Project acronym	B4B
Project full name	Brains for Building's Energy Systems
Grant No	MOOI32004
Project duration	4 year (Starting date May 1, 2021)

Deliverable 3.11

Practical use cases of design dimensions for interface selection and design in Smart Buildings

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Work package	WP3
Result	6
Lead beneficiary	HAN
Due Date	17/07/2025
Deliverable Status	Final
File name	B4BWP3D3.11Practical use cases for design dimensions.docx
Reviewers	Marleen Spiekman (TNO), Olivia Guerra-Santin (TU/e)

This project received funding from Dutch Ministry of Economic Affairs and Climate Policy and Ministry of the Interior and Kingdom Relations under the MOOI program

SUMMARY

A set of design dimensions was developed to help designers create interfaces that support the delicate *dance* between occupant needs and building climate system capabilities. The dimensions are also useful for building owners, facility managers, engineers and architects, as well as suppliers of existing interfaces when choosing a suitable existing interface for their building. The usability and applicability of the dimensions were tested with a group comprised of interface designers and building (climate systems) experts. This deliverable contains the results of this evaluation as well as practical guidelines for implementing the dimensions for different use cases.

Overall, we found the dimensions useful to guide and inspire the design or selection of interfaces for Smart Buildings. The dimensions also form a shared vocabulary for different aspects of an interface and create mutual understanding of user needs, stakeholder goals and building requirements.

Limitations of the dimensions include potential misunderstandings around ambiguous or vague labels, and the fact that the dimensions do not determine the resulting interface. Furthermore, the dimensions do not encompass all possible design or selection criteria and should therefore be used as a tool to guide the process, alongside other tools such as requirements and user goals/stories.

TABLE OF CONTENTS

1 INTRODUCTION

As we wrap up work on Task 3.4.2 for deliverable 3.11, we look back on the experience and knowledge gained throughout the project on climate control user interfaces, occupant behaviour and their needs. As part of work package 3, we have focused on the dynamics and roles of building climate interfaces and their users, which we metaphorically coined 'the dance'.

In Deliverable 3.09, we conducted exploratory interviews and inspiration sessions to gain insights into user needs and requirements for climate control interfaces in (smart) buildings. From there, cultural probes and other generative user research were conducted in 5 living labs to further explore latent and tacit occupant experiences, wishes, and needs. In deliverable 3.04, the methods and results of this research are presented. Deliverable 3.10 introduces the design dimensions framework and applies it to an iterative interface design process and poses preliminary guidelines for its use.

In this final deliverable (3.11) we reflect on three design research activities in which the dimensions were applied, with varying and overall decreasing influence from our side on the design process. Each activity made use of real-life examples of interfaces, with designers, domain experts and students participating in each. Finally, the insights gained throughout these activities were synthesised and summarised in three use cases presented in this deliverable, including a practical guide (workbook, see appendix).

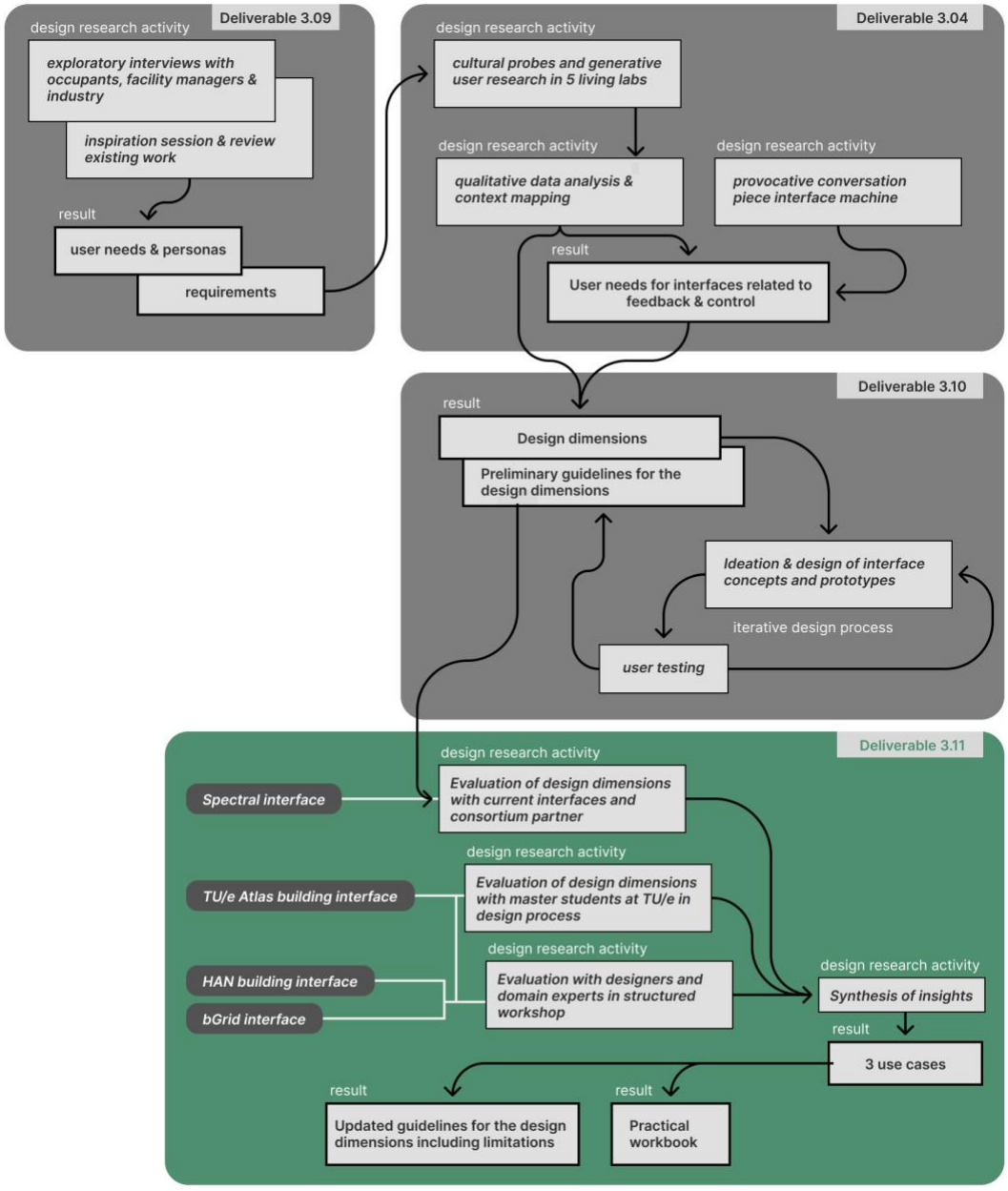


Figure 1: Overview of deliverables we worked on in Work Package 3 of the Brains4Buildings project

The perspective of 'the dance'

Increasing automation can only lead to optimal comfort and energy efficiency when working in tandem with a level of agency for occupants and/or facility managers through interfaces. We propose to look at the interaction between building and occupant from a symbiotic perspective where (human and non-human) actors act and react to each other. Much like a dance, someone takes the lead, while both partners still need to listen and adapt to each other (see also: Brains4Buildings Webinar #22). This symbiotic dynamic between Smart building and building occupant has been referred to as *the dance* since deliverable 3.10.

