TECHNION
Israel Institute
of Technology

Faculty of
Architecture and Town Planning
Industrial Design Program

DESIGN TECH

DESIGNTECH2019

International Conference

Conference Proceedings

18 ⟶ 19.06.2019

Technion, Haifa, Israel

Contents

DESIGN TECH 2019

International Conference on Design and Technology

Conference Chair: Prof. Ezri Tarazi

Program Committee: Prof. Barry Katz, Prof. Gabi Goldschmidt, Haim Parnas, Dr. David Behar and Yoav Shterman.

Organization Committee: Rachel-Getz Solomon, Noam Atias, Lior Arbel, Marnina Herrmann Elozory, Ronen Eidelman, Alexander Geht and Ofer Berman.

Conference Manager: Valeria Geselev

Conference Producer: Meital Gotfrid, TRDF

Book Design (Inner pages): Alexander Geht

Cover Design: Ofri Fortis

Book Compilation: Dana Shaviv

Published by: Design Tech, Faculty of Architecture, Technion, Haifa
ISBN: 978-965-572-991-7

Contacts: Designtech@technion.ac.il
Conference Website: designtech.net.technion.ac.il/2019-conference/

The Technion Design-Tech Initiative is generously supported by

The Firefly Scientists' Foundation

Technion Israel Institute of Technology DESIGN TECH

DESIGN TECH 2019

International Conference on Design and Technology

The Design-Tech 2019 conference is a new and unique platform for researchers and practitioners in the field of design initiated to showcase their work and research. Being held for the first time at the Technion, Israel Institute of Technology, the conference enables attendees to visit one of the most vibrant start-up eco-systems in the world.

While design has always been an integral part of the technological development process, in recent years it has been gaining a more significant role. Today, a technological process that is not based on design fundamentals is almost unheard of. The design aspects of a technological R&D process raise unique questions and concerns which are critical to the success and viability of the technology itself.

Design is no longer just a “nice to have,” beauty and taste issue. Rather, it is a strategic resource for successful technology companies; it is now seen as one of the key elements required for differentiation and for technology expansion and adoption. Design enhances technology and assists in making it accessible. Yet, since design has become a primary lens through which we observe and experience our surroundings, it has also become responsible for the negative outcomes of technology.

The Design-Tech conference aspires to create a platform for discussing such topics under the title of the role of design and technology in multi-facet crises. For its first edition, Design-Tech 2019 invited designers, researchers, educators, and students to submit both academic research papers and practice-based case studies. This is the collection of submitted and presented papers.

Technion Israel Institute of Technology

DESIGN TECH

DESIGN AS A HACKER

While the prevalence of small, agile start-ups is growing, it often seems as though the world is held hostage by certain monolithic industries and big technology giants. New feudalism is emerging based on the acceptance of people to rely on the giants' services. Design poses big questions that force those in charge to probe the new systems and hack them by building independent access routes into technology. New possibilities such as new digital manufacturing tools and blockchain concepts enable Design to bypass the giants and support independence from the main dominant systems and industries.

DESIGNED DEPOSITION

Freeform 3D Printing for Digitally Crafted Artefacts

Isabella Molloy
School of Design
Victoria University of
Wellington, New Zealand
molloy.isabella@gmail.com

Tim Miller
School of Design
Victoria University of
Wellington, New Zealand
miller@vuw.ac.nz

ABSTRACT

This research investigates an approach to FDM Freeform 3D printing that exploits synchronised x, y, z axis movement for the production of designed artefacts. Through the use of self-supporting materials, AM is no longer reliant on layer based techniques that are built from ground-up. Instead, a Form Responsive Method is researched which explores the design opportunities of simultaneous three dimensional movement, depositing extrudate in patterns of lines and curves that embrace functional, aesthetic and tectonic qualities, influenced largely by an industrial design perspective. The increased freedom of motion allows the designer to disregard the requisite that solid forms need to be delineated prior to considering material deposition. This research shows that form and material deposition can be designed concurrently by direct manipulation of the toolpath and extrusion factors. Many Freeform printing techniques create bands of space frame type structures, often defined by structural pursuits. Here, diversity of pattern and deposition of material is explored with consideration to the final printed artefact towards synthesis between structural performance and aesthetic resolution. Different aspects of the technique and challenges are described and discussed through a range of applied design experiments exploring objects, electronics, and furniture. Through the use of parametric modelling systems, this research also investigates how customisation and user input can influence geometry and material dispersion synchronously. Through the integrated techniques of the Form Responsive Method printing efficiencies are gained and a unique path towards designing materially informed artefacts using AM is demonstrated.

Figure 1. Details of a range of application based experiments designed and printed utilizing the Form Responsive Method to create Freeform 3D printed crafted artifacts.

INTRODUCTION

Freeform 3D printing provides new opportunities and approaches to building additive 3D forms. Currently, one of the main types of additive manufacturing (AM) is fused deposition modelling (FDM). This method melts and extrudes filament of thermoplastic material through a fine print nozzle and deposits thin layers of material which build up to form 3D geometries. Freeform 3D printing retains some inherent novelties from FDM printing, using the same computer numerical control (CNC) machine capabilities in conjunction with material extrusion to build 3D forms but no longer relying on planar layering methods. Instead, it employs self-supporting build material that solidifies upon extrusion to create free-standing strands of material in space. These are generated from the toolpath of the CNC machine which exploits the freedom of simultaneous x, y, z axis movement. Through this process, the need for support material diminishes. Resourcefully designed, the path the extruder head follows can become increasingly economic in material use and printer movements.

BACKGROUND

Form Responsive Method

Current applications of Freeform 3D printing are predominantly employing the dexterity of robotic arms towards architectural scale research pursuits. Commonly, they explore large scale building solutions for complex structures, taking a structural space frame approach in creating three dimensional printed forms. Similar to the slicing method of FDM printing, models are build ground up. Geometry is sliced and segmented into bands or cells of structure that create 3D lattices of printed material. Projects such as Wire Print by Mueller et al. (2014), Ai Build (2016) Branch Technology (n.d.) Iridescence Print, Helm et al. (2015) use a distinct banding approach as their process in order to break up large geometries into layers of spatially printable bands. The benefit of this is, as in traditional 3D printing, almost all geometries can be run through a slicing system, and turned into printable information.

Figure 2.Details of a range of application based experiments designed and printed utilizing the Form Responsive Method to create Freeform 3D printed crafted artifacts.

The research here takes intended forms and structures into consideration from the onset, informing bespoke material deposition and thereby differentiating the process from any automated, banded or layering methods. Figure 1 illustrates the Form Responsive Method (FRM), which utilizes simultaneous x, y, z axis movement with regards to the intended form. The FRM disregards the requisite that surface or solid forms need to be delineated prior to considering material deposition. Instead, artefact specific approaches have been applied to consider both form and material deposition concurrently. Artefacts are now fundamentally defined by repetitious lines used to create a toolpath which determines the geometries of the three dimensional built form.

When taking this approach to artefacts, through an industrial design perspective, the FRM presents an opportunity to embrace functional, aesthetic and tectonic applications of material, prospering upon the predominantly structural pursuits currently in the field. On the Industrial Design Society of America's website, NC State Industrial Design Program states:

Industrial Design (ID) is the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer. (IDSA), 2017

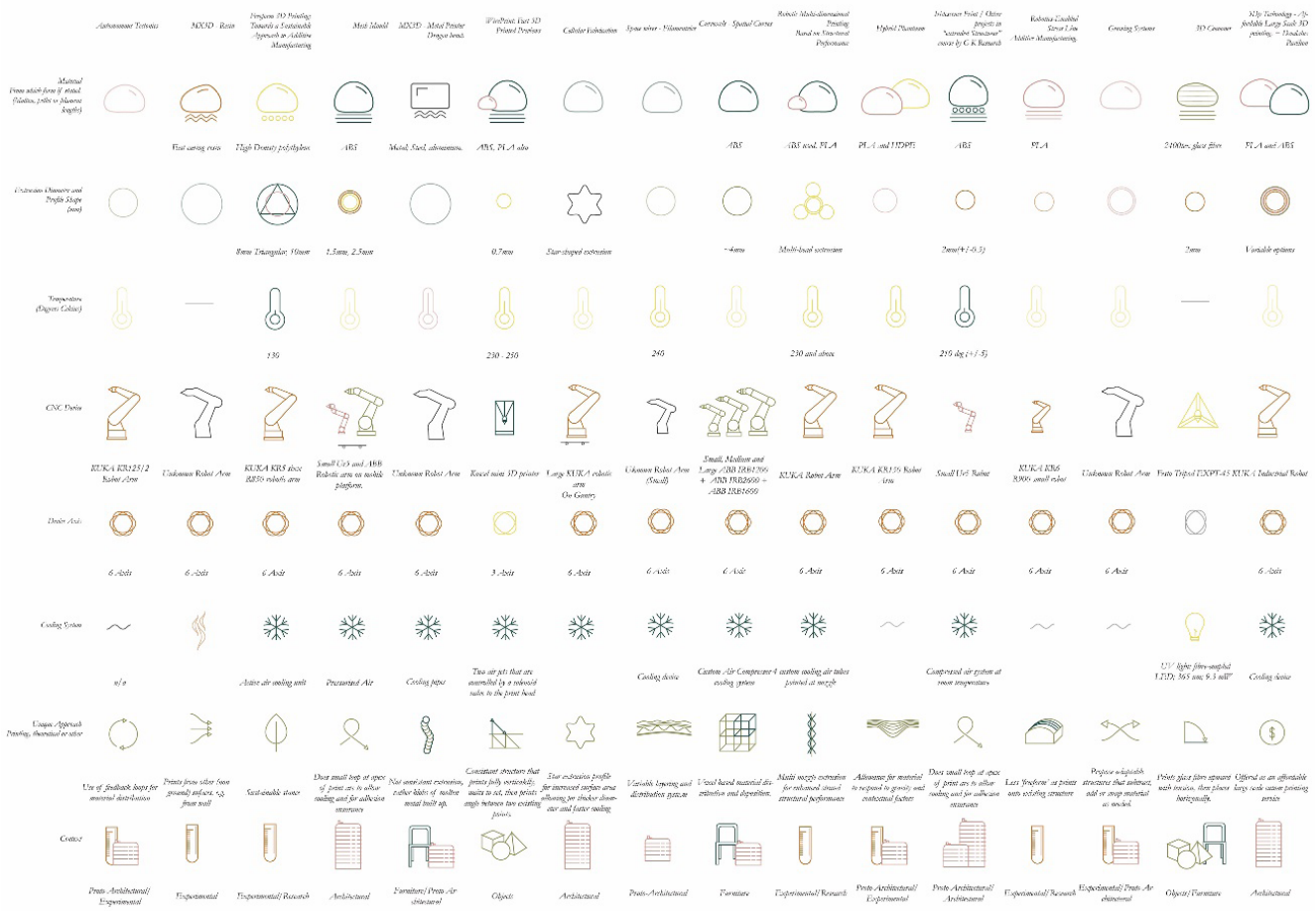


Figure 3. Technical analysis matrix, infographic of research precedents, Freeform and related 3D printing projects.

Cross-Discipline Freeform strategies and approaches

This research commenced with an in-depth study of state of the art, Freeform techniques at the time of the initial investigation (July 2016 - May 2017). From the information gathered, a matrix was developed to allow analysis of the techniques, materials and processes used with sixteen notable spatial printing projects evaluated (Figure 3). The majority were in the architectural domain using robotic arms, with others selected as they were closely aligned with the intent of this research.

Although the aforementioned projects use 3D bands that build up cumulatively, other projects, from the architecture research community, use a similar approach but explore more variability in toolpath and material deposition in response to the geometries at hand or the requirements of the object. For example; the Spacewires project and Curvoxels project, (Gilles and Manuel Jimenez 2016) with two notable exemplars that use multi extrusion tools; Freeform 3D printing: Towards a Sustainable Approach to Additive Manufacturing (Oxman et al. 2013) and Robotic Multi-dimensional printing based on structural performance (Yuan et al. 2016). Another project of interest, although not a Freefrom project as it employs a mould, is Robotic Enabled Stress Line Additive Manufacturing which uses simultaneous movement to create curvaceous lines defined by Finite Element Analysis (FEA) to create 2.5D surface layered structures (Tam et al. 2016)

Whilst there are multiple precedents showing the discovery of impressive qualities, possibilities and applications for spatial printing methods using 6 axis robotic arms, for the creation of complex architectural geometries with real world application, there are other groups undertaking experimental Freeform projects, such as Filament Sculpture (Lia, 2014), Vessel Experimental G-Code (Lobser, n.d.) from the maker community. These start to digress beyond traditional layer based printing techniques and begin to show how more variability in settings and material deposition can be used for rich visual and tectonic qualities, often exhibiting some loss of control/precision but embracing serendipitous findings. By amalgamating these concepts and successes the research here begins to understand the value of this technique in the

spaces between the micro and macro, the tinker and the engineer. An industrial design perspective provides a new set of guidelines and proprieties to interpret the process through.

Generative modelling and customisation

3D printing and CNC technologies allow the possibility to industrially manufacture individual non-standardised elements (Gramazio, Kohler, & Oesterle, 2010). With these technologies there is no incentive or benefit in manufacturing duplicate objects as there is when tooling and moulding are involved, thus, it becomes appropriate for consumer customisation services. Rapid production of additively manufacture objects in terms of production economics encompass several cost advantages; lesser waste than subtractive processes, input material is consistent, meaning no inventory of a variety of standard-sized stock is necessary, reduced labour for fabrication and assembly, better quality control as production is digitally driven as well as minimal setup costs (Bak,2003, p. 341). Spatial printing processes allow some of these values improved further, such as in the vast reduction of waste material, thus requiring less post-print clean-up. Although still in its early research stages, with development there may be potential for a unique path towards end-use additively manufactured products through Freeform 3D printing methods, enhanced through the integration of mass customisation and rapid production. Here, generative modelling is integrated to explore how geometry and material dispersion can be synchronously impacted through customisation and user input.

METHODS

Experimentation and optimization tests

Throughout the research both a MakerBot Replicator 2X and a MendelMax were adapted and used for spatial printing. Both 3 axis printers, had similar capabilities but the Mendelmax allowed for greater print height. Some minor modifications took place to maximize the printer's ability to work spatially and to gain control over the printers motions and material deposition. This included making custom print nozzles to allow greater spatial movement before collisions with the built form would occur. A Grasshopper script was developed to define print head location, speed of movement (F speed), extrusion rates (E rate) and temperature settings. A series of extrusion tests were conducted to ascertain optimum performance of unsupported printing across gaps (bridge test using N1) (Figure 4) and arc movements (Figure 5).

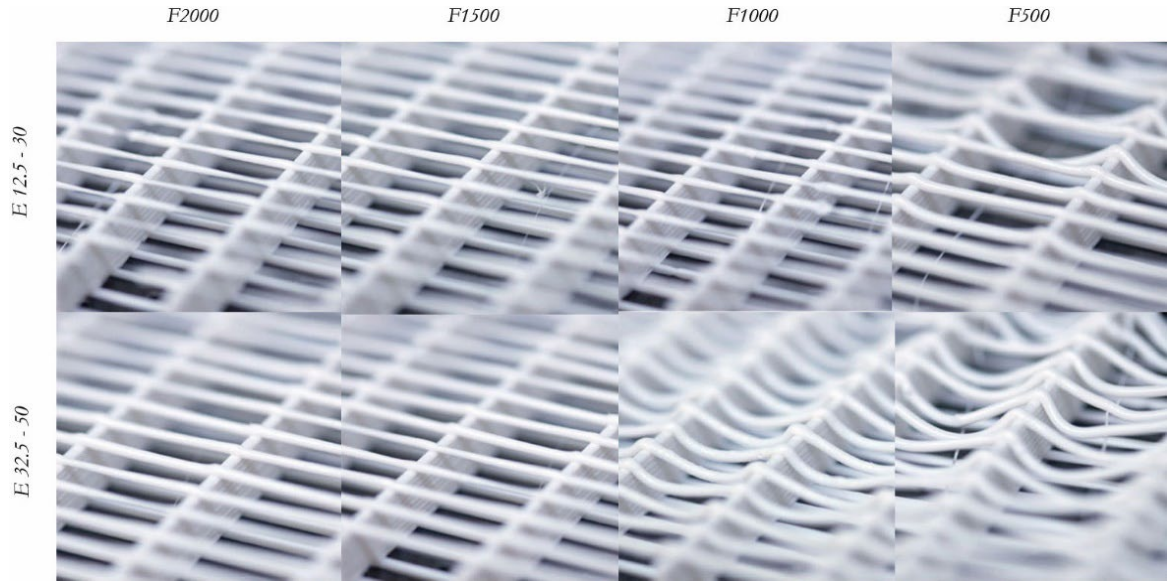


Figure 4. A small sample of the many bridge tests used to ascertain optimum F speed, E rate, temperature setting and layer adhesion. Temperature tests ranged from settings 230-260 °C, optimum 240 °C. Movement rate (F speed mm per minute) tests ranged from 500,

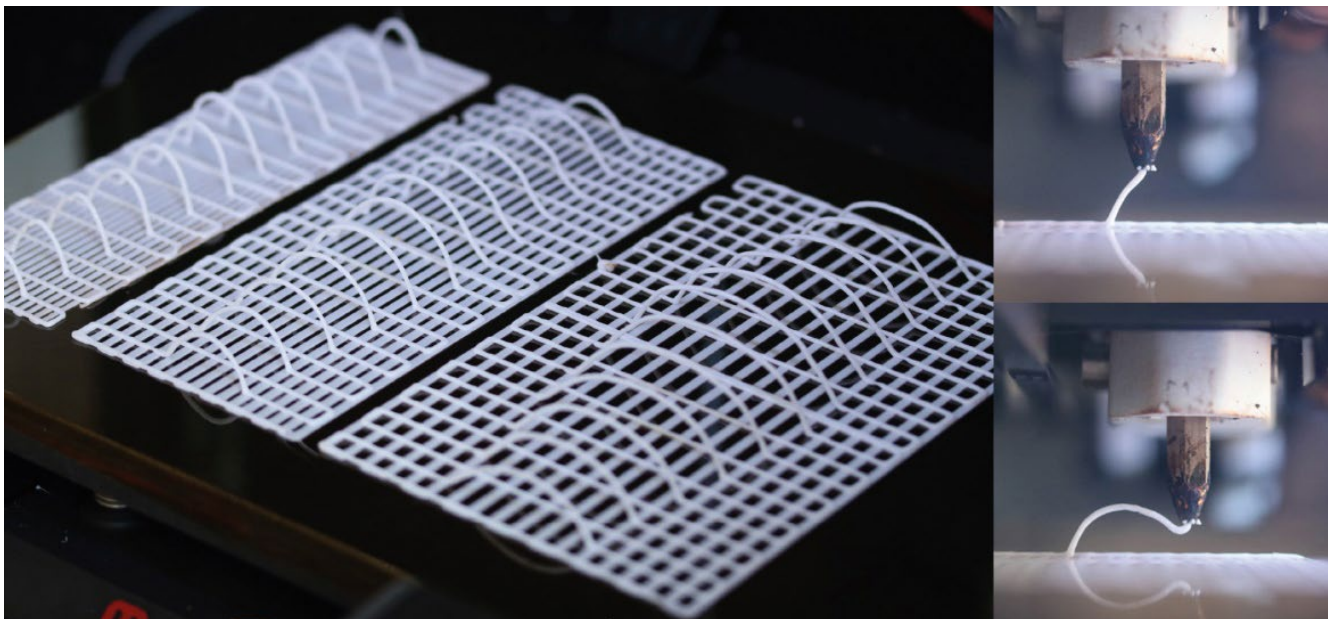


Figure 5. Samples from the arc tests of varying ranges of heights and widths. Each was printed twice in opposite directions to evaluate directional pull.

Different E rates and F speed relationships were ideal for different sized arcs, therefore in identifying the best-printed arcs of each radius allow for understanding of the relationship between the values and the correlated lines length(s), the optimum settings could be calculated. It was also discovered that the E-rate on the paths moving downwards (negative Z movements) needed to be slightly decreased compared to upward motions. This is due to the gravitational pull on the filament, meaning that excess filament was printed during downward motions. This is compared to the upwards motions during which the slight tension between the nozzle and printed geometry counteracts gravity. A comfortable adjustment for negative motions was to times the calculated extrusion rate by 0.8.

After initial optimization tests three groups of abstract design experiments (Figure 6) were used to find and explore opportunities for spatial printing through the proposed Form Responsive Method using the grasshopper definition. The three groups were as follows:

- The Minimal Base Adherence series, which tested techniques to avoid reliance on the base plane/raft or relying on large quantities of support structured to build complex forms.
- The Dynamic Layering series, which sought to pursue the opportunities arising from structures built through combinations of accumulative layers and spatial deposition.
- The Structures, Patterns and Tectonics series, which sought to test the impact of surface patterning on material integrity, with a focus towards influence on structure. It explored how direction, interaction, and density would impact the structural or mechanical qualities of a print. Tectonics and aesthetics were considered, with influence from the form.

