on data collection and data transfer for individual problems to be identified and solved by IANVS.

Method / Procedure

Since the participants of unit 2 as intended mainly not took part in unit 1 and in workshop on 28th of November 2019 started with a short recap of the previous workshops and their results.
In connection with this the participants watched the "IANVS introductory video" without interruption.

Detailed analysis and evaluation of phase 2 (monitoring) + phase 3 (safety) of "IANVS introductory video"

In an open discussion phase 2 (monitoring) and phase 3 (safety) were elaborated especially by analysing the clustering of the daily activities into the three phases of "IANVS introductory video" in unit 1 (see *figure 10*) and the following questions:

- With whom do you already / would you share your information today (monitoring)?
- For what purpose do / would you share this information?
- Acceptance concerning technology, data collection and data transfer?

Results of evaluation and analyses

Results assigned to individual generic terms

Modular concept

- growing with the needs of the user (individual adaptability and individual starting point!) (defining extent of support / content / activities)
- provide only as much help as necessary, not as much as possible"
- fear of loss of control: «technology takes thinking out of my hand»
- the user should decide "What is necessary? What do I want?"
- the system should rather enable than taking over everything → because of the fear of speeding up the process of cognitive decline due to the complete takeover by the system and an associated loss of control over the personal life → NO paternalism!

Accessibility

- be easy to install / retrofit / extend / remove regardless of the spatial conditions
- caregiver should be able to change configurations according to the current user needs

Data protection

- deal responsibly and conscientiously with personal data "protection of personality rights"
- only data should be gathered for which there is a concrete purpose, or which is necessary to help the user with coping of daily life (recognizing dangerous situations of highest importance)
- data must be deleted immediately when they are no longer needed (preferably at the end of a day)
- trends/statistics concerning health issues are ok, but only as far as they are needed to optimize personal health
- There is great uncertainty regarding data abuse → local storage must be guaranteed, data transfer only with the consent of the user, no network access!
- The user should determine how data must be handled (daily automatic deletion of data or after a defined period)
- Only authorized access by third parties with agreement of the end-user

Technology acceptance :

- **Sensors:** high acceptance
  even if it is not (directly) part of IANVS – but it popped up immediately and highlights
  the use of sensors!

- **Cameras:**
  - No face capturing; preserve anonymity, is accepted if the data is stored only on a local server without external access
  - Cameras should only be used if the problem cannot be technically solved in another way
  - Uncomfortable feeling that someone is watching you
- **Smart bracelet:** widely accepted, visual appealing

Willingness to use the system

- Focus on assistance (Monitoring) rather than early adoption (Smart Home) → there is a tendency to use the system not before there is a need for assistance
- When help is needed regarding safety issues (medication intake, hydration)
- when health-related impairments affect daily life and I am aware of this and want help

Willingness concerning data collection and data transfer

What personal information would you be willing to share and with whom?

Profile information	Willingness to share
Personal information (name, first name, date of birth, gender, living/living conditions, family status)	Only as far as necessary
Current physical condition	As far as necessary for the treatment by the therapist / doctor
Current cognitive condition	As far as necessary for the treatment by the therapist / doctor
Family medical history	As far as necessary for the treatment by the therapist / doctor
Medical treatment/medication	Ok if it ensures the regular intake of medication
Personal habits (e.g. daily routines)	As far as necessary for the support of activities of daily living

- The sharing of information depends on the perceived benefits → the greater the personal benefit, the greater the willingness to share information
- Only data should be collected that the system absolutely needs to support the user with performing activities of daily living
- Support of vital parameter measurement and transmission is considered useful

Problem areas only main daily activities/routines	**What information / indicators can reveal the problem?**	**With whom would you share this information? Who needs the information?**	**Why? What do you hope to gain by this?**
Food intake	Sensors; refrigerator not opened; oven/microwave not turned on; cutlery drawer not opened	Myself as a reminder; multi-level information transfer; passing on only in case of need for action / exceptional case not standard case	Recognize own condition; reassurance Peace of mind!
Drinking	No glass taken from cupboard; not yet gone to WC; bottle on	Myself as a reminder; multi-level information transfer;	Recognizing one's own condition; Calming; health care Peace of mind

	pressure sensor (solution)	passing on only in case of need for action / exceptional case not standard case	
Body care	Tap not running; shower not used; gesture recognition by sensors not performed	Myself as a reminder; multi-level information transfer; passing on only in case of need for action / exceptional case not standard case	Self-value retention; reassurance Peace of mind
Physical inactivity	No movement registered by sensors; too long in one place (sofa); consider exceptions (put your leg up because of ...)	Myself as a reminder; relative; trustworthy friend	health care; Self value retention
Fall	No movement of sensors registered; too long in one place; three-dimensional on the floor / bed	Spitex; Nachbar; Angehörige; Notfallorganisation	Free choice of the user where to register
Forgotten to take medication Correct combination of medication	No movement of sensors registered in the area where medicine is	multi-level information transfer; passing on only in case of need for action / exceptional case not standard case IANVS-system; Spitex; nursing staff	Ensuring treatment and health; avoiding disadvantages

