TEMPLORE: Intuitively Setting a Comfortable Temperature For a Smaller Area

Introduction

Changing temperatures requires energy, lots of it. At this moment, heating and cooling contribute to about half of our energy consumption [8]. No matter how efficient the technology is, active heating and cooling solutions always require some form of energy. This makes it important to not only focus on energy-efficient technologies for heating and cooling but also save energy in alternative ways. We believe a big opportunity in this regard is heating or cooling people instead of entire rooms and buildings [6].

There are various types of heating systems, each with its own set of advantages and drawbacks. Central heating systems often distribute warm air (heated using a central furnace or heat pump) through air vents or warm water/steam (heated using a central boiler) to radiators, heating the house [29]. Direct heating systems often function as an additional heating source for people, using systems such as gas-fired heaters, electric heaters or fireplaces [29]. Fireplaces are interesting, as they are arguably one of the oldest heating systems to exist and are still commonplace today [17].

Figure 1: Modern fireplace (Picture: Dina Alexandrova [2])

Fireplaces have changed over time from an indispensable component of survival to a prominent element in design. Even though the earliest fire pits were basic, they allowed humans to harness the power of fire for warmth, cooking, and protection [3]. Simplicity was a requirement in these early phases rather than a stylistic choice. Practicality was essential, and these fireplaces' elegance was found in their usefulness [9]. Furthermore, fireplaces acted as the centre of the home, a meeting spot where families and communities come together. They are extensively embedded in many different cultural traditions, frequently linked to festivities, customs, and storytelling [9]. Even though their cultural significance has been cemented in pop culture, modern households are increasingly distancing themselves from installing fireplaces [20]. Between 2011 and 2013, the average energy consumption of households with fireplaces was 23,650 kBtu (6,931 kWh), whereas the average energy consumption of homes without fireplaces was 18,055 kBtu (5,291 kWh) [7]. Other than the ecological side effects, there are health implications that are involved in the decline of fireplaces because particles emitted by burning wood are linked to several health issues [12]. For instance, they may influence the progression of Alzheimer's disease and aggravate mental illnesses like anxiety [12].

The connection between physical warmth and social warmth is evident when someone offers to share their warmth "with" you, so your burden to produce heat is lighter [22]. We spend the coldest months of the year adhering to customs that promote social gatherings because social warmth mitigates the effect of cold weather conditions [22]. For example, rodents share homes with three or more housemates, because then they need 40% less energy to keep warm [16]. Moreover, on a personal level, the warmth of physical contact can lower heart rate and blood pressure during a stressful experience [15].

When it comes to already existing products, of course, there are several different fireplaces ranging from the traditional wood-burning types to gas and electrically powered ones [1,23]. In addition, heated pillows and blankets have been around for a while offering temperature regulation and maintenance [18,21,25]. However, there aren't any products that provide the experience we are striving for, nothing we found is intended to bring people physically together to save energy. This report describes our design process, final design concept and the evaluation that followed.

Design Process

We approached the project with a question-driven design process in mind, which focuses on the importance of asking insightful questions to help guide the design process. It encourages designers to follow a method of inquiry by answering questions at each stage of the project, such as "What does your prototype need to be able to do?" Moreover, our design process was iterative and involved continuous adjustments to understand the needs and preferences of the end-users. As a result, the design requirements evolved along the way, adapting to unexpected challenges.

We started the process by looking into the needs of the mundane characters, to find aspects that can relate to our project scope around heating and cooling. We found that Edward enjoys spending time together with his family, which relates very well with our goal of heating and cooling people instead of entire rooms or buildings. If everyone is sitting in the same area in the home, this is not only an opportunity for more efficient heating and cooling but can also result in a feeling of togetherness. Therefore, based on Edward's needs, we aimed the project towards bringing people together by giving them a reason to be together. Later in the process, we slightly shifted the aim to supporting being together, partly because other characters such as Ayla and Lucas sometimes prefer to be alone. Additionally, according to the Integrated Behavioural Model of behaviour change, having more perceived control over one's behaviour can increase their intention to perform said behaviour [14]. In our case, to reach more energy efficiency, our main desired behaviour is being together in the same space, although we do want to also support being alone at times.

To describe our final project ambition in more detail, we aim to support the family members in being together. With our design, we want to make being together a special and pleasant experience and use the moments of togetherness to save energy by only regulating the temperature of the space they are currently in. Furthermore, we aim to provide insights into their energy usage when using our design. Another very important goal is to design a product which can be used intuitively without any prior instructions, the design should be understandable and self-explanatory.

Heating Table

Figure 2: Source of inspiration (Picture: Aaron Taylor [24])

During the design process, we searched many existing products and found that the fireplace in the living room has a special meaning to a family in many cultures, it can bring the family together [19]. Therefore, we decided on the fireplace as the design direction. According to our research, there are many forms of fireplaces. After some discussions, we decided to keep the fireplace as a reference point and inspiration to make a more modern and innovative version. Meaning, that it can both heat up and cool down to create a comfortable temperature within a given space and bring the family members together. We wanted to incorporate a rich interaction in our design concept because we believe this adds more room for creativity and has the potential to make a design more understandable and intuitive to use. Our initial idea to adjust the temperature was to add or subtract logs of "wood", similar to adding wood to a fireplace (see Figure 3). More logs would equal a higher temperature.

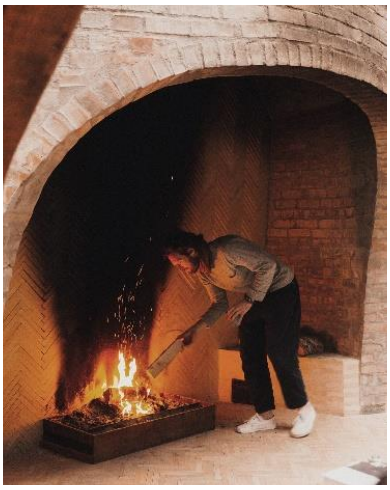


Figure 3: Adding wood to adjust fireplace temperature (Picture: brosundet [4])

We noticed that a typical fireplace is usually located in a corner or by a wall because it allows a simpler installation for the chimney. From a social point of view, gathering in an enclosed area like that would not invoke the desired experience of togetherness. From a practical point of view, there is a lot of energy waste since walls are one of the biggest contributors to heat loss in a building [13]. Thus, the solution was to position the table in a central area where the family members could interact with each other more inclusively. Not only that but, we believe that heating a smaller area from the middle can potentially save energy overall, instead of heating the whole room from a one-sided source.

To illustrate this concept, we made a basic model of the fireplace with temperature-controlling sticks out of cardboard (see Figure 4). However, based on feedback, this idea was too metaphorical to work with both heating and cooling. The sticks would represent the logs used in a fire, adding more would logically increase the temperature. With this interaction, there was no apparent way to decrease the temperature. At this point, we needed another form of interaction to be able to offer a wider range of temperatures, giving birth to the idea of rotating the entire table. One of the reasons for this was the contrasting difference it has from existing simple forms of interaction for temperature-controlling devices such as pressing buttons, either physical or digital. But there is still a sense of familiarity, mostly found in older generation cars where knobs are used to alter the fan temperature and speed. Compared to the simple gesture of a touchscreen, rotating the whole table would be more apparent to the other people present, potentially sparking conversation.