> *"Ideally, I want the building to be in a dance with me – a dynamic back and forth, where the building learns from my behavior and takes the lead on how to adjust the climate accordingly."*

Designing or choosing an interface which facilitates this dance, therefore, means considering all aspects of the design context and making conscious choices that lead to a more human-centred and optimised climate control system.

A design framework for climate building interfaces

Designers can rely on a vast list of design principles, such as Norman's fundamental design principles (1988), design heuristics (Nielsen), or the Gestalt principles (Ripalda et al., 2020), which are generally applicable and form the foundation for creating human-centred, usable and accessible interfaces. However, there is a lack of recent, rigorous principles that are more specifically tailored to building climate control interfaces. The Brains4Buildings project provided the opportunity to explore and define a framework of principles to match the context of Smart Buildings.

> *The design should always keep users informed about what is going on, through appropriate feedback within a reasonable amount of time. - Visibility of system status, Nielsen, 1990*

In Deliverable 3.10 we defined key design dimensions that enable interface designers to make informed and meaningful decisions when creating climate interfaces that support this dynamic of interaction—the "dance." Based on insights from our own design case, we developed guidelines for how these dimensions can be effectively applied. Together, the dimensions and guidelines form a coherent design system intended to support the development of climate interface designs.

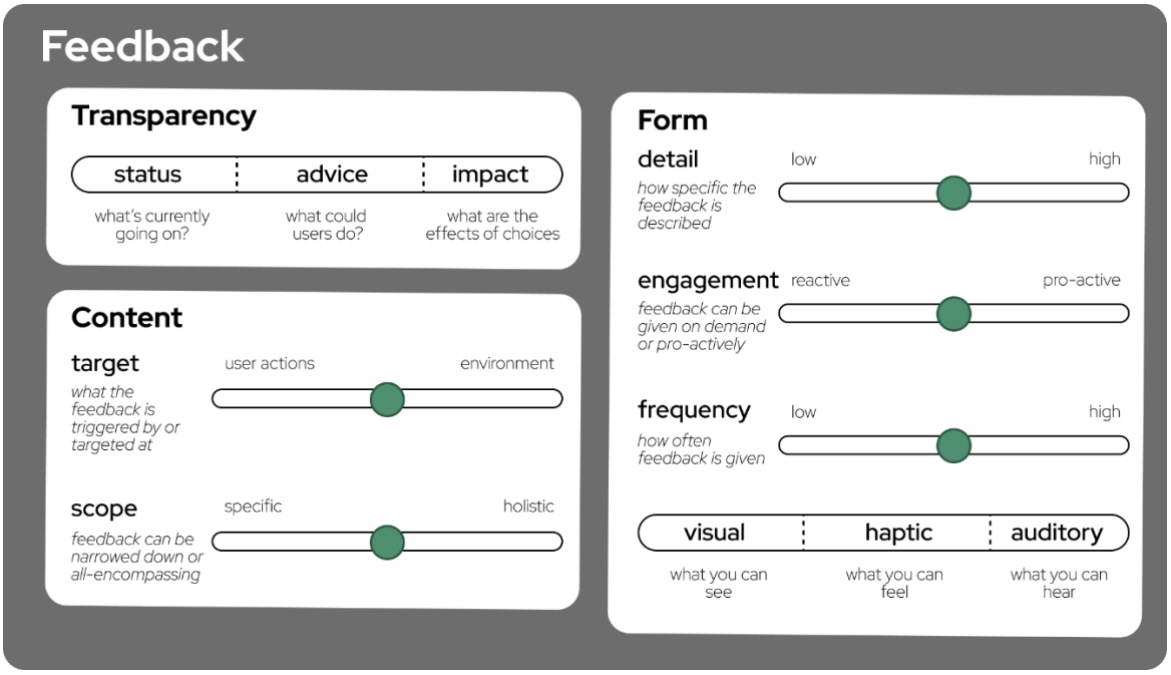


Figure 2: Feedback design dimensions

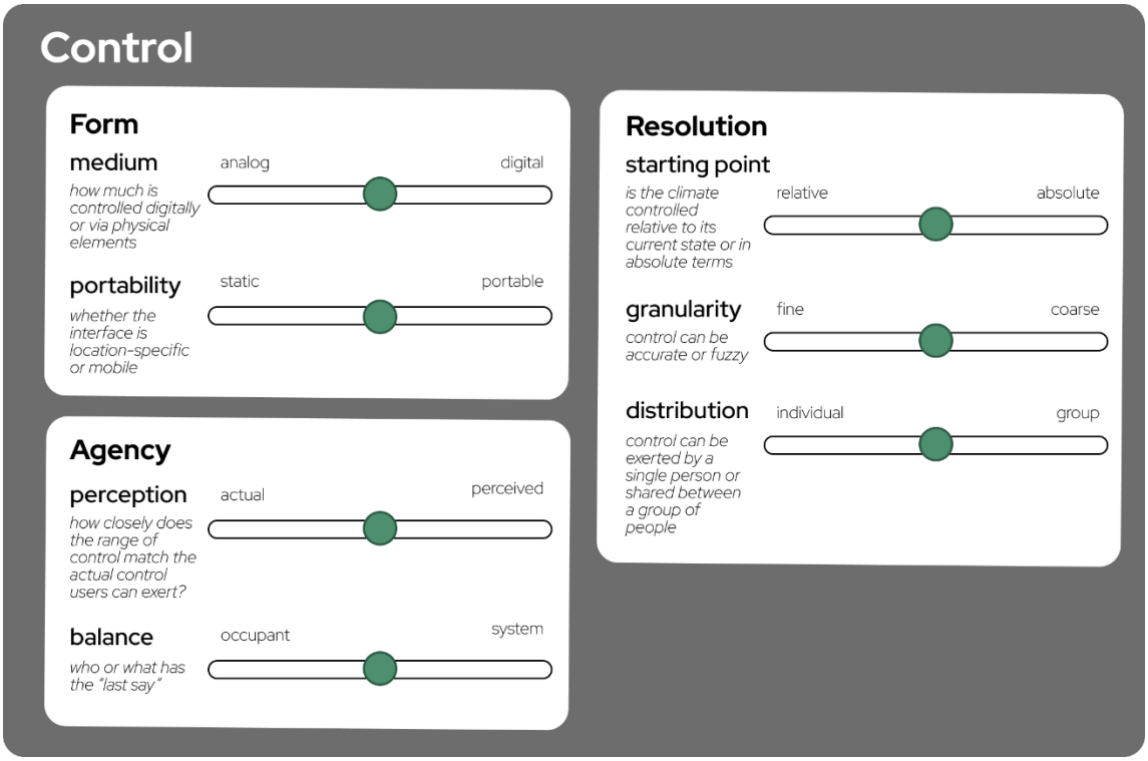


Figure 3: Control design dimensions

Evaluating and applying the framework

While experimenting with the dimensions, we found the design dimensions remained abstract and required further evaluation to assess their applicability in practice. As such, we have recalibrated the task 3.4.2 to better match and align with this need and our previous work. Through consultation with the work package lead, the task was redefined and agreed upon as follows:

In task 3.4.3 we evaluate our defined Guidelines and Design Dimensions in relationship to existing user interfaces. How can these Guidelines be translated into practical use, what is needed to implement these Guidelines, how do the Guidelines improve the interfaces, what can go wrong? (And how to prevent this)

In this deliverable, we report our findings on this evaluation and provide a nuanced view of the limitations and use cases of the framework. Chapter 2 describes how we approached the evaluation of the framework in 3 different evaluation contexts. In chapter 3 we provide a detailed account of the insights gained and describe these as design guidelines for the framework, differentiating between how and when the framework can be used in practice, based on 3 main use cases.