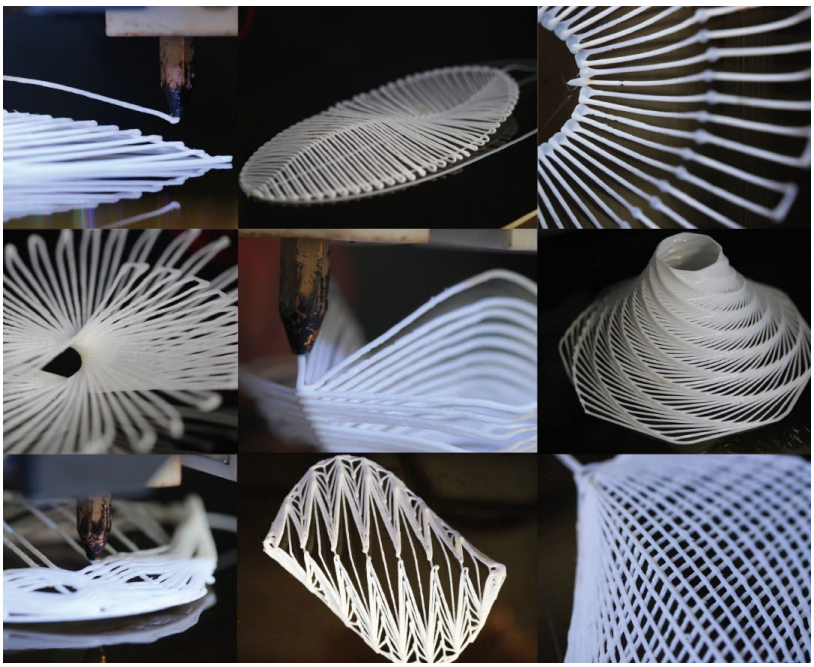


Figure 6. Sample prints from the three abstract experiments groups; Minimal Base Adherence (top row), Dynamic Layering (middle row), Structures, Patterns and Tectonics (bottom row).

These experiments began to express how simple, bespoke processes could create new material qualities through Freeform 3D printing. Many specific qualities were found in the experiments, and the integration of these were used to further increase opportunity for the FRM. More general opportunities exposed were:

- The ability to create variable material qualities, both locally within a single print, and over separate artefacts
- Freedom to define materiality and tectonic qualities for specific purposes
- Largely diminished need for support material and less wastage of material
- Greater control over visual, physical and tectonic impact of material deposition
- Ability to easily create open or mesh-like structures. (Compared to standard FDM)
- Visual patterning as a cue for the artefacts use and structural integrity

APPLICATION BASED EXPERIMENTS

To further understand how Freeform 3D printing could be embraced through an industrial design perspective, a number of application based exemplars were identified to span common industrial design artifacts from products to furniture. This resulted in a kitchen utensil set, computer mouse and a range of furniture items. Simple architypes with non-complex 3D forms were used as the research focused on new approaches to material deposition and the FRM. Here we present a kitchen utensil set, a computer mouse and two furniture items.

Application Exemplar1; Kitchen Utensil Set

Variable Density; Solidity and Open Structure Exploration

By digitally crafting through curves as opposed to solid forms, material becomes controllable down to the single print strand. This exposes greater government of the formation of open structure, and its morph into solid geometry. This series sought to explore varying levels of structural dispersion and its potential applications. A three part Kitchen Utensil Set was chosen to explore this through. Each object within the set had unique requirements for density towards its intended use. The set was designed to be for cooking or baking contexts, which use varying arrangements of meshes, solids, and structures to impact interaction with substances. Within each piece of the set there were local needs for designed printed structure to respond to, defined by use. Such as from a dense, strong handle, to a light, open mesh.

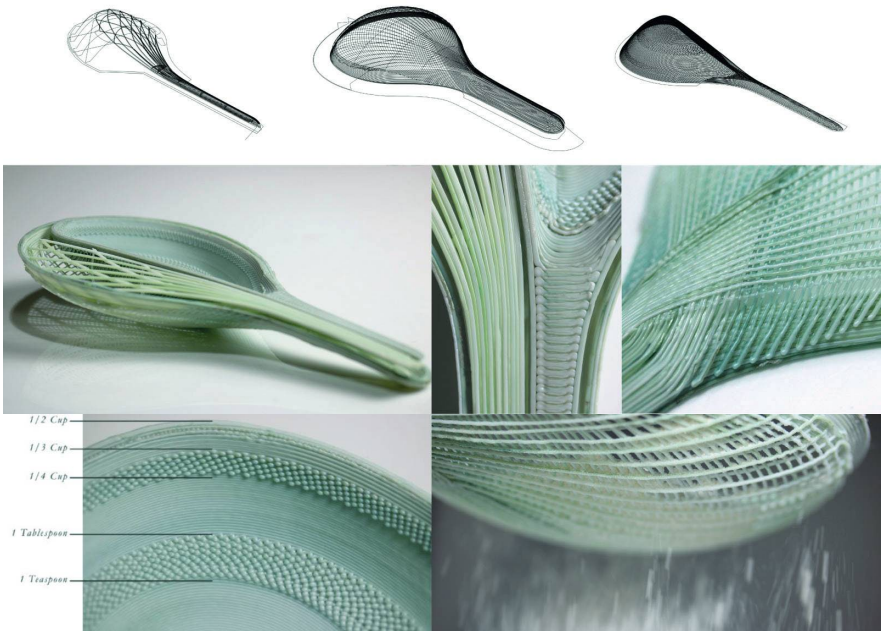


Figure 7. Kitchen Utensil Set, whisk, sieve and measuring spoon (top left, center, right), set assembled for storage, (Mid left), Nestled objects texture closeup (Mid Centre) increased density to facilitate structural handle (bottom center), Detail of measuring spoon volume indicators using texture (Bottom left), Seive in use (Mid Right).

Application Exemplar 2; Computer Mouse

Mechanical Use, Structural Diversity, and Ergonomic Customisation

How and where material is deposited has been found to impact the structural integrity of a printed artefact significantly. This series focuses on the structural and mechanical use of material dispersion and how simple implementations of patterning and directional deposition can influence structure. Expanding upon this, it explores the integration of electronic component and connections between printed parts. A computer mouse was the chosen application. How componentry was housed, how separately printed pieces could lock and release, and how material directions can inform structure and physicality became of primary interest as well as how forms and structure may influence use and interaction.

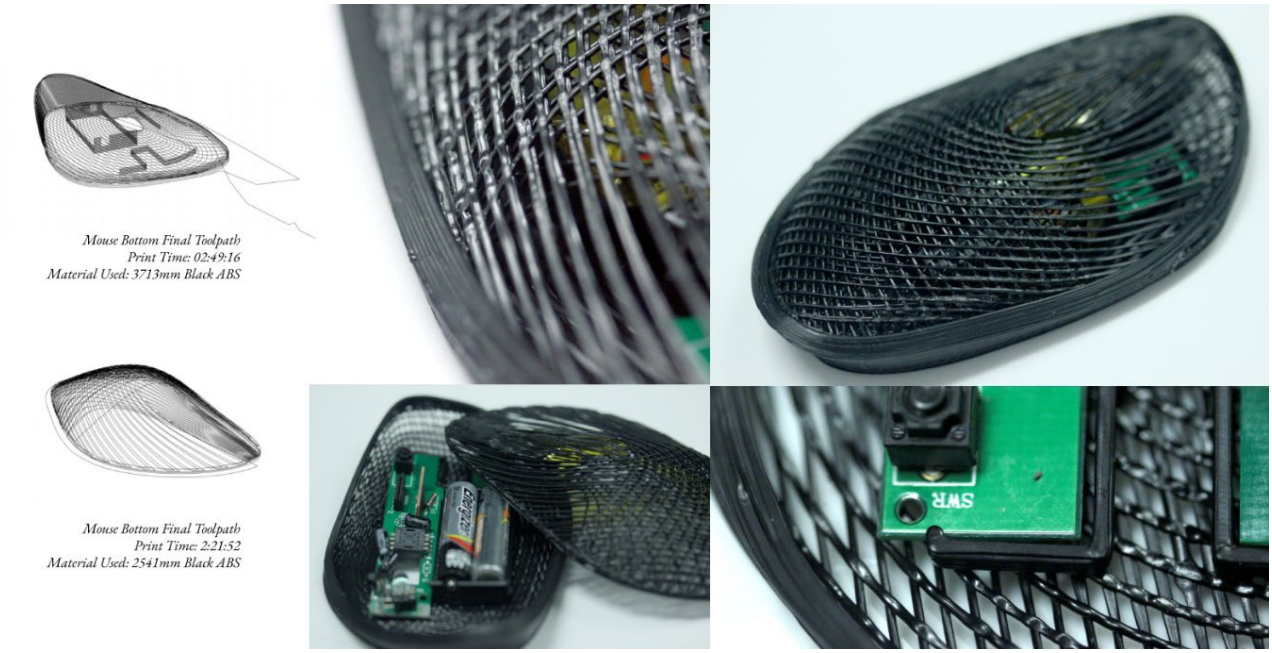


Figure 8. Computer mouse, consisting of top and bottom printed peices and housed electronic components.

Furthermore, the integration of parametric modelling for the development of toolpath allowed for ergonomics to become responsive to the user. Relationships between input dimensions of a user hand and corresponding areas of the mouse were defined, as seen in Figure 9. The final shape, proportions and patterns of the output mouse directly responded to input user data.

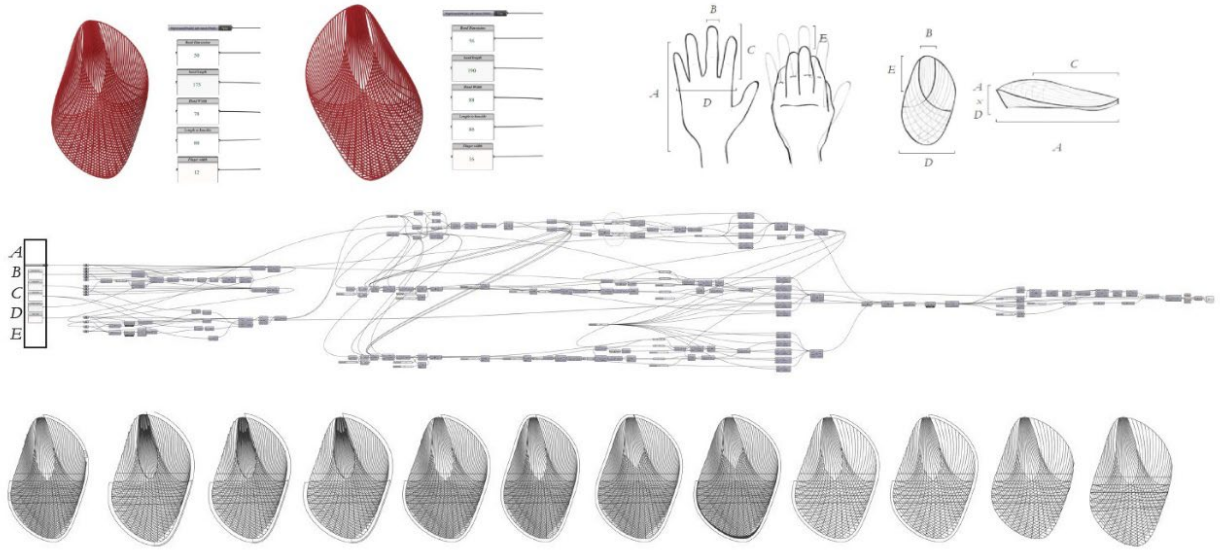


Figure 9. Mouse Parametric model. User input data effecting form, toolpath and material deposition to create varying individualized outputs.

Application Exemplar 3; Scale Furniture

Parametric Patterning, Variable density, and Mass Customisation

Throughout the research, one particular approach towards Designed Deposition was exposed to be of intense value, repetition and patterning. With the use of Grasshopper as the generative tool, there became opportunity for heightened intricacy of these patterning systems. A furniture context was defined to help discover implications of parametric patterning for aesthetics and variable density. The ability of generative modelling was utilised for further exploration of customisable and bespoke products. This developed to an exploration of how simple user interactions on defined parameters could bring large implications on the aesthetic, structural, and tectonic value of its artefact.

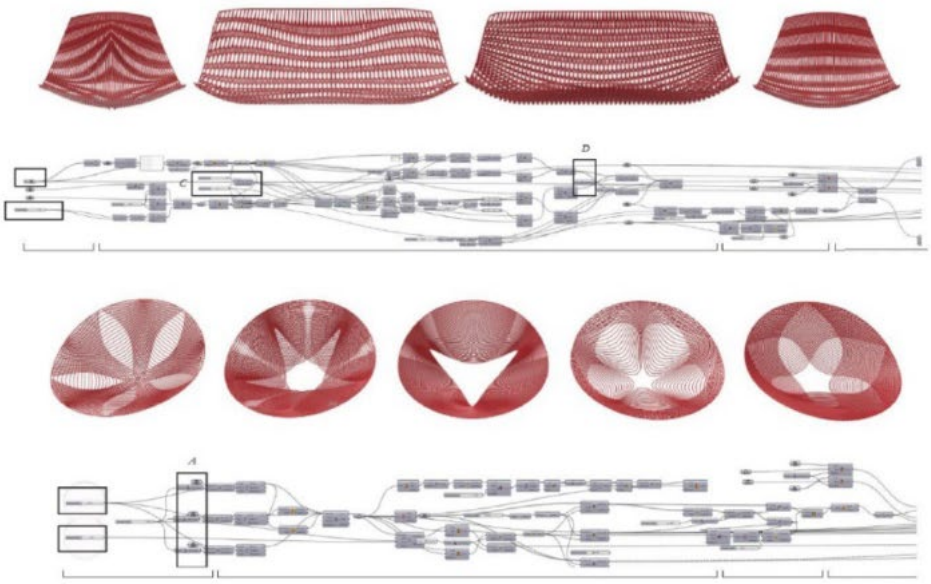


Figure 10. Furniture parametric models

With the intention to explore the FRM at a larger furniture scale, 1:5 scale samples were designed and made to test a range of toolpath strategies. These parametric furniture design experiments were broken down into furniture components, exploring two different seat forms with distinctive structural configurations/strategies and one common leg system with variable density. The chair pattern system, seen in Figure 11, explored rotational FRM pattern with opposing directions of material connecting at intersections, thus creating variability in layer densities from the center to the periphery. The pattern system used in the design in Figure 12, explores configurations where volumetric material flowed transversely over form in a primarily linear direction. The strategy employed on the legs facilitated the printing of open Freeform structures and FDM 2.5D printing conjointly to create cumulative dense patterns for vertical load and open bracing structures.

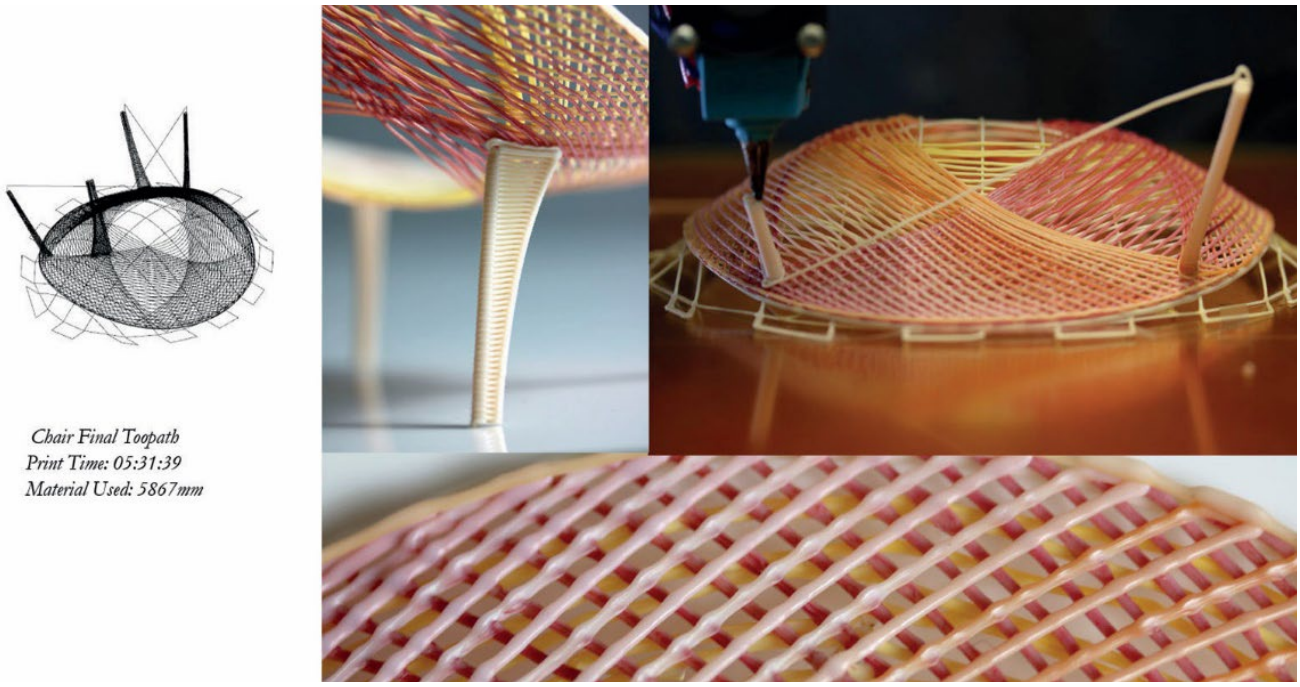


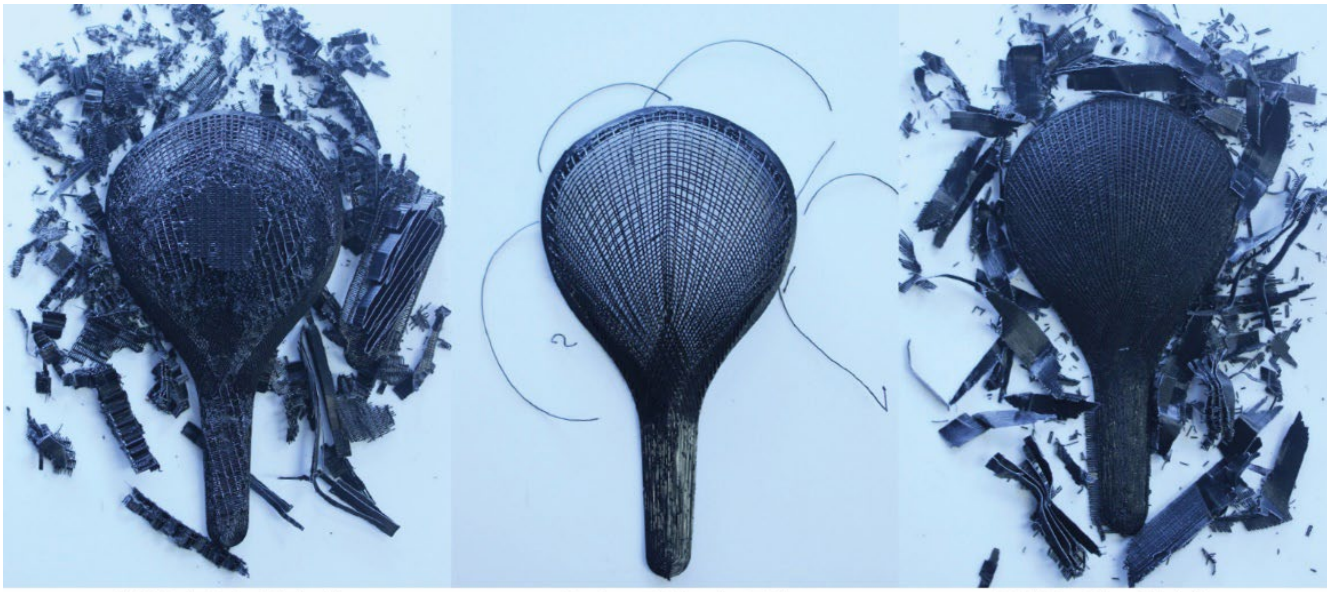
Figure 11. Single chair, utilizing long curved strands with greater structural density around the periphery and increased layering in leg locations, printed 1:5 scale.

Figure 12. Two-person chair showing volumetric 'knitted' seat connected to long transverse strands (bottom), leg detail (top and right) printed 1:5 scale

RESULTS AND DISCUSSION

Through the utensil, electronic and furniture based exemplars it was understood how widely impactful material deposition is to the integrity of the printed artefact. Interesting visual, physical and tectonic qualities were revealed through the different configurations of deposition and it became evident that many more could be explored. Only a handful of techniques were explored comprehensively with overlays of repetitious lines, three-dimensional layering, and other patterning techniques being given precedent.

To evaluate the success of Freeform printing the sieve element, from the set of kitchen utensils, was printed using a standard FDM slicing process on an UpBox printer. Through this comparison, the disparity of reliance on support material became explicit. As illustrated in Figure 13, the amount of material is vastly reduced when using the FRM approach with its self-supporting build material, compared to the mass of excess material required for FDM prints using standard slicers. The removal of these support structures also impacted on the quality of the print, in many areas where it could not be removed at all. The FRM printed sieve is shown in Figure 7. The time comparisons and linear material usage should also be noted, see Figure 13 caption.



FDM Print Oriented Facing Up
Print Time: 05:40:25
Material Use: 34522mm

Freeform 3D Print using FRM
Print Time: 02:41:10
Material Use: 7870

FDM Print Oriented Facing Down
Print Time: 04:40:56
Material Use: 25056mm

Figure 13. Comparison between FDM printed sieve (left, face up and right, face down) and Form Responsive Method (center). If the Form Responsive Method (center) has print time of 2:41:10 =100% and the material use of 7870mm =100%, the FDM print time (left) takes 211% more time and 438% more material. FDM print time (right) takes 174% more time and 318% more material.

As discussed earlier, many of the published Freeform projects investigate pragmatic architectural structural issues with less concern for aesthetic resolution, with some concealing the printed structure deep within the fabric of the building. The aim of the Form Responsive Method lies in the synergy between material deposition, functional/structural requirements and aesthetic control through the precise manipulation of the toolpath. By designing through curves that directly translate to printed geometry, great control over the printed expression can be gained. Self-supporting material and fully utilised spatial motions become tools necessary to realise material deposition considerate of the method of making and its implications for aesthetic, structural and tectonic value. Consideration of form, intended use and intended user interaction of an artefact was designed concurrently with deposition guide printed artefacts to gain qualities beneficial to its products use, structural qualities and aesthetics.

