A METADRAGONS PROJECT BOOK PROFESSORS VALENTINA AURICCHIO STEFANA BROADBENT MARTA CORUBOLO FABIO DI LIBERTO ILKKA SUPPANEN

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# A sincere letter to THE READER

- It all started with the first brainstorming. Going back to the first file and reading it was surprising for us: so many things were already there, almost the entire project. We decided that a specific filter was needed for working on Higher Education in 2037: the Biodesign Approach. We put those glasses on the first day and never took them off: being inspired by nature and drawing solutions from it has been our main mindset for months and led us to surprising paths.
- Again, in the first brainstorming we came out with insights like *tteaching active conservation of nature, building groups of professionals, new priorities, safety courses for extreme situations and exploring new places for learning.* In a very raw shape these sentences describe the main feature of our product and our service, precisely picturing our scenario.
- We already knew what our future students would have done, and it seems we already knew even how they would have reached their goals *acting as a beehive, being one organism*. The seeds of the symbiotic theory lied in those words, being under our eyes since the first day. Last but not least, the aim of our project should have been the regeneration of the environment: we were seeking for a connection with nature that seemed lost and exercises like forest bathing could have restored it.
- Another thing astonished us, this time in revising the bibliography: the huge amount of new things we have learnt. For instance, we now have deeper and more technical knowledge on climate change. Reading articles over articles was a necessary burden, sometimes evoking bad feelings and a kind of depressive state of mind, but having the chance to avoid the worst scenarios through design, this was motivating. Of course we developed a new and unexpected gaze over trees: we have already said how much we arrived to respect these living beings. Some useful examples were also given by the green schools practices all over the world, which opened our eyes to interesting realities: their know-how and active commitment in raising conscious generations were an important source of case studies. In addition, this project gave us the

chance to get in touch with Swedish culture, requiring us to take on the shoes of Scandinavian people. Through an interview, a survey and tons of vlogs and blogs (without neglecting horror movies) we discovered a different lifestyle from ours, which is always stimulating and food for thought. Nevertheless it was our first time designing a service and to play the game taught us a lot.

Summing up, we grew up both as designers and individuals. Working together and getting to know each other was a great adventure. We went through many ups and some downs, managing all the time to restore the balance and work as a productive and close-knit group. We effectively merge all our qualities into a product service system that picture our dreams for the future. We pushed this project far beyond our expectations, deeply understanding the potential of a product as a social innovator. In the end, the thing that most of all inspired and motivated us was the brighter future we wanted to shape. HOW TO

GET	TRÄ	USE TRÄ					ENJOY TRÄ		INTRODUCE TRÄ		EXPO	EXPORT TRÄ		
SCENARIO		PRODUCT					SERVICE		BRAND IDENTITY		CONCLUSIONS			
1	12	1	32					1	60	1	92	1	100	107
2	20	2	34					2	68			2	102	
3	24	3	38					3	78					
		4	56											

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GET TRÄ SCENARIO

## A complex relationship with <u>PLANTS</u>

#### HUMAN, CITIES AND PLANTS

- The relationship between human beings and plants is still mainly driven by our ancestral memory and our cultural legacy. People look at the plant world through a biasing filter, a lens that probably derives from our inner vulnerability, according to Stefano Mancuso: "Our relationship with plants is one of absolute, primordial dependence, and in that sense recalls the relationship of a child to its parents. While we're growing up, and especially in adolescence, we go through a period of totally denying our dependence on our parental figures that frees us to attain psychological autonomy. [...] No one likes depending on another". Ironically, this primordial dependence could be also the reason why plants have psychological benefits on human beings: the idea that without them life for our species wouldn't be possible is rooted in our unconscious.
- The construction of our cities reflects the human desire to build a safe place in which we can defend our species, separating from nature. We are not expanding, on the contrary we are crowding in urban centres, becoming "specialist organisms" able to develop only in our habitat, cities, a safe place that guarantees our survival. Unfortunately, cities are actually threatening our survival, growing their ecological footprint every year: it is therefore necessary to rethink them relying on the concept of "mutual support". The city should be seen as a living organism from now on. In a possible scenario, the cities of the future would be completely covered by plants. In fact, one of the problems of cities will be the heat and the development of "heat island". This is one of the consequences of how the city is made: impermeability, lack of vegetable cover, lack of wind. On the contrary, all its surface should be covered with plants: they can absorb the CO2 produced by the city itself and purify the majority of its polluting waste.
- Plants are connected by roots in enormous communities. They are the longest living being and they survive with the concept of cooperation instead of competition. Nowadays human society, based on competition, seems unable to see the practical

advantages of this different approach: anthropocentric and a predator-prey model rooted in our mindset state as part of a psychological block that precludes us to understand our real positioning amongst all the living beings. Plants represent 85% of the life on the planet, they live longer and will probably outlive humans, but still people cannot contemplate the idea of them as the dominant species of the world.

#### UNDERSTANDING PLANTS, A COMPLEX LIVING BEINGS

- Plants and human beings have followed diametrically opposed evolutionary paths. The primitive choice to evolve as beings that are stationary or in motion led, over time, to an extraordinary differentiation in bodies and ways of life: animals have chosen to defend and feed themselves, and to reproduce, through motion (or flight), while plants have chosen to remain fixed in one place, which has imposed on them the necessity of finding solutions that are completely original (at least from humans' point of view). To start with, being stationary and therefore subject to being preved on by animals, plants developed a kind of "passive resistance" to external attack. Their bodies are constructed on a modular design, in which each part is important but none is truly indispensable. In fact, some plants can have up to 90 or 95 percent of themselves eaten. but then grow back normally from the small surviving nub. This "modular designed body" is made up of repeating modules: the branches, stem, leaves, and roots are all combinations of very simple modules, which essentially add on to each other independently. The right way to think about a tree, a cactus, or a shrub is not to compare it to a human being or any other animal, but to picture it as a colony. A tree is much more like a colony of bees or ants than an individual animal.
- Furthermore, even if the majority of human beings see them as passive organisms, plants are completely aware of their surroundings, being able to take action in response to dangers, such as predators and natural disasters, or even to collaborate for overcoming difficulties. In fact, not only plants have their own taste, smell, sight, hear and touch, but they can rely on at least 15 additional senses.
- For what concerns senses, the most important element to keep in mind to understand plants is that they do not own single specific organs related to a determined perception: the entire body of the plant is disseminated by sense receptors. They could be more concentrated in some parts of the organism, but basically plants perceive with their entire body. In addition, plants take advantage of three different ways of communicating: chemicals, electrical impulses and ultrasounds.

### THE Nation

Plants

The Earth shall be the common home of life. Sovereignty shall pertain to every living being.

OF



#### WHAT DO PLANTS PERCEIVE AND HOW

*On sight.* Plants can intercept light, use it, and recognize its quantity and quality. They have developed this ability for the obvious reason that they get most of their energy from light, through photosynthesis. The quest for light dominates a plant's life and behavior: having plenty of light, for a plant, is what being rich is for a human. The rapid movement of a plant growing in the direction of light (and moving its leaves to maximize the benefits) is known as phototropism and it is linked to the phenomenon of "the escape from shade". During its escape, the plant starts growing faster in order to surpass its rival in height and thus obtain more light. But this rapid, intense growth has a very high energy cost to the plant, so high that if the effort doesn't succeed, it may prove fatal. The plant invests energy and materials in a rather expensive and uncertain operation: this behavior shows that it can plan and use resources to bring about future results - and this is typical intelligent behavior. Returning to the sense of the sight, inside the plant, a series of chemical molecules act as photoreceptors that receive and transmit information about the direction from which light rays originate, and about their quality. The plant not only distinguishes light from shade, it recognizes the quality of the light by the length of its waves. Different types of photoreceptors - phytochromes, cryptochromes, and phototropins - absorb specific wavelengths in the red, far red, blue, and ultraviolet bands. These are the most important wavelengths for the plant since they regulate many aspects of its development, from germination to growth to flowering.