2 METHOD

To evaluate the applicability and usability of the design dimensions, three sequential activities were conducted in different contexts. The results of each activity were used to improve the dimensions incrementally. The term *design space* is used in this deliverable to mean the range of possible interfaces that could be designed for a specific context.

1) Using the dimensions to evaluate their usability when determining an interface's **current state** and the **design space**/opportunities for future interfaces with project partner Spectral
2) Introducing the dimensions to Master students of project partner TU/e to use in their **interface design process**, including reflection on the framework's value
3) **Applying and evaluating** the dimensions with climate control experts and designers in a **workshop setting** using interfaces from project partners

Afterwards, we triangulated the insights to identify 3 use cases, providing the basis for a design workbook and nuanced review of the design guidelines.

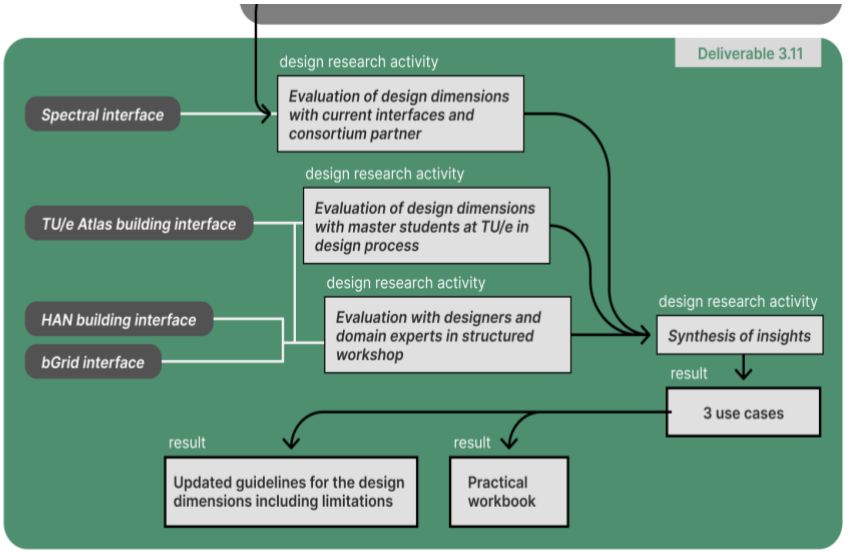


Figure 4: Overview of activities for deliverable 3.11

2.1 Current state and defining design space

2.1.1 Objective

Evaluating the applicability, usability and completeness of the dimensions when applied to a design process led by us in collaboration with an interface supplier/developer.

2.1.2 Approach

When designing interfaces described in deliverable 3.10, we used the dimensions to define the current state of a project partner's interface (Spectral), as well as the potential design space (direction) and scope of our (re-)design. After an initial briefing and instruction about the dimensions, Spectral filled in the dimensions according to their current interface and marked the direction for us to explore with a different colour (figure 4). The dimensions then shaped a second conversation in which the design space and specific dimensions were discussed in detail to get an understanding of the scope for the new design.

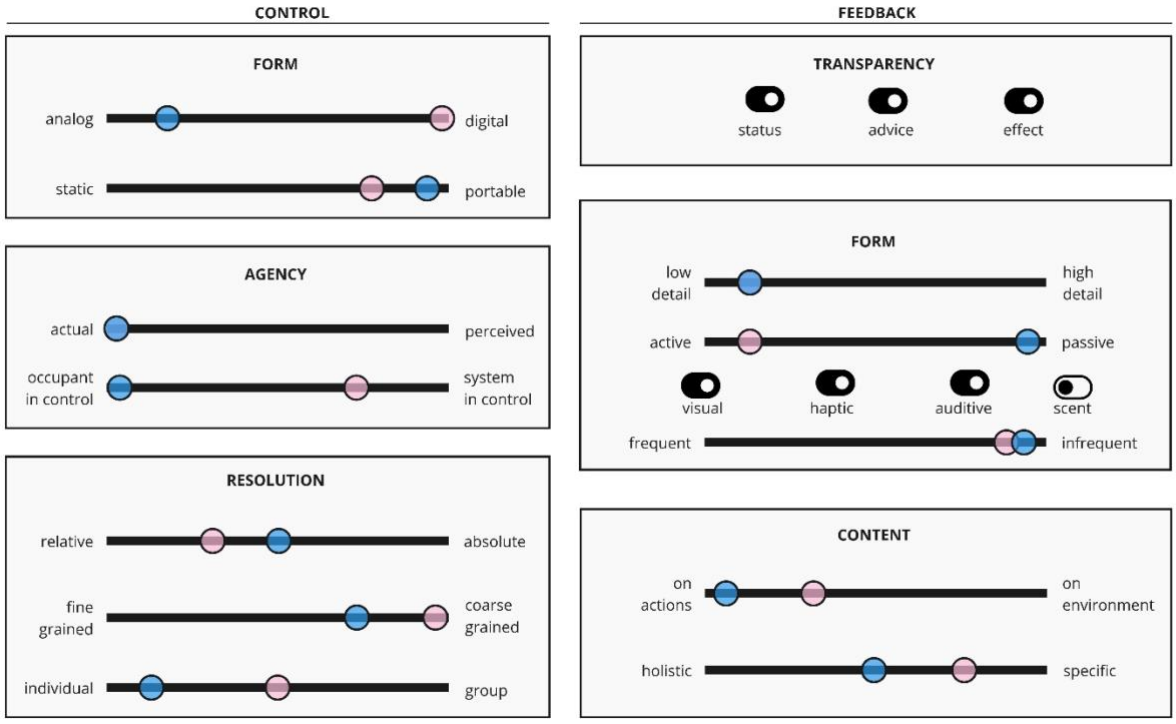


Figure 5: Early version of the dimensions, filled in by Spectral based on the current interface (blue) and the desired re-design direction (pink)

2.1.3 Result

The dimensions supported us as designers when talking to interface developers and aligning goals and expectations. Most dimensions, however, were still too vague to be filled in confidently by the developer. Filling in the dimension template together or providing clear explanations of each dimension would remedy this and further improve the alignment of goals/insight into the design space.

2.2 Interface design process

2.2.1 Objective

Confident about the dimensions as a tool for the design process, the next step was to let other designers work with them to see how well they could be applied and understood independently.

2.2.2 Approach

Work package partner TU/e provided the unique opportunity to allow two groups of Master students to apply the design dimensions in their research and design process. After a thorough introduction of the dimensions, the students used them to make tangible the research they had done on the Atlas building's users and the building climate control system and existing interfaces. After this definition of the current state, we encouraged them to use the dimensions in any way that would support their process, to discover how they would intuitively use the framework. Both groups used the dimensions to some extent in their process, but there were clear differences in the way they applied them.

2.2.3 Result

Group 1 was very selective in their use of the dimensions, focusing mainly on those dimensions they felt would create the most value for users. Group 2 looked at a broader range of dimensions and described more of their design decisions through the dimensions.

Both groups struggled with a few dimensions that were more vague and thus harder to understand. They also stated that it was especially difficult to determine the position on a dimension when neither extreme was the case OR when both were equally present. In the example shown below (Figure), the slider is set to the middle because the interface gives no feedback on user actions nor environmental factors. However, this could just as well be interpreted as the interface providing equal amounts of feedback on both.

