

Smart Business Model Innovation

Driving Demand and Relevancy in the Building Industry with Smart Technology Value Propositions

Blasberg, Lara Anne

Document Version

Final published version

Publication date:

2021

License

Unspecified

Citation for published version (APA):

Blasberg, L. A. (2021). *Smart Business Model Innovation: Driving Demand and Relevancy in the Building Industry with Smart Technology Value Propositions*. Copenhagen Business School Press.

[Link to publication in CBS Research Portal](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us (research.lib@cbs.dk) providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 12. Jul. 2025



Smart Business Model Innovation

Driving demand and relevancy in the building industry with smart technology value propositions

AUTHOR:
Lara Anne Blasberg

BUSINESS MODEL INNOVATION:
The VELUX Group

INDUSTRIAL POSTDOC:
**Copenhagen Business School
BLOXHUB Science Forum**

REPORT DATE:
May 2021

This report represents the culminative findings of business model innovation research on smart homes and smart buildings in the VELUX Group.

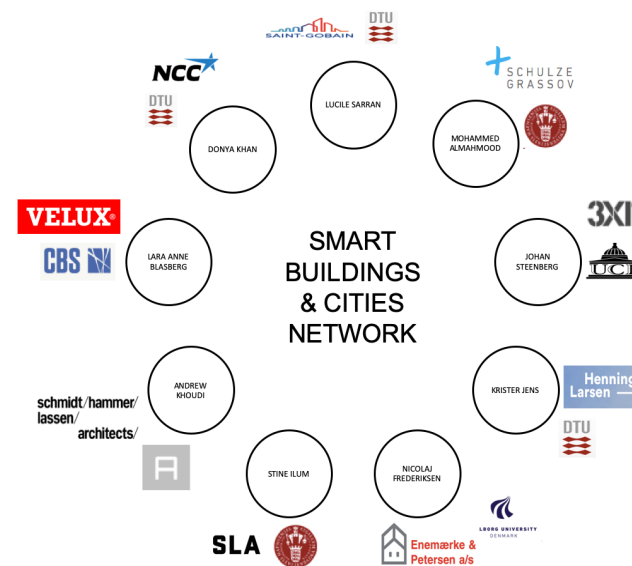


Author Lara Anne Blasberg
Photo credit: Maiken Kestner

The research was born out of a collaborative effort among key players in the building industry, the Danish Innovation Fund, and Realdania to strengthen cross-sector collaboration with a focused theme: **Smart Buildings & Smart Cities: Balancing technology and people**. This group of nine projects representing different companies and universities across the industry serves as the starting seed of the growing BLOXHUB Science Forum network, with the aim of strengthening industrial research with knowledge sharing and joint innovation.

One of the nine projects, **Smart Buildings Business Model Innovation** led by Lara Anne Blasberg, PhD, was conducted within the VELUX Group from January 2018 to April 2021. The purpose of the postdoc project was to investigate how the VELUX Group can innovate business models for smart building practice that places building user concerns - like health and well-being – at the center of value creation. This was accomplished through an inside-out and outside-in take on VELUX Group activities and a tracking and integration of broader trends across the industry. Lara's postdoc involved combining research strands and industry insights to build four cases, with a focus on demonstration projects and relevant stakeholders in Denmark, Belgium, and, Canada.

To date, there has not yet been a substantial, public disruption to business models of the building industry, neither in residential nor commercial buildings. This report is meant to share the insights of this business model research, meant to stimulate discussion and invite feedback on its interpretation of the business. It elucidates the emerging trends, initial steps taken, and promising business models for smart technologies in the building industry going forward.



Executive Summary

The Smart Business Model Innovation Report gives an overview the significance of business models for the building industry. Consolidating over three years of industrial research, the report examines emerging technologies and potential value propositions for a smart built environment. It introduces why smart technologies impact construction business models, and it outlines smartness trends that can increase relevancy for building organizations going into the future.

The report then sets forth four business model innovations based on **performance**, **incubator**, **co-innovation**, and **ecosystem value**, as well as four immediate focus areas.



Classroom at Kokkedal Skole, Denmark



UrbanTech 2020. From left to right: Lone Feifer, VELUX Group; Kerim Martinez, COWI; Lara Anne Blasberg, author; Thorbjørn Færing Asmussen, VELUX Group. Photo credit UrbanTech



Airbird workshop with Smith Innovation

Contents

05 Introduction

06 Why business models, why technology?

07 How technology is disrupting business models

08 Insights from the Smart Buildings & Smart Cities Research Group

10 Visualizing Business Models

11 Data-driven business cases

15 Smartness trends

16 Actionability

17 Partnership

18 Proptech

19 Living lab

20 Sustainability

23 An era of new business models

24 Performance

25 Incubator

26 Co-innovation

27 Ecosystem

28 Four next steps

29 Framing

30 Seamless functionality

31 End-user relations

32 Futureproofing

33 Closing remarks

34 Further Reading

36 Acknowledgements

Introduction

Business model innovation is a critical component of developing new areas of business, forming and strengthening partnerships, and creating value from smart technologies. The building industry is reputed to be both fragmented and slow to change, though a multitude of innovations have been integrated over the years, ranging from in-house bathrooms to sustainable construction materials. Key to the success of these transformations has been the ability to generate value from linking supply-side innovations to new demand and ways of living. This report seeks to highlight the increasing significance of such value generation from smart technologies - for driving demand and moving ahead of the digitalization curve.

Along with navigating the recent surge in technologies aimed at further digitalizing and automating the building industry, recent years have seen the advent of sustainability and health challenges. As environmental and energetic sustainability gain a foothold in practice, digital technologies are revealing how building monitoring, real-time data, and the quantified self can additionally support human well-being in buildings. The first proof that holistic sustainability (i.e. environmental, energetic, and well-being) can be implemented in practice is demonstrated in Active House-, DGNB-, and WELL-labeled buildings.

But change does not come pre-packaged. These advancements have been achieved through experimental approaches to creating value. These experiments involve testing value propositions, launching prototypes, and navigating the difficult terrain of scaling successes while dropping failures. We now face the challenge of forging an industry that successfully brings together smart technology and sustainability, from innovating digital products to supporting a societal transformation to sustainable living. This report looks at how value from smart building technologies can contribute to new business pathways for accomplishing both targets.



INCREASING DIGITAL VALUE

“ We sell a product, but what our customers buy is better living quality and better health indoors. Remember to focus on the value that actually matters.

Lone Feifer, Director of Sustainable Buildings, VELUX Group

Why business models, why technology?

Business model terminology has grown in popularity in recent years, and it is often attached to new or maturing technologies. In fact, the business model as a concept was born from the computer science field. This is because of the connection between business models and innovation through value, especially how technology can disrupt value chains. Though there are varying definitions of a business model, a good rule of thumb is that it is how businesses create, deliver, and capture value. Following from this, business model innovation involves experimental alterations to the value offered to customers.

Along these lines, there are two common BM misconceptions that should be dispelled here:

False: Business models are only about money.

True: While ideally an outcome is financial profit, money is only one manifestation of value. There is an innovation journey involved in translating value into business processes and eventually financial value.

False: Companies only have one business model.

True: There does tend to be a core product (e.g. roof windows) or service to any business, but this does not mean that companies only create value in one fixed manner. Adapting a business to future demands involves experimenting with different value propositions (such blinds for those windows, or a smart sensor to control them).

THE COMING CHANGE

// The construction industry shall change in the very way it is structured and its services rendered. Technology is just a puzzle piece, whereas true and sustainable innovation does not come from technology alone; it comes from new Business Models.