Final discussion – key findings and main results of unit 2

To finalize unit 2 the participants had a final and very intense discussion and analysis of the already elaborated impressions, findings and results. They contemplate on all the elaborated facts so that besides the detailed results (see above) the following key findings were carved out:

- internal information transfer to family members without problems
- external transfer of information only situational and to a person of trust
- results-oriented information transfer
- Data transfer depends on personal benefit
- Readiness for data transfer is phase-dependent, situation-dependent and usage-dependent
- depending on the health insurance model, data transfer to the family doctor is mandatory
- also important is the relation of costs to benefits / added value
- in general, users are not always aware that data is passed on (e.g. mobile phone, bank card)

5.3 End-user workshop January 2020

In addition to the end user workshops in November 2019 and December 2019, the terzStiftung held an additional end user workshop on 28 January 2020.

In this supplementary workshop, some of the questions of the previous workshops were dealt with in greater depth. While the workshops in November and December 2019 covered the age group 70+ and 80+, the January workshop consisted of participants in the age group 50-65 years. In particular, phase 1 "Smart Home / Comfort" of the IANVS concept was examined in detail again. This phase 1 is the entry-level phase to the IANVS concept. The investigations of the previous workshops were conducted with end-users of the age group 70+ and 80+. Therefore, it was important for the consortium partners to examine this entry-level phase with the associated value propositions in addition to the end user age group 50 - 65 years.

The supplementary workshop was held at terzStiftung, Berlingen, Switzerland. All participants were again terzExperten (end-users) from terzStiftung. Those terzExperten (end-users) are trained and qualified seniors, aged between 50 and 65 years, took part in their role as mature end-users and critical, informed customers.

The main goals of the workshop can be summarized as follows:

1. Supplementary, in-depth evaluation of the value proposition of Phase 1 "Smart Home / Comfort" (Entry-level phase) of the IANVS concept and the IANVS introduction video

2. Quality of Life (QOL) and SF36 regarding IANVS business model (IANVS 2)

The whole workshop was structured into two units with different contents:

Workshop UNIT A

- Presentation and watching of the IANVS introduction video
  - All three phases "Smart Home / Comfort", "Monitoring" and "Security" in a complete cycle
  - Detailed examination of Phase 1 "Smart Home / Comfort”
  - Open discussion / first spontaneous overall impression
  - In-depth discussion before specific questions

Workshop UNIT B

- Introduction to Quality of Life (QOL) and SF36 – Background
- Brief insight into the whole SF-36 questionnaire (all SF36 questions)
- Detailed consideration of questions 4, 7 and 8 (from SF36)

Workshop UNIT A

Background / Preparation

The AAL project IANVS was introduced and presented by the workshop leader in short form and limited to the main outlines and contents. To complete and create the right basis for the in-depth workshop, a summary review of the previous workshops held in November 2019 and December 2019 was given. For this purpose, the workshop leader uses a PPT presentation that presents the contents and results of the four previous workshop units in a compressed form.

Method / Procedure UNIT A

Right afterwards the participants directly watched the “IANVS introductory video” – first time without interruption. The “IANVS introductory video” shows applications of IANVS-system divided in the different application phases. At the same time those three application phases are directly interconnected with three age groups:

Phase 1 – Smart home / comfort (age group 50-65 years)
Phase 2 – Monitoring (age group 70-80 years)
Phase 3 – Safety (age group 80+ years).

Directly after watching the “IANVS introductory video” the participants watched Phase 1 – Smart Home / comfort – (the entry-level phase) again in detail.

With this in mind, the participants start an exchange and open discussion about their first spontaneous overall impressions.

Overall impressions and open discussion - results

- There is distrust / great mistrust of the use of a universal "remote control”
- There are fears of a loss of control or even the danger of incapacitation
- The danger of promoting comfort too much
- User moves less / too little
- Own initiative gets lost / more and more lost
- Fundamental mistrust
- Centralised surveillance
- Loss of autonomy
- Positive: support for absence simulation
- Positive: use of the system with immobile persons, after stroke etc.
- As personal needs for assistance and security grow, so does openness to the system
- The dignity of the user is touched
- The interest in technology and comfort is not strong enough for the implementation of the system
- Negative: existing devices can no longer be used in conjunction with the system

Immediately after the exchange and collection of the first, rather spontaneous impressions, thoughts and experiences, the participants enter an in-depth discussion and evaluation of the "Smart Home / Comfort" phase. To achieve this, the participants are asked the following questions:

- How do you feel as a user in the "Smart Home / Comfort" phase?
  What do you as a user feel in the "Smart Home / Comfort" phase?