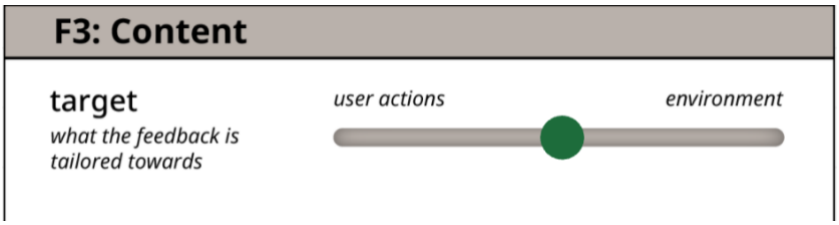


Figure 6: Positioning the slider on the Feedback: target design dimension

2.3 Applying and evaluating in workshop setting

2.3.1 Objective

The main research question of the evaluation was defined as follows: How useful and usable are the design dimensions when (re-)designing a Smart Building climate control interface?

2.3.2 Approach

We recruited five participants from the B4B work package. We aimed for a balanced mix of participants with a design background and relevant knowledge of climate building management and interfaces. Of the participants, all had design expertise (of which three UX designers), and two were building climate experts.

The workshop, which was conducted at the HAN, was structured in 3 parts:

1. Introduction

First, participants were briefed on the project as a whole and the purpose of the workshop. Then, the different design dimensions were presented and explained. Next, we collectively applied the design dimensions on an existing interface to get a more familiar feel for the contents and to provide a baseline 'measurement'. Afterwards, we would assign each participant to a set of design dimensions, giving them the role of advocating for these specific aspects. Dimension cards were handed out with more detailed explanations as a cheat sheet. The participants were grouped in duos, and finally, a central scenario was presented for which to design.

2. Design work

For the next 60 minutes, the duos were tasked with redesigning three different interfaces, where each individual participant focused on their respective design dimensions using a storyboard template. Due to the limited design time available, we decided that making them responsible for only part of the design dimensions would help participants focus and reduce the time needed to familiarize themselves. Each 20 minutes, the interfaces were redistributed among the duos, providing a new design context and starting point. During the design work, the researchers observed the participants, looking specifically at these pre-defined subjects:

- Precision: Do participants understand and reflect on the dimensions in the same way? Does this lead to discussion?
- Ease of use: How easily or intuitively can the dimensions be applied in a design scenario?
- Relevance: Are the dimensions suitable for making the kinds of decisions participants want to make/capture?
- Completeness: Do the dimensions sufficiently cover meaningful design aspects?

3. Discussion

Next, we discussed the designed results with the whole group. Then, we steered the discussion towards the usability and applicability of the design guidelines. The discussion was observed and recorded through annotations.

Selected interfaces

The following interfaces were used in the workshop, selected from the B4B community as well as the HAN environment (figure 6). The interfaces purposely ranged from low automation/manual control and low feedback to high automation and extensive feedback, to see if any notable differences could be observed when applying the dimensions to their re-design.

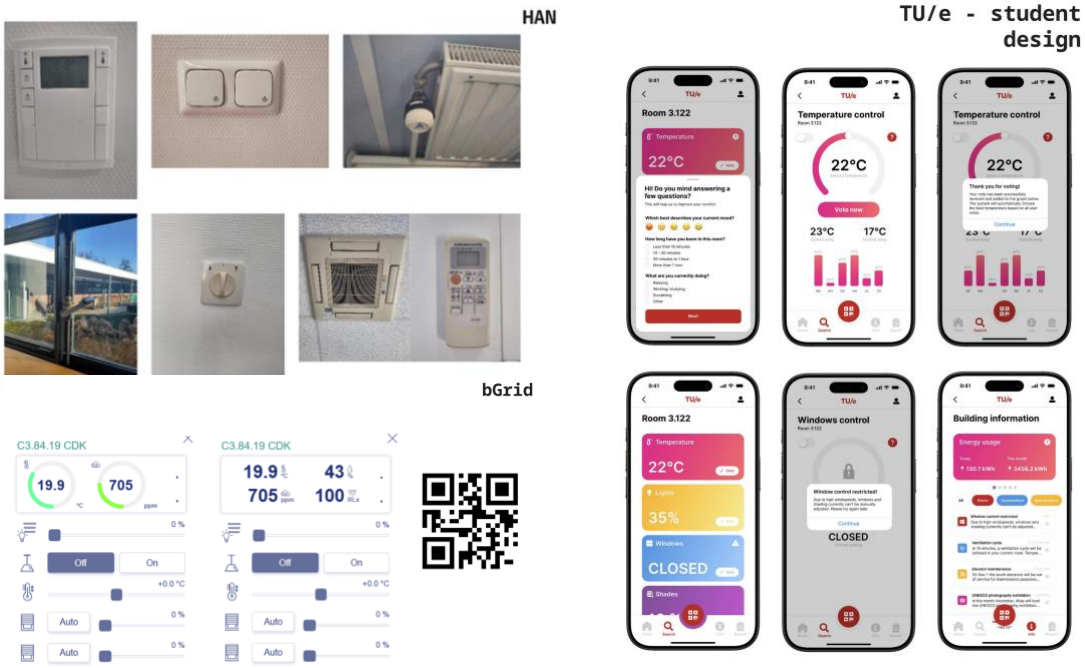
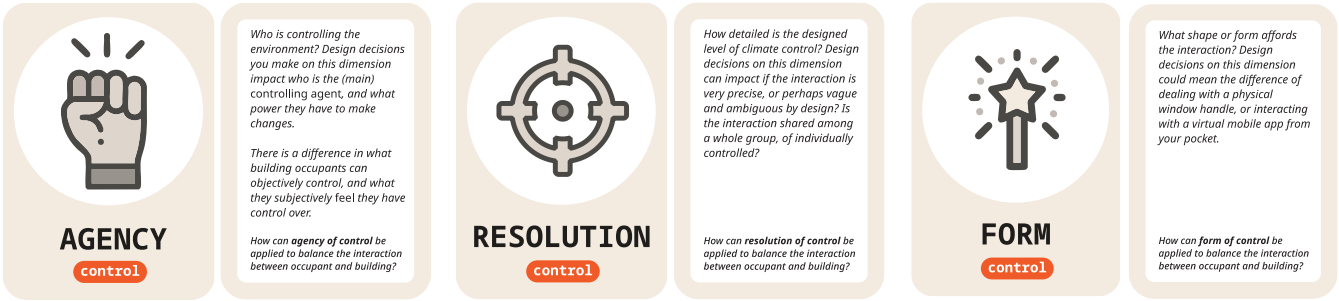


Figure 7: interfaces used in workshop (HAN, bGrid and TU/e Master student's redesign)

Dimension cards presented to the participants

Printed at playing card-size, the dimension cards offered an identifiable icon in front, and a short description at the back as a reminder, as well as a call to action prompting the participant to design with this specific dimension in mind.



2.3.3 Analysis

We started by analyzing the data gathered from the structured workshop. We clustered the data from the notes we took during the discussion and combined these with the data from our observation of the design activities. We also categorized the designed interfaces that were produced and assessed how the design dimensions played a role by looking at the different participants, the different interfaces, and the before and after positioning on the design dimensions. We identified patterns that stood out to us and formulated these as insights. Later, we would categorize the insights based on possible use cases and link them to common phases of a design process. This resulted in a traceable path from data to insights, to use cases to design steps. The resulting insights are presented as use cases in the following chapter.