Olivier Lepinoy, Digital Builder, June 2020

How technology is disrupting business models

Exploring new avenues of value and how technology can enable or enhance that value is fundamentally important for ensuring relevancy in the future of the building industry – whether in architecture and design, manufacturing, construction, or operations. It is important to note that technology in and of itself does not produce value, but rather value is from the business model through which it is brought to markets.

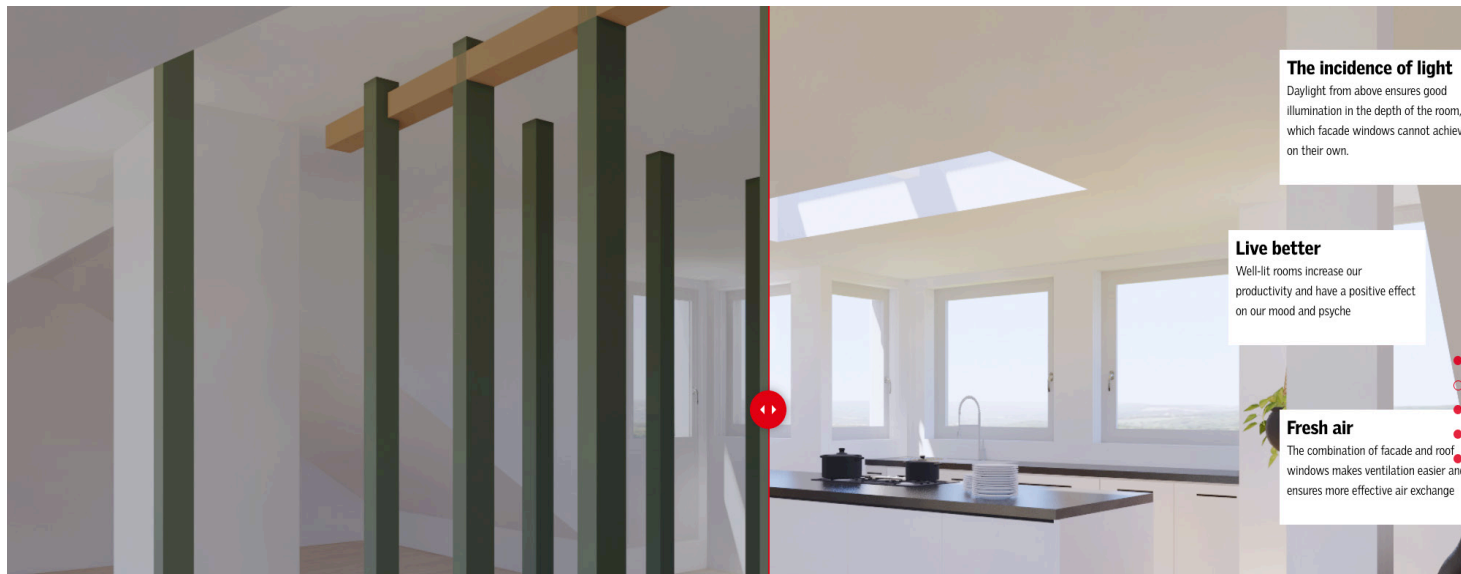
Digitalization has resulted in a digital communication tool – the smart phone – placed in the very hands of building users. At the same time, affordable, high quality sensors facilitate gathering data on invisible or otherwise previously neglected aspects of buildings, such as indoor air quality and light and noise levels. Altogether, organizations now have an unprecedented ability to provide benefits and services above and beyond what purely physical products offer. This also enables bringing business closer to end-users to learn about how buildings and building products are actually used, improve efficiency, and work across the business ecosystem on the building level. The implications touch every stage of the building process: Building Information Modeling (BIM)

and building passports for project overview and management; virtual reality and 3D interaction to support design choices and customer preferences; drone deliveries and RFID tagging to follow materials and conditions; smart home assistants with customer preference profiles and scene control during building use; and so on.

These areas have been developed experimentally, with an eye to future sources of value for the business – underlining that business model innovation is as much about business processes and organizational identity as it is about product development. But there are also waters that are yet uncharted for the building industry, such as AI technology that allows for responsive, social management of homes and offices based on big data analytics; or smart renovation, using plug-and-play smart systems to track and substantiate improvements made to existing buildings.

Going forward, the industry needs structured value propositions to frame these ventures, both in terms of shaping lifestyles externally in the market and redefining internal approaches to innovation.

Virtual reality for customers to explore indoor design options. Customers can click on the red tab and drag the slider to compare 3D renderings with and without VELUX products



Insights from the Smart Buildings & Smart Cities Research Group



Lucile Sarraan,
Industrial PhD at
Saint-Gobain Nordic and
DTU, Occupant-centric
approach to residential
heating and ventilation.



"We can see from post-occupancy evaluations in new and retrofitted dwellings that indoor environmental quality has overall improved in comparison to older buildings. However, occupants complain about a number of factors that are often missing from design criteria: usability of new building control interfaces, excessive automation, lack of transparency and guidance about how to operate heating and mechanical ventilation systems. Insufficient commissioning leads to faults on the technical installations that occupants are not equipped to diagnose, which translates into discomfort and energy waste. People are increasingly feeling estranged from these complex buildings they live in.

In my view, the role of digital technologies in buildings should be to make sure that occupants are kept in the control and information loop. Indoor climate sensors, energy meters and HVAC operational data could be used to keep users informed of the good operation of heating and ventilation, to assist them in making informed indoor climate control decisions, and to detect technical faults when they arise.

Such a wealth of data should also find its way back to the building design professionals. I can imagine that in the close future, continuous post-occupancy evaluations could be carried out through digital technology, prompting occupants to give feedback on indoor environmental quality, but also on usability, quality of the information provided, and esthetics. Occupants should occupy a central role, as their comfort experience could be used as a direct input for future product developments and design practices."



Krister Jens, PhD,
Data-driven architectural
design and development.

**Henning
Larsen —**

"Buildings have become increasingly ubiquitous. The depth of information we can achieve from pervasive technologies like phones and sensors will change the way we understand the use of our buildings. The knowledge generated from these technologies with regard to human-centric value propositions resulting from good design will challenge previous assessment metrics that focused only on operational performances such as HVAC systems, etc.

An improved user feedback loop is key as foundation for good design, as humans create the major value within the building's lifecycle. Today, we have consumption-based sensors such as: smart meters, water or energy readers, mechanical-based sensors, motion-based sensors, radio-based sensors, and image-based sensors that, in combination with qualitative user feedback, form the best foundation to achieve buildings that align with the dynamically changing use patterns in modern buildings.

While current data collection on humans mainly benefits the researcher or building administration, the future will likely democratize the collected data in ways that allow users to participate and benefit from improved indoor environments."



Donya Sheikh Khan,
Industrial PhD-student,
Increased occupant
satisfaction using
data-driven technologies.



"Construction companies typically compete for construction projects based on the lowest price. Activities and resources of a given construction project are primarily reviewed to reduce the cost and the risk of exceeding the project timeframe. However, this way of working has neither created more economic productivity nor led to sustainable buildings that benefit the building occupants.

I believe that construction companies need to adopt new business models that encourage them to focus on providing quality and sustainable solutions for the built environment. Furthermore, construction companies need to be better at using and implementing digital technologies. Specifically, the data scientists' toolkit, including data visualization, statistical methods, and machine learning, serve as relevant technologies for helping building professionals to study buildings' actual performance and gain new insights. They can use the new insights to make informed decisions and actions during building design and operation to benefit occupant well-being and sustainability. Consequently, the technologies that provide the most value are the ones that can 'cooperate' with building professionals to enhance their delivery of building-related services.