Parametric design technologies were embraced in many ways to grasp control over CNC technology and aid complex design solutions. It allows a bridge for information between designer and manufacturing device, to more intimately control the quality of outcomes and further expand novel design opportunities. Through generative modelling, mass customisation and user input becomes viable and aids greater diversity of results. Simple user interactions, available through parametric modelling, were found to grant large adjustments for ergonomic, visual, and structural influence from

its user. The software became a tool to translate digitally defined motions into designed deposition. Translating visual curves and forms created by the designer into g-code, readable by the printer, an integrated conversation was developed between designer and technology.

CONCLUSION

This research started with an in-depth survey of all the Freeform research projects published at the time, mid 2016 to early 2017, which analysed project processes, methods and outcomes. Due to the broad nature of the survey this research project became interdisciplinary, as generative software techniques used in architecture were cross-pollinated with concepts and approaches from industrial design. In addition, looking at Freeform 3D printed artistic expressions, in the maker space, further enriched project concepts. Inspired by the structural pursuits from architecture and celebration of experimentation of quality from the maker community and defined by industrial design briefs, new opportunities for spatial printing techniques arose.

Design and technology aided each other to expand the opportunities of both areas. Through intimate understanding of the values and limitations of the 3D printers used, they could be hacked to create novel qualities beyond original intention. The research here shows that by utilizing the Form Responsive Method and directly working with toolpaths the deposition of material can be defined to new levels of control resulting in digitally crafted artefacts with novel qualities. Through great reduction of support material, the method also proved to be highly economic in terms of time and material usage. Further integration of a range of technology such as structural systems, including FEA, may yield a greater diversity of deposition qualities and could move towards closer synchronization between structural performance and aesthetic resolution.

Diversity in digital techniques resulted in diversity in artifacts, both between prints, and locally within single designs. User input and generative design became further tools to expand results and grasp intimate governance over digital manufacturing. Designing through curves that directly translate to printed geometry, great control over the printed expression was gained. Through thoughtful relationships between design and technology there becomes the ability to expand the capacities of both realms.

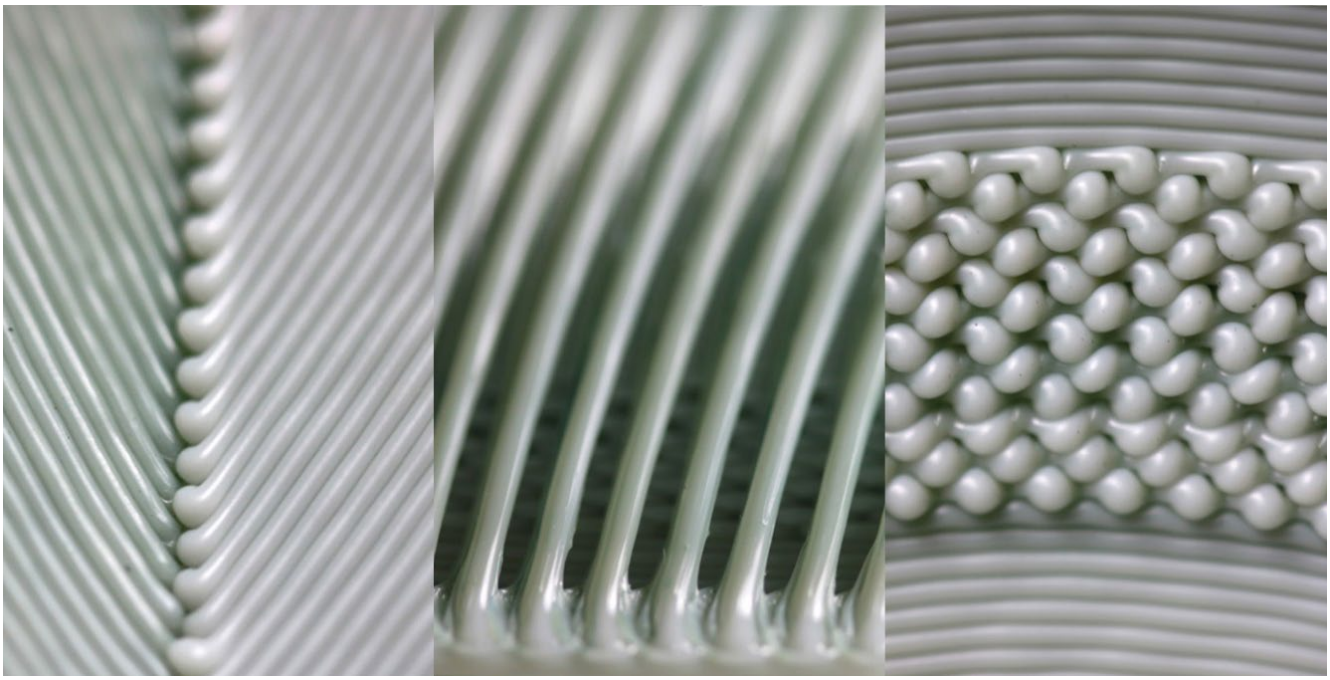


Figure 14. Tectonic digitally crafted textural details from the kitchen utensil set.

ACKNOWLEDGEMENTS

The work here presented was developed in a year-long individual Master Thesis by Isabella Molloy and supervised by Tim Miller, within MADE (research group): Master of Design Innovation, Industrial Design, at Victoria University of Wellington, New Zealand. We thank and acknowledge the grant funding through MADE and the New Zealand Product Accelerator and Liam Gilbertson for the use of the MendelMax printer.

REFERENCES

1. Ai Build. (2016) 3Dp Technology - Affordable Large Scale 3Dprinting. Retrieved July, 2016, from http://3dp.ai-build.com/
2. Bak, D. (2003). Rapid prototyping or rapid production? 3D printing processes move industry towards the latter. Assembly Automation, 23(4), 340-345.
3. Branch Technology, (n.d.), Cellular Fabrication, http://www. branch. technology/, last accessed 2016/7/30.
4. Doerstelmann, M. Knippers, J. Koslowski, V Menges, A. Prado, . Schieber, G. Vasey, L. 2015. "Material Synthesis: Fusing the Physical and the Computational" Architectural Design Sep-Oct, Vol.85(5), 60-65. 2015.
5. Helm, V. Willmann, J. Thoma, A. Piskorec, L. Hack, N. Gramazio, F. Kohler, M. 2015. "Iridescence Print: Robotically Printed Lightweight Mesh Structures." 3d Printing and Additive Manufacturing Vol 2, (3) Sept 2015: 117-122.
6. IDSA, http://www.idsa.org/events/what-id, last accessed 2017/03/6.
7. Laarman, 2014, http://www.friedmanbenda.com/exhibitions/past/ joris-laarman-lab-bits-and-crafts, last accessed 2017/1/30.
8. Lia, 2014. https://www.liaworks.com/theprojects/filament-sculptures/, last accessed 2017/12/5.
9. Lobser, D. (n.d.) Vessel-Experimental G-Code, http://www.dlobser. com/Vessel, last accessed 2018/02/10.
10. Mueller, S. Im, S. S Gurevich, S. Teibrich, A. Pfisterer, L. Guimbretière, F. Baudisch, P. 2014: "WirePrint: 3D Printed Previews for Fast Prototyping." In 27th Annual ACM Symposium on User Interface Software and Technology, Honolulu, 2014, 273-280. NewYork: ACM
11. Oxman, N. Laucks, J. Kayser, M. Tsai, E. Firstenberg, M. 2013. "Freeform 3D printing: Towards a Sustainable Approach to Additive Manufacturing." In Green Design, Materials and Manufacturing Processes. edited by Helena Bartolo et. al, 2013, 479–484. London:
12. Pye, D. 1968. The Nature and Art of Workmanship. London: Cambridge University Press
13. Gilles, R. Manuel Jimenez, G. 2016. "Discrete Computational Methods for Robotic Additive Manufacturing." In Proceedings of the 36th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA), Michigan, 2016, 332-341. Michigan, Ann Arbor MI
14. Tam, K. Coleman, J. Fine, N. Muller, C. 2016. "Robotic-Enabled Stress Line Additive Manufacturing." In Robotic Fabrication in Architecture, Art and Design, Sydney, 2016, 93-105. Heidelberg: Springer
15. Yuan, P. Meng, H. Yu L. Zhang, L. 2016. "Robotic Multi-dimensional Printing Based on Structural Performance." In Robotic Fabrication in Architecture, Art and Design, Sydney, 2016, 93-105. Heidelberg: Springer

METHOD OF THE DESIGN THE MODERN SURFBOARD

A bridge between shape and context, re-designing the shape of the modern surfboard

Offri Lotan
Design Graduate Program
Faculty of Architecture and Town planning
Technion, Haifa, Israel
lotanoffri@gmail.com

Gil Iosilevskii
Faculty of Aerospace Engineering
Technion, Haifa, Israel

Prof. Ezri Tarazi
Design Tech Lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

ABSTRACT

Modern surfboard design is still based on an experience of a gifted craftsman. There is no mathematical theory that can predict the feel of a surfboard under a surfer's foot. In this study we suggest to make a small step toward rationalizing surfboard design by correlating measurable merits of performance (as forces and moments acting on the board in linear and curvilinear motion), with surfboards shape parameters (as rocker, planform and thickness) and with surfers' subjective feelings on a wave.

The research methodology relays on a quantitative method, a few representative surfboards are measured, and tested both in the towing tank and at sea. Testing in the towing tank will furnish the hydrodynamic forces and moments generated by a board as a function of its orientation relative to the direction of motion. Testing at sea by a group of experienced surfers has furnished grades on the ability of the boards to perform well defined tasks (e.g. accelerate to catch wave, keep speed, top and bottom turns). Grading of the subjective opinion of the surfers has been collected by conducting a survey , an equivalent of the Cooper-Harper scale extensively used in flight testing to grade the subjective opinion of pilots on the ability of an aircraft to perform various tasks.

REFERENCES

1. French, R. B. (n.d.). Surfboard Hydrodynamics, 1–27. Herriko, E. (2016). Design of a New Surfboards Digital Modelling a University-Company
2. Project : Design of a New, (October).
3. Paine, M. (1974). Surfboard Hydrodynamics, BE(MECH) Thesis, Mechanical Engineering Department, Sydney University.
4. Webber D. (2008). Zen and the Art of Surfboard Design. Indo-Pacific Journal of Phenomenology, 8: 1-7.

LITHOPIA PROJECT

Engaging stakeholders in blockchain futures

Denisa Reshef Kera
BISITE
University of Salamanca
Salamanca, Spain
denisa.kera@usal.es

ABSTRACT

Lithopia (Lithopy) is a fictional “smart village” used for prototyping blockchain futures and discussing the limits of automation and data governance. In Lithopia smart contracts are triggered by gestures and land-art type interventions visible to the satellites and drones. We created several Hyperledger Fabric smart contracts used as blockchain templates for exploring feasible near future scenario. Together with Node-RED dashboard for following the data from the open API services and the blockchain, and a design fiction movie they serve as props for stakeholder engagements. In this paper, we will discuss the combination of design methods in the proposed stakeholder engagement and claim that it supports anticipatory governance of emerging technologies. The project is inspired by traditional mining region of Cínovec in the Czech Republic that is rich in lithium deposits. We created a tool for the villagers to reclaim symbolically the ownership of these deposits and to creatively resist the interests of the mining industries with performances in front of satellites. The whole project is currently on a display as an installation representing the Czech national pavilion at Milano’s Triennial of Design “Broken Nature” (March – September 2019). The 7 screens follow the different perspectives on the smart contracts (land, earth, infrastructure) and a dashboard enables visitors to become Lithopians and interact with the blockchain platform by offering fictional properties or partnerships.

INTRODUCTION

Hyperledger Composer is an open source development framework for Distributed Ledger Technology (DLT) applications on the private and closed (permissioned) Hyperledger platform hosted by The Linux Foundation in association with several corporations (IBM, Oracle, etc.). It differs from blockchain technologies because it does not use mining nor tokens to support its decentralized ledger(s) applications[1]–[3]. This makes it more robust for the type of automation and smart contracts that we were interested to test (involving open APIs of satellite and drone data).

Most public and open fintech blockchain solutions (Ethereum, Bitcoin etc.) are based on strict consensus mechanisms that enable decentralization involving large numbers of unknown users forming the ledger infrastructure with their transactions. Because of investments and exchanges to national currencies, most public and permissionless blockchains involve security rather than UX or design issues. They are simply less design friendly for testing smart contracts involving external data and so called “escrows” and for developing educational and research project.

The parody of a “smart” blockchain-managed village uses external open satellite data from Sentinel 2A and B Copernicus system to trigger Hyperledger Composer/Fabric based contracts (chaincodes) over REST API services (GET and POST commands), such as change of ownership of a space or a property. The Java Script based “logic” of the Lithopian contract basically says that if there is a pixel (10 x 10m2) of red color on a given location saved by another the name of the owner will be changed to the string listed under the variable newOwner. There is also a partnership contract for which we plan to use drone data of special handshakes in the future. We are continuing the work on these “space based” smart contracts in the context of the ESA’s (European Space Agency) Summer of Code (SOCIS) challenge from May till September 2019.

On Github we documented the minimal contracts you need to set up such Lithopian village anywhere in the world. There is also the code needed to offer a dashboard for the “villagers” over which they can communicate with various APIs (Sentinel satellite location, weather conditions, Twitter sentiments, cryptocurrency charts) including the REST API of the

Hyperledger Fabric contracts. The dashboard uses open source Node RED application programming tool for connecting data from various hardware devices, APIs etc. where you can design the user interface for communicating with various infrastructures. The contracts and the dashboard are featured in a design fiction movie directed by the Czech theater director and artist, Petr Sourek, who worked with a group of actors to recreate the Lithopian village[4].

ANTICIPATORY GOVERNANCE: REGULATING OF PROTOTYPING FUTURES?

Anticipatory governance emphasizes the capacities or "foresight, engagement, and integration" as a way of "managing emerging knowledge-based technologies while such management is still possible"[5]. It is an approach to R&D and emerging technologies that insists on public engagement directly in the processes of making future through scenarios, foresight, public debates, stakeholder engagement, and integration[6]–[8]. What is often missing in these discursive methods inspired by calls for more direct and participatory politics is design and prototyping as a type of direct engagement with the technologies. This more "material" than purely discursive engagement can increase literacy and knowledge about the technology, but also identify the issues and the connection between the technological and social possibilities and limits of an emerging infrastructure.

The goal of anticipatory governance is to identify and make use of "windows" of opportunity in the emergent technologies, where we can still define some aspiration rather than regulate ex post. For this we need to involve the various stakeholders and the general public in the prototyping and design of future blockchain applications. This will enable the work on the regulations to go hand in hand with prototyping and define our common future as a public good, which needs our care. With our combination of design methods and deliberation, we are trying to test how to think and use regulations, ethics and our ideas of justice as not just concepts or behaviors, which we can easily teach and reproduce, but iterative and participatory design processes. We see these processes as a form of creative resistance and direct engagement of citizens in future making.

The project is inspired by the traditional mining region of Cínovec in the Czech Republic and its resistance to the interests of the mining industries trying to extract its rich lithium deposits, but also the current search for national cryptocurrencies and speculative investments in ICOs. We use Lithopia as a prop to explore the modes of resistance to future „crypto and data-mining" interests and to involve various stakeholders directly in this promissory future distributed ledger infrastructure. We hope that the project will support inclusive and democratic "future-making" (anticipatory governance) against the current misuses of emerging technologies in the so-called predictive, anticipatory and frictionless design [9], [10].

Lithopia's goal is to test a possibility of anticipatory governance of emergent distributed ledger and blockchain technologies and question the promises of governance merging with automation driven by APIs and data. The lives of the Lithopians in the design fiction movie hint on the creative forms of resistance that the villagers will invent even in such blockchain and satellite driven utopia. The movie and the templates of the contracts then enable the direct experiences, but also discussions, and support the iterative design process of gathering feedback and recommendations, which will plan to summarize with a future scenario exercise.

The villagers in Lithopia govern their affairs in what we describe on the Github as "an extremely transparent, but also aesthetic manner. Special long gestures and large LiCoins, but also acts of covering spaces in a land-art, Christo manner trigger the transactions". We claim that the Lithopian DLT is inspired by similar large stone coins from Micronesian island of Yap preserving the oral memory of ownership, marriages, and important events. Similarly, "Lithopians deploy smart contracts as a form of oral culture timestamping emphasizing genealogy over exchange and stewardship over ownership". (Ibid.)

DESIGN FOR ANTICIPATORY ENGAGEMENT OF STAKEHOLDERS

Lithopia combines three tools and methods related to the contracts, dashboard, and movie to connect prototyping and deliberation, design and policy, in three steps:

1. Lithopia movie about a "smart village": experiencing and discussing blockchain futures. Lithopia dashboard (Node-RED interface): explaining and performing blockchain infrastructure

2. Lithopia templates of smart contracts (Hyperledger Fabric/Composer): co-prototyping blockchain solutions (Hyperledger Fabric/Composer)

3. Two axes future scenario exercise: envisioning the future of blockchain and anticipatory governance

The participants in the workshop are given stakeholder roles in Lithopia and asked to perform game-simulation activities while learning more about Lithopia from the contracts and the movie: “You live in Lithopia where people trigger contracts by performing gestures and rituals of covering spaces in front of drones and satellites when they partner, marry or change the ownership of a property. The blockchain system allows smart contracts that use satellite and drone data to automatize various social institutions. Make an Instagram/Facebook feed on your life there or send a postcard.”

We also simulate Lithopia council meetings and a referendum on the use of blockchain based smart contracts automatizing further various transactions and contracts, and ask the participants to define their position based on the role: “What will be your agenda, issues, solution, and ultimate vote? Present your position. Vote.”

At the end of the exercise they all must join team of developers to understand, improve, destroy or transform the contracts and then vote again about the implementation of blockchain in Lithopia. Based on their experience of living shortly in Lithopia, at the end we ask them to collaborate on a future scenario about blockchain governance.

The whole workshop comprises from following activities that use the different tools :

1. Self-assessment of blockchain/DLTs attitudes and knowledge

2. Icebreaker: Instagram feed (postcard) from Lithopia

3. Dashboard: become Lithopian, offer a property & marriage.

4. Read your assigned stakeholder role and argument cards for participants to define stakes, interests, and opinions

5. Present arguments & proposals

6. Vote on the future of blockchain in Lithopia

7. Co-prototype smart contracts from templates

8. Present your prototypes/mockups and improvement for old/new services

9. New voting on Lithopia blockchain

10. Collaborative two axes scenario on blockchain and governance

These 10 activities relate to the different design and policy phases of the workshop during which we try to compare the opinions on blockchain governance before and after prototyping (direct experience with the system). The whole workshop also supports design of new services or giving feedback on existing ones. Everything finishes with reflective and collaborative future scenario exercise defining the design and governance expectations of future blockchain infrastructure.

SUMMARY

Lithopia is a simulation game based on prototypes and a design fiction movie that supports stakeholder engagement in blockchain and decentralized ledger futures. It starts as a parody of a “smart” blockchain managed village that uses satellite and drone data to trigger smart contracts on the open source blockchain platform, Hyperledger Composer/ Fabric. It is a functional prototype of a Node-RED interface/dashboard connected to the blockchain smart contracts on Hyperldger over a REST API service; all offered as templates for workshops involving stakeholders. The services and the smart contracts are also featured in a design fiction movie to create a more compelling context for further discussion on data governance. The project is testing the possibility of anticipatory governance of emerging blockchain and distributed ledger technologies (DLTs) by involving stakeholders in the design process over templates. The goal is to question the promises of blockchain governance happening over automation and smart contracts. The “anticipatory prototyping” supports inclusive and democratic “future-making” (anticipatory governance) against the current misuses of emerging technologies in the so-called predictive, anticipatory and frictionless design.

ACKNOWLEDGMENTS

The design fiction work was supported by the Czech Ministry of Culture and the Czech Industrial Design Museum. The research into anticipatory prototyping, governance, and design is supported by Horizon 2020 Marie Curie Individual Fellowship.

REFERENCES

1. M. Casey and P. Vigna, The truth machine : the blockchain and the future of everything. .
2. D. (David K. C. Lee and R. H. Deng, Handbook of blockchain, digital finance, and inclusion. Volume 2, ChinaTech, mobile security, and dis tributed ledger. .
3. K. Kulkarni, Learn Bitcoin and blockchain : understanding blockchain and Bitcoin architecture to build decentralized applications. .
4. D. R. Kera, P. Šourek, M. Krainski, Y. Reshef, J. M. C. Rodríguez, and I. M. Knobloch, “Lithopia,” in Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems - CHI ’19, 2019, pp. 1–6.
5. D. H. Guston, “Understanding ‘anticipatory governance,’” Soc. Stud. Sci., vol. 44, no. 2, pp. 218–242, Apr. 2014.
6. A. Nordmann, “Responsible innovation, the art and craft of anticipation,” J. Responsible Innov., vol. 1, no. 1, pp. 87–98, Jan. 2014.
7. B. A. Wender et al., “Anticipatory life-cycle assessment for responsible research and innovation,” J. Responsible Innov., vol. 1, no. 2, pp. 200–207, May 2014.
8. R. Quay, “Anticipatory Governance,” J. Am. Plan. Assoc., vol. 76, no. 4, pp. 496–511, Sep. 2010.
9. A. Monus, “Anticipatory Design: The Opportunities and Risks,” Hongkiat, Dec-2018.
10. V. Sgarro, “The tyranny of frictionless design – UX Collective,” UX Collective, 2019. [Online]. Available: https://uxdesign.cc/the-tyranny-of-friction-less-design-1325ab14432c. [Accessed: 07-Feb-2019].