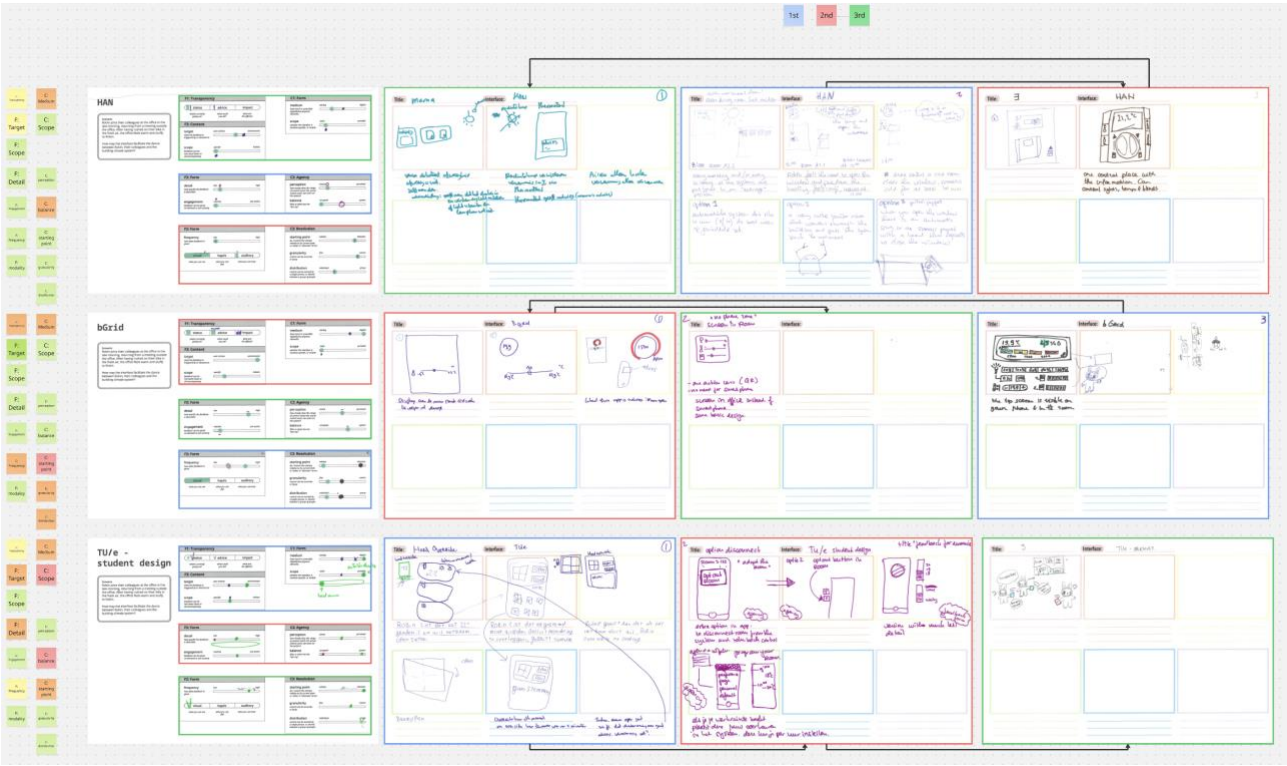


Figure 8: structuring the designed interfaces, while accounting for participant groups, order, and severity of deviation on different design dimensions from the existing interface

3 DIMENSION GUIDELINES

3.1 Introduction

By applying the dimensions in different settings, we were able to evaluate their practical application, relevance and ease of use. The various experiences of designers, domain experts and students with the framework are represented in the three use cases in this chapter. The use cases are not completely separate from each other. Instead, they provide guidance on how to apply the design dimensions in different situations to achieve effective communication, explore the full range of possible interface solutions and/or to align the interface with user needs, building limitations and efficiency goals.

The design dimensions afford flexibility of use by design as together they form a framework which can be used by various stakeholders and for all kinds of buildings. Since the framework allows for description of the current as well as future state of the interface and climate system, it can be used during different stages of development and design – to describe, inspire and evaluate interfaces. When mapping the aspects of an interface on the different dimensions/scales, it helps to keep in mind the *dance* between occupants and building (system) and how each choice impacts this dynamic.

This chapter provides guidance for implementing the design dimensions for three use cases and outlines their limitations. The three use cases present ways the dimensions can support the process of designing, developing and/or selecting an interface for (occupant-side) climate control in Smart Buildings. The first use case reflects the common descriptive language the dimensions can provide for everyone involved with the creation, selection, installation and even maintenance of interfaces and climate systems. Common ground and a shared framework ease communication and allow for more closely aligned goals and visions. The two latter use cases, using the dimensions for inspiration and guidance, provide guidelines useful for anyone contributing to the creation or selection of interfaces, such as designers, developers, building owners, and facility managers.

3.2 The dimensions as a descriptive language for interfaces

> *"When sitting down with a technician the dimensions could help – it makes it easier to talk to them and discuss priorities and how to get to the same goals but through different paths."*

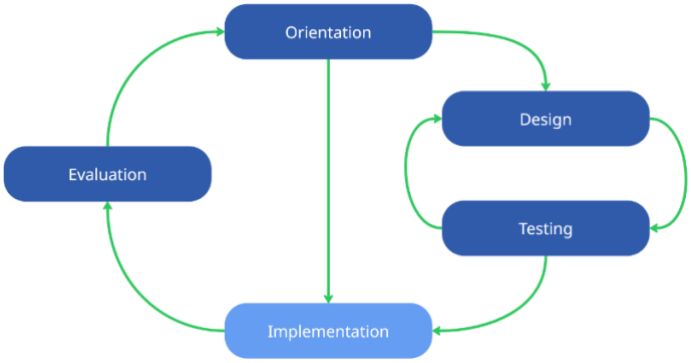
After a short introduction, designers and non-designers alike are able to pick up the vocabulary of the framework quickly and intuitively to deliberate on options and choices. This creates a common language, which lowers barriers and facilitates shared understanding of the interface and (building) context. The words used for the dimensions strike a balance between abstract and concrete, which leaves enough room for interpretation. Sometimes this ambiguity leads to misaligned views on the meaning of the dimensions or their extremes, but this seems to be easily resolved through discussion of nuances to reach mutual understanding. To supplement the dimensions requirements or accompanying notes should be created, since the dimensions may be too indeterminate on their own.

Most dimensions offer a scale, which visualizes the push and pull between occupant needs and the building system and its limitations. Using the dimensions in conversation with occupants, engineers, facility managers, building owners and other stakeholders, brings to light discrepancies in expectations of what's possible and what is needed, as well as creating a common goal to choose or design an interface that facilitates the "dance".

3.2.1 When to use the dimensions as descriptive language

Having a shared vocabulary is useful when choosing, designing, implementing and evaluating a building climate interface. It's especially valuable when discussing discrepancies between goals and possibilities and when bridging gaps in understanding or expectations. Times when the shared vocabulary of the dimensions is useful are:

- **Orientation/design:** Discussing user needs and building restrictions (feasibility)
- **Orientation:** Comparing interfaces currently on the market



– **Testing/Evaluation:** Evaluating the current state of the interface and/or the building system, and deciding on possible improvements

3.2.2 How to use the dimensions as a descriptive language

The dimensions intuitively guide discussions about interfaces by covering a wide range of aspects to consider. The framework can be used flexibly to suit the situation. For example, filling in the dimensions as preparation before talking to an interface supplier helps align expectations. Alternatively, bringing a blank sheet of dimensions to a conversation and filling them in together leads to the creation of a clear vision of goals, limitations, and options.