- How do you feel about the value proposition of the “entry” phase of IANVS?
  What appeals to you about the value proposition of the "Smart Home / Comfort" phase?

- What personal experiences have you already had with Smart Home?

- Is the value proposition of the "Smart Home / Comfort" phase a welcome “entry” for you?

- How do you otherwise imagine the "entry" into the IANVS system, which is growing with you?

Key findings and main results of the in-depth discussion and evaluation

- The entry and acceptance of IANVS system is not age dependent
- A great fear is the total control by technology
- High demands are placed on system security and system reliability
- Dangers with data access and data use up to virus attack and data misuse (black-mailing by hackers)
- Practical implementation of the setting (basic setting) of the IANVS system
- Integration of already existing devices: Is that even possible? How is this done? Who implements this?
- There are more and more devices in the household that are directly connected to the internet
- Through big data analysis the system is self-learning - this causes anxiety and dis-comfort
- What happens when the personal situation of the user changes?
- The willingness to invest decreases with age
- The end-users find the IANVS system very complex, with the risk of dealing too much with the issue of constant adaptation of the system: Which service, which app do I have to add now?
- The complexity of the system is perceived as negative, oppressive or even over-straining
- The whole subject around the system is very fast moving and subject to very constant changes (technical and personal)
- Fear that the individuality of each household cannot be represented and taken into account
- Household appliances increasingly have their own comfort functions or autonomy
- Early entry or entry into the basic system in younger years is rather seen as questionable, also because of the implementation of the own, already existing devices
- The use of the system is seen by some participants rather in nursing homes, hotels, rehabilitation facilities, single households and business apartments - all services and functions optimally coordinated
- The “children's departure” is seen as a good time to enter the system
- Additional benefits in the area of remote home monitoring during absence
- All functions that have the appearance of "player entry" are perceived as negative especially when retrofitting the system, there are great concerns about the equipment brought in by the user
- As need increases, so does the interest in entering the system
- Neediness is seen as the main criterion for entry into the system
- In principle, a local, autonomous network is preferred for the operation of the system.
- Access to the web is negative and not all services should be networked

Concluding remarks to UNIT A

The end-user group (age 50-65 years) does not differ significantly from the end-user age group (70+ and 80+) in its openness and basic attitude towards phase 1 of the IANVS introduction video - Smart Home / Comfort. The end-user age group 50-65 years also sees the entry into the IANVS system less as an age-related background and more as a reference to the needs of the individual user. Increasing comfort through Smart Home and the appeal of the technology are not enough driving forces for an early entry into the system. Loss of self-control and independence, up to perceived incapacitation and the complexity of the system is named as reasons against an early entry. This age group is also very concerned about data security, data use, data transfer and possible data misuse. The neediness and suddenly arising neediness due to accident, illness or other life circumstances are mentioned as main reasons for starting at "younger" years.

Workshop UNIT B

Background / Preparation

Unit B of this supplementary end-user workshop is based on the so-called "third workshop unit", the intensive exchange between the terzStiftung and the technical meeting in Steckborn on 4th of December 2019. In this intensive exchange, the consortium partners have agreed that an introductory examination of the topic Quality of Life (QOL) SF-36 will be carried out within the framework of an end-user workshop. This first will be done on a very superficial level and only serve as a guideline. For this purpose, the consortium partners selected three questions from the SF36 questionnaire.

Method / Procedure UNIT B

In order to learn possible personal experiences of the participants about points of contact with any kind of QOL survey, at the beginning the participants are confronted with two concrete introductory questions:

Question No. 1:

What personal experiences have you already had with Quality of Life (QOL) surveys?

Question No. 2 :

Have you personally ever come into contact with QOL surveys - also via spouses, partners, family members?

Results of introductory questions:

Of the five participants, only one single participant has ever been involved in a QOL survey. This one participant, in turn, has made this experience several times, each time in the context of preventive medical check-ups. However, this participant has only had preventive medical check-up's in Vienna (Austria). He was not confronted with this during examinations in Switzerland. The participant with experience had no problem answering the questions directly and providing all necessary information.

All other participants have no experience or contact with QOL surveys, neither personally nor with family members. Three out of four participants without experience have no idea what QOL and SF36 mean.

Introduction to Quality of Life (QOL) and SF36 – Background

Immediately after answering these two introductory questions, the participants were briefly introduced to the QOL topic by the workshop leader.
In the form of a deliberately brief PPT presentation, the basic term "Quality of Life" was first explained via definition.