AUTONOMOUS ROBOTIC STONE DRESSING

Craft-Oriented Middleware for Design and Production of Stone Elements

Tom Shaked
Material Topology Research Lab (MTRL), Faculty of Architecture and Town Planning, Technion
shakedtom@campus.technion.ac.il

Aaron Sprecher
Material Topology Research Lab (MTRL), Faculty of Architecture and Town Planning, Technion

ABSTRACT

The Mediterranean area has a long history of using stone as a central architectural element (Canaan, 1933; Fuchs, 1998). This practice is particularly present in Jerusalem, where there is a mandatory law that requires every building - old and new alike - to be covered with 'Jerusalem Stone', a local type of pale dolomitic limestone, originating in the area. In recent decades the local stone industry transformed to provide automated processes for most of its needs. However, as highly custom tasks cannot be automated, there is still a demand for skilled craftsmen to perform complex stone work – namely carving delicate features, three dimensional patterns and more. The advantage of human craftsmen is achieved by their ability to negotiate with the material and overcome conditions that arise due to the inherent uncertainty of the stone as a natural material. This uncertainty is overcome by the craftsman's real-time decision-making process, which is based on the visual and haptic feedback enabled by the nervous system. However, as the craft of stone dressing is one that is traditionally passed on from father to son, the number of skilled workers is diminishing, as the craft is on the brink of extinction. Encouraged by recent developments in the field of robotics, we suggest tackling this crisis by employing the use of industrial robotic arms as an intelligent fabrication platform for the production of custom architectural stone elements.

Currently, the modus operandi in robotic fabrication relies on a linear process – one in which a form is initially created using computer-aided-design software (CAD), and then the operating instructions for the robotic arm are generated using computer-aided-manufacturing software (CAM), which account for the form, the used end-effector, and the selected material (Gramazio & Kohler, 2008). However, with increasing accessibility to new technologies such as open source electronics and machine vision, alternative practices are emerging. Of these practices, we perceive two distinct approaches. The first establishes a fabrication process that is modulated by real-time feedback in order to deploy design rules, which respond to varying material properties (Dubor et al., 2016). The second is a process in which human action on a specific material is recorded, categorized, and analyzed in order to be interpreted as operative robot instructions (Bard, Blackwood, Sekhar, & Smith, 2016). Besides these, we would like to propose a third approach – one which integrates these two frameworks, and thereby envisions a practice in which a robotic arm could be "taught" to react to a specific, material scenario similarly to the way a craftsman would (Shaked & Sprecher, 2017). In order to integrate design and fabrication with real-time sensing, we devised a toolkit which allows to communicate between various sensors and the robot. While the robot is the moving platform, the sensors mediate material and environmental sensations back to the robotic arm (Shaked & Dubin, 2019).

The paper focuses on the simulation, visualization and fabrication aspects of robotic stone production. We first present the manual process of subtractive stone dressing involving multiple tools which was used to develop a robotic fabrication method. We then describe our approach to real-time robot control and machine vision feedback data. Lastly, we will present our toolpath generation logic and discuss the result stone products.

REFERENCES

1. Bard, J., Blackwood, D., Sekhar, N., & Smith, B. (2016). Reality Is Interface: Two Motion Capture Case Studies of Human–machine Collaboration in High-skill Domains. International Journal of Architectural Computing, 14(4), 398–408. https://doi.org/10.1177/1478077116670747
2. Canaan, T. (1933). The Palestinian Arab House, Its Architecture and Folklore. Syrian orphanage Press.
3. 3ubor, A., Camprodom, G., Diaz, G. B., Reinhardt, D., Saunders, R., Dunn, K., … Watt, R. (2016). Sensors and Workflow Evolutions: Developing a Framework for Instant Robotic Toolpath Revision. In D. Reinhardt, R. Saunders, & J. Burry (Eds.), Robotic Fabrication in Architecture, Art and Design 2016 (pp. 410–425). https://doi.org/10.1007/978-3-319-26378-6_33
4. Fuchs, R. (1998). The Palestinian Arab House and the Islamic "Primitive Hut." Mugarnas, 15(5), 157–177. https://doi.org/10.1163/22118993-90000413
5. Gramazio, F., & Kohler, M. (2008). Digital Materiality in Architecture. Baden: Lars Müller Publishers.
6. Shaked, T., & Dubin, U. (2019). Exercises in Style: A Transdisciplinary Discussion. In A. Sprecher & C. Ahrens (Eds.), Instabilities and Potentialities: Notes on the Nature of Knowledge in Digital Architecture. Routledge.
7. Shaked, T., & Sprecher, A. (2017). Technical Indeterminism: Toward a Sensible Architectural Tool. In The Tools of the Architect EAHN CONFERENCE, TU DELFT and HNI.

DESIGN AS A PROTECTOR

The accelerating demand for greater security with the technological ability to monitor and collect data on every aspect of one's life raises moral, social and cultural issues. At the same time, it also creates new opportunities for knowledge, ideas, and tools. Design can play a huge role in this emerging field both for good and for bad. Design can and does create tools that may benefit society by providing safety and comfort, and it helps protect values such as privacy, social awareness, and self-preservation.

D-MARS - DESIGN RESEARCH OUT OF THIS WORLD

Design in Extreme Conditions Seminar

Roee Bigger
Graduate Program Industrial Design, Bezalel Academy of Arts and Design
Jerusalem, Israel
roeebigger@gmail.com

Arch. Eldar Gantz
D-Mars
London, UK
eldargantz@gmail.com

Dr. Romi Mikulinsy
Graduate Program Industrial Design, Bezalel Academy of Arts and Design
Jerusalem, Israel
rominska@gmail.com

Arch. Alon Shikar
D-Mars
Tel Aviv, Israel
alonshikar@gmail.com

ABSTRACT

“As for me, I am tormented with an everlasting itch for things remote. I love to sail forbidden seas” (Herman Melville, Moby Dick)

New conceptual frameworks are evolving as we move towards deep space exploration; the design of stable habitats capable of sustaining life has therefore become essential. The variances between atmospheres and landscapes, the constraints of mobilizing materials, combined with conceptual and ethical challenges arising from humans’ immigration from Earth, render the design of such complex constructions a remarkable challenge (physical and theoretical).

This paper presentation overviews the challenges and outcomes of a unique design seminar dedicated to the possibility of inhabiting Mars. This initiative is a collaboration between Bezalel Academy’s Graduate Program in Industrial Design and D-MARS space analog research center, located at Ramon Crater.

This seminar’s goal was to inspire and encourage designers and inventors to advance new ideas and technologies for extra-terrestrial habitation. We focused on four challenges, each design project working not just on the individual level, but on what the collective is and may be:

•Habitat

designing a sustainable shelter for a crew of 4-6 astronauts, using a variety of construction techniques and materials from available technologies, as well as envisioning novel possibilities.

•Space Colonialism

The Anthropocene is a widely used term indicating a period where human activity has profoundly changed Earth’s atmosphere, oceans, and surface. This group’s design outcome highlights ethical concerns regarding the colonization of Mars in response to the dramatic human effects on Earth’s ecosystem.

•Ecotourism - Ecological Space Tourism

Can we limit human impact on the environment and turn space waste into new sustainable experiences?

The arrival of human colonizers to Mars can be the steppingstone and testing ground for us to develop into a space-faring, technologically advanced society like we have never seen before. These ideas incite us to re-think our attachments to the world, and our concepts of nature, culture and ecology.

REFERENCES

1. Raimond, D. H. (2016) Dwelling Beyond: Sustainable Design on Mars, Dissertation. University of Maryland.
2. Koolhaas, R. (Author, Editor), Wigley, M. (Editor), Ouman, O. (Editor), (2008) Volume: Unsolicited Architecture (v. 14), Single Issue Magazine.
3. Benaroya, H. (2018) Buidling Habitats on the Moon, Springer Praxis Books, Switzerland.

DIGITAL TABULAR CORAL

Freeform clay deposition in the service of marine biology

Ofer Berman
Design Graduate Program, Design-Tech Lab, Faculty of Architecture and Town planning, Technion, Haifa, Israel
ofer.berman@campus.technion.ac.il

Tom Shaked
Material Topology Research lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

Michael Weizmann
T_CODE, Technion's Computer Oriented Design lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

Haim Parnas
Design-Tech Lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

Nadav Shashar
Ben Gurion University, Eilat campus.
Eilat, Israel

Prof. Ezri Tarazi
Design-Tech Lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

ABSTRACT

This research investigates an approach to design and produce an artificial tabular coral by means of freeform 3D printing using natural clay. Most 3D printed artificial corals are formed by scanning natural corals and printing them with conventional layer-by-layer methods, often defined as slicing a model. Here, a new approach of parametric freeform clay deposition method is used, which exploits the design opportunities of creating new morphologies of artificial corals, influenced largely by an industrial design perspective. The system allows the designer complete control of the pattern and deposition of the material in relation to the parallel natural coral. This method of designing crafty corals requires full understanding of marine biology and direct control on the 3D machinery to achieve the desired functionality and aesthetics.

REFERENCES

1. J. T. Kerry and D. R. Bellwood, "The effect of coral morphology on shelter selection by coral reef fishes," Coral Reefs, vol. 31, no. 2, pp. 415–424, 2012.
2. J. Seaman, William, Ed., ARTIFICIAL REEF Evaluation With Application to Natural Marine Habitats, vol. II. Taylor&Francis, 2000.
3. O. Polak and N. Shashar, "Can a small artificial reef reduce diving pressure from a natural coral reef? Lessons learned from Eilat, Red Sea," Ocean Coast. Manag., vol. 55, pp. 94–100, Jan. 2012.

SOCIAL LIVING LABS

Co-Designing Public and Political Deliberation

Bianca Herlo
Berlin University of the Arts (UdK)
bianca.herlo@udk-berlin.de

Andreas Unteidig
Weizenbaum Institut/Berlin
University of the Arts (UdK)
andreas.unteidig@udk-berlin.de

ABSTRACT

This proposal reports on three practice-led design research projects, located at the intersection of participatory design, technology development and their political and social implications, conducted between 2013 and 2018 at the Berlin University of the Arts: “Community Now?” (2013-2016)1, “Participatory City” (2016-2017)2 and “Citizens Connect Neighborhoods: Social Living Labs in NRW” (2016-2018)3. The paper aims at situating the projects’ processes and outcomes in the context of the currently renewed discourse on the potential of practice-based and transdisciplinary research for shaping new social practices and civic technologies that affect democratic developments in our everyday lives (Manzini 2014).

All three cases inquired how to advance democratic practices within a local level and through small- scale spatial appropriations. The main methodological approach in these participatory design processes was the development of “socially oriented living labs” (Franz 2015). Social living labs stress the importance of considering the local context by developing a space of encounter and collaboration that is rooted in the actual life-worlds of those partaking in these processes of transdisciplinary inquiry, and by implementing a set of co-design methods and new technologies that foster negotiation processes with a special focus on countering phenomena described as the “digital divide” (UN 2018). The focus was on questions about who gets to shape and to take part in the digitalization of societal, political and cultural processes, and who determines the way we communicate or have access to information.

Through our public interventions and by implementing social living labs, we provided analog and digital tools for collective and transformative practices. The living lab became the focal point, by which a series of intensive workshops with residents were conducted, as well as public interventions, group discussions, informal and half structured interviews, meetings with different stakeholders and public presentations. These transdisciplinary processes engaged us critically in the urgent question of design’s agency within practices of collaboration and co-creation and provided us with a productive framework for the queries into the interdependence of digitalization, political participation and social cohesion, on which this paper will report.

[1]The German-Israeli cooperation (Berlin University of the Arts and Bezalel Academy Jerusalem) aimed at developing a deeper understanding of the potential of design interventions in highly diverse neighborhoods and to support civic initiatives in Jerusalem and Berlin in taking on ownership of processes in their neighborhoods and become part of political decision-making. The research was concluded with an international conference, exhibition and a series of neighborhood walks and interventions funded by the German-Israeli Future Forum Foundation (DIZF) and the Federal Agency for Civic Education (bpb): www.community-now.org 2 “Mit-Mach-Stadt Brandis” (“Participatory City”), had the goal to implement new avenues for civic engagement as well as to improve communication and exchange between the municipality and the citizens. The project was funded by the Saxon Ministry of the Interior (SMI). For further information, please see drlab.org/projects/mit-mach-stadt [last view 10.01.2019]. 3 The aim of the project was to promote an experimental landscape for active participation processes and to support neighborhoods and bottom-up initiatives in dealing with digitalization; funded by the State of North Rhine-Westphalia: www.modellproject-nrw.de

REFERENCES

1. Franz, Y. (2015): Designing social living labs in urban research. In: Living Labs: Concepts, Tools and
2. Cases. Dr Ballon, P. & Schuurman, D. (eds.)
3. Manzini, E. (2014): Making things happen: Social innovation and design. Design Issues, 30(1), pp 57-66.
4. UN Department of Economic and Social Affairs (2018): United Nations E-Government Survey 2018. Gearing E-Government to support transformation towards sustainable and resilient societies. New York, 2018.

DESIGN AS A HEALER

While designers and architects have long been an important part of shaping hospitals and medical devices, their roles in these fields have expanded to account for people's psychological and physical comfort. Additionally, the more we understand the impact of our surroundings on our well-being, the more the designers' role expands, and the opportunities they have to help build a world that places people's wellness first grow. Design is a healer of the flora and fauna, putting nature in the center and regulating the human impact on it.

ROLE OF DIGITAL CRAFTS FOR NON-VERBAL SELF-EXPRESSION IN THE INDIAN SOCIAL SPACE

Deepshikha and Pradeep Yammiyavar
Department of Design
Indian Institute of Technology, Guwahati
Assam, India. 781039.

ABSTRACT

Digital crafts have been sparsely researched in context of India which is known for its culturally diverse and lengthy textile traditions. The textile industry in India is the second largest employment provider, after agriculture. The hand-crafted textile sector in India employs 4.3 million people with total exports worth 356millionUS$ during 2017. Over the last two decades, value addition has taken place and the quality of handcrafted sector has improved through the intervention of Government, NGOs and designers, yet the handloom and handcrafted textile sector has been on a sharp decline owing to limited technological upgradation, low individual income, involvement of middlemen, time taking weather dependent processes, intensive labour, and so on. While researchers have done extensive studies in documenting craft traditions and marketers have studied the role of textiles and crafts in fashion, preferences and marketing strategies, few designers in India have merged textiles and crafts with the ongoing wearables trend. Present research attempts to address certain gaps that exist between crafts, fashion, technology and scientific design research in India. The research cares for textile craft communities in India by demonstrating example of integrating minimal technology as part of their traditional skills to design a niche range of e-textile crafts. The paper reports a comparative study between static and dynamic crafts and their role in non-verbal self-expression in the social space of 124 young college going students. Quantitative analysis of the results indicate that digital crafts are capable of enabling users for expressing their emotions and feelings than static crafts. The response yields a positive attitude of users towards digital crafts and their likability to use it in near future. The research encourages researchers in domains of wearable technology, fashion, design and automation to draw inspirations from varied textile traditions and create technologically advanced and culturally rich interfaces that could become a unique part of the wearable trend for context specific applications.

INTRODUCTION

The textile industry in India is the second largest employment provider, after agriculture, with 51 million people involved directly and 68 million involved indirectly [1]. The apparel and textile sector contributes 15% to the country's total export earnings, 14% to industrial production in India and 4% to the Gross Domestic Product [1]. The handloom and hand-crafted textile sector in India employs 4.3 million people with total exports worth 356million US$ during 2017 [2]. Although value addition has taken place and the quality of handcrafted sector has improved through the intervention of Government, NGOs and designers, the handloom and handcrafted textile sector has been on a sharp decline over the decades owing to limited technological upgradation, low individual income, time taking processes, hard labor, shifting of skilled labors to other occupations, dependency on weather, and so on [3]. Thus, the rich hierarchical craft traditions of India which showcase the cultural diversity have suffered a major setback with globalization, industrialization and technological advancements.

Pertaining to handicraft sector, designers and researchers have conducted and published several ethnographic and subjective studies at much detail [4-8]. Pertaining to fashion and textiles, designers have merged contemporary fashion with ethnic traditions for multitude of textile products for both the Indian and global markets [9-10]. While marketers have studied the role of textiles and crafts in fashion, buying preferences and selling and marketing strategies [11-13], few designers and multinationals in India have merged textiles and crafts with the ongoing wearables trend [14-15]. For example, led based, electronic, smart or intelligent textile crafts have been explored limitedly with respect to the wide

wide variety of Indian textile traditions, indigenous and contemporary fashion. Globally researchers have studied role of textiles and clothing in personality, preferences, emotions, behavior, health, wearables, etc. at much detail [16-22], which is sparse with respect to traditional textiles of India. Role of designers and researchers in India, hence, could be beneficial in this regard.

Thus, present research attempts to address certain gaps that exist between crafts, fashion, technology and scientific design research in India. Researchers have thus designed two handcrafted textile products, traditional jacket or bundi (Figure 3-5), which is worn by both men and women as part of traditional and modern clothing. The jacket has been embroidered with running stitches, a contemporary version of the traditional crafts of embroidering. One of the two same jackets have LED strip attached to the inner side which can change 8 colors using a wireless remote control. The jacket being a handcrafted LED textile, is being referred to as a digital/dynamic craft while the other jacket with no LEDs is being termed as static craft/jacket. Authors have experimented with 124 young college going students, the possibilities of digital crafts expressing emotions and feelings of respondents in their social space in a given scenario, which will be reported further.

The present research cares for textile craft communities in India by demonstrating example of integrating minimal technology as part of their traditional skills to design a niche range of e-textile crafts. The authors cater to the fashion and textile designers in India who could design unique digital crafts for both Indian and global markets as a niche segment of their collections or product portfolios. The research encourages researchers in domains of wearable technology, fashion, design and automation in India to draw inspirations from varied textile traditions and create technologically advanced and culturally rich interfaces that could become a unique part of the wearable trend for context specific applications.

The objective of the paper is to report a comparative experimentation between static and dynamic craft and their role in non-verbal self-expression in the social space of the users. Likability of the users for using dynamic crafts for non-verbal expression has also been indicated. The two hypotheses that the authors test and verify through experimentation in this paper, are: (i) Digital textiles enable users to significantly express emotions in their social space than static textiles; and, (ii) Digital textiles enable users to significantly express feelings in their social space than static textiles. The paper also presents few design explorations of digital crafts inspired from traditional textiles of India as implications of the research conducted for further studies.

EXPERIMENT DESIGN

The objective is to collect response of young Indian students to a traditional bundi/jacket capable of changing visual cues/colors by a remote control. The visual cues enable wearer to express meanings – emotions, feelings to people around in certain contexts allowing non-verbal communication in situations where words need not be used to express one-self subtly. This capability of textile wearables for non-verbal self-expression is being captured by the experiment being conducted. The study was conducted with 124 graduate and postgraduate students studying a national institution for fashion design, accessory design and fashion management studies, located in the North-East of India. 60% of them belonged to semi-urban background, 40% belonged to urban background. 80% of them were more experimental about fashion and new products. A static jacket (without LEDs) and a LED tee shirt with verbal messaging was also used for comparison with LED jacket. College going students between 18-28 years were considered for the study as 75% of Indian population is under 35 years and is more trendy, has the capacity to spend on new products and provides a general overview of the young population of India [23].

12 Emotions (6 positive – Happiness, Optimism, Awesome, Interesting, Admirable and Surprised; 6 negative emotions – Sadness, Pessimism, Boring, Annoying, Disgusting and Angry [24]) were rated on a 5-point Likert scale for both the static and the dynamic jacket with LEDs with respect to the 8 colors (Red, Green, Blue, Teal, Purple, Orange, Yellow and White). 7 feelings had to be rated on a 5-point semantic differential scale (Disagree-Agree) with respect to the static and the 8 colors of the dynamic jacket (Figure 1). Questionnaire comprises five parts: (i) 12 Emotions (6 positive - Happiness, Optimism, Awesome, Interesting, Admirable, Surprised; and 6 negative - Sad, Pessimistic, Boring, Annoying, Disgusting, Angry; from Plutchik's Wheel of Emotion) evoked by static jacket and feelings expressed by static jacket rated on a five point Likert scale (1=very low, 5=very high); (ii) The 12 Emotions evoked by the 8 colors (Red, Blue, Green, Teal, Purple, Orange, Yellow, White) in the respondents, five point Likert scale (1=very low, 5=very high); (iii) Feelings expressed by the model in the cafeteria pictures in 8 different colors as understood by the respondents during photo elicitation [25], rated on a five point Likert scale (1=very low, 5=very high); (iv) Feelings respondents would have expressed had they been in place of the model at the cafeteria, five point semantic differential scale (1=disagree, 5=agree); (v) Descriptive section for comments, suggestions, etc. and one binary question of choosing one of the two as the preferred method for self-expression in certain social spaces and contexts – verbal or non-verbal.

The list of 7 Feelings have been derived on the basis of earlier experiments conducted by the authors about user behavior in social space - comfortability and feelings experienced in different social contexts [26]. It was revealed though exploratory studies that young Indian users experience different feelings in different social contexts, and the possibility of subtle expression, only when required though textiles could be innovative.

Emotions	1 Very low	2 Low	3 Neutral	4 High	5 Very High
Happy					
Optimistic					
Awesome					
Interesting					
Admirable					
Sad					
Pessimistic					
Boring					
Annoying					
Disgusting					
Angry					
Surprised					

Feelings	1 Disagree	2 Slightly Disagree	3 Neutral	4 Slightly agree	5 Agree
I am relaxed					
Leave me alone					
I am waiting for friends to join					
I am thinking deeply					
I'm ok to chat with anyone					
I am angry					
I am in a good mood today					

Figure 1: Matrices for rating Emotions and Feelings with respect to static and 8 colors of dynamic jacket

The experiment was carried out in an enclosed space where respondents were seated in batches of 20-30 at a time (Figure 2). The tools used were – a static jacket (Figure 3-5), dynamic jacket with LEDs attached to it inside that could change colors with a wireless remote control (Figure 6-7), a LED tee shirt which could display verbal messages when typed on phone (Figure 8), and a questionnaire to mark responses.