Figure 4: Cardboard model of modern fireplace with cooling capabilities, the sticks were too metaphorical

Every interaction has some kind of feedback, until now, we were used to associating temperature with a number displayed on the product itself, either digitally or in print. Lacking a quantitative representation and making the table move vertically as a response to every rotation, we hope to increase awareness of the consequences of changes. Being aware of how much the temperature has changed is correlated to its consumption of electricity, emphasising energy use rather than the temperature. Furthermore, building onto this idea of the table itself going up and down, we determined it would be better to allocate a specific area in the centre where only a vent tube moves vertically instead. This addition allows the user to intuitively understand how the product operates and that the height is proportional to the air released because the vent holes are visible, which is shown in Figure 5.

Figure 5: Midterm Demoday concept render showing the vent tube in the middle rising after rotating the table

The next step entailed the creation of a low-fi prototype. As the intention behind the prototype was to test the interaction we envisioned, it was made out of foam and recycled materials from previous projects. The most significant insight that came up was the fact that turning the whole table meant that objects placed on the surface would move around with every rotation. To prevent this, we decided to keep the table still and have the bezel rotate as a substitute. This way, the interaction is still incorporated while solving a potentially annoying issue.

Halfway through, we decided to explore different forms and materials to find a more efficient and convenient interaction for a more energy-efficient way to heat and cool the room. We developed three conceptual designs at this stage (see Figure 6). Concept A is a small bar in front of the sofa in the living room, with triangular air vents that can be popped up and rotated on top. Underneath is a drawer where food and drinks can be heated or cooled. Concept B utilises water circulation to regulate the temperature of the product, while cushions and pillows can be placed in the gap in the centre. Concept C integrates the cushion, storage drawer and bar into one product, which can be used separately to save space when not in use. We chose to tweak our current design towards the premise of Concept C, which was more comprehensive than options A and B. In the process of refining our design, we kept it circular to keep our existing idea of the rotating bezel and added the cushion and storage boxes to our earlier concept. We wanted to include the storage boxes to store the pillows we designed, which are described in the next section.

Figure 6: Renders of three different concepts (in order: A, B, C), to explore additional functionality and aesthetics

To make the demonstrator, we 3D printed the central vent tube which should rise from the table surface. We decided to make the table surface out of Vivak because it can be laser cut, is smooth, and affordable. This polyester sheet happened to be transparent, which gave us the option to either keep it transparent or add an opaque layer underneath at a later stage. We liked the aesthetic of the transparency and decided to keep it, resulting in the gear system for the rotating bezel being visible. This ended up being one of the nice qualities of our demonstrator.

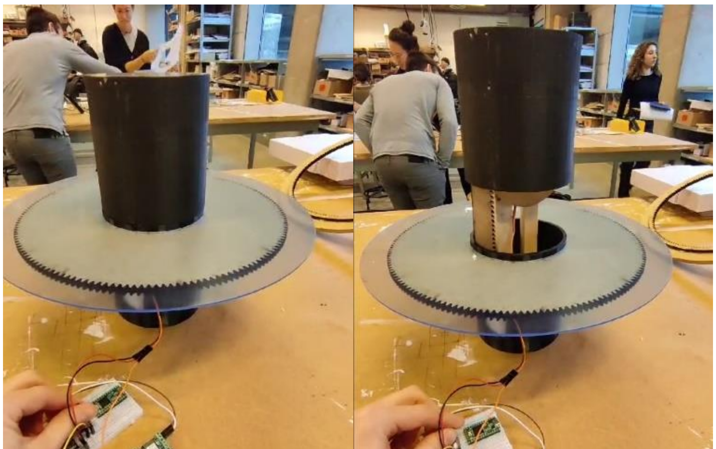


Figure 7: Testing mechanism of central vent tube rising and lowering with servomotor

For our final design concept, as mentioned above, we decided to keep the top transparent (see Figure 8). Having the actual gears visible through the table surface works like an affordance [11], it clearly shows that there is a rotation possibility. To better illustrate what can be rotated, we believe that adding a grippy texture to the bezel will show that it affords to be moved somehow. By then looking at the gear connected to the bezel, it should make sense that the bezel can be rotated. Using affordances like this contributes to making the interaction more intuitive and easier to understand.

Figure 8: Final demonstrator, with working interaction and gear visible through the transparent surface

Something that was missing from our demonstrator, was the ability to switch between heating and cooling modes. However, being able to try out the main interaction allowed us to decide on how to include the modes. At first, we wanted to add a separate interaction to control the mode but decided against this for simplicity. Instead, the mode can be selected based on the direction the bezel is turned when the device is turned off. Turning it clockwise will activate the heating mode and turning it counter-clockwise will activate the cooling mode. In both cases, the vent tube (and therefore airflow) will rise the more you turn it in the same direction and decrease when turning in the opposite direction.

Since the vent tube rising up or down only offers feedback on the amount of airflow (which can be related to energy use), we plan to use lighting effects to offer feedback on the current mode. When in heating mode, the lights will be dark orange, while in cooling mode, the lights will be blue (see Figure 9). Further, the energy use can also be communicated using the lights by changing the intensity or using certain lighting effects. Finding what kind of effects would be most effective at inducing consciousness about energy use in this context requires more in-depth user testing.

Figure 9: Blue lighting effects when in cooling mode

Pillows

While the table fosters the whole family through Edward's desire to spend more time with them, we felt that we still neglected the needs of the other members. A particular quirk shared by both Lucas and Ayla is their enjoyment of alone time. It may seem like a contradiction to our concept, but we also wanted to offer an option for the users to control their personal temperature, even in other areas of the house. Our initial idea revolved around a robotic humidifier which would follow you within the limits of your home, inspired by R2-D2 from the fictional universe of Star Wars [28]. Even though it was an intriguing thought, we opted for a simpler design: pillows. One of the reasons has to do with the interconnected function of the pillows with the table since their temperature can be regulated with the assistance of the table. This will allow the users to also micromanage their comfort in conjunction with the experience of a shared space offered by the table. Lastly, appointing one robotic humidifier for each person would be quite expensive and less versatile.

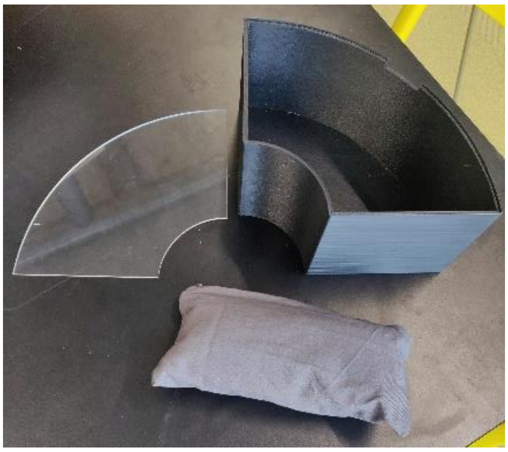


Figure 10: A pillow next to the box it is stored in

The most important aspect of making the pillows had to do with the materials involved. After thorough experimentation, we decided to use a combination of wool and flax seeds, since wool is a sustainable material that is often wasted [27] and flax seeds are an organic material capable of retaining heat [10,18]. Besides being heated up by the table when stored in one of the boxes (see Figure 10), for more individual control we want the pillows to be able to work independently as well. This can be achieved by adding a heating element inside the pillow, along with either a battery or power chord to power it. Because we don't expect every family to use the heating element and because the pillows can always be heated up by the table, we think it is best to make the heating element optional. This allows people to adjust the product based on their needs and beliefs. Not buying the heating element means the pillows are cheaper and more sustainable to produce due to requiring less material and no electronics. It should be possible to purchase a heating element separately at a later time and place it in the existing pillow, so the pillows need to be made in a modular way.