*On smell*. From the roots to the leaves, a plant is composed of billions of cells, whose surfaces often have receptors for volatile substances able to set off a chain of signals communicating information to the entire organism. Plants use "smells" - that is, molecules called BVOCs (biogenic volatile organic compounds) - to receive information from their environment and to communicate with each other and with insects. All smells produced by plants are equivalent to precise messages: they are the plants' words. Scientists are not able yet to read all the millions of different chemical compounds: each of them transmits precise information, such as warnings of imminent danger, or messages of attraction or repulsion, but what makes the decoding more difficult is the known fact that the message isn't always associated with a single volatile molecule, but rather with a set of many molecules, each in a fixed proportion to the others. If it is not true that a universal plant language exists, many volatile compounds that plants exchange with each other carry the same message: it is pos-

On side Page: Mancuso's Nation of Plants Constitution's articles, taken from The Nation of Plants. Following: 1. The Earth shall be the common home of life. Sovereignty shall pertain to every living being. 2. The Nation of Plants shall recognize and protect the inviolable rights of natural communities as societies based on the relationships among the organisms that compose them

3. The Nation of Plants shall not recognize animal hierarchies, which are founded on command centers and centralized functions. and shall foster diffuse and decentralized vegetable democracies 4. The Nation of Plants shall universally respect the rights of the currently living and those of future generations. 5 The Nation of Plants shall guarantee the right to clean water soil and atmosphere 6. The consumption of any resource that cannot be reconstituted for future generations of living beings shall be prohibited 7. The Nation of Plants shall not have borders Every living being shall be free to travel, move, and live there without limitation. 8. The Nation of Plants shall recognize and foster mutual aid among natural communities of living beings as an instrument of coexistence and progress.

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sible to hypothesize a common root as the substrate of many different plant languages (specific to different species).

- *On taste.* The organs responsible for plants' sense of taste are certain receptors for the chemical substances they use as food, substances for which they probe the soil through the exploratory movements of their roots. The roots continually taste the soil in search of nutrients such as nitrates, phosphates, or potassium, which they can locate with great precision even in very limited amounts, perceiving minuscule chemical gradients present in the soil. But plants do not only live by chemicals alone: surprisingly, plant carnivory is more extensive than was previously thought and involves hundreds of different species. The number increases if we consider plant species that benefit indirectly in some way from the capture of insects. Until a few years ago it was thought that only certain species of plants had the capacity to digest small animals, obtaining from them the nutrients they need. But recent studies have shown that the plant world's use of animal nourishment is quite widespread - for some species it has been coined the term "proto carnivores".
- On touch. In the plant world, the sense of touch is closely related to the sense of hearing and makes use of small sensorv organs called mechanosensitive channels, found in small numbers everywhere on the plant but with greatest frequency on the epidermal cells (the cells that are in direct contact with the external environment). These special receptors (the mechanosensitive channels) are activated when the plant touches something, or when vibrations reach it. Laboratory experiments show that the root tip touches the obstacle and continues growing, twisting around it to try to find out what sort of thing it is, and when it knows, it moves accordingly. For the aerial part of the plant, the best example is surely the climbing plants (and all tendril-producing plants). The pea vine, for example, produces many sensitive tendrils, which curl up in a few seconds when they touch something, attempting to twine around the object with which they have come in contact.
- *On hearing.* In order to transmit sounds, plants take advantage of the ground as a vector. In plants, even the sense of hearing is diffuse: all the cells of the organism are able to capture vibrations. Laboratory researchers recently demonstrated how exposure to sounds could also bring out genetic expression in plants: certain frequencies, especially bass (between 100 and 500 Hz), promote seed germination, plant growth, and root lengthening, while other, higher frequencies have an inhibitory effect. The roots perceive a broad range of sound vibrations, which can influence the direction of root growth, according to

a movement called "phonotropism". As a function of the type of vibrations they perceive, the roots decide whether to move toward or away from the sound source.

And 15 more senses. For example, a plant is capable of precisely measuring the humidity of the soil and identifying sources of water even at a great distance. It uses a kind of hygrometer. They can sense gravity and electromagnetic fields (which influence their growth), and can recognize and measure numerous chemical gradients in the air or in the ground.

#### PLANTS' PHYSIOLOGY, NEUROBIOLOGY AND FURTHER

- The human sight on plants evolved through time. It was Aristotle and his students who made the first philosophical attempts to understand plants in their complexity - but at this ancient time, the main interest for plants was limited to their usefulness in medicine. Much later, in the sixteenth century, the research focused on the basic principles of the structure and the functions of plants. A huge change in perception came by the end of the nineteenth century, when areat scientists and researchers, first among all Charles Darwin, advanced courageous ideas that shook the scientific community. Since then, the research outcomes confirmed that plants and animals have a lot of things in common, especially with regard to some of the basic physiological processes, such as respiration, digestion, and cell growth. Plants are as sophisticated in behaviour as animals but their potential has been masked because it operates on time scales many orders of magnitude longer than that operating in animals. In such circumstances, plant physiology was born; and it now dominates work in the plant sciences. "Somnus Plantarum", that is the different positions assumed by certain plants' leaves and branches during the night, is one of the most impressive similitudes with animals (and even human beings). The multiplicity of nocturnal positions, in fact, follows a general law: the leaves show a common tendency to assume the same position at night that they had during germination.
- Further advances in plant sciences revealed that plants are intelligent organisms capable of learning and taking decisions in relation to their environmental situation. In plants, cognition and bodily functions are not separate but are present in every cell: a real, living example of what artificial intelligence scientists call an "embodied agent", that is, an intelligent agent that interacts with the world with its own physical body.
- In the era of plant neurobiology, plants are depicted as dynamic and highly sensitive organisms, actively and competitively foraging for limited resources both above and below ground, able

to accurately compute their circumstances, use sophisticated cost-benefit analysis, and take defined actions to mitigate and control diverse environmental attacks. Plants are also capable of a refined recognition of self and non-self and can recognize even their relatives, behaving much friendlier to them than they are to strangers. This ability comes with the capability to manage their territory better, defending themselves against enemies without wasting energy fighting against kins: they can avoid reproducing with close relations; and above all they can benefit indirectly from the success of individuals who closely resemble them genetically. This new view considers plants as information-processing organisms with complex communication throughout their own bodies and the environment around them. It replaced the traditional view that plants would adopt a stereotypical and repetitive mechanism with a much more complex estimation that takes into account different factors. including genetic kinship.

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## <sup>a</sup> The outcomes of climate change on FORESTS

#### TEMPERATURE, STORMS, CO2 LEVELS, DROUGHT

- Climate change is a multifactorial phenomenon (temperature, storms, CO<sub>2</sub> levels, drought) and each of these factors modifies forest health in an interconnected manner. These complex interactions make it difficult to predict the consequences of climate change on forests making it necessary to analyze each factor individually.
- Generally, a rise in climate warming favors the proliferation of living beings with short life cycles over other species characterized by long generational time-scales.
- The increase in temperature will have a positive impact on the proliferation of insects that cause tree pests: a higher temperature decreases the generative time of insects increasing the number of newborns which contributes to the establishment of an out-breaking population.
- Climate change is a multifaceted issue, with increased CO<sub>2</sub> and other greenhouse gases triggering temperature and drought increase, which both can modify storm regimes. All of these components can independently and interactively affect forest pest dynamics and behaviour. The main identified mechanisms of positive forest insect responses to climate change are higher number of generations per year and higher survival under warmer temperatures, lower tree resistance to insect attack under more severe droughts, higher amount of breeding substrate for bark beetles following storms, and changes in substrate quality for defoliators due to elevated CO<sub>2</sub>. Although most of these effects are likely to result in increased forest damage, many particular but overlooked climate driven processes can have negative effects on insect herbivores in forests.
- Making forests and forest ecosystems more resilient to pests, diseases and invasive species requires sustainable forest management practice that both reduce vulnerability of forests to the impacts of climate change and biodiversity conservation and sustainable use into consideration.