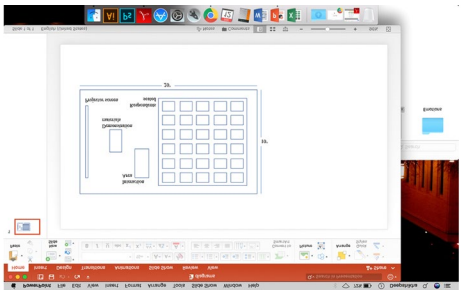


Figure 2: Experimental Set-up

Figure 3: Static jacket; Figure 4: Close-up hand embroidery on the top surface of the jacket; Figure 5: Model wearing static jacket at a cafeteria

Figure 6: Dynamic jacket – 8 colors shown sequentially

Figure 8: Participants wearing LED tee shirt with verbal messages

A small brief was presented on a projector screen with the background of research, state of the art in the field of LED textiles, objectives and overall methodology of the experiment. Following this the static jacket (Figure 3,5) was given to them to be worn and then mark their response in the questionnaire provided pertaining to 12 emotions evoked in them upon wearing or viewing the jacket and if the jacket conveyed the 7 listed feelings. Further the LED jacket was first demonstrated (Figure 6) and given to the participants to wear and interact for 5-10 minutes each. The respondents then marked their response for Emotions evoked in them according to the eight different colors/visual cues of the LED jacket. Feelings had to be first marked in response to the model seated in a group at a cafeteria. This was a photo-elicitation part where the model has neutral expression on face while expressing herself only through the colors of the LED jacket. The respondents rated feelings expressed by the model as perceived by them in a series of photographs shown to them (Figure 6) for 8 different colors. In the next part, respondents had to imagine themselves seated in place of the model at the cafeteria, and rate which colors could express the feelings listed in the questionnaire. The LED tee shirt that displayed verbal messages was demonstrated next. The respondents marked their preference for either non-verbal expression or verbal expression through the LED tee shirt (Figure 8) as demonstrated. This question aims to understand whether respondents would prefer non-verbal expression of emotions and feeling in certain contexts, such as using visual cues of textiles subtly or verbal expression, such as saying it or typing it on their tee shirt with the example of an LED tee shirt recently launched in India for verbal messaging [27]. Further they noted their views, opinions, suggestions, etc. in the descriptive section. Figure 9-10 depict participants of the Experimental study.

Figure 9: Participants of the Experimental Study; Figure 10: Participants interacting with the LED jacket

FINDINGS OF THE EXPERIMENT CONDUCTED

Analysis was carried out on IBM SPSS. Normality tests Kolmogrov-Smirnov and Shapiro-Wilk were significant, the data was non-parametric. Descriptive statistics were used to represent color representations of emotions and feelings and preference of users for verbal or non-verbal expression. Friedmans' ANOVA for 12 emotions for Static jacket and average of 8 colors as dynamic jacket were significant (Table 1). So, Post-hoc analysis Wilcoxon Signed Ranks Test was conducted for ratings of static jacket with each of the eight colors – Red, Green, Blue, Teal, Purple, Orange, Yellow and White (Table 2). Significant result was obtained for emotions evoked by the visual cues of the jacket with respect to the static jacket. Table 5.14 and 5.15 with p=0.00 for values of emotions evoked for static with the dynamic jacket confirms the first hypothesis. Null hypothesis is rejected. The Cronbach's Alpha for Reliability was 0.798.

$H1_a$ - Digital textiles enable users to significantly express emotions in their social space than static textiles.

$H1_0$ - There is no significant difference between evoked by the static and dynamic textiles in the social space of users

Table 1: Friedman's ANOVA for static with average of dynamic responses

Test Statistics[a]	
N	1500
Chi-Square	31.557
df	8
Asymp. Sig.	.000
a. Friedman Test	

Table 2: Post-hoc analysis for emotions evoked by static jacket with 8 colors of dynamic jacket

Test Statistics[a]								
	Red - Emo Stat	**Green - Emo Stat**	**Blue - Emo Stat**	**Teal - Emo Stat**	**Purple - Emo Stat**	**Orange - Emo Stat**	**Yellow - Emo Stat**	**White - Emo Stat**
Z	-3.647[b]	-3.221[b]	-4.087[b]	-4.299[b]	-3.775[b]	-5.963[b]	-6.134[b]	-4.530[b]
Asymp. Sig. (2-tailed)	.000	.001	.000	.000	.000	.000	.000	.000
a. Wilcoxon Signed Ranks Test; b. Based on negative ranks.								

According to descriptive mean table, Positive emotions were evoked higher than the negative emotions for both static and dynamic jacket similarly (Table 3). According to mean values of colors with respect to 12 emotions, following are the three most preferred or most-representative emotions (Table 4). Negative emotions have been least preferred. The mean values are only above average for first preference, in the range of 3.22-3.8 (Table 4). According to Table 4, the Static jacket being white represents Optimism, Admirability and arouses Interest among participants. The Red color of dynamic jacket represents Anger, Annoyance and Surprise; Green represents Interest, Optimism and Happiness; Blue and Purple represent Awesomeness, Interest and Happiness; Orange represents Happiness, Interest and Optimism, Yellow represents Happiness, Optimism and Awesomeness; while, White represents Optimism, Admiration and Happiness. An evaluation of Table 4 also re-confirms strong associations of the colors with positive connotations and emotional expression. Such color connotations could come useful in designing a vocabulary for non-verbal expression using visual cues, such as colors that could mean or represent the same meanings to a culturally distinct population.

Table 3: Mean values of emotions evoked with respect to static and 8 colors of dynamic jackets

Emotion	**Static**	**Red**	**Green**	**Blue**	**Teal**	**Purple**	**Orange**	**Yellow**	**White**
Happiness	2.92	2.18	3.09	3.47	3.54	3.27	3.48	3.77	3.40
Optimism	3.38	2.23	3.21	3.31	3.38	3.18	3.27	3.67	3.63
Awesome	2.80	2.51	3.08	3.68	3.55	3.40	3.23	3.64	3.29
Interesting	3.08	2.78	3.23	3.62	3.61	3.42	3.38	3.55	3.22
Admirable	3.09	2.56	2.93	3.45	3.53	3.37	3.09	3.36	3.47
Sad	2.09	2.05	1.94	2.09	1.90	1.93	1.87	1.76	2.37
Pessimistic	2.15	2.68	2.26	2.20	2.00	2.11	2.06	1.88	2.05
Boring	2.48	2.09	2.10	1.82	1.81	1.93	2.06	2.00	2.25
Annoying	1.85	3.06	2.15	1.69	1.84	2.02	2.31	1.97	1.86
Disgusting	1.63	2.57	2.30	1.58	1.82	1.97	2.15	1.93	1.67
Angry	1.54	3.89	1.82	1.52	1.54	1.79	2.15	1.93	1.67
Surprised	2.37	2.91	2.86	2.86	2.95	2.93	3.26	3.17	2.59

Table 4: Most preferred three representations of colors with emotions (mean value in brackets)

Color	Emotion 1	Emotion 2	Emotion 3
Static	Optimism (3.38)	Admirable (3.09)	Interesting (3.08)
Red	Angry (3.8)	Annoying (3.06)	Surprised (2.9)
Green	Interesting (3.22)	Optimism (3.2)	Happiness (3.09)
Blue	Awesome (3.7)	Interesting (3.6)	Happiness (3.47)
Teal	Interesting (3.6)	Awesome (3.55)	Happiness (3.54)
Purple	Interesting (3.41)	Awesome (3.40)	Happiness (3.27)
Orange	Happiness (3.48)	Interesting (3.37)	Optimism (3.27)
Yellow	Happiness (3.77)	Optimism (3.66)	Awesome (3.63)
White	Optimism (3.62)	Admirable (3.46)	Happiness (3.4)

Friedman's ANOVA for ratings for the 7 feelings of static jacket with mean values of Feelings as being expressed by the model in the photograph and Feelings as the users would express in the same setting were carried out, which yielded significant results (Table 5,7). Post Hoc analysis (Wilcoxon Signed Ranks Test) for 7 feelings represented by static jacket with the 8 colors of dynamic jacket during photo elicitation (Table 6), depicts significant results for Red, Blue and White at $p<0.05$ and significant for Teal at $p<0.10$. 7 feelings represented by static jacket with the 8 colors of dynamic jacket as the participants would represent if they were in the same scenario as that of the cafeteria (Table 8), depicts significant results for Red, Blue, White and Yellow at $p<0.05$ and Teal at $p<0.10$. The results collectively prove that users felt that visual cues or colors of a dynamic jacket could possibly be used to represent feelings if required, in a given social context than a static jacket. The null hypothesis is rejected. The Cronbach's Alpha for Reliability was 0.727.

$H2_a$ – Digital textiles enable users to significantly express feelings in their social space than static textiles

$H2_0$ – There is no significant difference between feelings expressed by static and dynamic textiles

Table 5 (left): Friedman's ANOVA Feelings Expressed by static jacket and the model in the photograph as rated by respondents during photo elicitation; and, Table 7 (right): Friedman's ANOVA Feelings Expressed by static jacket and what the users would represent if in the same scenario

Test Statistics[a]	
N	875
Chi-Square	119.698
df	8
Asymp. Sig.	.000
a. Friedman Test	

Test Statistics[a]	
N	874
Chi-Square	122.865
df	8
Asymp. Sig.	.000
a. Friedman Test	

Table 6: Post hoc analysis - Feelings Expressed by static jacket and the model in the photograph as rated by respondents during photo elicitation

Test Statistics[a]								
	Red1 - Static	Green1 - Static	Blue1 - Static	Teal1 - Static	Purple1 - Static	Orange1 - Static	Yellow1 - Static	White1 - Static
Z	-3.066[b]	-.582[c]	-3.334[c]	-1.582[c]	-.977[b]	-.139[b]	-.590[c]	-5.363[c]
Asymp. Sig. (2-tailed)	.002	.561	.001	.114	.329	.890	.555	.000
a. Wilcoxon Signed Ranks Test; b. Based on positive ranks; c. Based on negative ranks.								

Table 8: Post hoc analysis for Feelings Expressed by static jacket and what the users would represent if in the same scenario

Test Statistics[a]								
	Red1 - Static	**Green1 - Static**	**Blue1 - Static**	**Teal1 - Static**	**Purple1 - Static**	**Orange1 - Static**	**Yellow1 - Static**	**White1 - Static**
Z	-2.804[b]	-.1273[c]	-4.508[c]	-1.521[c]	-.964[c]	-.529[c]	-.1886[c]	-4.990[c]
Asymp. Sig. (2-tailed)	.005	.203	.000	.128	.335	.597	.059	.000
a. Wilcoxon Signed Ranks Test; b. Based on positive ranks; c. Based on negative ranks.								

According to mean values of colors with respect to the 7 feelings, following are the three most preferred or most-representative colors for the 7 feelings during photo elicitation. The mean values are only above average for first preference, in the range of 4.3-2.59 (Table 9). According to table 9, the static jacket evokes and represents feelings of Relaxation, being in good mood and deep thought; color Red of the dynamic jacket represents strong messages of Anger and Leave me alone; Green, Blue, Teal, Orange, Yellow and White represent Relaxation and being in a good mood.

Table 9: Representing feelings through colors as observed by the respondents for the model in the cafeteria depicted in the picture series – three most preferred response (Mean values in brackets)

Color	Feeling 1	Feeling 2	Feeling 3
Static	I am relaxed (3.83)	I am in a good mood (3.57)	I am thinking deeply (3.32)
Red	I am angry (4.3)	Leave me alone (3.9)	I am thinking deeply (2.59)
Green	I am okay to chat (3.4)	I am in a good mood (3.38)	I am waiting (3.26)
Blue	I am relaxed (3.8)	I am in a good mood (3.65)	I am waiting (3.42)
Teal	I am relaxed (3.82)	I am in a good mood (3.43)	I am ok to chat (3.42)
Purple	I am waiting (3.24)	I am okay to chat (3.12)	I am in a good mood (3.08)
Orange	I am in a good mood (3.15)	I am okay to chat (3.07)	I am waiting (3.04)
Yellow	I am in a good mood (3.57)	I am relaxed (3.34)	I am okay to chat (3.33)
White	I am relaxed (4.19)	I am in a good mood (3.83)	I am thinking deeply (3.59)

When asked to opt for a method of expression of emotions and feelings between verbal and non-verbal – 34% opted for verbal expression, 34% opted for non-verbal expression, 16% provided a mixed response in descriptive section and 16% did not say anything (Figure 11). An example of verbal expression was the LED message tee and for non-verbal expression was the LED jacket that could convey meanings through visual cues. Most participants were however, positive about non-verbal expression with textiles in near future. In the descriptive section, participants mentioned that they appreciated the idea of non-verbal expression when need through visual cues, it was innovative, interesting and amazing for them, the concept of LED jacket and tees could come useful for performances, for assisted living, for education, etc. They suggested that if the LEDs were individually embroidered like the pearls, that would improve the aesthetic look and feel of the jacket. They had concerns about wash-ability, battery power, product longevity, environment friendliness, harmful effects on body and reuse.

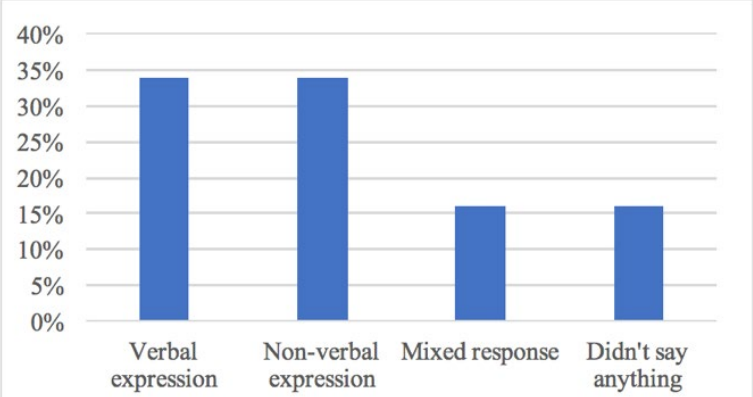


Figure 11: Preference for verbal or non-verbal expression by respondents

IMPLICATIONS IN DESIGNING DIGITAL CRAFTS INSPIRED FROM TRADITIONAL TEXTILES OF INDIA

Based on varied traditional textiles of India, design exploration for LED based digital crafts has been carried out by the authors as depicted Figures 12-15. Zardozi is a craft embroidery done in hand with precious and semi-precious metals, stones, sequins, etc. for expensive to semi-expensive textiles which usually form a part of bridal trousseau (Figure 12). Based on Zardozi, petal shaped embellishments were stitched in floral arrangements and micro RGB LEDs were embedded in the center (Figure 12). Kantha is another kind of running stitch embroidery from West Bengal, India which comprises primitive geometric representations of flora, fauna and mythological figures (Figure 13). Based on Kantha embroidery, running stitch floral designs were embroidered and 27 LEDs were embedded to replace floral elements in 9 rows and three different colors (Figure 13). Madhubani Painting is another hierarchical craft tradition of India with primitive geometric designs, originally done on mud painted wall exteriors of houses (Figure 14). Contemporarily they are done on textile and interior artefacts. Based on traditional styles a painted design was made with commonly used lotus motif and 3 rows of 5 LEDs each were embedded on the top surface (Figure 14). All connections were made with conductive thread at the back side of the fabrics connected with 3.2V Lipoly batteries and three buttons to control the colors of LEDs.

The fourth example (Figure 15) is from block printed textiles of India traditionally carried out in the Western states. Originally natural colors were used but contemporarily synthetic dyes are being used widely apart from expensive organic dyes. The sample has been painted with thermo-chromic paint on fabric which appear and disappear on heat application (Figure 15). The sample resembles block printed textiles of India and can be easily prepared by local artisans. The connections have been made at the back of the fabric with conductive thread connected to a voltage supply for prototyping. These explorations demonstrate the potential of incorporating wearable electronics in traditional textile interfaces seamlessly to be integrated as part of ethnic design elements or patterns. Such digital artefacts can find varied applications in clothing, interior textiles, performances, installations, art, etc. interestingly for context specific applications or aesthetic sensibilities.

Figure 12 [Top]: Zardozi embroidery of India and LED embedded zardozi digital craft [28]

Figure 13 [Middle}: Kantha embroidery of India and LED embedded Kantha digital craft [28]

Figure 14 [Bottom}: Madhubani painting of India and LED embedded Madhubani digital craft [28]

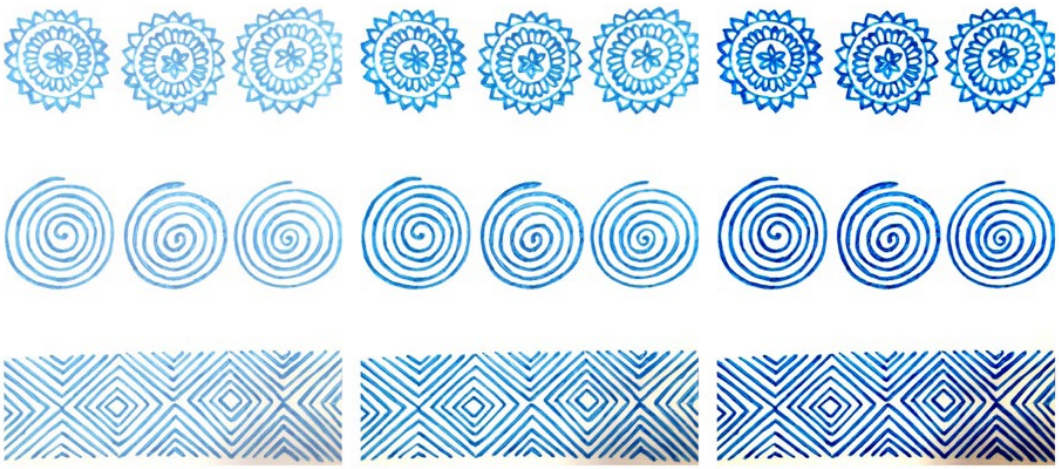


Figure 15: Thermo-chromic paint sample with diminishing paint on heat application

CONCLUSION

Textile wearables and digital textiles have been explored or introduced limitedly in India. Cognitive and scientific studies by designers have been conducted less with respect to varied textile crafts of the country that are diminishing gradually. Most studies are in-depth ethnographies and theoretical documentation conducted with reachability to subjective audiences. The attempt is to introduce Indian digital crafts to HCI, cognitive design and technological fields keeping in line with the trends of HCI and role of textiles as wearables in near future in India. Digital crafts could have interesting applications for smart living, assisted living, therapy, health, child education, etc. Non-verbal expression could also find suitable applications in the daily life of users. For example, since India is quite populated and commuting by metro or bus gets very crowded, this results in negligible distances between people. If comfort levels could be addressed by commuters, when needed, could itself be a minor yet sensitive approach towards a comfortable journey. However, due to the excessive crowded Indian spaces, participants of the experiment also mentioned, that even expressing oneself with visual cues may not help during rush hour. But the concept of expressing comfort levels or boundaries could be applied to other contexts such as cafeteria, railway station, train journeys, college, etc. and needs to be tested for user evaluation in actual scenarios. Larger sample size, different user categories need to be experimented with for better insights and accurate results, especially in case of a diverse and culturally distinct population as that of India. The present research encourages designers and researchers to design unique digital crafts to seamlessly merge crafts, fashion, textile and technology for context specific applications that could benefit craft sector and generate niche product segment for textile brands