Final Design Concept

Figure 11: Our design concept render showing the ability to remove the boxes and stools

TEMPLORE is a round table to be placed in the middle of the seating area in the house. People can sit around it. By turning the outer bezel, the user can make the central vent tube rise from the table. The height of the tube reflects the amount of air being blown in all directions around the table. If the user rotates clockwise, the air will be hot, which is indicated by the dark orange lights in the table surface. If turned counter-clockwise, the air will be cold, indicated by blue lights. A very important part of the design is awareness of energy use, the interaction to change the temperature being very visible allows for discussion about temperature changes. Both the height of the tube, as well as certain lighting effects, will also communicate the current energy used by the table.

Around the bottom of the table, four stools are integrated into the design. These can be taken out and placed anywhere around the table, allowing someone to feel more of the heated or cooled air being released by sitting closer to the table. Another way of micromanaging your comfort is possible by using the pillows stored in the boxes above the stools, our second product. These are made from a material that can retain heat and optionally come with an internal heating element to make it possible to use the pillows individually as well.

Open-endedness

Here, we present some scenarios for users. For example, in the summer of 2038, family members sit together to watch a football game of the World Cup. They gather around TEMPLORE and feel the cold air radiating from the table while enjoying a cool beer. When they are concentrating on the game, they will put their beer on the top to keep the temperature and taste through the cold air. After the team they support scores a goal, they can grab the beer from the table and raise it in celebration. When feeling hungry, they can also store chilled fruit in the boxes below.

Figure 12: Visualization of how TEMPLORE could be used during summer (background image: Zaozuo [26])

Another user scenario is in winter where Lucas is drinking hot chocolate and watching TV while Isabel prepares tomorrow's outfits and puts them in a box. Other family members are talking around the table, enjoying their relaxation time and the "warm" atmosphere around TEMPLORE.

Figure 13: Visualization of how TEMPLORE could be used during winter (background image: Zaozuo [26])

Although we have created some scenarios for users, we also expect that in the future, users will develop different ways of using the product according to their own family's habits, adapting to different habits from different cultures. We have on/off buttons on each stool and box so that users can choose to turn them on or off allowing flexible use of our product and saving energy.

Connectivity with other projects

Starting with “SAMMASATI” and “Bear with me”, both of which take into consideration the emotional state of users, who use the heating pillows. “SAMMASATI” determines when and what kind of break the user should take from work. One of those types of breaks involves relaxing and studies show that hugging something warm helps reduce stress [5]. So, the idea is that the user will be able to set a timer for when they would like the pillow to reach a certain temperature in time for their scheduled break. The data exchange in this case can go both ways with TEMPLORE sharing its availability and battery status. Likewise, “Bear with me” helps its users to reflect on their emotions through guided mediation.

Similarly, “My Digital Kitchen” makes use of the tabletop by setting up a temperature to maintain food quality. The project revolves around the monitoring of fridge content and food preparation. Hence, a chosen temperature can be reached as soon as the food is ready allowing the user to eat their dishes at the correct temperature throughout their whole meal.

On the other hand, we have “QueStory” where they place various clues around a room using their custom-made devices, each with a specific purpose. The goal is to solve a mystery step by step by incorporating the whole room and its contents. Part of their game includes the allocation of a specific temperature to proceed. Hence, it made sense that TEMPLORE could also be part of the game.

Evaluation

Survey

We distributed an online survey to receive qualitative and quantitative insights about how our concept would be perceived and used. The goal of this survey is to test the general idea behind our concept, not the final design itself in detail.

The first part of the survey is targeted towards learning the respondent's living situation. For instance, a family likely behaves differently around heat and energy than the people living in a student house. The information collected in the second part tells us what practices currently exist around energy and heat that might give us clues about why these practices do or do not change. For instance, we ask questions like what kind of heating/cooling methods are being used, if residents usually spend their evenings together, or how they currently save energy.

For the third part, we first explained the design concept, focusing on the aspect of sitting around it to save energy, and the physical interaction being visible to others. This part is the most important because it tells us how people see our design concept and envision using it. We gave 8 statements about practices that might result from using our concept and asked participants to indicate, on a Likert scale, how much they agreed with these statements (ranging from “Fully agree” to “Fully disagree”). The final section allows the participants to list some pros and cons of the concept. All questions and statements can be found in Appendix B.

Findings

We were not able to draw statistically sound conclusions due to only having 12 responses. However, we extracted some insights from the survey responses, like that our concept would likely be less effective for students living in a student house. We can come to this conclusion by grouping five of the eight statements, since these statements are all about an intended outcome, meaning that if someone agrees they can be considered "positive" and likely to perform it. These statements are about (1) actively adjusting the temperature on the device, (2) sitting together in the same space, (3) talking about the temperature set by others, (4) using the device to save energy, and (5) using the device because it is cosy. When plotting the answers to all these statements in a bar graph sorted by the current household situation (see Figure 14), we can see that respondents living in a student house disagree more than respondents living individually or with their parents.

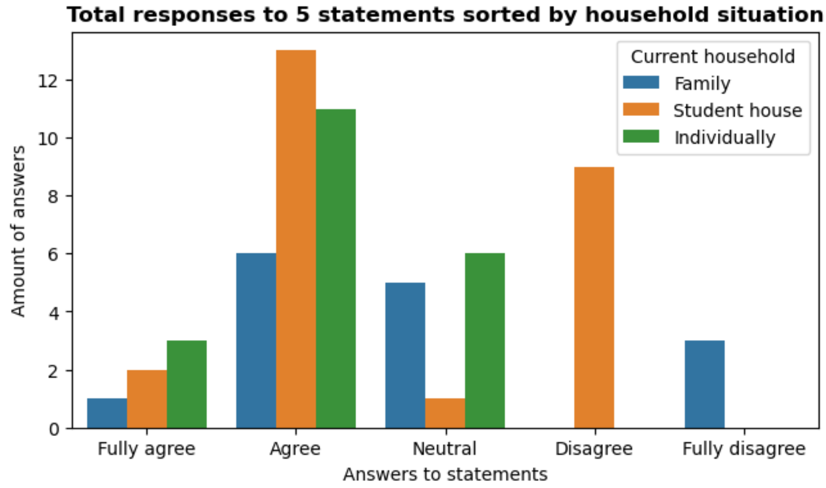


Figure 14: Positivity towards design concept sorted by household situation

This can be explained by studying the statements individually (see Figure 15). People in a student house tend to disagree with statements whenever they involve others. For instance, they do not expect that this device will cause them to sit together in the same space, and they would not talk about the temperature set by others. This makes sense because they often do not have a shared area to sit together. This is elaborated perfectly by a respondent: *"We don't have a shared living room so everyone just lives in their room, only interacting when we're in the kitchen. So probably everyone would need their device for their room."* Students in a student house are also less likely to use this device to save energy, which is explained by another respondent: *"We are not very aware of our energy usage, since we pay our rent including gas, water and electricity. (...) some of my roommates are not motivated to save any energy and use the heating a lot."*