#### THE SCANDINAVIAN FORESTS

- Within all of the European territory there is no bigger ecoregion than the Scandinavian-Russian Taiga. This area is composed of different types of forestal ecosystems physically linked and delimited by what is known as the Boreal region. The countries that are part of this mega-ecosystem are Norway, Sweden, Finland and Western Russia. This region grows about 2.1 million square kilometres, which translates to almost a third of the land within Europe. Compared to other forestal regions of the world the Scandinavian forest may not have the size of the south American Amazon, may not have the mega diversity of Mexican tropical forests, and may not be the biggest source for wood and paper production like Chinese, Canadian and US's forests, However, the Scandinavian forest does have an ecological importance for the continent (and the world) that cannot be substituted by any other European place. This ecoregion is able to capture 13,428 million metric tons of carbon dioxide every year, according to the FAO's 2015 annual report. This means that the countries owning these forestal resources are playing a big impact in ecological sustainability and combat against climate change simply by maintaining their native ecosystem.
- Given the evidence, the Scandinavian forest is arguably the most important forestal region within Europe and therefore presents a higher relevancy when discussing future projects involving this type of ecosystems not only for its ecological value, but also for their socio-economic-cultural relevance.
- Unfortunately, in this past decade the Nordic Forest Research and the Nordic Council of Ministers have reported increases in several biotic and abiotic dangers for the forests of Finland, Norway and mostly Sweden. It has been stated that the effects of climate change have provoked dry heat conditions for the Scandinavian taiga, resulting in the hottest temperatures of the soil recorded in the last 150 years. Some of the conseguences of this atmospheric conditioning are wildfires and the oversurge of insects (some of which are parasite to tree hosts and spread plant pathogens). In 2018, Sweden reported more than 40 wildfires within their forestal regions, after reporting some of the highest temperatures ever recorded across their territory. As of July 20 of 2020 Sweden has over 10,000 hectares of burned land, which is nearly 24 times higher than the amount of burned land averaged over 2008-2017. In a similar way, Norway has been fighting a pest infestation of bark beetles that kill trees and even make their wood unusable for any kind of production. A research team led by Ph.D., María Sousa has been attempting to fight this pest by reforesting with trees

infected with pathogens that the bark beetles will avoid, but so far it has not been successful.

Temperature anomaly map - in the previous pages - is based on data from MODIS on NASA's Terra satellite. It shows land surface temperatures from July 1-15, 2018, compared to the 2000–2015 average for the same two-week period. Darker colors depict areas that were hotter than average; lighter were colder than average. Note that it depicts land surface temperatures, not air temperatures. Land surface temperatures reflect how hot the surface of the Earth would feel to the touch in a particular location. Along with wood cutting, lodging, agriculture and other human activities, the Scandinavian forest is in a critique stage where the role of education may be the key into developing a positive future for the ecoregion and all the value it represents for people.

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## In 2037, extreme weather conditions will bring new challenges in *MONITORING AND MAINTAIN-ING FORESTS IN HEALTH*.

Challenged-based projects will make students, local communities and the forest themselves face all together the multiple consequences of a deranged environment. These actions will become part of the average curricula activities of higher education students. We choose to concentrate on the Boreal ecosystem, specifically on the Taiga: this ancient and huge forest, part of the world's largest land biome, absorbs more than a tenth of the total carbon emitted to the atmosphere by human activity in a year - and its activities increase with the rising of the temperature. In Northern Europe, the increase in the temperature will strongly affect the environment, both enhancing the possibility for forests to grow over and over, and at the same time setting the basis for forest pests and fires to quickly spread, impacting on the ecosystem.

Given the number and the relevance of green schools in this area, we decided to locate our project here and enhance the already strong boundary between northern people and their forests. The university students from the Real School of Design will spend time in curricular activities related to the monitoring of the forest and the education of local communities of volunteers in taking care of their own green treasure.

## THE Real School of Design



We teach a design than can tackle the huge challenges ahead: our design is regenerative, just and democratic. We believe learning can happen in many different spaces indoors and outdoors, traditional and innovative, public and private. We are aware that mobility is increasingly a barrier for inclusion so we try to bring education where students are. We design to preserve the future not only to improve the present: nothing we do should damage the future and we strive to fix the damages that h ave already been done. Through our work, we attempt to create space for inno- vation to emerge, not for its own sake, but for pushing the boundaries of how we interact with the world and each other.

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MAIN POINTS

On previous Page: The Real School of design Manifesto. 1. We use technology and local resources to lower the barriers to a truly inclusive education. 2 We combine the best of local and global knowledge We move minds not hodies but recognize the importance of being together when it matters. 3 We teach a design than can tackle the huge challenges ahead: our design is regenerative, just and democratic. 4. We design to preserve the future not only to improve the present: nothing we do should damage the future and we strive to fix the damages that have already been done. 5. We don't shy away from the big challenges but use all our means to address them. To do this we never work alone 6. Our students are our partners. 7. We help organisations that have to transition to new economic models. and help our students become part of them 8. We will help people imagine different and better futures so that desire not fear drives transformations 9. We are political and will engage our design in poli- cymaking. The time for apolitical design is over. 10. We teach our students how to embed design in policy, lawmaking and democratic participation.

#### GOALS

The main goal of the service offered by TRÄ is to prevent a variety of forestal issues deriving from the effects of climate change, being ahead of them instead of repairing damages. In particular, TRÄ's functions will be particularly effective in anticipating and facing the spread of forest pests, but the product will also be useful, for example, in monitoring the response of trees towards heat waves and predicting the breaking out of wildfires. These are only two amongst the several issues in which TRÄ

could play a fundamental role in the future: its primary data-collecting function makes it a great support in interpreting the rapid and ever evolving changes the forests will encounter, perpetually keeping an eye on the trees and giving the researchers a solid starting point to work on.

In doing this, TRÄ also contributes to create a proficuous, stable and long-lasting connection between humans and trees: by translating the trees' status into harmonious movements it makes possible a sort of communication between the two living beings; in addition, with time and research, it may even reveal if human company affects the growing of trees and to which extent.

#### PLACING

The choice of the location fell on the town of Eksio due to its relatively small dimensions, the limited number of inhabitants (9701) and the proximity of various forests. In addition, many of the activities on which the inhabitants of Eksjo rely on are based on woods and in Sweden it is common for families to already own areas of forests themselves. All these factors combined together provide a fertile ground for piloting our project. The placing of TRÄs inside the Klinten Natural Reserve near Eksjo will follow a similar pattern to the original placing operation of the talking trees instruments in the Piegaro Woods (PG). In the latter, 25 devices were placed over a surface of 146 hectares; Klinten Forest measures about 81 hectares, therefore we hypothesize the placement of 14 TRÄ units with 2 additional TRÄ Hubs. This number of devices should be sufficient for mapping the forest and intervening when and where necessary.



USE TRÄ *PRODUCT* 

# A system of products TRÄ

- The TRÄ System is composed by the TRÄ Unit and the TRÄ Hub. The TRÄ Unit is a single device placed on a determined tree that collects data and represents the tree status through the movements of its pattern.
- The TRÄ Hub is a tool that can be placed among a restricted number of trees already equipped with TRÄ Units. The TRÄ Hub is made up of modular triangle-shaped units bound together with rubber and electrical wire and consists of a structure that connects trees and shows their mutual communication through the movement of the pattern on its units. The placing of TRÄ Hub implies the product to be inclined to avoid leaves and snow to weigh on it, sticking the set of modules at different heights of the involved trees. If TRÄ displays the condition of a single tree, the TRÄ Hub is intended to make it visible how the trees behave in confrontation with each other.