The dimensions can also be used to compare existing interfaces – to collect information on all relevant aspects of the interfaces and when choosing an interface with the configuration that best suits the building. Suppliers often use targeted, marketed language to showcase what makes their interface unique. Using generalized language through the dimensions helps compare the features of each interface and how it suits the needs of occupants and the possibilities of the climate system.

3.2.3 Limitations

While the labels of each dimension can help create a shared vocabulary, they can also cause misunderstandings when interpreted differently. Some labels are intentionally kept slightly ambiguous to stimulate conversation about nuances. This can potentially backfire if these nuances are not brought up in conversation. Furthermore, positioning the slider in the middle of a dimension is difficult to interpret. This position means that both aspects are represented equally, but not whether both are represented strongly or not at all.

To optimally use the dimensions as a basis for shared vocabulary, it should be used as a guide for conversation. Make sure to discuss nuances and take notes alongside them to create reliable documentation of the conversation and the choices made. Introducing the dimensions by someone who has experience with the framework can further alleviate this risk.

3.3 The dimensions as inspiration for interface design

Participants were asked to (re)design different interfaces. In generative phases of design, the goal is typically to produce a wide range of ideas or concepts. However, the beginning of such a phase can often feel daunting—where to begin? The dimensions presented to participants served as an effective starting point, inviting them to “pull some levers” and begin experimenting. As a result, no participant struggled to initiate ideation; instead, the dimensions immediately sparked creative engagement. Within limited timeframes of ten minutes, all participants were able to produce tangible design concepts.

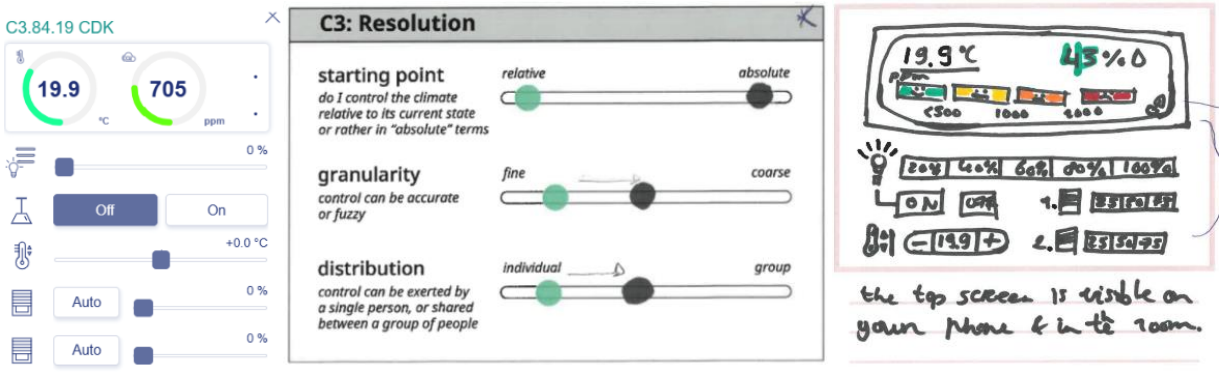


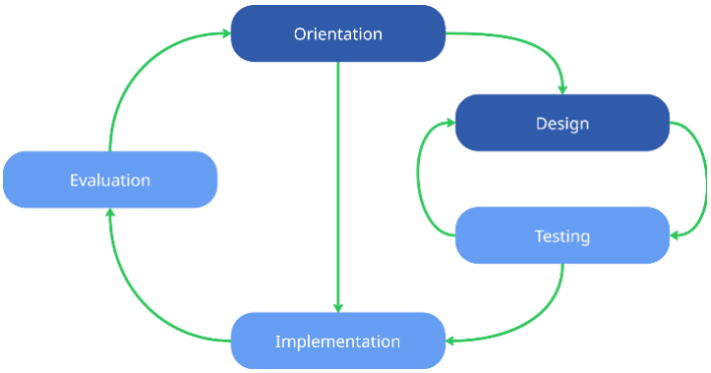
Figure 3: participants redesigning the bGrid interface on the user 'Control – Resolution dimension', showing the impact of absolute values in control; these sparked a short discussion on the merits and disadvantages of being able to precisely set the temperature versus deviating from a (hidden) value.

We also observed that the dimensions encouraged participants to explore different directions. A common strategy among participants was to look at the extreme end of a given dimension to see how it would affect the interface. This led to alterations that in some cases significantly differed from the original design. And while some of these extreme solutions were eventually dismissed as unfeasible, the ability to explore them ensured that the design space was thoroughly examined.

> *I left the agency as it was, because I liked that a conversation about justifying not making changes on the agency aspects of an interface*

This aligns with the second goal of generative design: generating a set of designs as diverse as possible. Our analysis of the design outcomes confirmed this — participants consistently selected different positions on the dimensions with each design iteration. This indicates that the dimensions did not lead to fatigue or repetition sometimes seen when filling out questionnaires or forms and instead encouraged ongoing critical reflection and variation in design choices.

3.3.1 When to use the dimensions as inspiration



In the **divergent, initial phase of design**, a designer will typically try to generate a large variety of solutions covering the breadth of the solution space, rather than trying to find a single 'golden idea' or best solution. As such, there will most likely be variability in the relevancy, applicability, and suitability of the designs. Moreover, each design may have its own pros and cons. A selection of promising design approaches usually follows in a defining or convergent phase.

With the goal of **exploring the full potential of design space** in mind, the question then arises "*Did I explore enough?*" or "*Did I miss something important?*". While a competent designer is skilled at navigating the design space by thinking outside the box and deviating from obvious ideas, available tools or resources that help inspire design can still be useful to complement the designer's ability.

3.3.2 How to use the dimensions as inspiration

This interface design framework for climate interfaces in buildings facilitates exploration of the design space by offering six main dimensions on which design decisions can be made, resulting in interfaces with different characteristics.

A designer may, for example, use the dimensions to explore what alternative versions of a particular design may look like by flipping the position on a single dimension. This aids in exploring alternatives that may have previously remained unnoticed. Similarly, a dimension may open new possibilities for the designer.

It is important to note that particularly with the goal of exploring design space in mind, it is necessary to keep an open mind, and to not be forced or nudged into a specific direction. The dimensions were developed with exactly this aesthetic in mind: there is no right or wrong positioning on the dimensions; every position is potentially viable. Evaluation of our framework shows that the design space is indeed explored to its full extent, indicating that the dimensions do not steer design in a particular direction.

3.3.3 Limitations

While the framework aids in covering meaningful aspects of design space, it is hard to argue that it encompasses *all.* From this perspective, the framework should be seen as something that aids, rather than prescribes, navigating the design space.

We evaluated the completeness framework by discussing the designed results and asking the participants to reflect on the design process. We were curious whether participants felt that the design dimensions covered all relevant interface aspects. Missing aspects like *level of personalization* and *technical feasibility* of an interface were named, indicating that indeed, there is room to expand the set of dimensions to encompass more.

