

PRoF Award abstract – Call 2018

HomeLab UGent - imec

1. Research Outline

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| Acronym | HomeLab |
| Project name in English | HomeLab UGent – imec: Europe’s first independent testing ground for smart home applications and services |
| Pitch | The future of smart (health)care services at home starts in the UGent – imec HomeLab |
| Executive summary | <p>The imec – UGent HomeLab is a new research infrastructure for the independent testing of new smart living / smart (health)care services in the Home environment. The HomeLab offers full technical flexibility to co-create, test and validate new (health)care services at home. Next to this it is an authentic two-story house where people can live and test new applications in a real-life setting. Starting from the conceptual phase industry actors, end-users, researchers, (in)formal caregivers, care organisations, are engaged thus enabling the quadruple helix innovation methodology. As such, the HomeLab contributes to the development of integrated care scenario’s bridging hospital care and homecare or formal care and informal care. Social inclusion, safety, security, comfort and the safeguarding of the privacy are keywords in the HomeLab research agenda.</p> |

2. Cause and context of the research

The ageing society, higher prevalence of chronic diseases and comorbidity and the pressure on the social care budget calls for innovation in the healthcare services. Shorter in-hospital stays, integrated care processes and remote follow up of patients are being investigated and start to come to practice. Digital technologies can support new integrated care delivery, but these digital services need to be carefully co-designed and iteratively tested with the relevant end-users in order to give the correct support at the moment and time of need.

Previous interdisciplinary research projects for integrated care services at home, such as ICON-OCareCloudS, ICON-FallRisk, AAL-Care4BALANCE have illustrated that co-design and iterative development of these types of services is improved when testing can be done in an early stage in settings that simulate home conditions. Users are more involved and depicted scenarios come closer to the real usage of digital technologies. Before reaching market readiness the prototypes need to be tested and debugged in real homes of end users. These so-called field trials are done in random selected end user's homes and often prove to be very cumbersome and time consuming due to uncontrollable technological conditions in the houses. Test environments that can be controlled, but that are at the same time as realistic as possible are envisaged to be a crucial stepping stone in between the lab environment and the field trial testing.

In the context of this challenge the IDLab team started in 2014 with a mini-HomeLab, being a testing space in the lab equipped with real furniture, simulating a residential bedroom and a living room. This test space already proved valuable for end-user interaction. At the same time the IDLab team did market research on existing 'test houses' in the EU and beyond. Some of these test houses were visited (such as Aware Home in Atlanta, iHomeLab in Luzerne, De Slimste Woning van Nederland and inHaus in Germany) and inspired the creation of an own research and test environment in Belgium.

UGent and imec combined efforts in order to create the first authentic test house in Belgium:

*HomeLab, Europe's first independent testing ground
for smart home applications and services.*

<https://www.youtube.com/watch?v=m48vDoDZ15U>

<https://www.imec-int.com/nl/homelab>

HomeLab on Google StreetView: <https://goo.gl/MU9XFQ>

3. Innovation results achieved

The UGent - imec HomeLab has been realized on the Technology Campus in Zwijnaarde Gent. The HomeLab is on one hand a 600-square meter test lab with technical corridors in every room, elevated floors and cavity ceilings and an open home automation system. On the other hand, it is an authentic two-story house in which people can live temporarily to test and co-create IoT prototypes or products. A kitchen counter with adaptable height, bathroom accessible for wheelchairs, automatic doors and an in-house elevator make the house accessible for people with special care needs. During the opening in October 2017 a set of demonstrations were given covering different application domains (comfort, safety, security, care, energy) in the home context.

Within EU the UGent-imec HomeLab is unique due to following features:

- The HomeLab is fully **vendor-neutral**: The test infrastructure is independent of commercial investments and at the onset a clear mission towards **technological interoperability** is taken. Next to this **technical flexibility** is ensured due to elevated floors and cavity ceilings allowing for rapid and easy deployment of new technologies and sensors. The in-house developed software platform DYAMAND forms the heart of the HomeLab and offers the possibility to connect both existing devices and/or newly developed prototypes with each other. This is a crucial stepping stone towards future digital services at home that combine sensors and appliances from multiple vendors.
- The HomeLab focuses on **interdisciplinary research**: At the onset of the innovation cycle all relevant stakeholders (researchers from different disciplines, technology developers, integrators, end users, service providers, etc.) can step into a co-creation and co-design cycle in a **real-life environment**. The HomeLab team has ample experience in this research methodology and can tap into the broader UGent-imec community for any complementary expertise needed depending on the application domain (such as for example on security-by-design, privacy enhancement of services, end-user research, techno-economical validation, legal aspects, etc.)