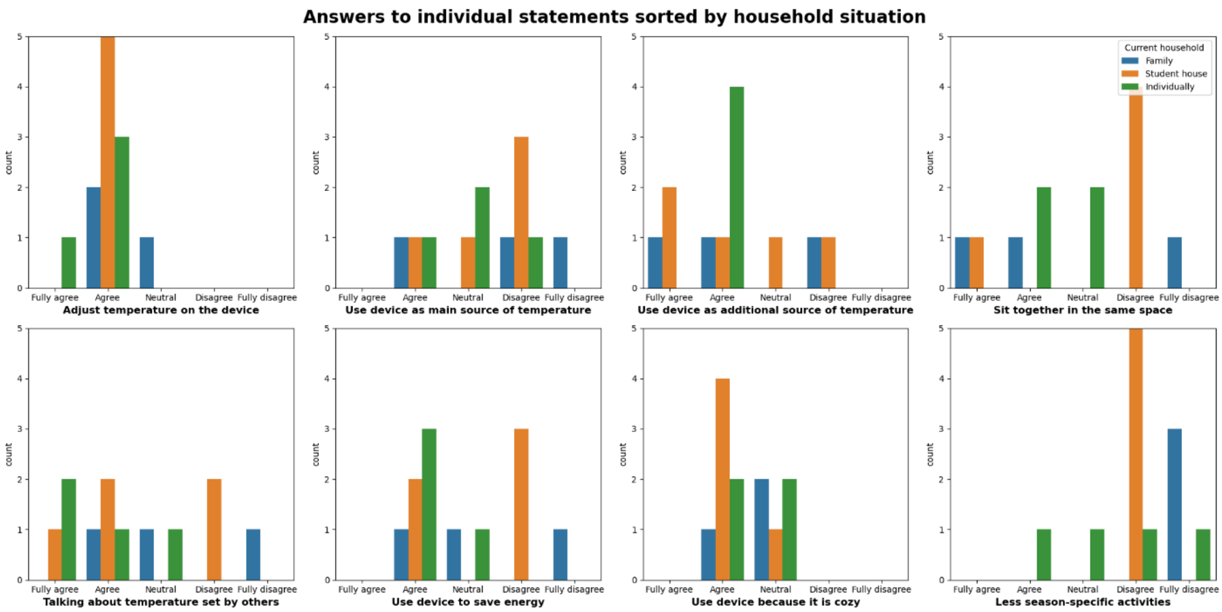


Figure 15: Answers to all statements separately, sorted by household situation

These findings are not surprising, since the design was deliberately designed for family use. And while only 3 respondents live with their parents, overall, they agree more with the intended purpose of the design. On some statements, most respondents generally agree: They all expect to actively adjust the temperature on the device by interacting with it, that the cosy feeling is a reason to use the device, and that they would not do less season-specific activities like eating ice cream in summer or drinking hot drinks in winter. Also, the respondents generally expect to be using the device more as an additional source of heating or cooling rather than the main source.

Interviews

The purpose of the interviews was to get an impression of how practices and tendencies may potentially form with the use of TEMPLORE. Before asking any questions, we wanted the participants to experience and interact with our design in a group setting. These questions revolved around their current practices, group dynamics and user interactions throughout the year, highlighting winter and summer because they are the two extremes. To be more precise, we asked the participants how they would handle specific scenarios concerning specific aspects of the design, such as the use of the pillows and the tabletop. We wanted to put our assumptions to the test while keeping an open mind to the participants' comments and suggestions, as they could provide a third-party perspective with ideas we hadn't thought of ourselves. All questions and statements can be found in Appendix C.

Findings

It was pointed out that the localised nature of TEMPLORE initiates "hangouts" and more frequent sharing of a common space. Leading to its noticeability that "starts arguments", as described by one out of the three participants. In retrospect, it was reassuring to see that participants came to the conclusions we intended to convey on their own.

Regarding usage, both winter and summer were highlighted as the most suitable time to benefit from TEMPLORE. On one side, it was said that during winter it is more difficult to find a concentrated heat source rather than "heating everywhere". On the other side, it was emphasised that in northern countries like the Netherlands, houses are built to keep the heat inside. Thus, during summer our product would be "effective to cool down". In addition, participants opted for using the pillows while working instead of specifically using them to relax or calm down, as suggested by us. Once again, we can see that the openness of the product allows for alternative applications.

Moreover, the temperature regulation of the tabletop was not something that participants would use regularly, they would use it for limited foods or drinks such as ice cream and tea. The turning mechanism though, was universally deemed intuitive for multiple reasons. One was the difference in material indicating it could be something to interact with. Another explanation had to do with the fact that seeing the vent tube rise while turning "felt natural"—an additional example of the participants confirming our hypothesis on the interaction's intuitiveness. Two participants also brought up the point that being able to see the gear "helped understand that it rotates".

Finally, two responses stood out the most when asked to think of other original ways to use TEMPLORE that were not mentioned beforehand. The first one was simple but effective, to sit on the table "after being cold outside". The second one involved an entertaining way of using the rotating feature, such as purposefully starting arguments and fights by changing the height of the vent tube.

Discussion

Looking back at our initial project ambitions, we believe we have achieved most of our goals according to our evaluation methods. Firstly, the survey revealed that the level of comfort we aimed for was in line with the respondents' opinions. In addition, the interview results suggested that our user interactions are indeed intuitive and easy to use without the need for detailed instructions. Not only that but, there was also positive feedback regarding the togetherness aspect we intended to provide. Even people who live individually were fairly positive about a device like this, despite not having others to use it with. Based on this, it made sense that we adjusted our concept to accommodate individual use as well. In the future, this can be expanded further by offering control over which direction the air is blown towards. We could have conducted a more thorough evaluation with more participants taking part in both the survey and the interviews. Ideally, we would have organised focus group sessions where we could go more in-depth about the practices occurring around energy and heat if testers could live through the experience we want to invoke.

During the making process, we encountered obstacles in multiple stages, which was completely normal. The limitation that had the most significant influence on our prototype was the fact that the gears were laser cut. This meant that we were restricted to the dimensions of the laser-cutting machine, 700 mm x 400 mm. On top of that, the purpose of the initial model was to investigate the gear mechanism, so the scale wasn't important at the time. We could have made a modular design, assembling smaller parts to form a bigger structure, however, because of the limited time available, it wasn't possible to make a full-sized model afterwards.