REFERENCES

1. Solanki, D.P. (2017). A role of textile industry in Indian economy. National Journal of Advanced Research, 3(3), pp. 60-65
2. IBEF (2018). Handloom sector in India – India Brand Equity Foundation. [online] Available at: https://www.ibef.org/exports/handloom-industry-india.aspx [Accessed 12 Jun. 2018].
3. Ministry of Textiles. (2015). Note on handloom sector. Office of the Development Commissioner (Handlooms), Ministry of Textiles, Government of India. [online] Available at: http://handlooms.nic.in/writereaddata/2486.pdf [Accessed 24 Dec. 2018].
4. Ambalal, A. (1987). Krishna as Srinathji. Ahmedabad, Gujarat: Mapin.
5. Bhatnagar, P. (2004). Traditional Indian Costumes and Textiles. Delhi: Abhishek Publications.
6. Bhatnagar, P. (2005). Decorative Design History in Indian Textiles & Costumes. Delhi: Abhishek Publications.
7. Chishti, R. K. (2010). Saris of India: Tradition and Beyond. Delhi, Delhi: Roli Books.
8. Veenu, Katare, C. and Sharma, R.B. (2016). Symbolic motifs in traditional Indian textiles and embroideries. International Journal of Research in Economics and Social Sciences, 6(3), pp. 311-321.
9. Strandofsilk. (2015). The rise of young contemporary Indian fashion designers. [online] Available at: https://strandofsilk.com/indian-fashion-blog/stylish-thoughts/rise-young-contemporary-indian-fashion-designers [Accessed 09 Jan. 2019].
10. Khanna, J. M. (2015). Make in India: 50 fashion brands we love Cool, contemporary fashion using traditional techniques and materials. [online] Available at: https://www.cntraveller.in/story/make-in-india-50-fashion-brands-we-love/#s-custparzor-crafts [Accessed 09 Jan. 2019].
11. ETBrandEquity. (2018). India's online fashion market to grow 3.5x from $4 billion to $14 billion by 2020. [online] Available at: https://brandequity.economictimes.indiatimes.com/news/business-of-brands/indias-online-fashion-market-to-grow-3-5x-from-4-billion-to-14-billion-by-2020/63313245 [Accessed 09 Jan. 2019].
12. Tellefsen, R. (n.d.). Fashion marketing merges psychology and style. [online] Available at: https://www.fibre2fashion.com/industry-article/2741/fashion-marketing?page=1 [Accessed 09 Jan. 2019].
13. Pani, A. and Sharma, M. (2012). Emerging Trends in Fashion Marketing: A Case Study of Apparel Retailing in India. International Journal of Business and Management Tomorrow, 2(10).
14. Singhania, D. (2017). Presenting intelligent fashion: IBM's Watson and Vogue unveil the world's first AI-inspired saree. [online] Available at: from <https://yourstory.com/2017/10/ibm-watson-voguefirst- aisaree/> [Accessed 27 Jun. 2018].
15. Pankaj and Nidhi. (2012). Geometrica Spring-Summer 2012. [online] Available at: http://www.pankajnidhi.com/ss12-Geometrica.html [Accessed 27 Jun. 2018].
16. Quinn, B. (2010). Textile Futures: Fashion, Design and Technology. NY, USA: Berg, Oxford.
17. Hartman, K. (2014). Make: Wearable Electronics: Design, Prototype, and Wear your own interactive garments. CA, USA: MakerMedia Inc.
18. Schneiderman, D. and Winton, A.G. (2016). Textile Technology and Design: From Interior Space to Outer Space. London, UK: Bloomsbury.
19. Bye, E. (2010). A direction for Clothing and Textile Design Research. Clothing and Textile Research Journal, 28(3), pp. 205-217.
20. Nimkulrat, N. (2012). Hands-on intellect: Integrating craft practice into design research. International Journal of Design, 6(3), pp. 1-14.
21. Dolan, A. and Holloway, S. (2016) Emotional Textiles-An Introduction. TEXTILE, 14(2), pp. 152-159
22. Moody, W., Kinderman, P., Shinha, P. and Sook, Y. K. (2009). An exploratory study: Relationships between trying on clothing, mood, emotion, personality and clothing preference. Journal of Fashion Marketing and Management: An International Journal, 14(1), pp. 161 – 179.
23. Warc.com. (2012). Brands target Indian Youth. [online] Available at: https://www.warc.com/NewsAndOpinion/News/Brands_target_Indian_youth/30373 [Accessed 27 Jun. 2018].
24. Plutchik, R. (2001). The Nature of Emotions: Human emotions have deep evolutionary roots, a fact that may explain their complexity and provide tools for clinical practice. American Scientist, 89(4), pp. 344-350.
25. Richard, V. R. and Lahman, M. K. E. (2015). Photo-elicitation: reflexivity on method, analysis, and graphic portraits. International Journal of Research & Method in Education, 38(1), pp. 3-22.
26. Yammiyavar P. and Deepshikha. (2018). Exploring Potential of Traditionally Crafted Textiles to Transform into e- Wearables for Use in Socio-cultural Space. Human Work Interaction Design- Designing Engaging Automation. HWID 2018. IFIP Advances in Information and Communication Technology, vol 544. Springer, Cham.
27. Broadcastwear. (2017). Sygnal Message T-Shirt. [online] Available at: https://www.youtube.com/watch?v=kUNdMXzBNOY [Accessed 27 Nov. 2018].
28. Deepshikha and Yammiyavar P. (2018). Title. In: ACM SIGCHI International Conference on Interactive Surfaces and Spaces, 2018. Tokyo, Japan. NY, USA: ACM.

BLADESHIELD 101

Novel IDF Prehospital Digital Wearable Combat Casualty System

Ariel Hirschhorn
D.M.D
IDF Medical Corps

Prof. Ezri Tarazi
Design-Tech Lab,
Technion

Yonathan Ben Haim
Design-Tech Lab,
Technion

Ofer Berman
Design-Tech Lab,
Technion

Dimitry Stravets
Design-Tech Lab,
Technion

ABSTRACT

Combat casualty care is conducted under the harshest conditions by several echelons of care. This is the reason why approximately 90% of combat-related deaths, occur prior to a casualty reaching a medical treatment facility, and that as much as 24% of deaths on the battlefield are categorized as "potentially survivable". At the point of injury, the medical care provider must simultaneously address four consecutive efforts, usually risking his own life in the process:

1.Triage and priorities treatment.

2.Administer critical care to the casualties.

3.Call for help - arrange evacuation of the wounded to the next echelon of care.

4.Monitor vital signs and document the treatment given.

During the tactical field care phase, a TCCC (tactical combat casualty care) Card is completed by the medical or nonmedical first responder and attached to the casualty, prior to transport to the following echelon of care. This provides critical treatment information to personnel providing care during transport, and to the medical team receiving the casualty at the hospital.

In a recent study, conducted in US military only 7% of military casualties which qualified for TCCC card reporting, had a TCCC card. A similar study conducted in the IDF found that TCCC card reporting rate, during operation protective edge, was as low as 11%. Documentation is conceived by the care providers, as a time-consuming procedure which defers his or her attention from the main lifesaving efforts. Hence; the care provider will usually focus on combat care & evacuation. The consequences of lack of documentation will be evident only at the following echelon of care.

BladeShield 101 is an eco-system, which harnesses emerging technologies - Internet of Things (IoT), Near-field Communication (NFC) and cloud-based data, including an android based mobile device and a smart, automated, wearable wrist-watch-like intermediary developed for combat theatre automated digital casualty card file creation. This eco system functions as a decision support tool, aimed to assist the medical care provider, in making the right real-time treatment decision. This revolutionary system is comprised of 3 consecutive layers:

1.Capture of data - BladeShield 101 which is placed on the casualty by the medic, captures crucial data (vital signs from sensors placed on the casualty & treatment given) in real-time.

2.Creation of valuable real time knowledge - data display on a tactical android application used by the senior medic, enables evidence-based treatment prioritization and automatic combat casualty card creation.

3.Decision support tool - knowledge created at real-time, is readily available to the physician augmenting his ability to make the right clinical decision at the combat theatre.

The system was field tested by warfighter medical staffs. Improvement of up to 40% in real time data capture at the combat theatre, in comparison to the TCCC card used was noted. The BladeShield 101 device is flexible, lightweight, inexpensive, fast and intuitive to operate; thus, it was easy to implement in the harsh combat theater Comprehensive digital information including location of the event, nature, severity of the injury and evacuation sequence was recorded. Any instructions or special emphases by the treating medical officer or support staff were added to the system by using the application attached or verbally. Use of the BladeShield 101 eco-system, provides an efficient mean for data transfer and mining. Data are readily available to following echelon of care, central medical command and receiving hospital at the same time. This revolutionary system will, improve information capture and transfer. This will reduce morbidity and mortality. Hence, improve overall survivability in the combat theatre.

FORM FOLLOWS FUNCTION: RE-THINKING THE DESIGN OF REHABILITATIVE DEVICES

Process and outcome of a doctoral research in design sciences

Francesca Toso
Department of Project Cultures, Univeristà Iuav di Venezia, Italy
f.toso.phd@gmail.com

ABSTRACT

The present paper addresses the need to increase the interdisciplinary cooperation between the professionals developing systems for sensorimotor rehabilitation after stroke through a case-study analysed for a doctoral research in product design.

The research starts from a literature review through which the researcher has focused on the early treatment of patients hospitalized after stroke: a first analysis of the patient condition has been conducted through desk research, to be then verified with an ethnographic on-field observation in the Stroke Unit of the local hospital. The observation has driven to a series of interactions and interviews with the operators of the SU, allowing the creation of a Patient Journey Map and the collection of five areas for which a design intervention is desirable. An analysis of the state of art of rehabilitative robotic devices and a comparative analysis of five products in commerce has driven to the identification of a lack of devices that can be used by bedridden patients, making it difficult to regain the balance and the sense of confidence in standing position.

The analysis of the state of art of rehabilitation techniques has allowed to start a phase of research through design, driving the development of a sensorimotor system tailored on bedridden patients in public healthcare facilities.

Despite the conclusion of the doctoral research, it is believed that the involvement of designers addressing HF from early stages of development of rehabilitative technologies can improve the outcome of rehabilitation.

INTRODUCTION

The consequences of stroke vary based on the area of the brain that is affected, and for each backwash a specific treatment is required. The result is that the need of customized therapies often drives to efficacy studies conducted on single cases or intra-subject analysis, being therefore considered as experimental (Vallar & Papagno, 2007). Nevertheless, the recovery can be total, and it is supported through rehabilitative therapies: the aim of rehabilitation is to induce a faster recovery than the one the patient can reach spontaneously, but it requires the patient involvement, dedication, external support and appropriate devices. It is in the design of these devices that an interdisciplinary contribution is compulsory.

For the doctoral research presented in the paper, the focus has been given on the involvement dynamics driven through gamification (Toso, 2017) to elaborate a concept for a system of devices that addressed the sensorimotor rehabilitation of lower limbs (Toso, 2018). The intervention is directed to a specific moment and condition of the recovery after stroke, when the patient is bedridden due to the early stage of the recovery or to physiological reasons connected to the typology of stroke occurred.

However, the design of the system has been a chance to investigate how the contribution of industrial design since early stages of medical product development can bring interdisciplinary research as ground of the process, revealing into user-centered systems of products that integrates human factors and usability principles.

The present paper introduces the process that has driven to the identification of the case study and to its development, paying specific attention to the impact of the users and the context on the brief and, therefore, the requirements for the final design.

METHODOLOGY

The research has been structured in three main phases, represented in Table 1, mixing research approaches with the aim to define an advanced overview on the state of art and the problems affecting the existing devices, above all related to the experience of interaction with these by real users.

The initial steps have been mainly oriented to understand the state of art of rehabilitation after stroke, clarifying the goal of the research through the use of instruments from the Design Research Methodology (Blessing & Chakrabarti, 2009) to identify the research questions and a checklist of needs to deal with in the system development. A further analysis has been conducted on the scientific literature addressing trends both from a technological point of view (Belda-Lois et al., 2011) and a cognitive approach (Gaggioli, 2009). A comparison of the taxonomy of commercial products for the rehabilitation of lower limbs has shown a lack of systems addressing patients in lying position and an on-field observation of the Stroke Unit (SU) of a local public hospital has driven to a series of interactions and interviews with the operators of the SU, allowing the creation of a Patient Journey and the identification of four areas for which a design intervention is appropriate and desirable. The Patient Journey will be discussed in detail in the following section.

Table 1 – Structure of the research

Preliminary research				
1st Literature study	Research clarification	2nd literature study	On-field observation	Problem identification
Topic identification State of art of rehab	Research questions ARC Diagram Checklist	Benchmark analysis State of art of technologies	Patient Journey	

Design Process				
Brief	Concept	Sketching	Mock-up	Engineering
	Validation	UX Test		

Production			
Engineering	Prototyping	Stakeholders Identification	Production
Clinical testing			

The subsequent steps have focused on the definition of the system objectives, on the technologies of reference and on the expected impact into the rehabilitative process. The users and their interaction with the different elements have been singularly analyzed through the development of physical and digital mock-ups, submitted to the attention of the SU operators to identify strengths and weaknesses for the proposed solutions.

The final steps have been covered only on a theoretical level, with the description of the procedure to be followed for a product development oriented to the market, therefore comprehensive of clinical testing, certification of appliances for international regulations for medical devices, identification of stakeholders and production. This last section has been introduced as a possible development and implementation of the case study.

A parallel reflection concerning the relation between technologies and the human brain has been conducted, driving an in-depth analysis on how the impact of technologies on the human behavior has been investigated by pop-culture, in particular with science-fiction declination of hybrid bodies, cyborgs and extended mind (Clark, 2004), and how design hijacked these concepts (Colomina & Wigley, 2016; Dunne & Raby, 2013; Pullin, 2009; Rawsthorn, 2013).

DEFINING AND UNDERSTANDING USERS: THE PATIENT JOURNEY

The Patient Journey can be considered the core of the Preliminary Research since it allowed to define the actors of the interaction, where with actors are intended all the figures involved into the care and assistance of the patient since the first aid intervention until the recovery in healthcare facilities or housing solutions, and the instruments used to conduct the therapy. Inspired to the Patient Journey Mapping proposed by the TUDelft team to guide the design in healthcare, it has been adjusted to collect the results of the on-field observation in the SU, of the interviews conducted with the personnel

of the SU and the regional protocol of intervention in case of stroke. The analysis of the protocols has been relevant also to visualize the phases and to notice how the patient is always considered as the object of the treatment and not as an active element of the interaction: it is important to notice that during the hospitalization the patient may not be always conscious.

The Patient Journey has been used as a graphic representation that identifies the actors on a temporal axis, on which their interaction with the patient is clarified. The actors have been identified during the interviews and the list has been integrated with the regional guidelines, and they consists in:

- medical personnel;
- technical staff;
- relatives;
- caregivers;
- diagnostic tools;
- monitoring tools;
- intervention protocols.

The data has then been divided into the intervention phases, distinguished in ischemic stroke with thrombolytic treatment, ischemic stroke without thrombolytic treatment, hemorrhagic stroke, and organized into a time span. The graphic translation of the data has been built around a central figure, the patient, and the phases has been differentiated with the use of different colors, following a clockwise spiral that suggests the timing. The start of the time span has been considered the call to the First Aid, when the protocol gets activated.

The actors have then inserted into a table that allowed to better visualize their involvement, and a further table has been drawn to identify their specific actions. The analysis of the patient's mood during the journey has not been evaluated in this phase since it has not been identified as main user of the system: together with a better comprehension of the environment and the actions carried on inside the healthcare facilities, the Patient Journey has allowed to focus the attention on the interactions between the different actors. The patient results the beneficiary of the interaction with the surroundings, but the main users are the physicians, the nurses and the caregivers that have a direct impact on the environment.

AREAS OF INTERVENTION AND DEFINITION OF CONSTRAINTS

Right after the Patient Journey clarified the role and the interactions of the actors, the on-field observation conducted following an ethnographic approach(Calabrese, 2013; Clarke, 2010; Stevenson, 2013) has allowed to identify four areas for which an improvement can descend from a design intervention. The four points addressed the digitalization of the patients' data, the support to nurses for patients' mobilization during acute phase and facilitators for communication with patients and the analysis confirmed the need for a lower limb rehabilitation system to be used with patients bedridden in the early stages of the hospitalization.

Although the efficacy of the intervention is believed to be increased if applied on the entire SU environment of each institute, the focus of a reduced unit that provides a punctual rehabilitative intervention is relevant for the introduction and the application of instruments for experimental therapies in an increased number of SUs. The choice to work on a public structure as destination of use requires an eye to low cost of acquisition and maintenance, quick cleansing and encumbrance of a minimal amount of space, plus compactness to avoid the loss of functional elements or the obstruction of common paths. The training for the use of the system by the therapists should be minimal, therefore the design of the user interface has to be simple and efficient.

The need to work with bedridden patients gave the first consistent constraint on the design brief: the accessibility of a hospital bed, with all the possible product declinations, and the patient position need to be considered as basis of the product development. The patient position requires specific attention in terms of Human Factors and Ergonomics, especially due to the possibility of paresis following the stroke, demanding additional care for the design of the interaction.

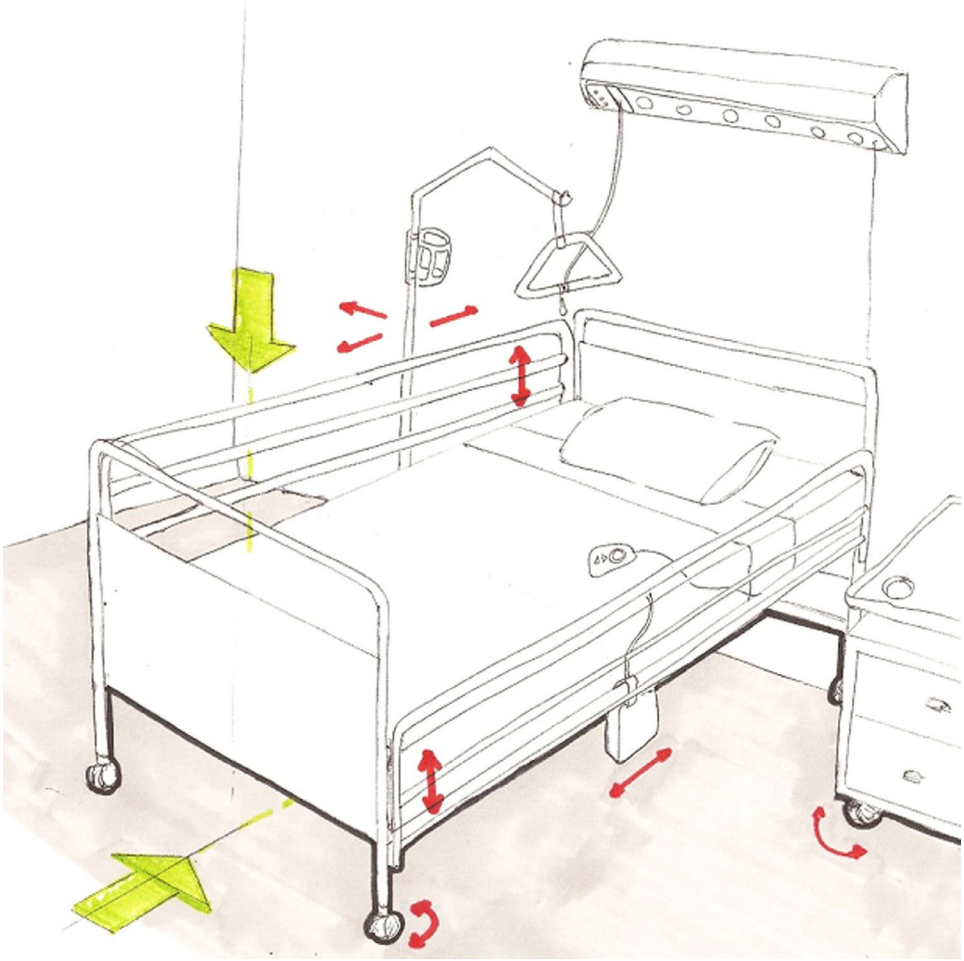


Fig.3 – Sketch of the accessibility of a hospital bed for additional devices

The principle on which the case study has been developed follows an approach of an Italian physiotherapy school (Perfetti & Pieroni, 1992) and focuses on the pressure made on the sole of the foot: the need to stimulate a specific part of the human body determines the shape of the platform on which the interaction needs to take place. Starting from two historical mappings of the sole, the design has followed the common areas and simplified them into a series of elements for the stimulation. The stimulation, based on a platform for the load transfer, is activated thanks to a system of sensors and pumps that substitute the haptic feedback provided by gravity for the standing position.

The need for the system to be placed on the patient's bed, to be removed and to be adapted to different patients defines the necessity of mobility and flexibility: implying lightness for the relocation by the nurses or operators, possibility to move the elements and to work on a single foot, to adapt the structure to multiple sizes for both genders and ages.

The simultaneous use of the system by an operator, identified as main user, and the patient, identified as beneficiary, requires the division of the controller of the system from the interactive part, therefore the use of tablets running an unique application with different levels of access can allow the customization and the monitor of the interaction without compromising the effectiveness of the interaction by the patient. The use of tablets allows also an improvement of the legibility of the screens without forcing the operator or the patient to assume uncomfortable positions.

CONCLUSIONS

The identification of constraints as a result of a preliminary research allowed to circumscribe the field of intervention for the design phase, providing a set of fixed elements for which a creative formal solution needs to be defined in a User-centered design approach. This case study aims to show how the research is driven by functional choices, for which the formal result is deeply connected.

The implementation of interdisciplinary research on the relation between formal solutions and cognitive response can

provide further elements for the design of systems with impact on the sensorimotor system, therefore it is believed that the involvement of designers addressing HF from early stages of development of rehabilitative technologies can improve the outcome of rehabilitation.

Designers should be recognized and involved into the research processes for medical devices since early stages: the interdisciplinary background requires the development of a creative mindset that contributes to the construction of T-shaped skills, necessary to address the development of products that integrates knowledges from fields apparently distant such as engineering, medicine and human factors. The need to consider a medical project in all its complexity to better integrate systems with an already complex surrounding but most of all with an user-centered approach, enhancing the interaction and the pleasure of its use from individuals with altered physiological and psychological conditions, is the core of design research and the keystone for designing more efficient, effective and satisfactory healing experiences.

REFERENCES

1. Belda-Lois, J.-M., Mena-del Horno, S., Bermejo-Bosch, I., Moreno, J. C., Pons, J. L., Farina, D., … Rea, M. (2011). Rehabilitation of gait after stroke: a review towards a top-down approach. Journal of NeuroEngineering and Rehabilitation, 8, 66. https://doi.org/10.1186/1743-0003-8-66
2. Blessing, L. T. M., & Chakrabarti, A. (2009). DRM, a Design Research Methodology. Springer Science & Business Media.
3. Calabrese, J. D. (2013). Ethnographic approaches to health experiences research.pdf. In Understanding and Using Health Experiences: Improving patient Care (Vol. 2).
4. Clark, A. (2004). Natural-born Cyborgs: Minds, Technologies, and the Future of Human Intelligence. Oxford University Press.
5. Clarke, A. J. (2010). Design Anthropology: Object Culture in the 21st Century. Springer.
6. Colomina, B., & Wigley, M. (2016). Are We Human?: Notes on an Archaeology of Design. Ernst & Sohn Verlag.
7. Dunne, A., & Raby, F. (2013). Speculative Everything: Design, Fiction, and Social Dreaming. MIT Press.
8. Gaggioli, A. (Ed.). (2009). Advanced technologies in rehabilitation: empowering cognitive, physical, social and communicative skills through virtual reality, robots, wearable systems and brain-computer interfaces. Amsterdam: IOS Press.
9. Perfetti, C., & Pieroni, A. (1992). La logica dell'esercizio. Idelson Liviana.
10. Pullin, G. (2009). Design Meets Disability. MIT Press.
11. Rawsthorn, A. (2013). Hello World: Where Design Meets Life. Penguin UK.
12. Stevenson, F. (2013). Observing interactions as an approach to understanding patients' experiences. In Understanding and Using Health Experiences: Improving patient Care (Vol. 2).
13. Toso, F. (2017). Sense and movement. Design of a system for sensorimotor rehabilitation after stroke. The Design Journal, 20(sup1), S2463–S2472. https://doi.org/10.1080/14606925.2017.1352761
14. Toso, F. (2018). Design for the Lower Limbs. A Study for the Development of an Assistive Robotic System for Sensorimotor Rehabilitation After Stroke. Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018), 1236–1240. https://doi.org/10.1007/978-3-319-96071-5_124
15. Vallar, G., & Papagno, C. (2007). Manuale di neuropsicologia: clinica ed elementi di riabilitazione. Il Mulino.