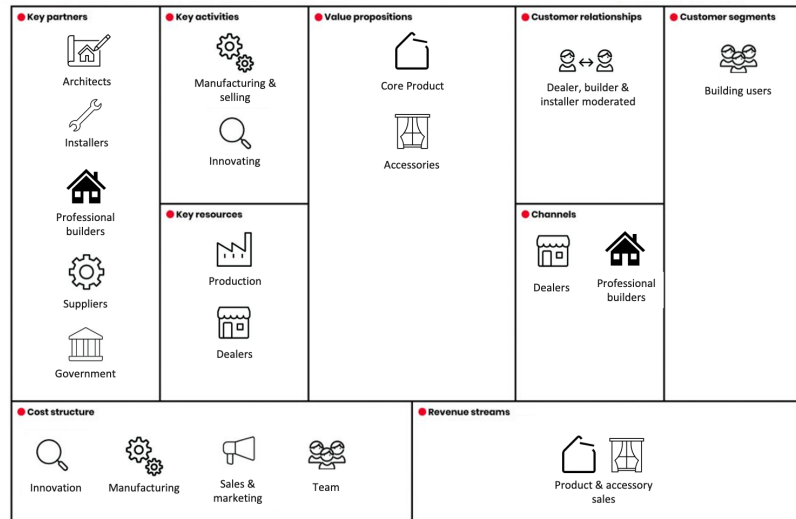
However, the biggest challenge to overcome, which a technological fix cannot sufficiently provide, is the fragmentation between the construction industry and the facility management industry. Construction projects rarely incorporate the knowledge or consider the building operation stage into the design and construction of buildings. I believe this division between the two industries is because of the policymakers focusing primarily on the as-designed building

performance and the lack of relevant stakeholders representing building operation during the construction processes. Building occupants and building operation should be the central focus of construction projects. Construction projects should already today aim to provide value for the building occupants and ensure building operational performance."



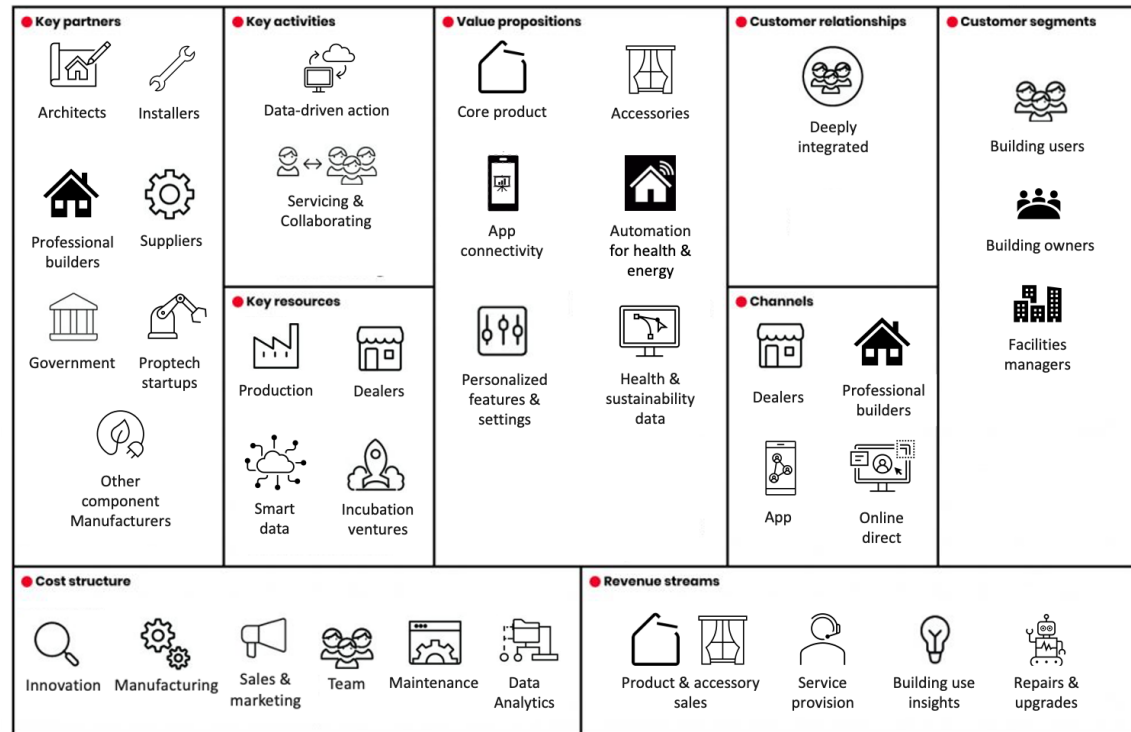
Research group from left to right: Andrew Khoudi, Mohammed Almahmood, Donya Sheikh Khan, Krister Jens, Lara Anne Blasberg (author), Nikolaj Frederiksen, Lucile Sarra, Stine Ilum
Photo credit: Ditte Frisk Hansen

Visualizing Business Models



Canvas for conventional building value.

A decade ago, Osterwalder and Pigneur conceptualized the Business Model Canvas, and it has since been used extensively in corporate settings. The purpose of the canvas is to: visualize business models, represent value areas for a company, and support strategic management. The below canvases are based upon research in the VELUX Group and were drafted to support visualizing both traditional and smart technology business models for building component manufacturers. Neither canvas is necessarily comprehensive, nor exhaustive; but they are meant to serve as starting points for value discussions. They are also meant to illustrate that business model innovation need not threaten core value propositions, but rather new business models expand the business with additional value streams.



Canvas for expanded smart building value

There are additional useful ways of visualizing business models, depending on the innovation focus of the company. They can more thoroughly reflect the business ecosystem, such as with interactive network webs, or they place more focus on sustainability value, such as with the Flourishing Business Model Canvas.

Data-driven business cases

The findings at the heart of this report are derived from these business cases, built upon ethnographic and technical data from: the VELUX Group, key customers such as architects and professional house builders (PHBs), end-users, and partners across the building sector. Four business cases were developed from industrial postdoc research in the VELUX Group between 2018 and 2021, reflecting various approaches to value in different areas of the building business.

These cases have involved 90 interviews, over 40 industry events, and hundreds of observational notes. The cases emphasize the business relevancy of smart building technology; and if technology is the what, the cases substantiate the how, who, and why of business model innovation.



Photo credit: Adam Mørk



Photo credit: EMPTYHOUSE Media & Communication ApS, René Jepsen

Green Solutions House, Bornholm, Denmark

Green Solutions House is a combination renovation and new build project, contributing to sustainability as part of the Bright Green Island program on the island of Bornholm. It is a hotel and conference center, where guests can enjoy natural materials, breathtaking light and air design, and various experiments with the native ecosystem, the restaurant, and building use data.

RenovActive, Anderlecht, Belgium

RenovActive is a social housing renovation project in the Bon Air (good air) garden neighborhood of Anderlecht, Belgium. The challenge was to set forth a renovation solution that could be achieved affordably and replicated to other housing units. The challenge was met with the RenovActive design principles and implemented through partnerships.