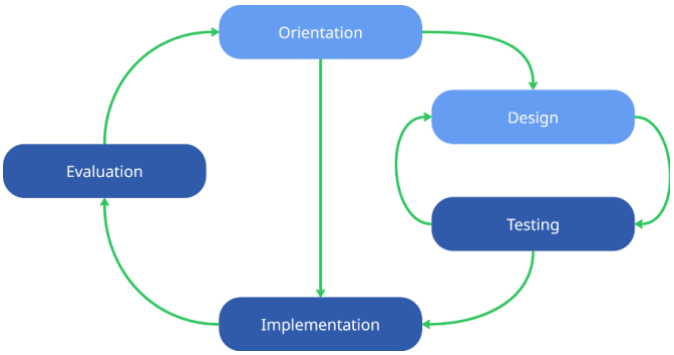
3.4 The dimensions as a guide for interface design

Designers often use requirements and insights from user testing as guidelines to inform their design decisions throughout the design process. Using the dimensions at key points to capture the wishes and needs of clients and end-users provides a visual tool to guide the design process. This can include using the dimensions to indicate interface properties that are off-limits due to the climate systems capabilities or goals set by the building owner or tenant.

Throughout a design project, the dimensions can also showcase/keep track of the evolving nature of an interface from early sketches and prototypes to the final product and help designers support their decisions.

3.4.1 When to use the dimensions as a guide

The dimensions can provide guidance particularly during the convergent phases of the design process, when decisions need to be made and the design/solution space needs to be (re-)defined. It is also a useful tool when evaluating and testing interfaces, as well as when moving towards implementation to make sure the design fits the system and occupants.



3.4.2 How to use the dimensions as a guide

Using the dimensions as a guide means referencing them during key convergent moments in the design or evaluation process. Defining design goals through the dimensions up front is crucial, since this is the reference point that should guide the rest of the process. Of course, goals can change over time as designers uncover different options and test them in the context of use, so the positions on dimensions can and should be updated regularly to reflect this.

During the **design process**, the settings on the dimensions limit the possible solutions to a point on each dimension, forcing the designer to be creative in the different ways an interface could represent this aspect/configuration.

During **testing and evaluation phases**, the dimensions can be used as a scoring mechanism to see how well the interface fulfills the set goals.

3.4.3 Limitations

The dimensions contain limited detail by design. The “slider” facilitates intuitive use but loses detail and nuance, which may have been valuable during the design process.

The dimensions themselves also state little about the specific interface that is or should be designed. A nearly unlimited number of different interfaces may be designed based on a single setting on the dimensions. Regularly testing the effects of design choices and evaluating them with stakeholders is crucial for guidance, in addition to referencing the dimensions themselves.

4 CONCLUSION & DISCUSSION

In this deliverable, we report the evaluation of our design framework—composed of a set of interface design dimensions—for its usability, applicability, and value in designing and assessing climate interfaces for Smart Buildings. This evaluation was conducted across a variety of contexts: in collaboration with a project partner (Spectral), with Master students in an educational setting, and in a structured workshop with climate and design professionals.

Through this multi-perspective evaluation, we identified three primary use cases for the framework:

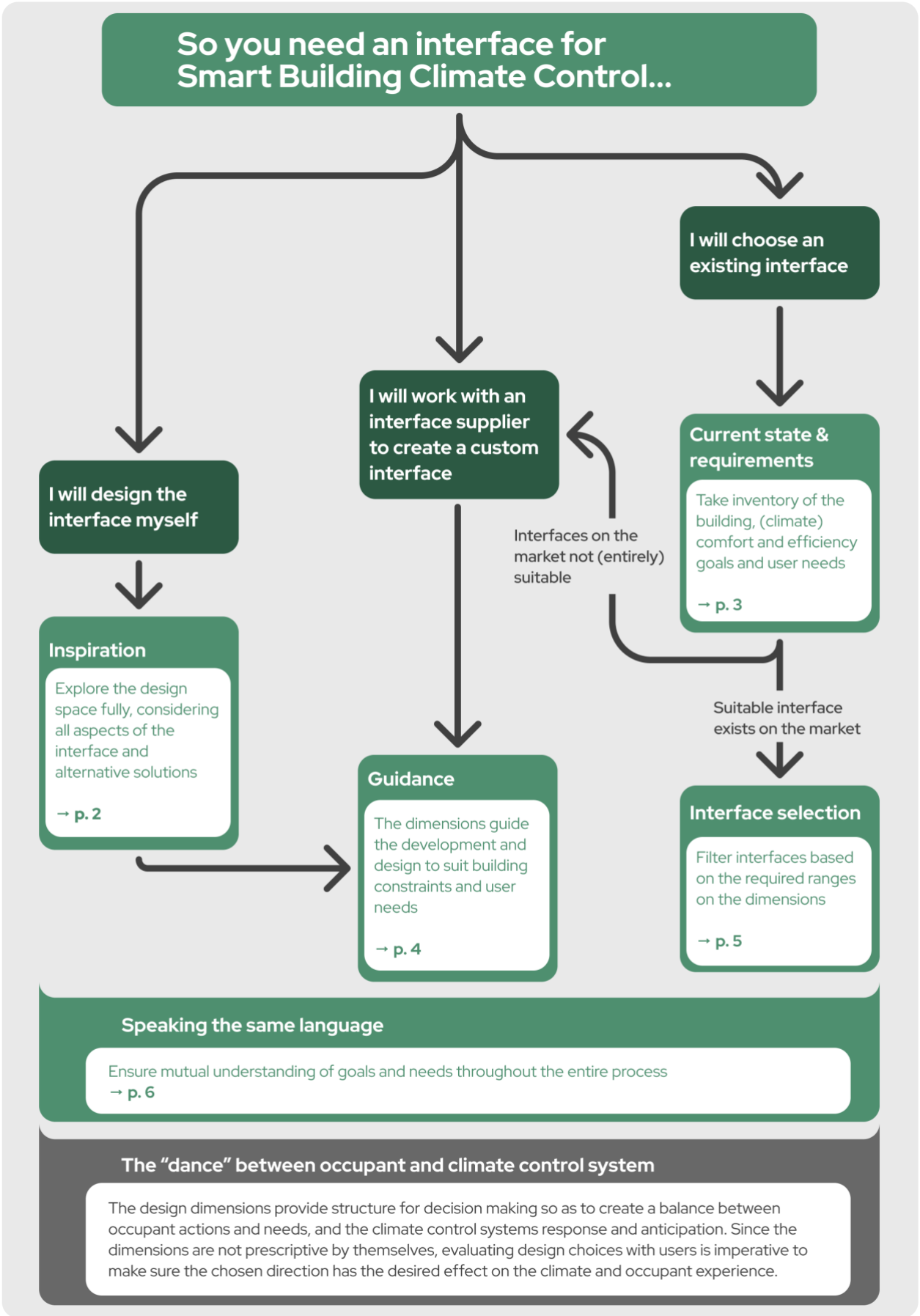
1) As a **descriptive language** to establish shared understanding and facilitate dialogue between stakeholders such as designers, occupants, technicians, and facility managers.
2) As a **source of inspiration** during early ideation phases to explore diverse and unconventional design directions.
3) As a **guiding tool** to help structure and evaluate design decisions, especially when aligning interface behavior with user needs and system constraints.

While the framework proved flexible and valuable in these use cases, several limitations surfaced. Some dimensions were perceived as too abstract or ambiguous, which occasionally hindered consistent interpretation and confident use. Furthermore, the dimensions alone are not a complete design documentation, and thus supplemental requirements, documents, or annotations may be necessary to convey choices made. Additionally, there may be relevant aspects of an interface, such as the level of personalisation or system feasibility, that are not covered by the design dimensions in the framework. It should therefore be regarded as a conversation starter and exploratory aid, rather than a prescriptive checklist.