In the (health)care domain for example **active inclusion of end-users** (patients, healthcare professionals, informal caregivers) at all stages of the innovation cycle is facilitated and enabled. At the ideation phase, concept testing, process validation and/or service testing, actual end-users are invited to the HomeLab and test persons can stay for prolonged periods of time so that a more profound validation is possible. This can offer a valid stepping stone towards clinical validation.

4. Link to the PRoF values

The HomeLab is a so-called Smart Space, being at the same time a controllable technological test environment and a authentic house where people can stay for a longer period.

Due to the interdisciplinary research methodology and the active end-user inclusion at all stages of the innovation cycle we aim at developing services with a high acceptance and likability rate. **Co-creation and iterative co-design** of new (health)care services has proven to be of essential to realise non-stigmatising and adaptive solutions to meet the end-user requirements.

Respecting the autonomy and privacy of the care-receivers and care-givers is very important and being able to control the digital services developed is essential. Voice control interfaces and dashboard systems will allow the end-users to have a clear view on the status of the IoT devices. These technologies will be adapted to the end-users profiles and usability will be tested.

Security-by-design will be implemented at all stages of the development process. Expert knowledge on maximum security at different levels (hardware systems, embedded software, data transfer and management, etc) will be incorporated and monitoring systems will be installed.

The IoT services will be targeted to be **cross-life domain**, and similar or identical end-user control systems are envisaged for services in the (health)care area, home control, smart energy, leisure, safety etc. This will augment the **user comfort** and the **adaptability** to changing life situations.

Although the HomeLab in itself is a very modern and high comfort house, we target to develop solutions and service that are **adaptable to a large range of homes and societal environments**. Links have already been established towards the 'City of People' initiative of the city of Ghent, where **social inclusion** in the neighbourhood and initiatives based on informal care are being elaborated.

It is the ambition of the HomeLab team to **reach out to the broader community** by developing easily installable and adaptable test-systems for residential homes. Software platforms such as DYAMAND allow for remote control of IoT services implemented in field trials. Next to this we plan to develop 'IoT toolbox' systems that allow for rapid deployment of certain types of use cases in homes. This would allow people with specific needs to test innovative services at home for a certain time period, without the need for high upfront investments. A first case for assisting people with visual impairments at home is under evaluation at the moment of writing.

The PRoF award would boost the ambition of the HomeLab to reach out to the community at large and to support future integrated care services based on the PRoF values.

5. Applicable IPR rules

For collaborative projects the imec ICON IPR rules for research are applicable and covered by collaborative agreements involving all stakeholders.

For bilateral projects the IPR agreements are stipulated in the contract agreements.

Own in-house developed software components remain the full ownership of the IDLab UGent – imec team and can or will be open-sourced or licensed to companies depending on the specific case and the project conditions in which the development took place.

6. Information on the partners

imec is a world-leading research institute in nano-electronics and creates ground-breaking innovation in application domains such as healthcare, smart cities and mobility, logistics and manufacturing, and energy. The combination of leadership in microchip technology and profound software and ICT expertise is what makes imec unique.

The **imec - WHS** department combines electronics and data science expertise to develop and validate wearable solutions for our customers' health applications. imec develops solutions for a variety of wearable health applications, focusing on:

- Medical devices and chronic disease management
- Lifestyle and preventive care

imec's pioneering hardware and software solutions enable comfortable, reliable, clinical-grade healthcare and lifestyle applications through continuous monitoring and coaching on-the-go, at home, and during daily life.

UGent – IDLab is a core research group embedded in imec. The research of IDLab targets Internet and Data Science applications for future society. Distributing intelligence in IoT, machine learning and data mining, semantic reasoning, wireless and fixed networking solutions are main research topics. The IDLab has an international track record in these technological areas, and has ample experience in collaborative research in application domains such as healthcare, smart energy, smart mobility and smart cities.

The UGent-IDLab has a variety of unique research infrastructures (<https://www.ugent.be/ea/idlab/en/research/research-infrastructure>) allowing the testing and validation of prototype technologies in different stages of development and design. Testing can be envisaged towards the testing of a new technology, software component or end-to-end service. Testing tools and platforms are generic across the different testing environments allowing for upscaling testing scenarios. The HomeLab is the newest research infrastructure targeting all the applications domains relevant for future living.



Note:

If your project is selected as laureate for the Award Symposium, a powerpoint presentation that reflects the project as suggested will be required (in advance), including a future plan how the funding will be used.

If your project is selected as the winner of the Award, you will be invited to present the results achieved thanks to the award during the Award Symposium of the next year.



Addendum: Contact information

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