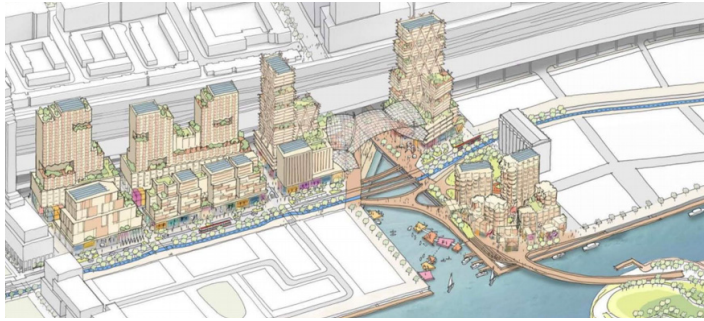


Image credit: Sidewalk Lab

Quayside and innovation, Toronto, Canada

The Quayside project was initiated by Sidewalk Labs (Google's sister company) in partnership with City of Toronto and Waterfront Toronto. It aimed to turn the former industrial area of the city's lakefront into the world's best designed smart city. In the wake of its dissolution, Toronto has nonetheless emerged as an innovation and Proptech leader, and its professional house builders, such as Great Gulf, are frontrunners in the widespread development of smart, sustainable, and healthy homes.



Image credit: Lara Anne Blasberg

Kokkedal Skole, Kokkedal, Denmark

Kokkedal Skole is a public elementary school in Kokkedal, Fredensborg Kommune, just north of Copenhagen. Kokkedal Skole has emerged as a lighthouse project for the kommune, wherein it has invested towards its "Future of Public Schools" (Fremtidens Folkeskoler) program. The program at the school has included air quality monitoring, interviewing with staff and teachers, and initial renovations, set to complete summer 2021. It also includes innovative approaches to classroom layouts, science and engineering education, and the centrality of sustainability in all teaching subjects.

THE NEXT NORMAL

// A combination of sustainability requirements, cost pressure, skills scarcity, new materials, industrial approaches, digitalization, and a new breed of player looks set to transform the value chain. The shifts ahead include productization and specialization, increased value-chain control, and greater customer centricity and branding.

McKinsey report The next normal in construction: How disruption is reshaping the world's largest ecosystem, June 2020 [See full report here](#)



Mircom's building user interface system for Great Gulf homes



Renson's smart, sensor-controlled Health Box 3.0 ventilation system



Dyson smart air filters in a department store in Denmark

Smartness trends

The following smartness trends are identified for improving relevance and spearheading the smart building future:

- Actionability
- Partnership
- Proptech
- Living lab
- Sustainability

Smartness trends

Actionability

Sensor systems and post-occupancy measurements are just beginning to give us extensive data and a better understanding of what is happening inside buildings, in terms of both product performance and the human experience. But they do not necessarily give the ability to take action when there is a problem. In the example featured here of Green Solution House on Bornholm, the conference area is monitored with real-time data on indoor air quality and building performance, which can be compared with the design intention. Guests are able to enjoy the roof windows and shading solutions in the atrium and conference rooms. However, it is difficult to adjust the system settings themselves.

Actionability has been integrated into the design of VELUX Active (smart roof window and blinds control), which allows users to override any changes, as well as to see an overview of conditions and adjust the system with the associated app. Successful solutions going forward will offer such actionability as a feature; and this action can be taken by building users, building automation systems, or some combination of the two. Actionability is also about how research and evidence change the way business is done. Data itself does not bring value, but rather the ability to act on it does. In this way, the ultimate actionability lies in the ability to use building data to learn from past mistakes and design, construct, and renovate buildings in a more clever and informed way.



Event attendees at Green Solution House, Bornholm, enjoying the bright and airy atrium

// What about the light?
I think – because I'm sensitive to light in my eyes – that sometimes I missed shading.

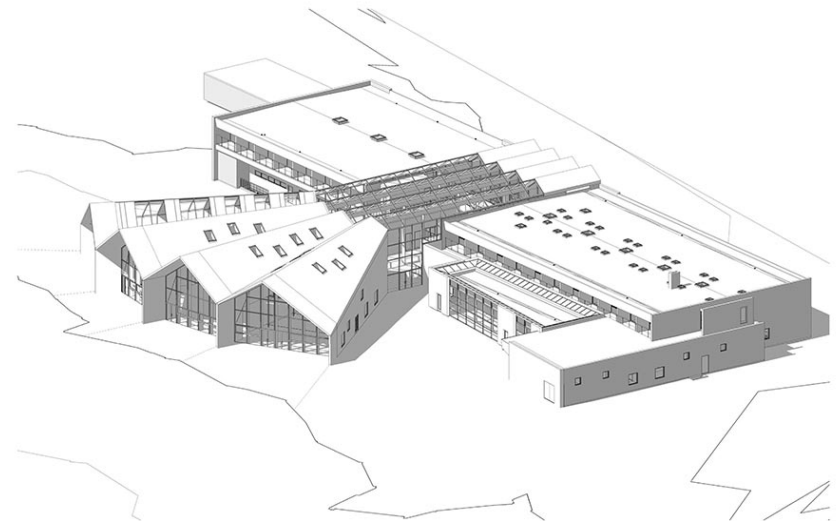
It was too much?

Yes, you could say that. I was standing up and telling things in there, and when the light came down it was very hard for my eyes ... But I saw that there were shades on the windows. Someone should have put them down.

And you never did?

No.

Interview perspective



Aerial view sketch of Green Solution House, Bornholm
Image credit: VELUX Group

Smartness trends

Partnership

Partnership is increasingly seen as a crucial component of business models in digitalized industry. This is in part because of the complexity of smart technology solutions and their implementation, but it is also because of the dispersion of value across the business ecosystem.

The VELUX Group has a longstanding history of innovating through partnership, both in building design and technological solutions. The VELUX Group's sustainability partnerships - with the World Wildlife Fund and with Schneider Electric - are good examples of how partnership can lead to win-win value propositions along strategic lines. Its leadership of events like Healthy Buildings Day and the Daylight Symposium, now brought together as VELUX Days since 2019, serves as knowledge-sharing, timely agenda promotion, and partnership strengthening.

As technological disruptions are occurring across the construction value chain, business models will increasingly depend upon partnership within the building ecosystem, each contributing (and gaining) value in a different way. Yet, there is the risk of isolating and focusing on proprietary solutions; while unique building-level value can often be realized through partnerships. As emphasized in several interviews, there is no single organization responsible for the whole building and emerging smart systems, and viable business models will involve joint efforts.

// With the rise of smart building technology, many departments are again working in silos and implementing one-off IoT initiatives to solve a single issue, instead of looking at the bigger picture.

Iwan van Eldijk, VP Partnering & Alliances, Planonw



VELUX Group partnership with Schneider Electric for renewable energy solutions. Image credit: The VELUX Group



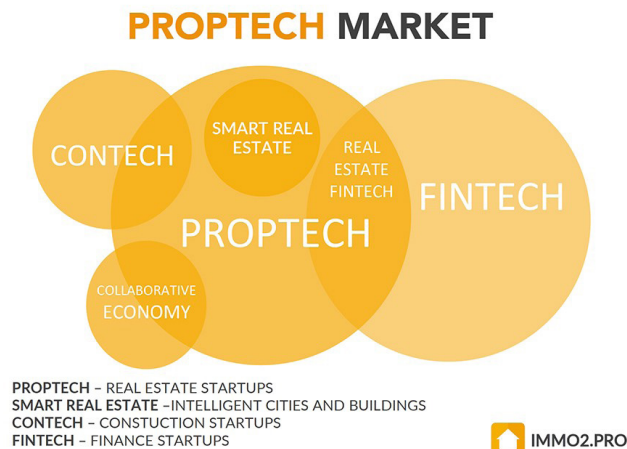
Healthy Buildings Day 2018 welcome with Keith Riddle, Senior VP Sales and Marketing, VELUX Group