## Convert data into moving DEVICES

#### COLLECT DATA: A CASE STUDY

- Talking Trees is a scientific project which uses the monitoring data coming from trees through IoT sensors, Tree Talkers, directly applied to the trunk. A Tree Talker allows monitoring data on climate change, biologic processes and interactions in habitat. Currently in Italy there are 25 areas where this monitoring activity is carried out. As a premise, most of Tree Talker is installed on beech and chestnut trees, however, are not excluded autochthonous trees such as the spruce of the Alps and the shrubs typical of the Mediterranean. In South Tyrol, the devices are also installed on the pylons used for weather surveys. The project is directed by Riccardo Valentini, Nobel peace laureate in 2007 as an IPCC and Euro-Mediterranean Center for Climate Change, and Antonio Brunori, PEFC Italia.
- The technology used in the project described above has allowed us the implementation for obtaining the physical and biological parameters in the trees and even adding new technologies that have not been implemented before for monitoring purposes. The lot system implemented in our project uses technology that stores and shares the data in semi-real time; it is mainly composed of a microcontroller, an ATMega328 processor chip that is responsible to receive the signals from a number of sensors. Firstly, to measure the sap flow (or water quantity) in the Xylem of the trunk it's needed a thermistor: two 20 mm long probes are inserted into the stem wood and their temperature is monitored; both have to be placed at a 10 centimeters distance along the trunk vertical axis. The probe in the lower part is assisted additionally with a capacitive sensor for wood humidity measurements.
- Another important aspect found and added in this project is the control and measurement in the color of the leaves, that allows us to know the amount of chlorophyll; therefore, by placing RGB sensors the spectral analysis of this data can be reached. On the top of the object case we have placed the solar panel that, combined with the high-efficiency lithium-ion battery, (3.V) gives autonomous power for up to one year. Besides the

solar panel it is installed a spectrometer, that measures the multispectral signature of light transmitted through the canopy: this device is performed across 12 spectral bands that captures all the information.

- Another data that is considered important is the stem radial growth, measured by an infra-red pulse, that consists of a carbon fiber stick, placed inside the trunk and anchored in the xylem; this method works through considering the distance that is grown incrementally in the sensor itself. Any stem radial increment therefore translates into a reduction of the distance between the sensor and the targeted tree trunk's surface.
- For the tree trunk axis movement, we have set an accelerometer, that allows the interpretation of any change of the device position and instant acceleration during an established time, interpreting this movement and evaluating the risk of a tree failure (because of wind or other factors).
- Finally all the parameter are transmitted through wireless connection using a microcontroller, that keeps all the data into a Cloud, and then connecting to the GPRS network to sending everything to a computer server.

#### REDUCE BARRIERS BETWEEN HUMANS AND TREES

The basic "functioning" of a tree, necessary to understand how it is possible to translate data into useful information. could be described as below. Trees, like all plants, soak up carbon dioxide from the air with the help of light and, in the process, release water and oxygen. This is how photosynthesis works. The amount of water and carbon involved in this process can be identified as health indicators for the trees: infact, the amount of wood that trees make is related to how much carbon dioxide they soak up from the air, because the more they soak up, the more the trees grow and therefore the more wood they produce. Likewise, the more carbon dioxide the trees soak up, the more water they release. The balance between the water released and the carbon dioxide absorbed is delicate and, in case of aggressive environmental disturbances, easy to unbalance. For example, in the case of a strong increase in temperatures, a high rate of carbon dioxide absorbed associated with a lack of water could likely dry a tree out. Furthermore, when trees experience a disturbance (like an insect chewing its leaves), their capacity to soak up carbon dioxide and therefore to grow is strongly reduced. Every stress signal can be detected by TRÄ devices and traced back to the issue that generates it.



#### Peace of Mind Status.

A slow and harmonious movement; the flakes of the pattern flip row after row reproducing a wave-inspired motion. The pattern transmits serenity and balance. Distress Status. Quick and repetitive movement; each flake of the pattern flips simultaneously. The pattern transmits a sense of anxiety and pressure. Having said that, as designers, a great challenge that we had to face was how to make a tree talk. We imagined using sounds, graphics on the phone and lights, but each of those solutions had been discarded: we wanted to avoid gamification in the service as well as including too many artificial and inorganic elements to our product appearance. Having the goal to change the perception of the trees among people we thought about what really impedes humans to consider trees intelligent living beings: the answer we gave ourselves was the lack of movement. Trees are sessile organisms and for this simple reason we use to look at them as elements of the landscape. "Iridescence" by Behnaz Farahi was the project that helped us

the most in shaping our imagination into a real product: this 3D printed emotional collar is made of many self-propelled quills that flip colors and make patterns in response to the onlookers' facial expression (through a facial tracing camera). We then look at the work of Iris Van Herpen, a couture fashion designer who creates beautiful looks incorporating the latest technology to achieve movements and visual effects, and at many brands that work plywood in dynamic and innovative shapes.

With these references in mind, the next step was to abstract the tree bark into moving flakes. After having generated many geometrical patterns we choose one made by folded rounded rectangles in tidy rows: it seemed to us the most appealing, recalling an organic structure associable with the tree itself. In fact, the problem with many other geometrical patterns and organic structures was that they were giving the impression of being a sort of "other living being on the tree", something like a parasite or a symbiotic organism, shifting the focus of the attention from the tree itself.

Having defined both the technology and the appearance of the product we then designed the movement by matching two basic status of the trees (detected by the product itself) with as many moving flakes patterns. In the case of what we have called the "peace of mind" status, the flakes on the device will follow a slow and harmonious movement, flipping column after column and reproducing a wave-inspired motion which transmits serenity and balance. On the contrary, in the case of the "distress" status, each flake will flip simultaneously showing a quick and repetitive movement that evoke a sense of anxiety and pressure.

# <sup>a</sup> Get inspired by forest for SHAPING

#### PROTOTYPING THE PRODUCT

- For what concern the appearance of the products, the leading approach has been to try having the least visual impact possible on the forest. The single TRÄ Unit design has been simplified day by day in order to arrive at the most essential shape possible and it plays with the contraposition of a darker and a lighter plywood; it is arrow shaped, with the bottom extremity merging into the tree, and covered with a friendly pattern. It is also inclined to avoid anything to cover the solar panel and hides the joints that fix it on the tree.
- TRÄ Hub recalls the geometries at the base of the design of the TRÄ Unit and brings them just below the tree crowns. Its design is meant to play with the sunlight giving birth to new spaces in the forest, spaces where open lectures, guided tours and mindfulness sessions could take place.



This sketch shows the first version of our product: a box containing all the technical and electrical requirements of the device was coupled with a flat panel inlaid with geometrical patterns. We were hypothetizing several interchangeable panels with different geometries on them to highlight the uniqueness of each tree. The electricity would have streamed from the box to the panel activating the pattern on it and making it move depending on the tree status. The box was encircled on the tree through an elastic band with mechanical wooden hinges (ito permit the trunk to grow). Maintenance was simple too. We then discarded this idea. We did not like the general appearance of the product, it was too detatched from the tree: our aim was to make the bark talking and this solution was not that effective.

The evolution of the idea: bringing the moving pattern on the tree itself. At this stage our product was made of overlapping layers. The first layer was composed by the technical and electrical box, this time triangular-shaped but still encircled on the tree with a rubber belt. The second layer included a rubber wire covered with plywood flakes: the latters were designed to move accordingly to the tree status. A new kind of rubber was chosen for its capacity of auto-regeneration. The plywood flakes seemed to us the best solution for providing the illusion of a moving bark. At this stage, the flakes were still triangular shapes and placed following a fading pattern meant to merge them into the tree bark. This idea was then discarded for the overlapping of repetitive elements, both useless and confusing on a visual perspective. In addition, the growing tree could have added difficulties in the product manteinance. Furthermore, we perceived as not very elegant the horizontally development of the product on the vertically developina tree.