References

[1] aflamo. Modern Electric Fires. *aflamo*. Retrieved December 17, 2023 from https://www.aflamo.nl/en_GB/c-5011409/modern-electric-fires/

[2] Dina Alexandrova. 2020. Cet appartement à Moscou possède une véritable cheminée. *Planète Déco*. Retrieved February 16, 2024 from https://planete-deco.fr/2020/02/10/cet-appartement-a-moscou-possede-une-veritable-cheminee/

[3] F. Braadbaart, F. H. Reidsma, W. Roebroeks, L. Chiotti, V. Slon, M. Meyer, I. Théry-Parisot, A. van Hoesel, K. G. J. Nierop, J. Kaal, B. van Os, and L. Marquer. 2020. Heating histories and taphonomy of ancient fireplaces: A multi-proxy case study from the Upper Palaeolithic sequence of Abri Pataud (Les Eyzies-de-Tayac, France). *J. Archaeol. Sci. Rep.* 33, (October 2020), 102468. https://doi.org/10.1016/j.jasrep.2020.102468

[4] BROSUNDET. 2021. BROSUNDET on Instagram: "Have a great weekend, friends 🪵 🔥." *Instagram*. Retrieved February 16, 2024 from https://www.instagram.com/p/CNdKG7xJTh5/

[5] Sheldon Cohen, Denise Janicki-Deverts, Ronald B. Turner, and William J. Doyle. 2015. Does hugging provide stress-buffering social support? A study of susceptibility to upper respiratory infection and illness. *Psychol. Sci.* 26, 2 (February 2015), 135–147. https://doi.org/10.1177/0956797614559284

[6] Kris De Decker. 2015. How to Keep Warm in a Cool House. *LOW←TECH MAGAZINE*. Retrieved December 17, 2023 from https://solar.lowtechmagazine.com/2015/03/how-to-keep-warm-in-a-cool-house/

[7] Afamia Elnakat and Juan D. Gomez. 2016. The flame dilemma: A data analytics study of fireplace influence on winter energy consumption at the residential household level. *Energy Rep.* 2, (November 2016), 14–20. https://doi.org/10.1016/j.egyr.2016.01.002

[8] European Commission. Heating and cooling. *Energy, Climate change, Environment*. Retrieved December 17, 2023 from https://energy.ec.europa.eu/topics/energy-efficiency/heating-and-cooling_en

[9] Thomas Green. 2023. 6 Eras In The History Of Fireplaces And Their Styles. *Golden Chimney*. Retrieved December 17, 2023 from https://goldengatechimney.com/history-of-fireplaces-and-their-styles/

[10] Liz Johnson. 2018. Best Organic Fillers For Warming Pads. *Sew4Home*. Retrieved December 17, 2023 from https://sew4home.com/organic-fillers-for-warming-pads-rice-corn-and-flaxseed-compared/

[11] Victor Kaptelinin. 2014. Affordances. In *The Encyclopedia of Human-Computer Interaction* (2nd ed.). Interaction Design Foundation. Retrieved December 17, 2023 from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/affordances

[12] Bodil S. A. Karlsson, Maria Håkansson, Jonas Sjöblom, and Henrik Ström. 2020. Light my fire but don't choke on the smoke: Wellbeing and pollution from fireplace use in Sweden. *Energy Res. Soc. Sci.* 69, (November 2020), 101696. https://doi.org/10.1016/j.erss.2020.101696

[13] Tomasz Kisilewicz, Małgorzata Fedorczak-Cisak, and Tamas Barkanyi. 2019. Active thermal insulation as an element limiting heat loss through external walls. *Energy Build.* 205, (December 2019), 109541. https://doi.org/10.1016/j.enbuild.2019.109541

[14] Daniel E. Montaño and Danuta Kasprzyk. 2008. Theory of Reasoned Action, Theory of Planned Behavior, and the Integrated Behavioral Model. In *Health Behavior and Health Education:*

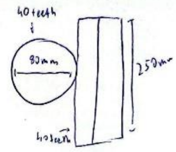
Theory, Research, and Practice (4th ed.). 67–92. Retrieved from https://www.researchgate.net/publication/288927435_Health_Behavior_and_Health_Education_Theory_Research_and_Practice
[15] Johannes Naumann, Julian Grebe, Sonja Kaifel, Tomas Weinert, Catharina Sadaghiani, and Roman Huber. 2017. Effects of hyperthermic baths on depression, sleep and heart rate variability in patients with depressive disorder: a randomized clinical pilot trial. *BMC Complement. Altern. Med.* 17, (March 2017), 172. https://doi.org/10.1186/s12906-017-1676-5
[16] Monica Nuñez-Villegas, Francisco Bozinovic, and Pablo Sabat. 2014. Interplay between group size, huddling behavior and basal metabolism: an experimental approach in the social degu. *J. Exp. Biol.* 217, Pt 6 (March 2014), 997–1002. https://doi.org/10.1242/jeb.096164
[17] Mary Ellen Polson. 2013. The History of the Fireplace. *Old House Journal Magazine*. Retrieved February 13, 2024 from https://www.oldhouseonline.com/interiors-and-decor/history-of-the-fireplace/
[18] Revolana. 2018. Organic flax seeds heat packs. *Revolana*. Retrieved December 17, 2023 from https://revolana.com/heat-packs/
[19] Katherine Anne-Marie Roberts. 1990. Hearth and soul: The fireplace in American culture. University of Minnesota. Retrieved February 13, 2024 from https://www.proquest.com/openview/7c8f6f0e2de8a478dd97fe95a76ae896/1?cbl=18750&diss=y&parentSessionId=zDqsB87VL4akxLBlgKrmRgACVB3UAGjRS2fjyG3r6Q8%3D&pq-origsite=gscholar&accountid=27128
[20] Stidac. 2023. Why Aren't Houses Built With Fireplaces Anymore? *RooHome - Your Home Design & Plans*. Retrieved December 17, 2023 from https://roohome.com/41488/why-arent-houses-built-with-fireplaces-anymore/
[21] stoov. Warmtekussens & warmtedekens. *stoov*. Retrieved December 17, 2023 from https://nl.stoov.com/
[22] Mithu Storoni. 2017. Exposure to Heat Can Improve Mental Well-Being. *Psychology Today*. Retrieved December 17, 2023 from https://www.psychologytoday.com/intl/blog/the-stress-proof-life/201712/exposure-heat-can-improve-mental-well-being
[23] Stovax & Gazco. Modern Contemporary Fireplaces. *Stovax & Gazco*. Retrieved December 17, 2023 from https://www.stovax.com/products/fireplaces/contemporary/
[24] Aaron Taylor. 2022. Restaurant interior, Commercial design, Architecture. *Pinterest*. Retrieved February 16, 2024 from https://www.pinterest.com/pin/159737118025206923/
[25] Warmies. Warmies - Snuggable, Huggable, Loveable. *Warmies*. Retrieved December 17, 2023 from https://warmies.co.uk/
[26] Zaozuo. Living family vol. 19 | Dismantle 6 walls, the bedroom becomes the living room, and only run away for children. *Zaozuo*. Retrieved December 20, 2023 from https://www.zaozuo.com/b/4735
[27] 2021. Dutch wool: from waste material to valuable product. *MaterialDistrict*. Retrieved February 18, 2024 from https://materialdistrict.com/article/dutch-wool-from-waste-material-to-valuable-product/
[28] 2024. R2-D2. *Wookieepedia*. Retrieved February 13, 2024 from https://starwars.fandom.com/wiki/R2-D2
[29] Types of Heating Systems. *Smarter House*. Retrieved February 13, 2024 from https://smarterhouse.org/heating-systems/types-heating-systems