Smartness trends

Proptech

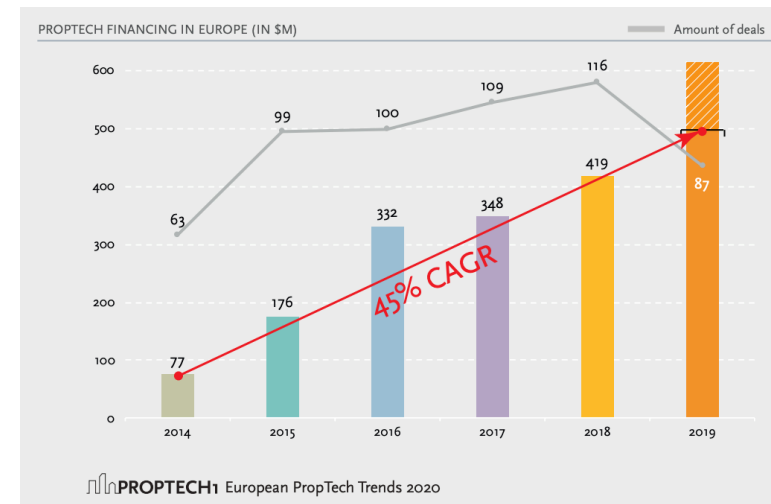
Startups in the property technologies or 'Proptech' arena are accelerating change across the building industry with rapid innovation and shelf-ready solutions. According to Proptech1, the sector has seen a 550% increase in investment funding since 2015; and in Europe, where venturing is more conservative, the investment trajectory likewise resembles a steep incline. Larger tech companies have thus far been unsuccessful at replacing the building industry's value chain, with examples of controversial smart city projects like Quayside in Toronto and Songdo in South Korea.

That said, to gain a competitive edge and adapt to clearly shifting terrain, building companies can benefit from working with nimble, agile companies to test out more high-risk, adventurous technologies. A combination of tried and true industry knowledge with cutting edge entrepreneurship is sure to reshape the industry.



“ If we do not do anything, we will be reduced to a components supplier, and we offer a commodity. That is definitely not our ambition.

Interview perspective



See the full PROPTech1 European PropTech Trends 2020 report [here](#)

Smartness trends

Living lab

Business model innovation involves iterative innovation, that is, repeated experiments with adjustments from learnings along the way. Experimenting is usually high risk in the building industry due to the inherently low structural and technological flexibility of buildings. These challenges point towards trends in living labs, the terminology for conducting experiments during use, in a live context. Living labs can involve devoting particular physical spaces to experimentation – such as with the Kokkedal Skole project led by Copenhagen Business School, VELUX, and Leapcraft, and the forthcoming VELUX Innovation Centre in Østbirk – or it can involve an amped up level of modularity and design for disassembly, lending buildings greater flexibility. This trend is also impacting building design standards, as demonstrated with the ongoing development of an EU Smart Readiness Indicator that will mark the plug-and-play readiness of buildings and enable governments to follow the progress of upgrades.

// Living lab is an answer to many contemporary trends such as, for instance: users changed roles from passive consumers to active prosumers of content, shortened time to market for innovators, and a globalized market through internet and IT's entrance into peoples everyday activities.

Anna Ståhlbröst and Marita Holst, The Living Lab Methodology Handbook



Groundbreaking for renovation at Kokkedal Skole



Site of the future VELUX Innovation Center. Photo Credit: Zeynep Yilmaztürk

Smartness trends

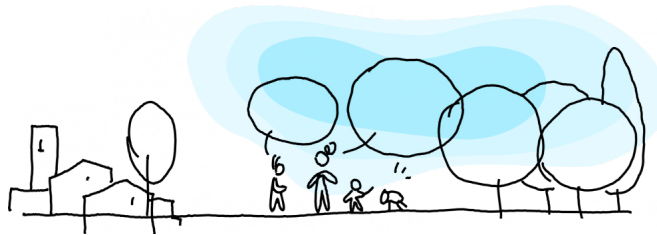
Sustainability

As has been witnessed in the EU, North America, and Asia, sustainability in the built environment will be further and more stringently regulated. Smartness and sustainability are increasingly viewed as intertwined, or, more specifically, smart technologies are seen as enablers of sustainability.

New forms of value will thus be made possible from the demonstrated (and measurable) energy performance, health, longevity, and eventually reusability and recyclability of buildings, across the entire life cycle. This trend offers a common aim towards which organizations can collaborate on a whole building level, such as the VELUX Group has done since its cofounding of the Active House Alliance. And further, this trend presents an opportunity to connect with users and the general public with the assurance of a better built environment.

The New European Bauhaus, announced as part of the New European Green Deal in September 2020, is the embodiment of this trend of looking to design, creativity, and community to create better future cities. Circular economy, an embedded aim of the New European Bauhaus, is considered the ultimate sustainable business model.

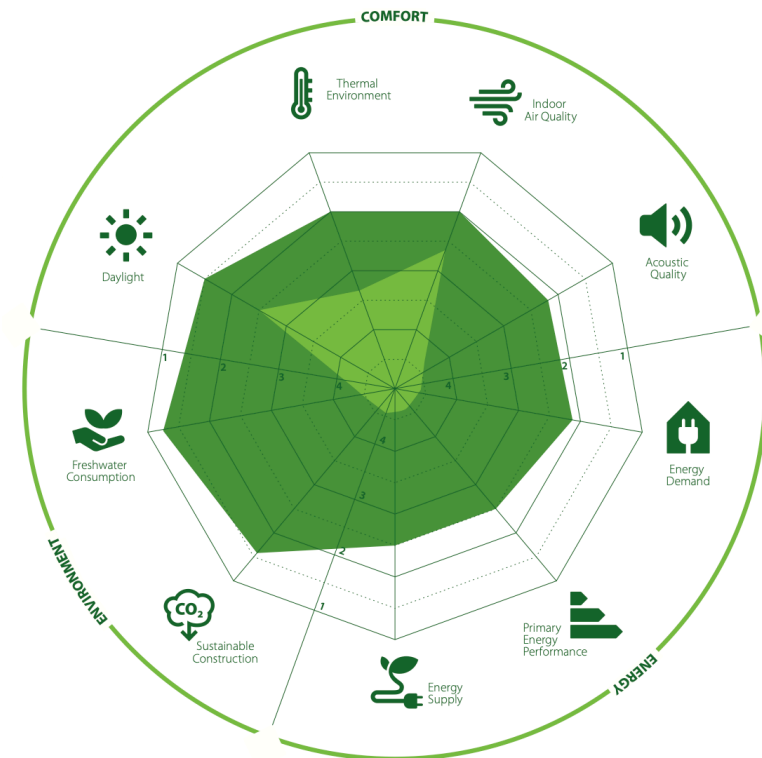
New European Bauhaus
beautiful | sustainable | together



The New European Bauhaus banner
Image credit: Europa.eu

// Part of [sustainability] is to think about how to build in a reasonable, performance-based way that addresses the uniqueness of use of buildings, but still drives them to the appropriate level of performance, given their uniqueness.

Interview perspective



Active House Radar for comfort, energy, and environment
Image credit: Active House Alliance

FROM PRODUCTS TO PROCESSES

// Business model innovations exceed the scope of the mere introduction of a new product or service offering and thus open up completely new opportunities of how to engage in economic exchanges.

Frankenberger et al. (2013). The 4I-framework of business model innovation:
A structured view on process phases and challenges. International Journal of Product Development. [See the article here](#)



Visitors at 307, Sidewalk Labs' Quayside project public site



Public tour of the RenovActive project in Belgium



Humlebyen (Hops town), Copenhagen, near the new Carlsberg City and site of UrbanTech 2020 project

An era of new business models

In order to harness new value from disruptive smart technologies and intersecting smartness trends, four business model innovations are brought into focus:

- Performance
- Incubator
- Co-innovation
- Ecosystem

Business model 1.