At this stage we defined the triangular shape of the technical box and the use of the wooden flakes, which form was still to define.













At the last stage we were thinking the product was not yet integrated with the tree, and we wanted it to become an extension of the plant itself.

We then decided to simplify the shape, integrating all the different part of the products in a single object, seamlessy. Infact, we were stuck on the initial idea of separating the technical and electrical components from the outside; by reducing the number of layers and dimensions, we simplify the form, achieving a vertically developing product that merges into the tree. Little by little we have adjusted the shaped into something that could really belong to a tree.

We also decided to make the flakes rectangular with rounded corners: this appearance seemed to us the most effective abstraction of the pine tree bark. Moreover, if at the beginning we were thinking of painting them in a lighter color, seeking for a chromatic contrast, in the last prototype we have colored them exactly as the surface they cover, achieving a more natural effect. During the shooting of the device, that was located inside a pine tree forest, we noted with satisfaction how much the product was blending into the environment.









A sketch representing TRÅ hub. TRÅ HUB should be placed with a terminal on the ground so that nothing can accumulate and burden it. It creates a space inside a space, defining a precise area among the trees where events could be held. On both pages: product development.

















## <sup>4</sup> The second life of the <u>PRODUCT</u>

#### GOING FURTHER IN THE FUTURE

- The TRÄ System is intended to have a second life after being dismantled conditions that could follow deterioration, mechanical issues or simply the death (or the necessity to cut) the tree that was hosting it. If possible, TRÄ will be repaired and will continue its function on other trees; this will make it necessary another year for TRÄ products to get to know that (or those) trees. However, if the main function of the TRÄ products can not be recovered they could still be up-cycled becoming totally new objects.
- The TRÄ Units are designed to become birdhouses: infact, they already "belong" to the tree and simply removing all the mechanical and electrical parts a new nest is ready. Furthermore, since the product will not move anymore it will be easier for nature to hack it in many different ways, enriching its structure with moss, rampicants and stuff brought by birds.
- The TRÄ Hubs can be reconfigured into storage structures inside the forest: due to their modular structure and highly resistance towards the environment it will be easy to dismantle and assemble them again into the desired shape. TRÄ Storages could contribute to future challenges by collecting "forest first aid kits" available for everyone.

This section is based on the following references:

- Valentini, R., Belelli Marchesin, L., & Gianelle, D. (2019). New tree monitoring systems: from Industry 4.0 to Nature 4.0. Annals of Silvic Cultural Research, https://journals-crea.4science.it/index. php/asr/article/view/1847. https://doi.org/10.12899/asr-1847
- Drewa D.M., Downes G.M. 2009 The use of precision dendrometers in research on daily stem size and wood property variation: A review. Dendrochronologia 27: 159–172 https://www.lifegate.it/bosco-di-piegaro-alberi-parlanti-trace

ENJOY TRÄ

SERVICE

## Explaining clearly the SERVICE

#### On side Page: The Offering Map clarifies what the service provides to the users, detailing the value proposition into more specific clusters of features.

#### ABSTRACT

Higher Education in 2037 won't be relegated to grandstanding universities or diffuse ecosystems of athenaeums, but it will be directly embedded in the social tissues and available for everyone. In those times, marked by the uncertainty and the unpredictable changes deriving from the effects of climate change, along with a great trust in technology shared by people of any age, challenge-based projects will provide trained volunteers the opportunities to shape their own future. Furthermore, our knowledge about trees will boost rapidly and affect increasingly our everyday life; the trä System will play an important role, being one of the products that will promote a declared symbiosis between human beings and forests. Based on the data collected by the TRÄ devices, a digitally supported network will mirror the existing connection among the roots of the trees and will promptly alert the volunteers whenever a natural calamity could be harming a forest, promoting a quick and effective reaction.

#### PRE SERVICE AND PRIMARY SERVICE

The TRÄ System comes with a service as well. It all begins with the placement of the TRÄ Unit and the TRÄ Hubs, performed by forest rangers and/or forest technicians under the supervision of university students - for the pilot project the chosen location is Eskjo (Sweden). Simultaneously, the call for volunteers opens and everyone can register to the TRÄ Program: in fact, there will be different levels of engagement, from the most basic and safe to the most active and dangerous. The first year of the Program is meant to settle the ground for products to effectively work: the TRÄ Units will collect data from the trees and will define the tree standards to which refers for detecting anomalies in the following years; at the same time, some volunteers will be asked to interact regularly with a limited amount of trees - by hugging them, talking to them and spending time around them - in order to give scientists the opportunity to understand if and how human interaction could

#### Pre service

**TECHNICAL TRAINING** 





affect the growing of the trees. All through the year open lectures and forest trips will be held for explaining both the latest discoveries on trees physiology, neurobiology and (we guess) behavioral science and the functioning of the TRÄ Units and Hubs. Last but not least, technical training sessions will start to be held for those who will actively enter the forest to provide assistance in solving ecological issues: one of the aims of TRÄ is to make average citizens able to face at least some of the hypothetical dangers by themselves. Infact, TRÄ has been designed primarily as a tool for alerting in case of danger and making the maintenance of the forests easier. As soon as a danger is perceived, the TRÄ Unit of the specific tree will send a signal to the university students, who will analyze the data and promote a challenge among the volunteers through the application. People will be notified and will have the possibility to enlist to the event (in the number that is needed) - of course trained users will be advantaged, but a few slots could be free for people who want to make field experience (depending on the riskiness of the operations). Each time a group of volunteers will be formed a leader will be elected for speeding up and making the process smoother.

Now, two paths could open: the path of a long-lasting issue or a fast issue. One example each will be provided.

- A long lasting issue could be the one represented by forest pests: by the time the signal has arrived, parasites could have already spread on other trees, or could have started on other trees and then have reached a tree equipped with a TRÄ Unit, therefore a forest inspection by a technician is needed. On the app, volunteers will find a list of experts to contact when needed and the leader of the group will arrange the meeting. Once the expert and the volunteers are in the forest they will analyze the situation; once the danger is identified and the area of the forest delimited, they will act together with the expert following his/her indication. Since a forest pest is not something that it is possible to solve overnight, the volunteers will keep on monitoring the project without the expert to come back; in addition, special lockers and storages will be placed where needed to make available the necessary materials for upcoming volunteers.
- A fast issue may be represented by a wildfire. In this specific case, the alert is sent via the app but also to the nearest fire-fighters station as well as to the army, if necessary. Since the risks are high, in such a situation only trained volunteers will be engaged, both on the field helping extinguishing the fire and at an organizational level to coordinate, for example, the safety operations in the town.

On side Page: The Stakeholder Map represents of all the stakeholder involved in the system, aimed at clarifying roles and relationships. On side Page: The Activity Map clarifies what the users do during the service itself. Some issues are intended to be fully delegated to volunteers once they have achieved the necessary knowledge while others, such as wildfires, will still need the intervention of professionals. In any case, once a challenge is completed, volunteers will gain experience and could achieve the next level of expertise (this can also occur after completing the training).