Appendices

A. Calculations of material properties and safety factors

Gear Specifications & Calculations

- https://thepihut.com/products/towerpro-servo-motor-mg946r-metal-gear
  - Servo Motor MG946R
  - Torque = 10.5kgf.cm = 1.03 Nm = 1030 Nmm
  - Speed = 0.2 sec/60 degrees = 50 rpm
  - Title: TowerPro Servo Motor - MG946R (Metal Gear)
- https://meridian.allenpress.com/fpj/article/61/1/56/51653/Bending-Properties-of-Medium-Density-Fiberboard
  - MDF Limiting Bending Stress (**σ**Flim) = 4.6 Nmm^-2
  - Title: Bending Properties of Medium-Density Fiberboard and Plywood Obtained by Compression Bending Test
- https://www.researchgate.net/profile/John-Nairn/publication/242270765_Fracture_Toughness_of_MDF_and_other_Materials_with_Fiber_Bridging/links/00463536d714dbcbd9000000/Fracture-Toughness-of-MDF-and-other-Materials-with-Fiber-Bridging.pdf
  - MDF Limiting Contact Stress (**σ**Hlim) = 20 Nmm^-2
  - Title: Fracture Toughness of MDF and other Materials with Fiber Bridging
- https://www.compositepanel.org/wp-content/uploads/Technical-Bulletin-Particleboard-MDF-for-Shelving.pdf
  - MDF Modulus of Elasticity (E) = 2160 Nmm^-2
  - Title: Technical Bulletin - Particleboard & MDF for Shelving
- https://www.thomasnet.com/articles/metals-metal-products/6061-aluminum/
  - Aluminium 6061 Tensile Yield Strength (**σ**Y) = 276 Nmm^-2
  - Aluminium 6061 Modulus of Elasticity (E) = 68900 Nmm^-2
  - Title: All About 6061 Aluminum (Properties, Strength and Uses)
- MDF
  - Vertical Rack and Pinion
    - Tangential Force (Ft) = 25.75 N
    - Bending Stress (**σ**b) = 3.39 Nmm^-2
    - Contact Stress (**σ**H) = 7.35 Nmm^-2
    - Safety Factor Bending Stress (SF) = 2.71
    - Safety Factor Contact Stress (SF) = 2.70
  - Horizontal Internal Gear
    - Safety Factor Bending Stress (SF) = 1.5 (Assumption)
    - Safety Factor Contact Stress (SF) = 1.5 (Assumption)
    - Bending Stress (**σ**b) = 6.13 Nmm^-2
    - Contact Stress (**σ**H) = 13.33 Nmm^-2
    - Tangetial Force (Ft) = 183.70 N (Ideal)
- Aluminium 6061
  - Vertical Rack and Pinion
    - Safety Factor Bending Stress (SF) = 162.8
    - Safety Factor Contact Stress (SF) = 37.55
  - Horizontal Internal Gear
    - Safety Factor Bending Stress (SF) = 1.5 (Assumption)
    - Safety Factor Contact Stress (SF) = 1.5 (Assumption)
    - Tangetial Force (Ft) = 1097.26 N (Ideal)



Module (m) = 2
pressure angle (φ) = 20°

$$\text{Tangential Force } (F_t) = \frac{2T}{d} = \frac{2(1030)}{80} = 25.75\ N$$

from source

$$\text{Radial Force } (F_r) = F_t \tan\varphi = (25.75)(\tan 20) = 9.37\ N$$

$$\text{Normal Force } (F_n) = F_t / \cos\varphi = (25.75)/(\cos 20) = 27.40\ N$$

$$\text{Weight } (W) = mg = (0.3)(9.81) = 2.94\ N$$

Bending Stress

$$\sigma_b = \frac{F_t L}{\frac{1}{6} b h^2} = \frac{(25.75)(4)}{\frac{1}{6}(9)(4.5)^2} = 3.39\ N\,mm^{-2}$$

L = working depth ($h_k = a + a$)
b = gear width
$h = h_t = a + b$

Form Factor

$$Y_{FA} = \frac{(\sigma_b)(b\,m)}{F_t} = \frac{3.39 \times (9)(2)}{25.75} = 2.37$$

→ 42 teeth

from source

$$S_F = \frac{2\sigma_{Flim}}{\sigma_b K_A} = \frac{2(4.6)}{(3.39)(1)} = 2.71$$

$(1.5 < x < 3)$

from source

σ_{Flim} = limiting bending stress
K_A = Application load factor

Contact Stress

$$\sigma_{H\,max} = \sqrt{0.175 \frac{F_t E}{b\rho}} = \sqrt{\frac{0.175\,(25.75)(2160)}{9\,(20)}} = 7.35\ N\,mm^{-2}$$

from source

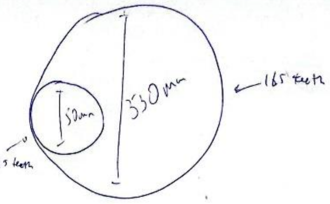
E: Elastic Modulus
ρ = radius of curvature $= \frac{\rho_1 \cdot \rho_2}{\rho_1 + \rho_2}$
b = gear width

$$S_H = \frac{\sigma_{Hlim}}{\sigma_H \sqrt{K_A}} = \frac{20}{7.35\sqrt{1}}$$

from source

σ_{Hlim} = limiting contact stress
K_A = Application load factor

$= 2.7$



Module (m) = 2
pressure angle (φ) = 20°

Bending Stress

$$S_F = \frac{2\sigma_{Flim}}{\sigma_b K_A}$$

from source

σ_{Flim} = limiting bending stress
K_A = Application load factor

$$\text{Assume } 1.5 = \frac{2(4.6)}{\sigma_b (1)}$$

$$\sigma_b = 6.13\ N\,mm^{-2}$$

$$\sigma_b = \frac{F_t L}{\frac{1}{6} b h^2}$$

L = working depth ($h_k = a + a$)
b = gear width

$$6.13 = \frac{F_t (4)}{\frac{1}{6}(9)(4.5)^2}$$

$$\text{Tangential Force } (F_t) = 46.55\ N$$

around this much force is needed to turn without breaking

$$\text{Radial force } (F_r) = F_t \tan\varphi = (46.55)(\tan 20) = 16.94\ N$$

$$\text{Normal force } (F_n) = F_t / \cos\varphi = (46.55)/(\cos 20) = 49.54\ N$$

Contact Stress

$$S_H = \frac{\sigma_{Hlim}}{\sigma_H \sqrt{K_A}}$$

from source

σ_{Hlim} = limiting contact stress
K_A = application load factor

$$\text{Assume } 1.5 = \frac{20}{\sigma_H \sqrt{1}}$$

$$\sigma_H = 13.33\ N\,mm^{-2}$$

$$\sigma_H = \sqrt{\frac{0.175\,(F_t)(E)}{b\rho}}$$

from source

E: Elastic Modulus
ρ = radius of curvature $= \frac{\rho_1 \cdot \rho_2}{\rho_1 + \rho_2}$, $\frac{330 \cdot 50}{380}$
b = gear width

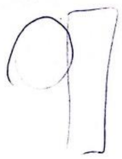
$$\sigma_H = \sqrt{\frac{0.175\,(F_t)(2160)}{(9)(43.42)}}$$

$$\frac{(9)(43.42)(13.33)^2}{(0.175)(2160)} = F_t$$

$$\text{Tangential Force } (F_t) = 183.70\ N$$

$$\text{Radial Force } (F_r) = F_t \tan\varphi = (183.70)(\tan 20) = 66.86\ N$$

$$\text{Normal Force } (F_n) = F_t / \cos\varphi = (183.7)/(\cos 20) = 195.49\ N$$