Performance

A business model that delivers value from product performance falls under the category of product-service systems (PSS), and more specifically, results-oriented PSS.* As smart technologies have made it possible to evaluate the actual performance of buildings in use – as versus the predicted performance, clients (and governments) will increasingly demand the demonstration of quality in use. The most important feature of performance value is that it establishes an ongoing relationship with the building user and improves the ability to adapt to their needs. This creates the opportunity for building organizations to analyze broader patterns from buildings in use; apply learnings to building design and renovation; and provide service that ensures the best conditions of buildings in use – and in turn, building user satisfaction and well-being.

DYNAMIC RESPONSE

// The [product-service system] supplier has an advantage over product-focused counterparts because of the ability to better understand and meet the needs of the customer in a dynamic manner.

DTU workbook PSS Business Models A workbook in the PROTEUS Series, 2013
[See workbook here](#)



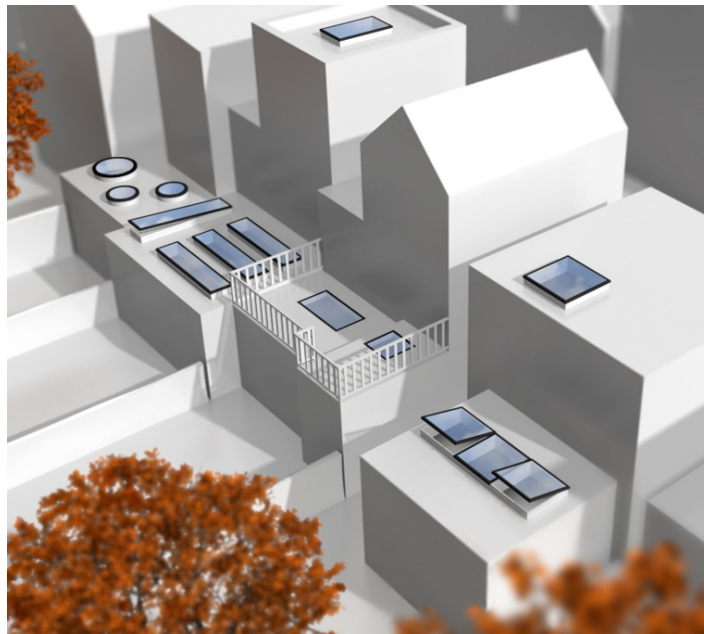
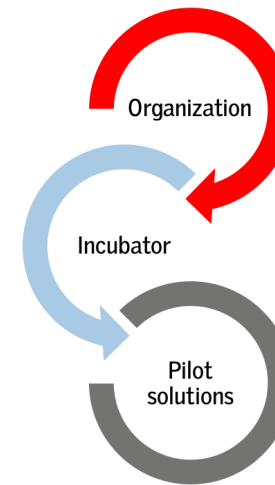
Service provision can be derived from comprehensive, real-time use data
Image credit: Cove.Tool

* One or more of the below business models will likely precede performance value, as the value proposition is dependent on partnerships in the business ecosystem.

Business model 2.

Incubator

Although this business model type is a very recent phenomenon in the business world, it has the advantage of creating rapid, small scale change akin to that of startup business models, but without as high risks. An example of this business model already underway in the VELUX Group is that of Vario by VELUX, essentially a startup nested within the larger organization. Established businesses are creating their own internal incubators to provide the agility needed to respond to continuous disruption in the environment, e.g. BMW Startup Garage, Novo Nordisk's Circular to Zero, and Saint Gobain's aereNmore. This business model allows for the startup within the company to experiment with piloting and scaling solutions in a structured manner and establish its own KPIs, while still benefitting from the stability and resources of the overall organization.



Vario by VELUX bespoke natural lighting solutions
Image credit: VELUX Group



BMW Startup Garage, Innovation Lab, Munich
Photo credit: Jens Heilmann for BMW Startup Garage

Business model 3.

Co-innovation

Business models with co-innovation value are rooted in mutual benefit. Many business models for innovative technologies do not breach or scale in the market because their structure does not distribute, and thus lower, risks during implementation. In co-innovation business models, partners jointly develop shared value propositions in a form of open innovation, wherein companies ideate outside of their traditional boundaries. In this process, established companies and startups are gathered to experiment with value propositions. The aim of these business models is to test out the feasibility of emerging technologies, while lowering risk and exploring mutual benefits. The VELUX Group and VKR have demonstrated initiative by supporting and partaking in the Urban Tech Program, wherein Rainmaking conducts global scouting and matchmaking to address the corporate sponsors' most salient challenges. In the first two years of this three-year program, 2019 and 2020, the VELUX Group demonstrated value propositions in partnership with seven startups offering solutions spanning advanced materials, machine learning, life cycle design, and environmental intelligence. Another excellent example of co-innovation is the AirBird, which tweets when the air quality is poor and fresh air is needed (i.e. from opening windows, or shifting behavior), thus enhancing awareness and interaction with the indoor space.

Airbird Launch in June 2020.
From left to right:
Kirsten Birkving
Principal of Kokkedal Skole.
Lara Anne Blasberg
author.
Thorbjørn Færing Asmussen
VELUX Group.
Vinay Venkatraman
CEO Leapcraft



Urban Tech Demo Day 2020



The AirBird® has been ideated, designed and developed in co-creation between GXN, VELUX Group and Leapcraft
[Try the AirBird here](#)

Business model 4.

Ecosystem

An ecosystem business model is one in which the value propositions stem from a whole-building approach. This business model is crucial for delivering on the highest-level benefits of building excellence, including energy performance, healthy indoor climate, and sustainable living. Although complex and difficult to negotiate, the partnership agreements involved in ecosystem value reach across competencies and market categories to present more convenient, appealing, and polished package offers for customers. In terms of smart home ecosystem value propositions, success depends on alignment with strategically compatible partners whose quality solutions work to enhance the performance of the building in use. The VELUX Group has historically engaged in such a business model with the co-development of io-Home Control, a radio frequency protocol through which building devices can communicate. The future of such an ecosystem approach depends on boundary-spanning business model innovation to include key smart technology actors, including from Proptech, and upgrade from basically connected devices to smart home service offerings.

// The most effective defense [...] is to ensure that you offer the best available product or platform and the best overall ecosystem solution. Having only a superior product or platform is no longer sufficient in an ecosystem world, where competition happens at the system level.

Boston Consulting Group's article How Do You Design a Business Ecosystem?
[Read the report here](#)



Smart Home as an ecosystem approach to providing better indoor climate for healthier living.
Image credit: EFFEKT Architects.

Four next steps

- Framing
- Seamless functionality
- User relations
- Futureproofing

Next step 1.

Framing

Going forward, the building industry is faced with the task of reframing building practice as smart and agile, while still ensuring security and reliability. This step is about establishing how building companies portray themselves as part of the solution - not only as sustainable, but astech-savvy -, and it will open individual actors for strategic opportunities from partnerships and from customers. Being recognized externally this way will instigate partners reaching out for collaboration, and it will help customers to know

why change is needed and what their options are. This framing involves internal alignment on the relevant terminology (smart, technology, digital, data), as well as a broader understanding of what the immediate future holds for the company and its employees. It also involves establishing an overview of the smart technology ecosystem as relevant for a particular business and to support defining the desired strategic placement within that ecosystem.



Image credit: Pexels from Pixabay

Next step 2.