#### SECONDARY SERVICES

- *Scientific research.* The alerting and maintaining service is strictly bound to scientific research. If it is true that researchers keep on collecting data throughout the years regardless of the occurrence of ecological issues, the happening of the latter could require a higher level of education and the disposal of scientific facilities to be solved. For example, climate change could bring new kinds of forest pests that may not be tackled with traditional and already existing methods. The potential of a government funded athenaeum is very high if channelled into the desired direction.
- *Forest bathing*. Forest bathing is an activity that comes along with the placing of the TRÄ System and which brings benefits to the researchers and the frequenters of the forest. On the one hand, it is proved that meditation activities in a natural context have a positive effect on people's state of mind. enhancing their health and their happiness. Such activities could draw inspiration from Japanese Shinrin Yoku practices: breathing exercises, walking barefoot in the forest, observation of the surrounding etc. The TRA System also contemplates the organization of guided Forest Bathing sessions for introducing people to this philosophy and encouraging them to take advantage of the nature that surrounds them. On the other hand, from the researchers' point of view it could be interesting to have access to data both coming from trees that do not benefit from human interaction and from trees that do: they could catch some insights about the effect of human presence on the tree themselves.
- *Educational activities.* Forest Bathing sessions could be considered part of the educational activities proposed by the TRÄ System. These could also include seminars, workshops and open lectures to make everyone aware of the greatness of the trees: the TRÄ Unit and Hubs themselves could mark gathering places in the forest where to hold events in order to reduce day by day the distance between humans and trees.

				_
ALERT AND MAINTENANCE	Maintaining	Alarm start	Ready intervention	
RESEARCH	Interaction	Data analysis and research		
EDUCATIONAL ACTIVITIES	Attending classes	Teaching		
FOREST BATHING	Forest bathing			

COMMUNITY UNIVERSITY EXPERTS



## <sup>2</sup> Designing interactions and EXPERIENCE

#### PERSONAS

For crafting our Personas we needed to know more about both everyday life in Sweden and how Swedish people perceive trees. Due to the limited time at our disposal and the lack of direct contacts with Swedish people (except for two persons, Bryan and Therese, who have been very kind and have been fundamental for crafting two of our Personas) we did a lot of background research, looking for Swedish people blogs, vlogs and both psychology and sociology articles. We have also launched a survey on social networks and the answers we have received were pretty interesting.

#### EXPERIENCE JOURNEY

Each Persona will play an important role in the service, therefore we decided to represent all of them inside our experience map, an ideal experience journey throughout the service in the case of a long term issue. We focused on a long term issue because, among the ones that may happen, it is the one that involves the majority of the Personas. The process is mapped from the user perspective (in this case Johann), describing what happens at each stage of the interaction, what touchpoints are involved and the level of positive/ negative emotions experienced throughout the interaction.

## SOME SURVEY QUESTIONS *What is a tree to you?*

#### It's life.

A nice element of sight, and a symbol of calmness

A living thing in nature, it makes up forests and other nice places in nature

Air, sound, paper, work

A tree is a beatiful living thing made out of wood somthing saving my memories ( trees in my hometown,in the city where I live for more than 10 years, in the city where I finished my bachelor degree, they can't be isolated with the internal emotion I add to them)

#### Important for our future

Do you recall any relevant memory involving trees or forests?

Hugging trees is such a nice way to embrace the nature and respect for how many years they've grown.

#### Yes

We used to play a game in school (when I was 9-10 years old) that would involve hugging trees

- Yes my entire childhood was spent growing up in a forest growing and planting trees, harvesting forest. Sustainability. Living off the land. It's life as I know it and the life I want when I get out of the city. I think that's where humans are the happiest and with least stress and mental health issues. I have land I look after and it's all I have ever known. I can see my ancestors having walked that land before me and I see my kids walking there after I'm gone.
- Yes most of the time I've spent with my grandpa was in the forest and I have a lot of memories from playing in the woods when I was younger.
- Of course, we I was very young, I always curious about a forest not far away from my home, cause my grandma said behind the forest there is another world where my parents work there (they leave me for working when I was 2yo and then come back in 3 years)

Would you consider a tree as a member of your family? Tell us why

It's our nature and gives us life and very important for the air.

- Nah, I usually barely consider people as such, animals and plants for me cannot be thay
- Maybe, I'd love to see something grow and take it with me throughout my life and see how big and tall it would grow, just like a family member. I'd feel proud of myself for taking good care.

The survey was developed in November and distributed for one week among people who are Swedish or who have lived in Sweden for at least 10 years. It consists of a short introduction, background questions and then specific questions.

#### THERESE LYSANDE

#### 34, Eskjö (SWE), Operation support officer and mom

Needs and desires Therese wants to keep the trees she hereditated from her family in health.

> She would like to adopt a more calm lifestyle, maybe subscribing to a sort of mindfulness program. She desires to focus more on her personal happiness.

> She is very curious and like learning new things, enrolling to online courses sometimes. She would be open to learn more about the trees and their nature.

- Pains Therese needs to dedicate a lot of time to her family and lacks occasions to spend time for herself
  - She has a great sensibility and perceives trees as living and complex beings, but she doesn't have any technical knowledge about them.

She wants to convey a sense of environmental responsibility to her children and usually looks for new activities to propose them

#### JOHANN BESTÄMD

18, Eskjö (SWE), High school student

Johann's family transmitted him the desire of keeping the forest in health. Needs and desires

He wants to live near forests even when grown up.

He would like to detox from digital omnipresence.

He wants to find a way to actively do his part for fighting the climate change effects.

Johann has just began living alone and needs to face all the responsibilities of having a place to tidy up, clean, adminsitrate.

- He tends to be lazy and would need motivations for doing more exercises.
- He lacks initiative and has a skeptical attitude towards environmental projects: he can see tons of them on social media, but sometimes they reveal to be greenwashing operations.
- He has some scientific and technical knowledge about trees, absorbed on YouTube or through Ted Talks, but his knowledge misses contextualization and linearity.





Hugging trees is such a nice way to embrace the nature and respect them for how many years they've grown.



Stress
Free Time
Perception of trees
Knowledge of trees

My father knows more about forestry than anyone I know and it's always been a topic of conversation at the dinner table. How do we ensure it's still there and growing in three generations down the line? ÖLAF STUDERANDE 25, Hasslehom (SWE), Master degree student

- Ölaf wants to work in the forestal industry. Needs and desires
  - He would love to reforestate the land inherited by his father. growing up a florid forest.

He wants to educate people about the incredible features of trees.

He desires to mantain Sweden's forestry for their cultural, social and economic importance.

- Ölaf will face new hard challenges involving the forest ecosys-Pains tem and will have a relatively short amount of time to find solutions and give instructions to the volunteers.
  - Research presupposes tools and timing, but he also needs to consider the harvesting of trees depending on worldwide wood and timber prices.
  - He needs to find easy ways to effectively communicating with people who don't have a profound technical tree knowledge and educate them.

#### **BRITA VÄKTARE** 46. Helsingborg (SWE). Forest ranger

- Brita needs people to be trained at least at a sufficient level Needs and desires before meeting them in the forest for action projects.

Pains

- She needs to be easily contacted by the volunteers and receive all the required information to prepare for the challenge.
- Her desire (and job) is to maintain the forest in health, following the family tradition.
- Owning a forest herself, she understands the importance to leave untouched the higher number of trees possible, in order to be able to sell them in the future.

There is hard manual work even in bad weather conditions. Feels the responsiblity of keeping safe the volunteers. She is afraid she could be replaced by volunteers if the service works very well.

The climate change perturbed the ecosystem and she is not sure anymore how to operate: new guidelines and more research are needed.





About a forest, you don't learn over night. Learning from a forest is a long process: it takes a lot of time, because you need to wait and see the results of your work. You must act and then look at how the forest reply to you. We try to learn from our trees everyday and then we plant for the future. And adapt, we adapt every time we are asked to do so.



Stress
Free Time
Perception of trees
Knowledge of trees

Trees are my job and I am not afraid of challenges: speaking about forest, I am cold blooded enough. The thing is, the climate change turned the tables. I appreciate being supported in my job, both by volunteers and scientists.