The explanations then went on to explain its meaning in the medical field and the two general categories of questionnaires there:
1. general / generic instruments
2. instruments specific to a disease, disorder or condition.

Then the four most important and recognised general / generic instruments were presented:

- CDC HRQOL-14 Healthy Days Measure
- AQoL-8D
- EQ-5D (which was used in the AAL project CO-TRAIN, among others)
- Short-Form Health Survey (SF-36, SF-12, SF-8)

Now the survey instrument SF36 was specifically addressed by mentioning some facts and backgrounds and presenting the eight different question groups of SF36:

SF-36 (Short Form 36) - Some facts / backgrounds

A systematic review study in 2009 showed that the SF-36 is the most widely used patient-reported outcome (PRO) instrument in clinical trials. It is therefore one of the most established instruments in medicine and its significance has already been validated in numerous studies. It is also available in over 170 languages. The SF-36 is comparatively long for a general health survey with 36 questions.
The SF-36 questionnaire is a worldwide established, validated and frequently used questionnaire, which is applied in various fields of medicine. It therefore has large clinical relevance and will presumably continue to maintain this in the future.

The SF-36 consists of 36 questions and is a general health questionnaire that allows statements about the patient's health status by means of 8 different dimensions. It makes statements about:

1. General health perception - 5 questions
2. Physical health - 10 questions
3. Limited physical role function - 4 questions
4. Physical pain - 2 questions
5. Vitality - 4 questions
6. Mental health - 5 questions
7. Limited emotional role function - 3 questions
8. Social functioning - 2 questions

Now a complete overview of all 36 questions of the SF36 questionnaire was given to the participants.

Afterwards the three questions selected by the consortium partners were examined in detail.

These three questions have the following foregoing explanation and premise:

"The following items are about activities you might do during a typical day. Does your health now limits you in these activities? If so, how much?"

The three questions selected are: Questions No. 4, No. 7 and No. 8 of the SF36 questionnaire.

Question No. 4
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

Question No. 7
Climbing **one** flight of stairs

Question No. 8
Bending, kneeling, or stooping

The answering options for all three questions (in each case) are:

1 = **Yes**, limited a lot
2 = **Yes**, limited a little
3 = **No**, not limited at all

Key findings and main results of introductory examination of the topic Quality of Life (QOL) SF-36

- In principle, the extent to which the activities of question No. 4 can be covered by the system was questioned (Q4)
- A fear of data misuse, uncontrolled data transfer became apparent
- The recording and dissemination of health data was considered a knockout criterion
- The participants are generally very sceptical and critical of the answers to the SF36 questions
- Participants are of the opinion that the generation of the end-user 70+ is less critical of the issue of recording and passing on health data due to greater belief in authorities (submission to authorities)
- With increasing age an increase in comfort is seen in the sense of indifference towards these reservations and fears
- It is considered much more positive to answer SF36's questions personally, not via the system
- It is seen as a great advantage that by answering the questions personally and independently, one's own awareness of the personal condition is sharpened
- The activities bowling, playing golf and climbing stairs (not given in an ordinary apartment) are outdoor activities or cannot be covered by the living space tracking
- The activity examples are perceived as too abstract (Q8)
- It is not possible to record how the individual activities are carried out, e.g. whether aids are used, or the system is attempted to "trick"
- The daily state of the user depends on the situation and is conditioned and influenced by the personal history. It is doubted that this can be sufficiently included
- Personal contact with a doctor is not necessary, although this personal contact is desirable and contributes to well-being
- Feeling, that personal responsibility is being handed over
- Entries and data should be intended for myself, not for publication and transfer – incapacitation
- Users want to determine themselves which parts of the tracked information they publish or pass on and to whom
- Data control and power of disposal should lie with the user
- A constant, permanent data analysis is not desired
- In direct connection with the big-data analysis, the danger of false correlations is pointed out

Concluding remarks to UNIT B

The introductory investigation and superficial examination of the topic Quality of Life (QOL) SF-36 in connection with the IANVS system based on the three selected questions shows quite a lot of scepticism and reservations among the end users. This scepticism and reservations are expressed in particular regarding data use, data transfer and control of the data collected.

At the same time, end users see some practical problems with data collection and the associated personal background. One of the main reasons for the reservations and rather critical attitudes of end-users is the doubt about the actual benefits and added values of the system's answering of questions. The participating end-users rather see disadvantages for the user, e.g. loss of independence, external control as well as limitation or loss of sense of responsibility. Also, the fact that personal contact when answering SF36 questions to a doctor (to the doctor of confidence) is eliminated by using the system is to be taken seriously. The end-users consider this to be desirable and important for the well-being of the users.