Seamless functionality

Integrating smart building technologies has been the first and largest barrier to the attractiveness of the smart home concept. Instead the smart home must be shelf-ready and easy to use. This has been reflected in a flourishing of hubs for controlling different elements (thermostat, windows, security, etc.). Connected Home Over IP (CHIP) promises to solve this as the one united protocol across smart home offerings. As much of a success CHIP may turn out to be as a baseline, building organizations must go further to apply industry-specific knowledge and experience. If any product can indirectly connect to a smart building component through this common protocol, it is important that the industry guides customers (and potential future customers) on which partners are trusted and which products will best support the delivery of healthy and sustainable living in buildings. In this way, the building industry should consider forming coalitions for best practice 'package solutions'. Without giving guidance to customers, the industry risks diluting the benefits of excellent construction and damaging reputations as a consequence of poorly performing or unreliable products linked through the protocol.



Examples of routers, hubs, and wires previously needed for connectivity

CHIP

// This alliance may be critical to the future of the smart home, and proof that no single company has managed to dominate this space. We've seen these types of unions form and fall by the wayside, but the fact that Apple, Google and Amazon are all sat at the same table provides some hope – and an acknowledgement that everyone has failed to own this space.

WIRED Magazine, December 2019

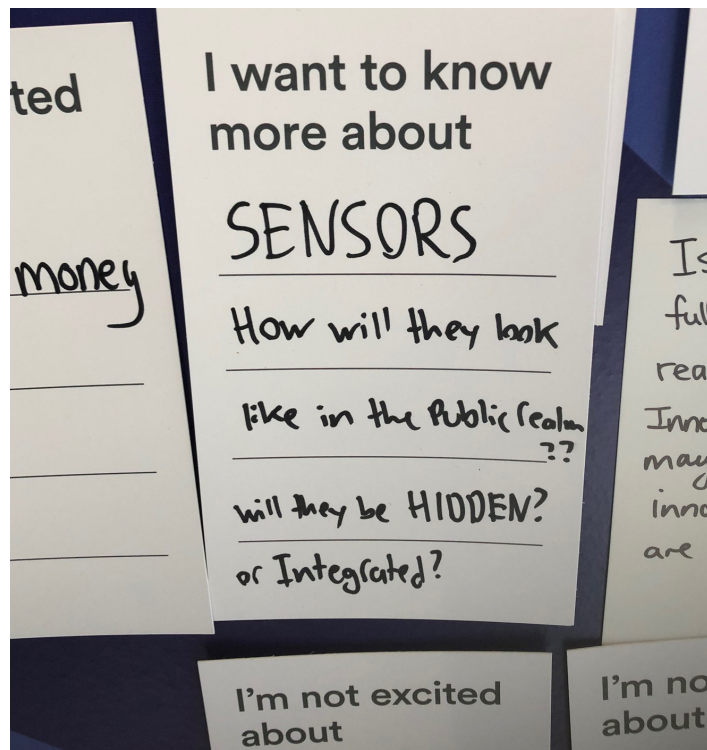


Next step 3.

User relations

Although building manufacturers have been able to finesse the reliability of their products over several decades, component quality has tended to be disconnected from the user experience (e.g. mechanical ventilation hidden in a closet, or floor heating embedded in the floor). The industry has not previously been geared toward an ongoing and interactive relationship with users. End-user engagement through smart connectivity is a win-win. Companies can learn more about how people use their products and what is going on inside the home; and users can respond with feedback and ideas, while becoming more aware of and better enjoying the benefits that healthy, sustainable buildings

provide. Establishing such relationships – through play, science, art or design – lays the groundwork that will be needed to advance into individual services. These are anticipated to become available through machine learning and artificial intelligence, and personalized design, such as will be mass marketable with digital design and modular construction. End-user relationships are also, arguably, the only avenue for effectively communicating about health and sustainability through living spaces. This next step involves an invitation for bi-directional communications – that is to say both sending and receiving content – through advanced app capabilities, building interfaces, or even virtual reality.



One of many user inputs to the Sidewalk Labs Quayside project in Toronto



Photo credit: Jesper Jørgen Fotografi ApS

Next step 4.

Futureproofing

This fourth step is also the largest step in terms of impact on the way the industry builds. Futureproofing buildings involves many strategies, such as design-for-disassembly, modular construction, and real-time monitoring. But a critical strategy is data feedback to design – that is to say, analyzing data from past and current product (and building) use in order to better inform how buildings are designed and constructed. The VELUX Group has pointed in this direction previously – by evaluating the Model Home 2020 demonstrations, and by using research to inform projects, such as with the Kokkedal Skole renovation.

The next step industry-wide involves formalizing feedback processes into all building projects going forward, both new build and renovation. The gravity of the predicted versus actual performance issue cannot be emphasized enough. Eventually, through regulations or through client demand, the industry will be held responsible for the performance of buildings. Those companies who have already established processes for using actual performance data to create excellent performance through design will be the front-runners in the future of building.

The RenovActive project is also an excellent example of converting learnings into design principles for affordable, healthy renovation.

RenovActive – the 7 elements

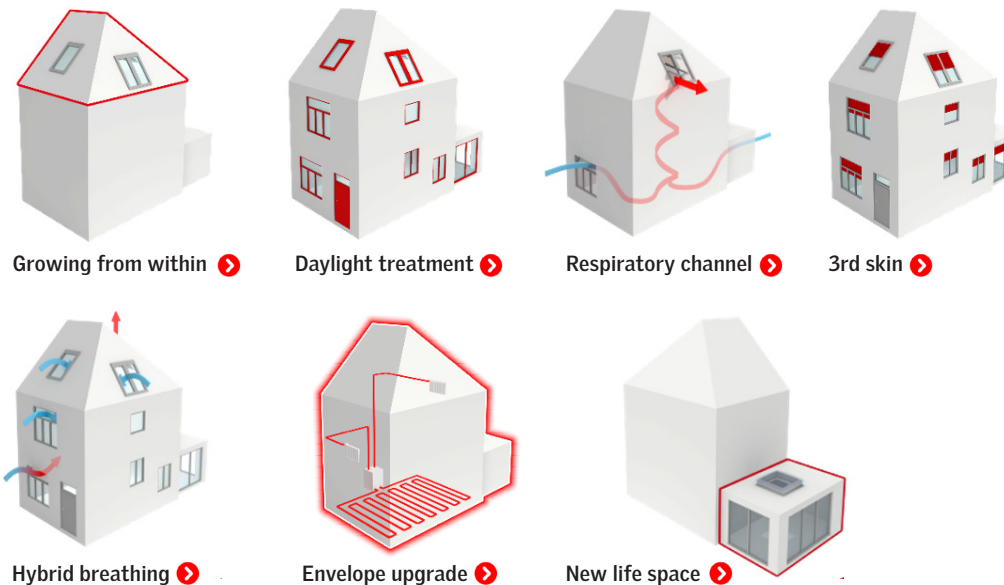


Image credit: The VELUX Group



RenovActive project. Photo credit: Adam Mørk

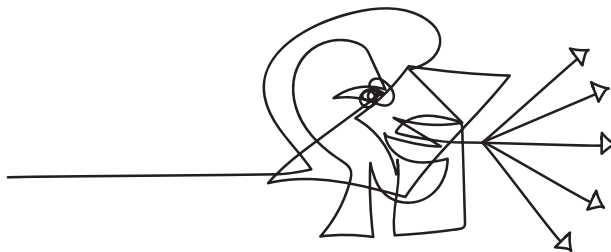
Closing remarks

The building industry has emphasized security, quality, and reliability since the times of Hammurabi. Although at first glance, smart technologies and the fourth industrial revolution may appear to threaten those qualities, there is in fact opportunity in disruption. Builders now have the possibility of tracking and ensuring quality through the entire building life cycle and of guaranteeing the well-being of the very users builders are made for.