Bending stress

$$S_F = \frac{2\sigma_{Flim}}{\sigma_b K_A} = \frac{2(270)}{3.39(1)} = 162.8$$

from source

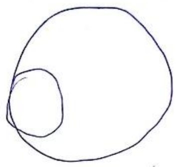
σ_{Flim} = limiting bending stress

Contact stress

$$S_H = \frac{\sigma_{Hlim}}{\sigma_H \sqrt{K_A}} = \frac{276}{7.35(\sqrt{1})} = 37.55$$

from source

σ_{Hlim} = limiting contact stress



Bending Stress

$$S_F = \frac{2\sigma_{Flim}}{\sigma_b K_A}$$

from source

σ_{Flim} = limiting bending stress

$$\text{Assume } 1.5 = \frac{2(276)}{\sigma_b (1)}$$

$$\sigma_b = 368\ N\,mm^{-2}$$

$$\sigma_b = \frac{F_t L}{\frac{1}{6} b h^2}$$

$$368 = \frac{F_t (4)}{\frac{9}{6}(4.5)^2}$$

$$F_t = 2794.5\ N$$

Contact Stress

$$S_H = \frac{\sigma_{Hlim}}{\sigma_H \sqrt{K_A}}$$

from source

σ_{Hlim} = limiting contact stress

$$\text{Assume } 1.5 = \frac{276}{\sigma_H (1)}$$

$$\sigma_H = 184\ N\,mm^{-2}$$

$$\sigma_H = \sqrt{\frac{0.175\,(F_t)(E)}{b\rho}}$$

from source

$$184 = \sqrt{\frac{0.175\,(F_t)(68700)}{(9)(43.42)}}$$

$$F_t = \frac{184^2\,(9)(43.42)}{(0.175)(68700)}$$

$$F_t = 1097.26\ N$$

B. Full survey used

Survey temperature practices

English version (Voor Nederlands, verander de taal rechtsboven)

Hello! Thank you for participating in this survey, it will be about temperature in the house and how you stay comfortable. In winter, we need heating, while in summer, we often need cooling in our house. How do you deal with this? What kind of heating and cooling do you use? Then, we will introduce our design concept for heating and cooling, and see how this would change the dynamics in your household.

The survey will not take more than 10 minutes. You can change the language to Dutch via the upper right corner.

* Vereist

Consent form

Even though we do not collect any personal data, we do need your consent for the use of the data you provided in this survey and to indicate that you participate in this study voluntarily.

1. Introduction
Participation in this research is voluntary, you decide for yourself if you want to participate or not. In this text, you can read what the project is about, what is expected from you and how your data will be processed. Based on this, you can decide whether you want to participate and consent to take part and the processing of your data. If you have any comments or questions, you can contact j.r.p.verstegen@student.tue.nl.

2. Purpose of the survey
This survey is managed by Jochem Verstegen for a project at Eindhoven University of Technology, faculty of Industrial Design. The purpose is to find out what practices currently exist in various households when it comes to staying within a comfortable temperature. With this, we mean the practices around heating in winter and around cooling in summer.

3. What will you be doing?
You will be filling in a questionnaire, including some open ended and some multiple-choice questions. This questionnaire will be completely anonymous, and the data will not be traceable to you.

4. Potential risks and inconveniences
Your participation does not involve any risks of any kind. Your participation is voluntary, which means you can end your participation at any moment by simply closing the questionnaire. If you close the questionnaire without submitting, none of your answers will be saved.

5. Confidentiality of data
The raw and processed research data will be retained for a period of at maximum 3 years. It can never be connected to an individual person, also before this period ends. If you wish to delete your data at any moment, you can send an email to j.r.p.verstegen@student.tue.nl. For this, we will need the exact time and date at which you submitted the questionnaire, without this it will be impossible to find and remove your submission.

1. I give my consent and acknowledge the following: *

1. I am sufficiently informed about the survey goals, have read the information and had the opportunity to ask questions. Any questions have been answered satisfactorily.

2. I participate in this survey voluntarily. There is no pressure for me to participate. I can end participation at any moment, without giving any reason.

- ○ Yes, I consent and want to participate.
- ○ No, I do not consent and do not want to participate.

Household situation

First, we would like to know a little bit about your household. This will help us make sense of the information.

2. In what kind of household do you currently live? *

- ○ Multiple parents/caregiver with one or more kids
- ○ Single parent/caregiver with one or more kids
- ○ Partners without kids
- ○ Individually
- ○ Student house (multiple students sharing a general area)
- ○ Andere

3. What is your role in your household? *

- ○ I am a parent/caregiver
- ○ I live with my parents
- ○ Andere

4. What age groups are currently living in your household? *
Select all that apply

- ☐ 0-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16-20
- ☐ 21-25
- ☐ 26-30
- ☐ 31-40
- ☐ 41-50
- ☐ 51-60
- ☐ 61-70
- ☐ 71+

Current practices (winter)

Now, we will ask some questions about your activities in the evening, mostly looking into what you do to stay comfortable temperature-wise. We will look into the seasons summer and winter separately.

Winter
The following questions are about winter, when it is cold outside:

5. What kind of heating do you mainly use in your house? *
If you have multiple, choose the one you use most.

- ○ Water based central heating (hot water through radiator)
- ○ Air based central heating (hot air through air ducts and vents)
- ○ Air conditioning / heat pumps in individual rooms
- ○ Andere

6. What extra methods of heating do you use when you are feeling cold? *

- ☐ Air conditioning / heat pumps in individual rooms
- ☐ Heated fans (like Dyson fans)
- ☐ Movable radiant heaters (without air)
- ☐ Heated blankets
- ☐ Regular blankets
- ☐ Andere

7. What about the others in your household? Do they use different methods to heat themselves up? If yes, what do they do?

8. How are the habitants situated in your house in evenings? *

- ○ We are often all together in the same space
- ○ Sometimes we are together, sometimes divided
- ○ We are almost never together in the same space
- ○ Andere

9. What do you do during winter you don't usually do during other seasons? *
Like drinking more warm drinks, using a blanket, sitting in front of fireplace, etc

10. What about the rest of your household?

11. What does your household do during winter to save energy? *

Current practices (summer)

Now, we will ask some questions about your activities in the evening, mostly looking into what you do to stay comfortable temperature-wise. We will look into the seasons summer and winter separately.

Summer
The following questions are about summer, when it is hot outside:

12. What kind of cooling do you mainly use in your house? *
If you have multiple, choose the one you use most.

- ○ Air based central cooling (HVAC, distributing cool air via air ducts)
- ○ Air conditioning / heat pumps in individual rooms
- ○ Fans (without water)
- ○ Misting fans (spraying a little water mist)
- ○ We don't use any methods of cooling
- ○ Andere

13. What extra methods of heating do you use when you are feeling hot? *

- ☐ Air conditioning / heat pumps in individual rooms
- ☐ Fans (without water)
- ☐ Misting fans (spraying a little water mist)
- ☐ We don't use any methods of cooling
- ☐ Andere

14. What about the others in your household? Do they use different methods to cool themselves down? If yes, what do they do?