AN INNOVATIVE SENSORY-DIAGNOSTIC TOOL FOR PATIENTS WITH MULTIPLE SCLEROSIS

Michal Greenberg Abrahami
Multiple Sclerosis Center
Sheba Medical Center
Tel-Aviv, Israel

M. Greenberg Abrahami, D. Magalashvili, A. Achiron.
Department of Occupational Therapy, Multiple Sclerosis Center, Sheba Medical Center, Tel-Hashomer, and Sackler School of Medicine, Tel-Aviv University, Israel

ABSTRACT

Background: Patients with multiple sclerosis (MS) frequently suffer from sensory impairments affecting both light touch and stereognosis. When involving the hands these sensory impairments can significantly interfere with daily tasks performance, especially tasks associated with fine-motor movements. Assessment of MS patients for sensory impairment is performed by the Semmes-Weinstein monofilaments testing the threshold of light touch sensation and the two-point discrimination which tests the ability to identify whether a tactile stimulus consists of one or two separated points of application. However, a tool to assess light touch and stereognosis in combination is missing.

Objective: To develop a sensory-diagnostic tool that will enable evaluation of light-touch in integration with stereognosis by identifying shapes and textures together.

Methods: The sensory-diagnostic tool was constructed from 10 shapes and 6 variants of texture and was performed with closed eyes. The first stage was a short learning procedure where the patient observed the shapes and textures for approximately 5 minutes without touching. Thereafter, each subject was asked to identify shapes and textures and was scored by a questionnaire combining three assessments: (1) Correct identification of a shape – 2 points each; (2) Correct identification of two shapes with different texture – 3 points each; (3) Correct identification of different shapes and various textures – 5 points each. A complete performance resulted in a score of 100.

Results: Fifty MS patients, 39 females, 11 males, age 40.7+1.5 years, disease duration 9.4 years, EDSS 3.5, were included in the study. Twenty-six MS patients (52%) had sensory impairment by the EDSS sensory sub-functional scale. Fifty healthy subjects, 38 females, 12 males, age 37.0+1.8 years served as controls. The mean sensory-diagnostic score was significantly lower in MS patients as compared with age-matched healthy subjects, 68.5+2.9 vs. 82.2+1.7, $p<0.01$. Moreover, the test was abnormal (score<78) in 37.5% of patients without sensory impairment on the EDSS sensory sub-scale.

Conclusion: The sensory-diagnostic tool incorporates the assessment of both light touch and stereognosis and can help to better detect sensory impairment in MS patients.

REFERENCES

1. Dellon, A. L. (1978). The moving two-point discrimination test: clinical evaluation of the quickly adapting fiber/receptor system. The Journal of hand surgery, 3(5), 474-481.
2. Carey, L. M. (1995). Somatosensory loss after stroke. Critical Reviews™ in Physical and Rehabilitation Medicine, 7(1).
3. Dellon, A. L. (1978). The moving two-point discrimination test: clinical evaluation of the quickly adapting fiber/receptor system. The Journal of hand surgery, 3(5), 474-481.
4. Kalron, A., Greenberg-Abrahami, M., Gelav, S., Achiron, A. (2013). Effects of a new sensory re-education training tool on hand sensibility and manual dexterity in people with multiple sclerosis. NeuroRehabilitation, 32(4), 943-948.
5. Liu, C., & Wechsler, H. (2001). A shape-and texture-based enhanced Fisher classifier for face recognition. IEEE transactions on image processing, 10(4), 598-608.
6. Vaina, L. (1987). Visual texture for recognition. In Matters of intelligence (pp. 89-114). Springer Netherlands.

DESIGNING MEDICAL VIBRATOR

Utilisation of Pleasure Device for Reproduction Purposes

Yonatan Assouline
Developed & Designed by:
Flamingo_Making Products
Commissioned by: Kate & Duck intl.
Tel Aviv, Israel
yonatan@flamingo.works.

ABSTRACT

Before Imagining what an insemination vibrator can be, the first step, before laying any line of sketch or 3D Cad designing any model, is to research and deepen our understanding of the field of operation. We begin by getting to know what we don't know in each of the aspects. At the medical perspective, the differences between the types of optional insemination: IVI, ICI, and IUI - which stands for Intra-Vaginal, Intra-Cervical, and Intra-Uteral, correspondingly. To understand the bureaucracy and regulation of sperm donation, costs and delivery. That's how we found out that DHL has Cryogenic shipment delivery, which means the procedure can take place at home.

At the same time, we took a look at the user personas, and more in details into the usage scenarios. We broke them into single actions in an attempt to distillate new insights. Our user can be in general under the definition of new modern families, a term which address a wide range of options; From choice mothers to gay couples, co-parenting. But also couples who need assistance along the way. A very heterogenic group when it comes to fertility issues, but with one thing in common they all typically been tagged as 'fertility patients' once they encounter the medical institutes. Usually, directed to the clinic for insemination procedure although most of the time they are perfectly healthy, they need the sperm and get it in. And where is a need there is a solution, digging in google, we've found the popular yet bizarre usage of a turkey baster for the mission.

Another important aspect of the research phase included the world of sex toys. This field had transformed dramatically in the past 15 years, with the rise of design-oriented sex toy. Companies such as Jimmyjane set a gold standard by recruiting star designer Yves Béhar. Creating an iconic sex toy which no longer lives in the drawer but one with an updated form, ergonomics, and material - a premium product.

Summarizing these three channels, the medical, user persona, and scenario with the desired look and feel for the product we get the picture of the future to be the product. This phase of product definition ends up in a detailed design plan, product schematics, hardware characterization, interface position and way of use. Now the design can begin

REFERENCES

1. Product Designed By - Flamingo_making Product, Industrial Design Firm.
2. Commissioned By - Kate & Duck.
3. Medical Advisory - Prof. Ariel Revel, Head Of Fertility Center Dep. Assaf Harofe.
4. Principale Designer - Naty Moskovich.

DESIGNING SMART CLOTHING FOR FALL PREVENTION IN OLDER ADULTS

A brief overview on the current status

Alessia Buffagni
School of Doctorate Studies in
Architecture, City and Design
Università Iuav di Venezia
Venice, Italy
abuffagni@iuav.it

ABSTRACT

Falls have been estimated by Institute for Health Metrics and Evaluation as major cause of death from injury among people over 70 years old in 2017, worldwide. Falls among the elderly is a severe health issue and substantial medical cost. Moreover, people who experienced falls develop fear of falling, a syndrome that leads to decreased mobility, social isolation, depression.

In the last three decades, falls have been the theme of concern for numerous researchers and consistent efforts have been made to design systems for fall-related issues. Most of them focus on common topics: to target fall risks through gait and balance analysis; to engage users in physical activity developing exergame and interactive applications; to detect falls and monitor them through wearable devices or home-based systems; to protect users from fall-related injuries spreading signals for prompt assistance. Nevertheless, in this well-supplied framework, limited attention has been given to smart clothing. Being in constant touch with the skin, clothes are part of humans' routine – supposedly designed to be comfortable as far as one basically forgets to wear them. That's why in order to collect body information (physiological data, motion data), research branches on wearable technologies for healthcare are moving towards embedding electronics in textiles – for their ubiquity, and versatility (clothes absorb body radiation, which means they can be also used as self-powered devices). The next frontier for smart clothes is not only to detect, but also react: giving dynamic feedbacks to specific body stimuli. New generations of wearable devices will represent a substantial input to answer the older-user needs, both in term of motion assistance and in term of injuries prevention. This paper seeks to provide a general landscape on the current status of smart clothes and garments which are designed to sense and react to the body (giving aid, adjusting postures, protecting from falls-related injuries), and the ones designed to deliver stimulation to the body. It addresses the pure design specificities of smart suits, footwear, and wearable airbags targeted to the elderly population – eventually, highlighting their potential evolution and contribution in a worldwide aging scenario.

INTRODUCTION (prior surveys on fall-related systems)

Approximately 28-35% of people aged 65 and over fall each year increasing to 34-42% for those over 70 (World Health Organization, 2007) – percentages that are going to grow due to the increasing of the ageing population. As consequence, most of them develop a syndrome called fear of falling – which leads to decreased mobility, social isolation, and depression (Zijlstra et al., 2007). And falls themselves have been estimated by the Institute for Health Metrics and Evaluation (University of Washington) as a major cause of death from injury among people over 70 years old in 2017 (IHME GBD Compare, 2018). As much as they represent a vital issue to the elderly, falls imply substantial medical costs to the community (Florence et al., 2018), requiring treatments in emergency departments and hospitalization for broken bones and head injuries – mostly hip fractures and traumatic brain injury (Center for Disease Control and Prevention, 2017).

In the last three decades, falls have been the theme of concern for several researchers (Sleet, Moffett, & Stevens, 2008) who made consistent efforts to design systems for fall-related issues – reason why it is not difficult today to find surveys for defining their types. Actually, it has been since 2008 that we can review papers about this topic (Xu, Zhou, & Zhu, 2018). Among these, it is particularly interesting the one in which, in 2013, Mubashir et al. gave a comprehensive survey of fall detection techniques. They categorized them into three groups: wearable device based, ambient device based, vision based – respectively referring to: accelerometry and posture sensors; audio/video and vibrations sensing; surveillance

by cameras. A more recent study developed a conceptual framework that represents the state of the art of today's falls prevention technologies (Hamm, Money, Atwal, & Paraskevopoulos, 2016). In this, intervention systems are split into four groups: pre-falls prevention, post-falls prevention, fall injury prevention, cross fall prevention. Overall, the goals of these systems are: to target risk factors (before and after a user has experienced falls); to monitor activities (detecting when an injury occurs); to give prompt alert for assistance. This same work classified applications into static and interactive: where static refers to those which offer no forms of interaction, generally worn by the users or installed in their living environment in connection with platforms (desktop computers, tablets, smartphone), and interactive refers to game consoles (Nintendo Wii, Microsoft Kinect) and Virtual Reality used to engage patients in physical activity – mitigating fall risks by enhancing exercise routines. Eventually, a more recent survey shows that since 2014, Kinect and accelerometer became the most popular types of sensors used in fall detection systems (Xu et al., 2018). Still, in this well-supplied framework, limited attention has been given to smart clothing.

WHEN CLOTHES ARE SMART

It was 1996 when Steve Mann stated: our clothing will significantly enhance our capabilities without requiring any conscious thought or effort. Being in constant touch with the skin, clothes are part of humans' routine. We are familiar with them since the day we were born, and likely we will be for the rest of the lifetime. In fact, clothes happen to be the most intimate surface after the skin: a kind of extension of the body (Ugur, 2013). They cover the major part of our anatomy absorbing the radiations we constantly emit. Potentially, they might be efficient wearable devices, because of their flexible, lightweight, unobtrusive properties. As a matter of fact, it is no coincidence that in the last two decades electronic and textile sectors have been converging, giving birth to a new research field: smart textiles – also called e-textiles.

We know that since the development of the wearable motherboard – designed for military purposes, which paved the way for today's smart clothing (Park & Jayaraman, 2017) – smart textiles have been largely tested for medical purposes, mostly to collect bio-parameters, as physiological and motion data (Cho, Lee, & Cho, 2009). But what exactly can we define as a smart textile?

Speaking about smart materials for clothing, Xiaoming Tao (2001) defined them as materials and structures that sense and react to environmental conditions or stimuli, such as those from mechanical, thermal, chemical, electrical, magnetic or other sources. She divided them into three groups of intelligence: passive smart materials – only sensing the environmental condition and stimuli; active smart materials – sensing and reacting to the condition or stimuli; very smart materials – sensing, reacting and adapting their structure accordingly. Generally speaking, passive smart textiles make use of sensors only; active smart textiles incorporate both sensors and actuators – which make things move, release substances, make noise and many others; and very smart textiles have sensors, actuators and even the skill to adapt their behavior to circumstances (Van Langenhove & Hertleer, 2004).

It is important not to confuse smart clothes with wearable computers, whose components are rigid, bulky, attached to clothes (Cho, Lee, & Cho, 2009), and designed to accomplish the functions we use to demand computers. Although it was pretty innovative, the first example in the market, the Mobile Assistant (launched by Xybernaut Corporation in 1994 and admittedly meant to replace personal computers) was not a success – and neither were the later and more wearable versions of it, because of ergonomic and battery issues (Malmivaara, 2009). Overcoming these issues, smartwatches became today's most popular examples of wearable computer – reading and sending emails, messages, answering and rejecting calls, detecting data and more. Smart clothes are not meant to process such a range of tasks: presently, they are designed to carry out limited and more focused functions.

We must not confuse them with wearable electronics either. Still on the topic of falls prevention, let's take for example the work of APDM Wearable Technologies: a comprehensive wearable system for gait and balance analysis composed by six wearable devices – each one equipped with a digital interface – designed to be worn on wrists, feet and the chest (Fig. 1). Working simultaneously, each part detects data on postural sway, gait and balance, and sends analyzes to a remote computer. However, the system is not designed to be worn all day long, but only through the duration of the tests, and thus for a specific purpose: to assess balance and fall risk. If we had to define it, we should classify it as a wearable electronic system.

Fig. 1

Smart clothes instead embed electronic functions straight inside textiles, and they are meant to be worn with no time limitation – as a matter of fact, they are designed to be as much comfortable as people basically forget they are wearing them.

FROM 1996 TILL NOW

As mentioned above, the first smart cloth has its origins in the military field. Developed by the Georgia Institute of Technology in collaboration with Defense Advanced Research Projects Agency (DARPA) in 1996, the wearable motherboard is a shirt with integrated conductive fibers for the physiological monitoring of soldiers and the detection of gunshot wounds. In 2001, the project was launched under the name of Smart Shirt (Malmivaara, 2009). Afterward, sensors and electronics integrated in textiles have been frequently applied for medical purposes, biomonitoring for healthcare mostly: electrocardiogram, electromyography, electroencephalography, heart rate, respiration, body hydration, body movement, impact detection (Cho et al., 2009; Stoppa & Chiolerio, 2014). Currently, they have found a most fitting field in sportswear and entertainment (Suh, Carroll, & Cassill, 2010). In 2005, Numetrex and Polar developed the Numetrex Sports Bra, a garment for women designed to sense heart rate. In 2014, Ralph Lauren and OMSignal launched the Polo Tech Shirt with sensitive silver fibers woven into the fabric in order to detect vital parameters; data is processed into an external device which needs to be attached to the shirt (Fig. 2) while a smartphone application returns real-time feedback and suggests moderation of efforts in case of stress. That components configuration is the same we find in the design of the Smart Socks developed by Sensoria, a sportswear specialized company. Their socks are capable of sensing gait, speed and foot posture (Fig. 3). Still regarding falls risk and socks, in 2018 a US-based startup (Palarum LLC.) released its own version, specific for hospitalized patients: the PUP (Patient is Up) smart socks, woven with electroconductive fiber that links pressure sensors on the bottom to a monitor on the top: when the patient hits the floor, the closest nurse is notified through a wristband to provide immediate assistance (Fig. 4).

Fig. 2, 3, 4

Almost the totality of smart clothes in the market (including cited examples) responds to this same logic of composition: conductive wires woven in textile plus a rigid device for data processing which needs to be applied to the garment through conductive pins or buttons. That occurs because of today's size of chipsets and batteries, which have to be bulky and rigid to ensure durability. In fact, as reported by a recent market analysis, smart clothing is still facing a lack of expansion: now

it represents less than 1% of the global wearables (Hanuska et al., 2017) but the percentage is expected to grow by 2021, especially if designers are able to fully understand consumer needs (affordability beyond function) and develop more effective models (Perry et al., 2017).

In a smart design perspective, researchers from the Centre for Assistive Technology and Connected Healthcare (University of Sheffield) developed an interesting device for falls protection and detection (Easton et al., 2017). They achieved a proper combination where a functional element is also used as a case for electronic components. They designed a garment for hips protection which embeds two soft pads on both sides of the waist in order to cushion impacts. The pads themselves contain sensors (for gait, falls, temperature) dialoguing with a smartphone ready to call for assistance. They are manufactured with Armougel, a sensitive material which is normally soft and flexible but textured to rapidly harden in response to shocks (and then to go back again to the primal state) (Fig. 5).

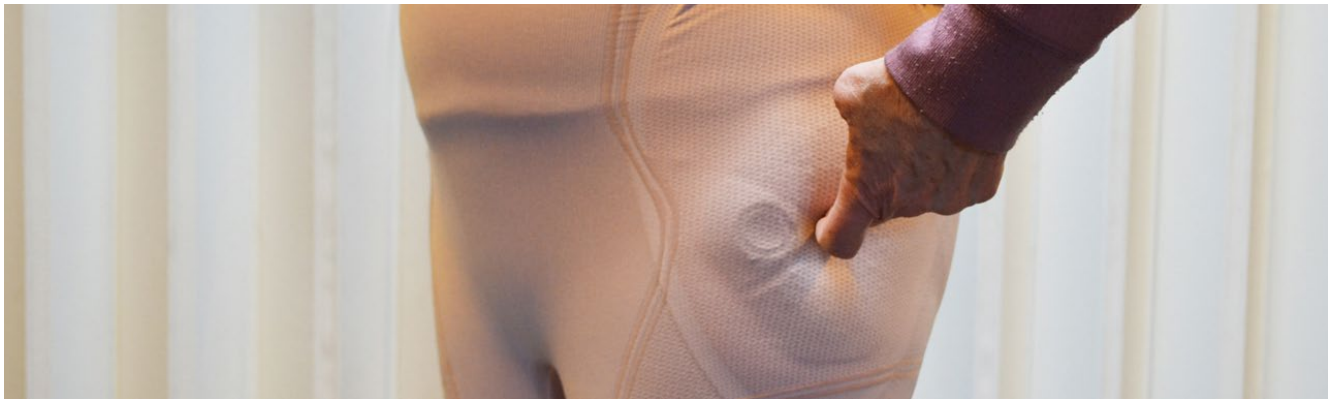


Fig. 5

In the attempt to get circuit boards, sensors, and batteries more wearable – which means more flexible, stretchable, thin, lightweight – research had already achieved remarkable goals over the years (Nag, Mukhopadhyay, & Kosel, 2017). The Planar Fashionable Circuit Board, for instance, is not a brand-new concept: it is a planar circuit printed on fabric that was already adopted ten years ago for ECG acquisition (Yoo, et al., 2009). Printed batteries had their history too: previously developed by The Fraunhofer Institute for Reliability and Microintegration to be applied on a variety of substrates (Stoppa & Chiolerio, 2014), lately sewed into women's trousers right to supply a fall detection system. In this last case, researchers devoted special attention both to the power consumption for the long-term monitoring, and to the convenient placement for the flexible component to ensure comfort and the minimum inhibitory effect to the user – opting eventually for the lower back (Uran & Geršak, 2018).

Anyway, the true challenge for smart clothing designers is not reshaping batteries, it is getting rid of them. Self-powered garments are not a futuristic concept anymore. It has been more than a decade we talk about flexible solar cells integrated into clothing to provide electricity for portable devices (Schubert & Werner, 2006). A Dutch fashion designer developed a series of fashionable garments sewed with solar panels exactly for that intent (Fig. 6).

Fig. 6

Yet, solar is not the ultimate source. Human body exhales radiations, constantly: energy that could be turned into power provision. Researchers from the Advanced Self-powered Systems of Integrated Sensors and Technologies center (ASSIST) lately developed a flexible, wearable, self-powered monitor for personal health which literally harvests energy out of a body (both thermal and kinetic) (Misra et al., 2015). This means that soon our smart clothes might become even smarter: designed to need nothing but a body to get fully charged, and effective.

A STEP FURTHER: FROM ACTIVE TO REACTIVE (KINETIC)

According to Tao's words, we might define the majority of smart clothes in the market as active smart clothing. They sense, process, collect data and react to provide haptic, auditory and visual feedback to users, caregivers, nurses, and physicians in order to make them aware about health conditions, adjust their behavior if wrong, and call for medical assistance (as we have seen for PUP socks and previous garments for falls detection and protection). Changing the user's behavior through smart clothes may be a good approach to prevent falls. Postural control, for instance, is fundamental to move safely (and independently): it is a fact that loss of balance and poor postural control imply a bigger risk of falling (Najafi et al., 2010). In this regard, Pauline Van Dongen designed a smart top that delivers haptic feedback when the wearers are slouching (PysioPal) – a gentle vibration that alerts a wrong upper-body position (Fig. 7) – and they have to adjust it, otherwise the shirt will keep buzzing.

Fig. 7

This is an example of a conscious change of behavior. Hence, there are also unconscious changes. Researchers have provided proof of significantly enhancement of balance and gait in elderly people using shoe insoles designed to deliver subsensory vibratory noise during walking (Lipsitz et al., 2015). The imperceptible vibration was set 10% below the threshold each subject could feel. Participants were aged between 65 and 90 years old and their gait and balance variability clearly reduced during the test.