	ENGAGE			DURING	Long lasting challer	nge: forest pest		
ons	"Everyday life"	"Alarm!"	"First Response"	"Notification"	"Teambuilding"	"Expert Call"	"Approach TRÄ Unit"	"First Investigation"
ACTI	Johann is studying with a few friends in the library after the lessons.	Ölaf receive a signal from the Trà Unit #8. It analyzes the data and understands that the issue could be a parasite.	Ölaf organizes a forest pest challenge for the tree which hosts Trä Unit #8. He chooses and contacts the right expert for facing this issue and launches the call to action via the App.	Suddenly, Johann receives a notifications from the Trä App: a tree is starting to suffer from a parasite attack. He enrolls for the challenge.	After a few hours a group is ready and since Johann had attended a training course on the first steps to handle a forest pest he is asked to be the referent of the volunteers group.	As soon as she manages, Brita contacts Johann as the referent of the volun- teers and they schedule an appointment.	Johann reaches the Trä Unit #8. Some volunteers are already there, others are coming. They all wait the expert; in the meanwhile, TRÄ Unit #8 moves expressing alert when they approach it.	The specialist arrives and evaluates the situation. Brita looks for clues and discovers the first insects nests. Brita and the volunteers spot all the trees with those nests and mark the area.
	@LIBRARY	@UNIVERSITY	@UNIVERSITY	@LIBRARY	→FOREST	@FOREST	@FOREST	@FOREST / UNIVERSITY
TOOLS		Trà Unit	TRÄ Trä App	TRÄ Trä App	TRÄ Trä App	TRÄ Trä App	Trà Unit + Trà App	Technical tools + Trä App



#### **DURING**

#### POST



## <sup>a</sup> Get connected by app LIVTRÄRD

#### THE MOBILE APPLICATION

The app completes the functions of the physical products creating a solid network which involves all the stakeholders. The concept behind the application is to mirror the existing relationship among the trees of the forest and extend it to the volunteers of the service: exactly as the roots that, running underground, connect each plant of the greenwood (and fungus, insect, ecc.), the app creates links among people and in between people and trees. Furthermore, it guides people among all the services offered by the TRÄ System, from the call to actions for challenges to the forest bathing sessions.



#### The Onboarding section.



#### LEARN

Among the trees there are longest-lived species on the planet, learn from them how to take care of your territory

0 • 0

#### TAKE CARE

#### Take care of the forest by checking the parameters collected by TRÅ and acting immediately

#### 000

#### Enable notification

Enable notification so you can always be up to date with new information.

Enable now

9:41	( <b>●</b>
Hey, <sup>-</sup> WELCOME	
Email	
SIGN UP	
LOG IN	
Forgot Password?	



RESET PASSWORD

Email

SEND ME AN EMAIL

The Log In section.

#### The Registration section.



Search

#### HOW SHOULD WE CALL YOU?

Name

9:41 .ul 📚	
	$\triangle$
Hello <i><sup>-</sup>JOHANN</i>	
FAVOURITES	
∆ALERT, PEST 08:09 AM Located 5 km NW of Eksjö, SW. TRÅ n247.	>
Around me TRA n 127,7 km TRA n 045, 15 km TRA n 102, 19 km	>
Keep up You have no recent intervention to keep up with.	>
Any question?	>
Show me more	>
RESERVATIONS	>
Federico Ortica is a sound designer and artist. He has been studying and researching for many years the resonance of various materials in order to create sound spaces. During his research on materials he found himself playing with wood ()	>
	>
ARTICLES	
TOM GODE	>
Tom guides the direction of the Cloudbridge Natural Reserve in Costa Rica. Come discover ()	
PAOLA	>/

The Homepage. Here the user is immediately brought to the alert section, the main feature of the app. It is also possible to surf among the user reservations and to read various articles published by researchers, scientists or diverse experts. The Alert page. The first one that appears on the homepage. Here the user can find all the fundamental information about a challenge and can apply to it. Beyond the historical records of the past challenges, with all the informations related to them, the user can accede to the "keep up" section that contains all the tools to face the challenge.



9:41	ul \$ 🗖
ACTIVITIES	
THIS MONTH	
∆ALERT, PEST 08:09 AM Located 5 km N of Oslo, Oslo, SW. TRÄ n147.	
ALERT, fire risk 02:23 AM	>
Located 6,3 km N of Oslo, Oslo, SW. TRÄ n137.	
Keep up	>
You have no recent intervention to keep up with.	
Keep up	>
You have no recent intervention to keep up with.	
LESS RECENT	
ALERT, fire risk 01:56 AM 08.14.2021	>
Located 6,3 km N of Oslo, Oslo, SW. TRÄ n137.	
ALERT, falling tree risk 01:56 AM 06.21.202	21 >
Located 4,8 km N of Oslo, Oslo, SW. TRÄ n123.	

The Notification page.

The Map section. The map is a useful tool for locating the different TRÅ units and hubs in the forest and quickly find the trees in trouble. It also make it easier for volunteers and experts to gather, or even for people that want to go and spend time with a specific tree to localize it.





Your Trä section. A rendered 3d model of the Trä units pattern connects the user with the tree unveiling the messages behind the movements of the wooden flakes, making them readable to the user. The Calendar section. The user can surf among all the events organized by the TRÄ CR unit together with the local cultural associations, book a place and visualize the events he/she has applied for.





The Profile section. The user can visualize his/her status, from beginner to expert. The user can also find a historical records of his/her completed challenges, as well as accede to the settings page.

INTRODUCE TRÄ BRAND IDENTITY

## Get connected by roots TRÄ

#### Vision:

A future in which there is synergy between individual communities and the forest environment, to create an ecosystem that is responsive and sensitive to the changes it will undergo.

#### Mission:

Create a product service system that allows man to safeguard and learn to perceive the forest system by communicating with it, addressing the challenges brought about by climate change.

#### VALUES, VISION AND MISSION

Every contact, synchrony and connection that the entire system created previously revolves around a new ideal of life. This is the philosophy that has generated the brand that promotes our product-service system, aimed at enabling mankind to safeguard and learn to perceive the forest system by communicating with it, facing the challenges brought about by climate change. Specifically, every single brand action is aimed at a vision of a future in which there is synergy between the individual communities and the forest environment, to create an ecosystem that is responsive and sensitive to the changes it will undergo.

- Starting from these firmly defined vision and mission, the core elements of the brand have been drawn up: the first is the idea of caring for the planet, for plants and for the future; then there is the single element of the tree, the heart of the project and the main actor; finally, last but essential, a reference to life, the glimmer and spark that keeps the project alive. This is where our brand fits in, acting both as a new glue and connection between the various players in the system, and as an extreme catalyst, enhancing the possibilities that such a synergy can bring to the ecosystem and to people's lives. It is community, therefore, the fourth and final keyword that we consider essential to emphasize when describing the identity.
- More specifically, the brand builds its brand equity by approaching the user as hi-tech and extremely innovative but at the same time friendly and suitable for their everyday life. For this reason each communication artefact revolves around the cultural perception of intelligent assistants, technological devices that found a way of placing themselves in people's everyday life without losing the simplicity necessary to create the right perception point. Another pillar that has been crucial in building the whole communication system has been the Scandinavian, and in particular Swedish, design. The reference to a Nordic aesthetic was constant during the design process of all the different phases of the project, having also been chosen as

the place to launch the pilot. This is because we found in this place the right mentality to perpetuate a project of fair care for the natural environment, understood not only as responsibility but also, and above all, as exchange. The Swedish people in fact see green as the resource it is for a deep-rooted cultural heritage, which has also influenced the design itself, in terms of lines, materials and visuals.

#### WRITING TRÄ DOWN

The typography part consists of two distinct font families. Of the first, from the Swiss Typefaces foundry, the Suisse Intl and *Suisse Works* fonts have been taken, sans serif and serif characterized by extreme versatility and readability. In addition to these, there is also BW Gradual, a font by Alberto Romanos with distinct Scandinavian characters which, however, in its almost ink-trap-like appearance and accentuated contrasts, gives extreme boldness to the typographic side of the brand.