15. How are the habitants situated in your house in evenings? *

- ○ We are often all together in the same space
- ○ Sometimes we are together, sometimes divided
- ○ We are almost never together in the same space
- ○ Andere

16

What do you do during summer you don't usually do during other seasons? *

Like eating ice-cream, spraying water, sitting in front of a fan, etc

17

What about the rest of your household?

18

What does your household do during summer to save energy? *

Our design concept

Now imagine a device near the couch, it can blow hot or cold air in all directions. Multiple people can sit around it to feel the air coming from the device. This device will create a "comfortable bubble" around it, meaning that anyone sitting around the device feels a comfortable temperature. Heating or cooling a smaller area like this takes a lot less energy than heating or cooling an entire room or house. Therefore, this device can contribute to decreased energy use.

It would work by manually setting a temperature by physically interacting with the device, this will make it visible to others that someone is changing the temperature. This opens up an opportunity to communicate about energy use and comfort.

19

How much do you agree with the following statements when you think about using this device? *

	Fully disagree	Disagree	Neutral	Agree	Fully agree
We will often sit together in the same space	○	○	○	○	○
We will adjust the temperature of the device when we feel too cold or warm	○	○	○	○	○
We will use this device as our main source of heating / cooling during the evening (turning other heaters or coolers off)	○	○	○	○	○
We will use this device as an additional source of heating / cooling, with other heaters or coolers still turned on	○	○	○	○	○
We will do less season-specific activities when we have this device (like eating ice-cream in summer or drinking hot drinks in	○	○	○	○	○

Pros and cons of this device

Finally, we would like to learn about the pros and cons of this device you think are important. We mention a few pros and cons we think might be relevant, but we would like you to also indicate your own if you have any!

21

I think these could be pros of using this device *

Select as many as you want

- ☐ Possible to save energy
- ☐ Makes it cozy to sit together
- ☐ Easy and intuitive to change the temperature
- ☐ Ability to sit closer to feel more temperature
- ☐ I can warm up (special) pillows to hug or lean on for extra comfort
- ☐ It offers more consciousness about energy use
- ☐ None
- ☐ Andere

22

These are some other pros that would be relevant for me

This could be anything

23

I think these could be cons of using this device *

Select as many as you want

- ☐ In order to save energy, the rest of the house would be less comfortable
- ☐ I feel forced to sit together with others
- ☐ It needs to be controlled manually
- ☐ I don't care about saving energy
- ☐ None
- ☐ Andere

24

These are some other cons that would be relevant for me

This could be anything

25

Overall, I would use this device *

No, never ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ Yes, I would love to!

C. Interview Notes

QUESTION 1:

Since there aren't any existing products that resemble Templore, how would it influence the way you interact with temperature regulating products?

- Bigger role in room (not background) at the forefront
- Centre of the room makes a difference.

QUESTION 2:

Regarding the rotating interaction needed to interact with Templore, what would change in the group dynamic when someone wants to change the height of the cylinder?

- Everyone would notice
- Conflict just like the [illegible]

QUESTION 3:

Taking into consideration that Templore can release both hot and cold air, in which season do you think it would be most effecting, and why?

- More effective in summer (~~[illegible]~~ no A/C)
- Helps to cool down
- For winter, homes are ~~[illegible]~~ already made to keep heat in (more used to it)

QUESTION 4:

In a scenario where you work from home and you use the pillows to relax, how would that change your overall perception of working?

- Using pillows to help work
- ~~[illegible]~~ Procrastinate until user is comfortable (with pillow)

QUESTION 5:

When it comes to food and drinks we usually eat hot meals/beverages during winter and colder meals/beverages during summer, so how much of a difference would Templore make since it can maintain a chosen temperature over a certain period of time?

- Depends on what it is and how much you enjoy it.
- More useful for cold drinks
- Ice cream (timing to get out of the freezer) Keep cold enough.

QUESTION 6:

Other than the two previously mentioned examples, what other alternative ways do you potentially see yourself using Templore?

-

QUESTION 7:

Finally, is the interaction intuitive enough to use? Or would this take a while before getting used to using it?

- Difference in material looks like it smelly you touch
- Steering wheel shape
- gear helps ~~[illegible]~~ to understand that it rotates.

QUESTION 1:

Since there aren't any existing products that resemble Templore, how would it influence the way you interact with temperature regulating products?

- Used to just room temp but get uncomfortable
- more comfortable, to fill in gaps
- not everyone is affected

QUESTION 2:

Regarding the rotating interaction needed to interact with Templore, what would change in the group dynamic when someone wants to change the height of the cylinder?

- More visual
- Dad wants tell off
- Talk about it, creates discussion
- Don't need to go somewhere to check.

QUESTION 3:

Taking into consideration that Templore can release both hot and cold air, in which season do you think it would be most effecting, and why?

- Winter, more difficult to find one central heating spot, rather than everywhere.

QUESTION 4:

In a scenario where you work from home and you use the pillows to relax, how would that change your overall perception of working?

- Extra app, keep warm while working
- ~~to~~ stay comfortable to keep working.

QUESTION 5:

When it comes to food and drinks we usually eat hot meals/beverages during winter and colder meals/beverages during summer, so how much of a difference would Templore make since it can maintain a chosen temperature over a certain period of time?

- Mostly with tea (tradition)
- Not with every meal
- If alone, more likely to use

QUESTION 6:

Other than the two previously mentioned examples, what other alternative ways do you potentially see yourself using Templore?

- Sit on it after coming home from cold weather
- just like heater

QUESTION 7:

Finally, is the interaction intuitive enough to use? Or would this take a while before getting used to using it?

- Simple
- Response to turning, direct effect of cylinder going up.

QUESTION 1:

Since there aren't any existing products that resemble Templore, how would it influence the way you interact with temperature regulating products?

- Depends on the setup of the room (central heating vs no ch)
- ~~[illegible]~~ More hanging out to save energy
- Sharing common ~~[illegible]~~ temp preferences

QUESTION 2:

Regarding the rotating interaction needed to interact with Templore, what would change in the group dynamic when someone wants to change the height of the cylinder?

- Hierarchy (Family roles)
- Discussion / Arguments
- ~~[illegible]~~ Existing dynamic translates
- Taking turns?
- Middle ground?

QUESTION 3:

Taking into consideration that Templore can release both hot and cold air, in which season do you think it would be most effecting, and why?

- In the Netherlands, mostly winter to warm up (like a campfire)
- ~~Summer~~ During summer might not be a good idea to sit in circle anw.

QUESTION 4:

In a scenario where you work from home and you use the pillows to relax, how would that change your overall perception of working?

- Might want to do at the end of the day
- Just warmth
- Act of meeting family / users ~~[illegible]~~ (looking forward to it)

QUESTION 5:

When it comes to food and drinks we usually eat hot meals/beverages during winter and colder meals/beverages during summer, so how much of a difference would Templore make since it can maintain a chosen temperature over a certain period of time?

- Makes eating / drinking more complex
- Appreciate but not depend

QUESTION 6:

Other than the two previously mentioned examples, what other alternative ways do you potentially see yourself using Templore?

- Start arguments about other discussions
- Make a game out of it ~~[illegible]~~
- rotating motion gives more options (eg work prioritising)

QUESTION 7:

Finally, is the interaction intuitive enough to use? Or would this take a while before getting used to using it?

- Being able to see gear through glass makes it easier to understand.