Smart business model innovation and experimenting with value propositions in a structured, strategic way will pave the way for driving demand and building relevancy. Business model innovation is not a destructive force, but rather a constructive force that can build upon decades, even centuries of knowledge and expertise.

The VELUX Group is already embarking on a journey from insights into action, as witnessed with the Urban Tech Program, Vario by VELUX, and the VELUX Innovation Center. And as emphasized in this report, collaboration (among organizations like VELUX, startups, governments, universities, and so on) underpins the successful business transformation and delivery of a healthy, sustainable built environment to our rapidly changing societies.

The saying goes, "It takes a village" ... and indeed, it takes a smart village to usher in the next generation.



Further Reading

The following references reflect the research and academic work invested in the Smart Buildings & Cities Business Model Innovation project and offer the possibility of delving deeper into the topics raised within the report.

"In the pursuit of service business models as modes of jointly interpreting the meaning of sustainability in homes, smart home technologies can serve as agency-infused objects that drive a landscape shift, gradually strengthening behavioural and values relations between producers and users."

Hale, L. A. Business models for smart sustainability: A critical perspective on smart homes and sustainability transitions. A. Aagaard; F. Lüdeke-Freund; P. Wells (Eds.). Business Models for Sustainability Transformation. London: Palgrave Macmillan. Forthcoming 2021.

"In the partnership, we bring together vision, knowledge and implementation. [...] Our goal is that this triangular approach to individual, facilities and political interventions forms a model for public-private partnership as a business opportunity that can be based on science, with demonstrable effects that can be scaled across primary and lower secondary schools in Denmark."

Kokkedal Skole's Future - monitoring, renovation and collaboration for a better future. Indoor climate project case in Realdania's publication Indeklimaløsninger i Danmarks Skoler (Indoor climate solutions in Danish schools) (working title). Forthcoming 2021.

"Making these [sustainability value] arguments explicit not only supports the collaboration process, but it also helps to identify synergies instead of assuming trade-offs – not dissimilar from processes involved in establishing industrial symbiosis."

Hale, L. A. Courtship for business model innovation: Early stage value negotiation for the sustainability of smart homes. Journal of Cleaner Production, 297, 126610. May 2021.

[Read the highlights here.](#)

"Quantification of health factors and measured impact of smart technologies for health can be the starting point of the business of healthy buildings. From the quantified value of indoor health follows a whole new health-based sustainability of the built environment."

Hale, L. A. Business Model Innovation for Smart, Healthy Buildings. World Sustainable Built Environment online conference. Holger Wallbaum; Alexander Hollberg; Liane Thuvander; Paula Femenias; Izabela Kurkowska; Kristina Mjörnell; Colin Fudge (Eds.). Beyond 2020: Conference Proceedings. Bristol: IOP Publishing 2020 (IOP Conference Series: Earth and Environmental Science, No. 1.09, Vol. 588). 2020.

[Read the full article here](#)

"The challenge is not just the circular, slowed flow of materials through multiple cycles, but rather the innovation of circular business models that enable companies to profit from utilizing a lifecycle perspective, even if their products are extraordinarily long-lived."

Hale, L. A. Circular Construction: Circularity through Business Models for Longer Building Life. J. Rodríguez Álvarez & J. C. Soares Gonçalves (Eds.). Planning Post Carbon Cities. Proceedings of the 35th PLEA Conference on Passive and Low Energy Architecture. A Coruña: University of A Coruña. 2020.

[Read the full article here](#)

"Our interpretation is that smaller but more frequent interventions -- whether by behavior, structure, or automation -- can have a very positive effect on the indoor climate."

Hale, L. A., Szwagierczak, J., Venkatraman, V., Asmussen, T. F. Making Sense of a School Year: One Year of Social and Sensor Monitoring at Kokkedal Skole. Frederiksberg: Copenhagen Business School, CBS. 2020.

[Read the report here.](#)

"Conscientious engagement with technology is a means for humans to co-develop, co-learn, and ultimately exercise a form of design deliberation that can represent social values."

Hale, L. A. Anthropocentric urban sustainability: Human significance in building automation. Sustainable Cities and Society, 42, 423-433. 2018.

[Read the highlights here.](#)

"Homes will likely be increasingly targeted for their effects on lifestyles and carbon dioxide emissions alike, and we will need to understand more about what the important design aspects of default rules are and how to responsibly innovate them for society-wide (as opposed to purely personalized) sustainability transitions."

Hale, L.A. At Home with Sustainability: From Green Default Rules to Sustainable Consumption. Sustainability, 10, 249. 2018.

[Read the full article here.](#)

Acknowledgements

The Smart Buildings & Cities Business Model Innovation project was made possible by funding and support from Realdania and the Danish Innovation Fund [grant 7039-00043B].

First and foremost, I would like to voice my appreciation for the supervisors, official and unofficial, who lifted this project up throughout its unfolding. **Lone Feifer**, my industrial supervisor at the VELUX Group, has provided invaluable mentorship, guidance, and inspiration. She sets the bar high. **Andreas Rasche** and **Jeremy Moon** of Copenhagen Business School have continued to provide advice and encouragement well beyond the PhD years. **Pernille Berg** of BLOXHUB has served as the research group's fearless leader and has laid the tracks for the entire BLOXHUB Science Forum's path forward.

I am also incredibly thankful to the VELUX Group and my colleagues there for shedding light on the complex and difficult issues of building in practice, but also on the opportunities to focus on what really matters: human beings and our one beautiful planet.

Many thanks to all the interviewees who carved out time to share their perspectives and encouraged the research with their curiosity and enthusiasm. And to my fellow researchers (and their supervisors) in the Smart Buildings & Cities group, who have always been willing to ask the hard questions and who have together created a community worth perpetuating.

I would like to give a special thanks to:

Thorbjørn Færring Asmussen of the DEIC team in VELUX for sharing all the answers to all the (engineering) questions and for supporting the execution of many a project.

Trine Richter, Managing Director of Green Solution House, for more than once giving me a place to rest my head as well as a research case on the Bright Green Island.

Sabine Pauquay of VELUX Belgium for always showing up with a smile and helping to navigate the complexity of the building industry at the seat of the EU Commission.

Shaun Joffe of Great Gulf for being a friend and guide in North America's fastest growing and completely overwhelming city of Toronto.

Kirsten Birkving and Lars Høgh-Hansen of Kokkedal Skole, as well as **Mads Toftegaard** of Fredensborg Kommune, for opening up their brilliant school and ambitiously pursuing better learning environments.

Vinay Venkatraman, CEO of Leapcraft, for holding true to the reputed agility of startups and always being up for a good experiment.

Federica Brunone of CMB (previously Polytecnico di Milano) for always bringing energy, positivity, and friendship at home and abroad.

The Active House Alliance for continuously proving buildings that achieve a high standard of environmental, energy, and comfort performance can be built.

Last but not least, I would like to thank **Charlotte Jensen** of the VELUX Group, who is no longer with us, but without whom this project would never have seen the light of day.



AUTHOR:
Lara Anne Blasberg

BUSINESS MODEL INNOVATION:
The VELUX Group

INDUSTRIAL POSTDOC:
**Copenhagen Business School
BLOXHUB Science Forum**

VELUX GROUP SUPERVISOR:
Lone Feifer, Director for Sustainable Buildings

COPENHAGEN BUSINESS SCHOOL SUPERVISOR:
Andreas Rasche, Professor

REPORT DATE:
May 2021