To help make the framework more accessible and actionable, we developed a workbook. This workbook translates the abstract design dimensions into practical formats and step-by-step instructions tailored to different user roles and stages of the design process.

Throughout our work in this project, we consistently balanced the user perspective in relation to the smart building. By highlighting the experience of occupants in relation to smart buildings—their needs, constraints and agency—we hope to catalyse a design perspective that enables a more symbiotic relationship between users and technology.

APPENDIX: WORKBOOK


So you need an interface for Smart Building Climate Control...
I will choose an existing interface
I will work with an interface supplier to create a custom interface
I will design the interface myself
Current state & requirements
Take inventory of the building, (climate) comfort and efficiency goals and user needs
→ p. 3
Interfaces on the market not (entirely) suitable
Inspiration
Explore the design space fully, considering all aspects of the interface and alternative solutions
→ p. 2
Suitable interface exists on the market
Guidance
The dimensions guide the development and design to suit building constraints and user needs
→ p. 4
Interface selection
Filter interfaces based on the required ranges on the dimensions
→ p. 5
Speaking the same language
Ensure mutual understanding of goals and needs throughout the entire process
→ p. 6
The "dance" between occupant and climate control system
The design dimensions provide structure for decision making so as to create a balance between occupant actions and needs, and the climate control systems response and anticipation. Since the dimensions are not prescriptive by themselves, evaluating design choices with users is imperative to make sure the chosen direction has the desired effect on the climate and occupant experience.

Inspiration

Back

Quick start guide

Material
- Filled-in design dimensions sheet
- Generative/ideative design methods

How to
During divergent, explorative design phases use the marks on the dimensions as starting points. Experiment with various choices and alternatives to expand the design space and learn whether the chosen design dimension settings suit the user needs and technical possibilities.

Especially useful for
UI/UX designer & developers, architects, engineers

Scope design choices

Instead of one fixed mark on the dimensions, try marking a range, opening up possibilities. At the same time, this range should provide you with enough boundaries to spark creative solutions.

Seeking out "extremes"

Are initial ideas or requirements leaning towards one end of a dimension? How would the interface change after "flipping" the dimension to the other extreme?
Does it still meet user needs and climate system requirements? Which "extreme" of the slider results in an interface that benefits **the dance** between occupant and building?

Exploring alternatives

Use the dimensions as sliders that result in different design characteristics to come up with alternative concepts. For example, explore what would change when adding portable controls to an initially static design.
Will other dimensions have to compensate for this change?
What changes in the user experience?

Guidance

Back

Quick start guide

Material
- Filled-in design dimensions sheet
- Convergent design methods

How to
Regularly evaluate whether the interface you are developing still matches the selected points on the dimensions. This is particularly useful when there are many ideas and a direction needs to be chosen. When the dimensions were filled in with or based on user input, they allow for quick decision making throughout the design process, without having to test with users for every detail.

Especially useful for
UI/UX designer & developer

Support design decisions

The dimensions can provide guidance particularly during the convergent phases of the design process, when decisions need to be made and the design/solution space needs to be (re-)defined. It is also a useful tool when evaluating and testing interfaces, as well as when moving towards implementation to make sure the design fits the system and occupants.

Evaluate & test

The dimensions are a useful tool when testing interfaces. Use them to evaluate the effect of specific aspects of the interface on the user experience, (efficiency) goals and overall dynamic.

When moving towards implementation, use the dimensions to make sure the design fits the system and occupants.

Current state & requirements

Back

Quick start guide

Material
- Empty design dimensions sheet

How to
Inspect the current system and interface either during a physical walk-through or by discussing plans, photos and screenshots and involve all types of stakeholders to gain an in-depth overview of the problems, loved features, wishes and needs of all humans involved in the use, (re-)design and implementation of the climate control system.

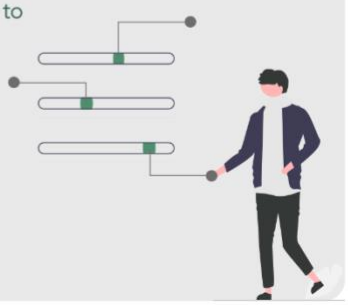
Especially useful for
Facility manager, building owner, UI/UX designer & developer, interface supplier

Holistic

When using the dimensions to map the current state of the building, climate system and interfaces, you make sure that all aspects relevant to the (new) interface are taken into account.

Take inventory together

Include the point of views of all user groups when taking stock of the current state, and discuss needs and wishes for a potential re-design. The filled-in dimension sheet should be part of any requirements list.
This way, it can be used to align the interface with the goals and needs throughout its development and implementation.



Interface selection

Back

Quick start guide

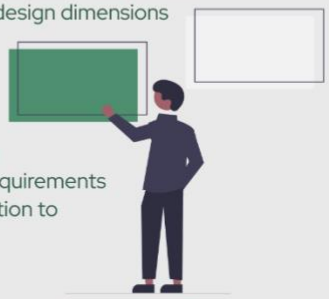
Material
- Filled-in design dimensions sheet
- Collection of available interfaces
- Requirements & technical documentation of building & climate system

How to
Supplement your usual approach for selecting interfaces with the properties selected on the dimensions. Compare available interfaces to the "goal" properties, to determine which best suits the building, its context and users.

Especially useful for
Building owner, facility manager, engineer/ technician

Collect, compare, select

After collecting interfaces that may be suitable, compare them using the design dimensions to see which ones match the pre-defined climate goals and user needs best. The dimensions can and should be used in combination with other requirements and technical documentation to ensure feasability as well.



No suitable interface on the market?

Considering most buildings and their climate control systems have unique properties and use cases, it's possible there's no suitable ready-to-use interface on the market that meets all requirements and dimension goals. Consider working with an interface supplier to customize aspects of an existing interface to better match your building.

Speaking the same language

Back

Quick start guide

How to
Use the design dimensions and their descriptors when communicating with others involved in the interface selection, design, development and/or implementation.

Especially useful for
All relevant stakeholders

Introduce terms early on

Share the dimensions and their descriptors early on when working with different stakeholders to avoid confusion later on.

More time for the important decisions

When everyone involved agrees on the terms for discussing different aspects of the interface and climate system, more time can be dedicated to discuss more important choices.

Design Dimensions

Back

Control

Form

medium — analog / digital

how much is controlled digitally or via physical elements

portability — static / portable

whether the interface is location-specific or mobile

Agency

perception — actual / perceived

how closely does the range of control match the actual control users can exert?

balance — occupant / system

who or what has the "last say"

Resolution

starting point — relative / absolute

is the climate controlled relative to its current state or in absolute terms

granularity — fine / coarse

control can be accurate or fuzzy

distribution — individual / group

control can be exerted by a single person or shared between a group of people

Feedback

Transparency

status	advice	impact
what's currently going on?	what could users do?	what are the effects of choices

Content

target — user actions / environment

what the feedback is triggered by or targeted at

scope — specific / holistic

feedback can be narrowed down or all-encompassing

Form

detail — low / high

how specific the feedback is described

engagement — reactive / pro-active

feedback can be given on demand or pro-actively

frequency — low / high

how often feedback is given

visual	haptic	auditory
what you can see	what you can feel	what you can hear