THE WIZARD QUICKLY JINXED THE GNOMES BEFORE THEY VAPORIZED The wizard quickly jinxed the gnomes before they vaporized 1234567890 THE WIZARD QUICKLY JINXED THE GNOMES BEFORE THEY VAPORIZED The wizard quickly jinxed the gnomes before they vaporized 1234567890 The typfaces used. In side page, the Suisse Intl is displayed, mainly used in Regular and Regular Italic. In this page, the Suisse Work, used in Medium Italic; and the BW Gradual used in Medium.

THE WIZARD QUICKLY JINXED THE GNOMES BEFORE THEY VAPORIZED The wizard quickly jinxed the gnomes before they vaporized 1234567890 THE WIZARD QUICKLY JINXED THE GNOMES BEFORE THEY VAPORIZED The wizard quickly jinxed the gnomes before they vaporized 1234567890

A METADRAGONS 2037 PROJECT BOOK

TRÄ logotype, in base 10 and 3. This two should represent the live effect and rendering of it in different dimensions.

#### APPROACHING TRÄ

- The logotype, as well as the name of the product itself, was created with the intention of recalling as much as possible the digital assistants already mentioned above, so as to simulate a familiarity that would make their daily use more fluid.
- The name identifies the heart of the entire service, as well as the working material around which it revolves. TRÄ is in fact the literal translation of 'made of wood' in swedish. This, written with the most disruptive and evocative typeface of the system, BW Gradual, is written in full without the accompaniment of any trademark, with the idea of literally giving a name to the object itself. As the system is complex and structured in different actors and parts, it was decided to extend the simple name of TRÄ to create the entire alert and forest maintenance service. This choice was made to recall the already mentioned highlights of the project as a whole: care, life, and the already present forest world. The lexical cohesion of these elements, always taken in their Swedish translation, generates the term LIVTRÄRD, literally tree of life, full name of the system.

#### SWEDISH AIR

In drawing up the entire identity project, supported by the key components just mentioned, we then oriented ourselves towards recalling the Scandinavian visual reference as much as possible. There are several case studies mentoring this system, including the Scanavian Design Group and The Brand Identity, in which we found classicism, cleanliness and extreme editorial and typographic avant-garde. Illustrations with daring strokes appear among the many recurring and substantial elements; the great prevalence of white is touched by sprinkles of brilliant green and, finally, particular attention was paid to the layout and material features of any artefact. We are not telling you this through case studies, because we hope that by the time you get to this page you have already appreciated the identity of TRÄ.

# **TRÄ**

BASE 10

TRÄ

BASE 3

This section is based on the following references: https://backcatalogue.co http://studio-sm.se https://aoki.se/case/gr/ https://emilvschofield.de/Archive https://melvinghandour.com http://www.republique.studio http://jameelartscentre.org/whats-on/the-distance-from-here/ https://www.formuswithlove.se/work/ikea-odger/ https://sda.no https://zaina.international/projects/venus-variations https://fontsinuse.com/uses/40270/jusqu-ici-tout-va-bien-palais-de-tokyo http://numbers.umprum.cz https://christiangruber.de/tag/2/ http://www.suspendedspaces.net/entree/Actualite.html https://www.fidele-editions.com Formafantasma for Broken Nature - Andrea Trimarchi and Simone Farresin

EXPORT TRÄ CONCLUSIONS

## From the pilot to the social *INNOVATION*

#### SETTLEMENT

TRÄ is a complex system built around a product and a service, but to bring alive and deliver the service to the final users, we need the collaboration of a series of stakeholders that provide us with relevant elements, thus allowing us to carry out specific activities at different stages. The project could be promoted by local university in partnership with local government and forest guards and could be financed by specific European organizations, such as the European Forest Institute (EFI). The European Forest Institute conducts research and provides policy support on forest-related issues, connecting knowledge to action. EFI facilitates and stimulates forest-related networking and promotes the dissemination of unbiased and policy-relevant information on forests and forestry. EFI also advocates for forest research and for the use of scientifically sound information as a basis for forest policies. Their work in the field includes enhanced support for decision takers and policy makers. In particular, the Resilience Programme investigates all questions relating to the resilience of forests and livelihoods connected to them, namely, global change adaptation, biodiversity and integrated forest management, and resilience at the urban and rural interface.

#### GO FURTHER

- The TRÄ System is seen as a means to an ambitious target: social innovation. Products like TRÄ are able to transform the society and generate fresh new culture and behaviors, building a better world to live in. Which means that TRÄ generates evolution, produces changing, and we as designers must keep on adapting it for the new society it will contribute to create. After the pilot project in Sweden, we are imagining the following steps.
- In 3-5 years the TRÄ System will be exported to other forests in different countries, such as Italy and Greece, where forest pests had already decimated ancient woods. It will be adapted to the different kinds of trees it will be placed on and

shaped for the environment that will receive it. According to the specific culture of each place, "tree perception" activities and lessons will be held for shaping a new consideration of the trees among the population: for example, the format of the Sweden Midsommar festivity could be replicated in a sort of TRÄ placing ceremony, open to everyone and aimed at introducing the forest to the people, and vice versa.

- *In 10 years* the TRÄ System will assume a Urban Skin and will be brought in city parks all over the world. Here, its technology will be implemented: TRÄ will become able to detect, register and reproduce the trees' ultrasounds bringing further the connection between humans and trees. The latter will start to be seen as citizens themselves and people will have the chance to interact with (or at least understand) them in their everyday life. TRÄ App could be implemented for this new society adding even more recreational features.
- *In 15 years* for what concerns the rural area, common people will be able to face the main forest calamities by themselves. They will have reached a level of expertise that may make them independent from university students and experts for the majority of the time. We also hope that many other projects like TRÄ would have been developed, produced and spread with benefits for every living being.
- We also hope that trees will have gained their own rights in each country and will be fully protected by the law.

## After Anthropocene entering SYMBIOCENE

The Anthropocene is generating despair and desolation. The Symbiocene represents its opposite (Albrecht, 2019).

- The late Anthropocene, an Era evolved under the influence of a fundamentally flawed set of dominant themes, is having a huge impact on the delicate balance of our planet. More and more people are now suffering from negative psychoterratic emotions such as eco-anxiety and eco-paralysis, defining the years we are living in "the age of solastalgia" where the word "solastalgia" refers to that sensation of missing your home even when you are actually at home. A deep-seated pessimism connects the younger generations who are watching their planet destroyed by auto-destructive forces that they cannot fight back.
- If the human race arrived at this point it is because humans think and act as individuals. Even the concept of "environment" itself presumes that people are something apart to what revolves around them, forgetting that each human itself was once a colony of different organisms living their symbiotic lives.
- Rejoining the diversity and unity of the rest of life on the planet, the human race will discover again the wonderful experience of living in a connected and self-sufficient ecosystem that can already offer to the people everything they really need.
- If once design was marked by biomimesis, it is now time to switch to symbiomimicry, or the replications of the life-on-Earth processes in all kinds of human creations. As the journalist Glenn Albrecht says, "symbiomimicry in human enterprise will both generate and distribute resources such that, in nurturing all humans, we nurture the life support system on which we all depend". In his words, "humans must become symbiocentric thinkers in order to get out of the anthropocentrism of the Anthropocene".
- And we, as the TRÄ System designers, tried to do that. Our product represents an attempt to overcome the mere human necessities and incorporate a wider universe of stakeholders, providing the people a toll for connecting with other living beings in a beneficial way. We hope that our product will generate a social innovation, making one of the first steps in leaving the Anthropocene and entering the Symbiocene.



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PSSD PRODUCT-SERVICE SYSTEM DESIGN