Coming back to Mann's statement Our clothing will significantly enhance our capabilities without requiring any conscious thought or effort, it is right here that this paper wants to get. Especially underlining: without requiring any conscious thought or effort. The next (and closest) frontier for smart clothing will be reaching a new degree of intelligence which will bring them to be helpful on a daily basis (Activities of Daily Living) without implying any direct effort from the user. And most likely, the people who more than others will benefit from that will be those who suffer from mobility and sensory impairments. Regarding the latter, the company CuteCircuit recently developed a smart shirt for deaf people that converts sound into touch (haptic feedback) giving the chance to feel the music over the body. Regarding the former, the following lines will provide some examples.

The title of this paragraph, A step further: from active to reactive (kinetic), clearly marks a passage from active smart to very smart clothing. To do so, it is necessary to widen the meaning of reactive. In a forward-looking scenario, being reactive implies not only to provide haptic, auditory and visual feedback, but also dynamic and kinematic. Joanna Berzowska introduced the concept of reactive fashion – or kinetic fashion – as "second skins" that can adapt to the environment and to the individual (Berzowska, 2006). Within the context of fashion and personal expression, she experimented kinetic garments which change their shape accordingly to heat, electrical inputs, and body language (Berzowska & Coelho, 2005). To extend to other contexts and functionalities, the term kinetic clothing better suits our purpose. Under this term, in fact, we might include those garments that inflate and change shape to provide protection. Wearable airbags for fall injuries prevention is a good example. In the last years, the Italian company Dainese – which has been producing protective sportswear for bikers since the early 80s – developed wearable airbags to cushion wearers from impacts (D-air®), both

for bikers and for older adults. Airbags are integrated into jackets or vests and inflate when a hazard is detected by the electronics embedded into the garment. Still for the elderly, researchers from Japan developed another type of airbag (Tamura & Yosimura, 2014): when it is not inflated it looks like a thin normal vest, once it boosts, it protects a large part of the back-body – head, shoulders, lower back, and hips (Fig. 8).

Fig. 8

Wearable airbags have also been designed as belt-like devices for hips protection. Firstly, by the Israeli company Hip-Hope Technologies Ltd whose prototype was presented at MEDICA 2015, and then by the French one Helite (Fig. 9-10), presented at CES 2018.

Fig. 9,10

Even if these last two products are manufactured with textiles, we cannot call them properly smart clothes. Being belt-shaped, they hint more to an accessory than clothing. Shoes or footwear on the contrary are part of everyday clothing routine: it would seem quite odd walking through today's environments without wearing any kind of them – for protection or hygiene at least. Which is likely one of the reasons that led researchers from Israel – working on aids for human balance – to develop the first prototype of Balancing Shoes. When the motion device on its soles detects an initial loss of balance, the mechanics on the lower surface reacts performing a backward step (Fig. 11).

Fig. 11

As a concept, it might be a good example of kinetic support for older people – who naturally have a delayed response and when they start to sway, they have no more the prompt reaction to perform the instinctive backward step. This kind of device aims to early detect the sway right to react in behalf of users. Even though it is quite rudimental, this prototype deserves the credit for proposing itself as a substitute – or even better an extension – for a fogged or ceased human instinct. Unfortunately, the project had very little success in crowdfunding – too many issues were posed about its lacking usability.

Still under the term kinetic clothing, we might include those garments specifically designed to provide assistance to the body in terms of mobility and independence (assistive clothing). Ageing is associated with the decline of muscle mass and the weakening of bones and joints, and as a consequence with the decline of every musculoskeletal function (WHO, 2015). Necessarily, when mobility decreases, physical activity decreases as well and a greater risk of falling, isolation, and depression occurs. To assist mobility, the Swiss designer Yves Béhar, in collaboration with Superflex, have devised a powered suit for elder people, the Aura Powered Suit (Fig. 12).

Fig. 12

It is an innovative garment that reacts to the body's natural movements, adding muscle power to naturally complement the user's strength in getting up, sitting down or staying upright. Designed to be worn under the clothing, it combines robotics and textile. On the legs, hips and throughout the back, it is positioned the electronic muscle system (sort of exomuscles aligned with the user's muscular anatomy) which ends up with a series of hexagonal pods containing motors, batteries and control boards. Pods are applied on an origami fold-in area which allows them to expand and contract in three dimensions according to the wearer movements, and they are all removable for cleaning (Fig. 13).

Fig. 13

Interviewed by Dezeen magazine, Béhar said: "What if technology could help us continue to move about the world and engage with it, physically, socially and emotionally? This is the question Superflex is answering with the concept of Powered Clothing: to empower us by enhancing our physical ability so we can continue to live actively". To achieve Aura Powersuit, Béhar's studio (Fuseproject) partnered with Superflex, a company (today rebranded as Seismic) that started developing wearable soft robotics specifically for military applications in a DARPA-funded project at SRI International. Rich Mahoney, founder and CEO, claimed he soon realized they were not innovating around robotics, they were innovating around clothing, so he thought they could definitely probe other applications, such as those for the ageing population for example. Their latest Seismic Powered Clothing™, which has been recognized as a 2018 Global Technology Pioneer by the

World Economic Forum, is a sort of reboot of the Aura Powered Suit. It is an intelligent wearable strength – Mahoney said – with robotic muscles outside of but aligned with your body. It is designed in three layers: base layer; strength layer (with muscles packs and gripping structures); and intelligent layer (brain of the system in a lumbar device) (Fig. 14). Muscles packs contain Inertial Measurement Unit (IMU) sensors, electronics, batteries (8 hours of activity) and can be removed for cleaning. To provide a constant aid, the suit automatically activates anytime the body starts moving (Mahoney calls it symbiosis) while force levels and activities are continuously tracked by a dashboard for tablets.

Fig. 14

These last achievements point at the horizon of a new era in which smart clothing could relieve people from movement and stability impairments. With the objective to make them move again independently and safely, this specific kind of garment represents a solid input to answer older people's needs, both in terms of motion assistance and injuries prevention – ultimately, without requiring any conscious thought or effort from them.

DESIGNING FOR THE ELDERLY (THINGS TO COPE WITH)

Ideally, clothing should enhance support for the body where needed without restricting movement (Jane McCann, 2009). Practically, designing for older adults implies to take account of a lot of factors, the very random combination of which, we call ageing. Growing old entails relentless body modifications: stature, proportion, conformation – and then bones, joints, and muscles deterioration (World Health Organization, 2015): we experience a gradual (and definitely personal) loss of shape. Beyond affecting the quality of life, this also affects the conception of what we consider (and accept) as wearable. There is evidence, in fact, that clothing may create discomfort to people with disabilities, worsening their social behaviors: the survey, conducted by researchers from the US, points out how clothing indeed is a relevant factor in the pursuit of a decent quality of life and level of social engagement among people with mobility impairments (Kabel et al., 2017).

Certainly, we must assess the users' physiological transitions. First, deterioration of the senses: loss of visual acuity, hearing, taste and smell (McCann, 2009); reduction of dexterity and proprioception – the sense of knowing where one's body is located in space (Bryson, 2014); decrement of skin functions, such as touch and physical sensation – which is followed by the decline of thermal sensitivity (Bryson, 2014); dermatological disorders due to the loss of collagen and elastin fibers, which leads to dermatitis, pressure ulcers, skin tears (World Health Organization, 2015); healing processes from wounds, which are delayed and way more complicated. Second: urinary incontinence – still one of the most common impairments in older adults (World Health Organization, 2015). It is not hard to see how the erratic combination of any of these factors draws a very tricky workspace for designers. Tight suits, for example, could be quite uncomfortable for those who suffer from urinary incontinence, or impeding to put on and off, and electronic components and conductive yarns sewed into fabrics may be tremendously irritating for aged skins. Any textile and feature must be always accurately selected and very easy to wear (McCann, 2009): in this sector more than elsewhere, usability is an imperative.

Beyond anatomical and physiological transformations, it is also necessary to examine the individual health conditions. Multimorbidity (the presence of multiple chronic conditions at the same time) combined with psychological and cognitive transitions have a great impact on functioning and quality of life (Jaul & Barron, 2017; World Health Organization, 2015). As suggested by Jane McCann (2009), to address the design requirements of older wearers it is fundamental to have a sensitive regard both to human physiology (sizing, fit, posture, thermal regulation, moisture management, protection) and to the psychological feel good factor. To do so, a collaborative design approach – involving users during the development and bypassing too problem-focused and technology-led endeavors – helps to better single out that extremely fluid concept we call user need. Besides, it is also important to remind that clothing needs and preferences become more peculiar in aged

people than in other consumer groups, and even gender difference comes to play a role (Palamutcu & Goren, 2015) in the physical and psychological choice of what is comfortable.

A focus on usability, a careful field research – spending plenty of time visiting senior living communities, picking many and diversified cases of study – in a fully collaborative perspective: this is the most recommended way to proceed. Which sounds pretty obvious, maybe. But in the end, as Alfred North Whitehead observed, it requires a very unusual mind to undertake the analysis of the obvious (2011). And it is exactly an unusual mind required from designers to accomplish such a demanding task.

CONCLUSION

Reactive, kinetic or assistive clothing are the terms we use to define those garments that sense and react on the body to provide assistance, protection, stimuli or adjust users' behavior. Latest achievements lead the way for a next generation of smart clothes: those which may significantly enhance the independence of the elderly providing them mobility assistance and protecting from severe falls. As Lucy Dunne reminded (2010), it is known this kind of products have been very slow to reach the market – and that is for many reasons (functionality, manufacture, developmental practice, consumer acceptance) – but it is also evident they have qualities (body sensing, ubiquity, visual expression, protection, and more) to become wearable devices truly suitable for healthcare. Not to mention how those same qualities could be remarkably improved by the forthcoming implementation of Artificial Intelligence and machine learning technologies. As for today, their potential is at least promising, and through an inter and multidisciplinary approach even lacks in commercialization and adoption can be overcome (Dunne, 2010). Thus, it is the task of designers – enhancing their unusual attitude, when needed – to interpret user demands and conceive something that is effective in a most subtle way: and more than smart, clothing that could be lastly perceived as familiar.

REFERENCES

1. Berzowska, J. (2006). Electronic Textiles: Wearable Computers, Reactive Fashion, and Soft Computation. Textile, 3(1), 58–75. https://doi.org/10.2752/147597505778052639
2. Berzowska, J., & Coelho, M. (2005). Kukkia and Vilkas: Kinetic electronic garments. Proceedings - International Symposium on Wearable Computers, ISWC, 2005, 82–85. https://doi.org/10.1109/ISWC.2005.29
3. Bryson, D. (2014). Anatomical and physiological changes with age: Implications for apparel design. Textile-led Design for the Active Ageing Population. Elsevier Ltd. https://doi.org/10.1016/B978-0-85709-538-1.00008-0
4. Cho, G., Lee, S., & Cho, J. (2009). Review and reappraisal of smart clothing. International Journal of Human-Computer Interaction, 25(6), 582–617. https://doi.org/10.1080/10447310902997744
5. Dunne, L. (2010). Smart Clothing in Practice: Key Design Barriers to Commercialization. Fashion Practice, 2(1), 41–65. https://doi.org/10.2752/175693810x12640026716393
6. Easton, K., Burton, T., Ariss, S., Bradburn, M., & Hawley, M. (2017). Smart Clothing for Falls Protection and Detection: User-Centred Co-Design and Feasibility Study. Studies in Health Technology and Informatics, 242, 152–159. https://doi.org/10.3233/978-1-61499-798-6-152
7. Florence, C. S., Bergen, G., Atherly, A., Burns, E., Stevens, J., & Drake, C. (2018). Medical Costs of Fatal and Nonfatal Falls in Older Adults. Journal of the American Geriatrics Society, 66(4), 693–698. https://doi.org/10.1111/jgs.15304
8. Hamm, J., Money, A. G., Atwal, A., & Paraskevopoulos, I. (2016). Fall prevention intervention technologies: A conceptual framework and survey of the state of the art. Journal of Biomedical Informatics. https://doi.org/10.1016/j.jbi.2015.12.013
9. Hanuska, A., Chandramohan, B., Bellamy, L., Burke, P., Ramanathan, R., & Balakrishnan, V. (2017). Smart Clothing Market Analysis. Sutardja Center for Entrepreneurship & Technology, 1–47. Retrieved from http://www.scet.berkeley.edu/wp-content/uploads/Smart-Clothing-Market-Analysis-Report.pdf

10. Jaul, E., & Barron, J. (2017). Age-Related Diseases and Clinical and Public Health Implications for the 85 Years Old and Over Population. Frontiers in Public Health, 5(December), 1–7. https://doi.org/10.3389/fpubh.2017.00335
11. Kabel, A., Dimka, J., & McBee-Black, K. (2017). Clothing-related barriers experienced by people with mobility disabilities and impairments. Applied Ergonomics, 59, 165–169. https://doi.org/10.1016/j.apergo.2016.08.036
12. IHME GBD Compare (2018), Causes of Deaths, 2017, 70+, Global, both sexes. Available at: http://ihmeuw.org/4nff. Accessed: 21st November 2018
13. Lipsitz, L., Lough, M., Niemi, J., Travison, T., Howlett, H., & Manor, B. (2015). A Shoe Insole Delivering Subsensory Vibratory Noise Improves Balance and Gait in Healthy Elderly People. Arch Phys Med Rehabil, 96(3), 432–439. https://doi.org/10.1016/j.apmr.2014.10.004.
14. Malmivaara, M. (2009). The emergence of wearable computing. Smart Clothes and Wearable Technology, 3–24. https://doi.org/10.1533/9781845695668.1.3
15. Mann, S. (1996). Smart Clothing: The Shift to Wearable Computing. Communications of the ACM, 39(8), 23–24. Retrieved from http://portal.acm.org/citation.cfm?doid=232014.232021
16. McCann, J. (2009). Design for ageing well: Improving the quality of life for the ageing population using a technology enabled garment system. Smart Textiles, 60, 154–163. https://doi.org/10.4028/www.scientific.net/AST.60.154
17. Misra, V., Bozkurt, A., Calhoun, B., Jackson, T., Jur, J. S., Lach, J., … Zhu, Y. (2015). Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing, 103(4), 665–681. https://doi.org/10.1109/JPROC.2015.2412493
18. Mubashir, M., Shao, L., & Seed, L. (2013). A survey on fall detection: Principles and approaches. Neurocomputing. https://doi.org/10.1016/j.neucom.2011.09.037
19. Nag, A., Mukhopadhyay, S. C., & Kosel, J. (2017). Wearable Flexible Sensors: A Review. IEEE Sensors Journal, 17(13), 3949–3960. https://doi.org/10.1109/JSEN.2017.2705700
20. Najafi, B., Ph, D., Horn, D., Marclay, S., Sc, M., Crews, R. T., … Wrobel, J. S. (2010). Assessing Postural Control and Postural Control Strategy in Diabetes Patients Using Innovative and Wearable Technology, 4(4), 780–791.
21. Palamutcu, S., & Goren, I. (2015). Functional Textile Preferences of Elderly People. Mediterranean Journal of Social Sciences, (April). https://doi.org/10.5901/mjss.2015.v6n2s5p279
22. Park, S., & Jayaraman, S. (2017). The wearables revolution and Big Data: the textile lineage. Journal of the Textile Institute, 108(4), 605–614. https://doi.org/10.1080/00405000.2016.1176632
23. Perry, A., Malinin, L., Sanders, E., Li, Y., & Leigh, K. (2017). Explore consumer needs and design purposes of smart clothing from designers' perspectives. International Journal of Fashion Design, Technology and Education, 10(3), 372–380. https://doi.org/10.1080/17543266.2016.1278465
24. Schubert, M. B., & Werner, J. H. (2006). Flexible solar cells for clothing. Materials Today, 9(6), 42–50. https://doi.org/10.1016/S1369-7021(06)71542-5
25. Sleet, D. A., Moffett, D. B., & Stevens, J. (2008). CDC's research portfolio in older adult fall prevention: A review of progress, 1985-2005, and future research directions. Journal of Safety Research, 39(3), 259–267. https://doi.org/10.1016/j.jsr.2008.05.003
26. Stoppa, M., & Chiolerio, A. (2014). Wearable electronics and smart textiles: A critical review. Sensors (Switzerland), 14(7), 11957–11992. https://doi.org/10.3390/s140711957
27. Suh, M., Carroll, K., & Cassill, N. (2010). Critical Review on Smart Clothing Product Development. Journal of Textile and Apparel Technology and Management (JTATM), 6(4), 1–18. https://doi.org/10.1093/beheco/arv141
28. Tamura, T., & Yosimura, T. (2014). Tools for the Care of Elderly People Applying Information and Communications Technology to Fall Risk Assessment. Advances in Science and Technology, 96, 73–77. https://doi.org/10.4028/www.scientific.net/ast.96.73
29. Tao, X. (2001). Smart fibres, fabrics and clothing. https://doi.org/10.1533/9781855737600
30. Ugur, S. (2013). Wearing Embodied Emotions A Practice Based Design Research on Wearable Technology. https://doi.org/10.1007/978-88-470-5247-5
31. Uran, S., & Geršak, J. (2018). Smart clothing to increase safety of people with dementia. In IOP Conference Series: Materials Science and Engineering (Vol. 460, p. 012047). IOP Publishing. https://doi.org/10.1088/1757-899X/460/1/012047
32. Van Langenhove, L., & Hertleer, C. (2004). Smart clothing: A new life. International Journal of Clothing Science and Technology, 16(1–2), 63–72. https://doi.org/10.1108/09556220410520360
33. Whitehead, A. N. (2011). Science and the modern world: Lowell lectures, 1925. Cambridge University Press.
34. WHO. (2007). WHO Global Report on Falls Prevention in Older Age. Ageing and Life Course, Family and Community Health, 53. https://doi.org/978 92 4 156353 6
35. World Health Organization. (2015). World report on ageing and health. Geneva: WHO Press.
36. Xu, T., Zhou, Y., & Zhu, J. (2018). New Advances and Challenges of Fall Detection Systems: A Survey. Applied Sciences, 8(3), 418. https://doi.org/10.3390/app8030418
37. Yoo, J., Yan, L., Lee, S., Kim, H., & Yoo, H.-J. (2009). A Wearable ECG Acquisition System With Compact, 13(6), 897–902.
38. Zijlstra, G. A. R., van Haastregt, J. C. M., van Eijk, J. T. M., van Rossum, E., Stalenhoef, P. A., & Kempen, G. I. J. M. (2007). Prevalence and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. Age and Ageing, 36(3), 304–309. https://doi.org/10.1093/ageing/afm021

Images
Fig. 1: https://www.apdm.com/mobility/
Fig. 2: https://inhabitat.com/ecouterre/ralph-laurens-biometric-sensing-polo-tech-shirt-now-on-sale/
Fig. 3: http://it.materialconnexion.com/sensoria-crea-una-calza-smart-per-i-nuovi-runners/
Fig. 4: https://www.palarum.com/solutions/
Fig. 5: http://www.catch.org.uk/wp-content/uploads/2016/03/DSC_1231_banner.jpg
Fig. 6: http://www.paulinevandongen.nl/projects/
Fig. 7: http://www.paulinevandongen.nl/project/fysiopal/
Fig. 8: https://www.prop-g.co.jp/service/welfareequipment
Fig. 9: https://www.israel21c.org/hip-hope-cushions-falls-to-prevent-fractures-in-elderly/
Fig. 10: https://senior.helite.com/en/wp-content/uploads/sites/2/2018/10/My-hipair-photos-01-1.jpg
Fig. 11: http://b-shoe.com/cnn-these-shoes-will-keep-you-from-falling/
Fig. 12-13: https://fuseproject.com/work/superflex/aura-powered-suit/?focus=overview
Fig. 14: https://www.myseismic.com/newsroom/

THE GAMIFICATION OF PHYSICAL THERAPY IN VIRTUAL REALITY

Improving, tracking and increase in efficiency of motoriacl rehabilitation, using Gamification of the rehabilitation process through VR

Ezra Ozery
Design Graduate Program, Design-Tech Lab, Faculty of Architecture and Town planning, Technion, Haifa, Israel
ezraozery@gmail.com

Prof. Ezri Tarazi
Design Tech Lab, Faculty of Architecture and Town planning
Technion, Haifa, Israel

ABSTRACT

Air Castle Therapy is a virtual reality (VR) system which consists of personalized games which are tailored by the physical therapist for the specific needs of the patient. The goal of this research is to gamify the physical therapy process which ranges from beginners training in the VR environment to active therapeutic use.

The target population of Air Castle Therapy are individuals aged 20-40 who have difficulties with core balance injuries which include but are not limited to; spinal injuries, orthopedic injuries damage due to stroke, scoliosis, and more. The focus of the first case study game is Posture rehabilitation.

The goal of gamifying the physical therapy process is to improve commitment to the regimen and shorten the therapeutic process due to increased compliance. The gamifying aspect of my research includes games in VR, the first case study game is in the genre of casual games that features upper limb reaching movement targeted at the front of the patient.

The main experiment in this research will try to find the correlation of a generic game mode in opposed to a tailor made game mode of the same game.

the experiment will try to asses the patient enjoyment, satisfaction, difficulty and future compliance to the VR therapy process through UI\UX point of view, specifically the range of options a player is given before playing a game.

IS THE iPHONE A WORK OF ART?

How Heidegger would define iPhone.

Yaniv Glozman
Bezalel Acadamy of Art and Design, The department for Industrial Design

ABSTRACT

In his book “The Origin of the Work of Art” (1935), Heidegger points out the paradox inherent in the question of what Art is. According to him, Art is something the artist does, and the artist is someone who does Art. In his complicated way, Heidegger takes us through a whirlwind circle that is gaining momentum, from which we conclude that Art is on its own. Art Defines the Artist, and Art defines what work of Art is.

Art not only defines the artist and itself. Art is what clearing new worlds for us.

Art precedes any other act. The Temple is what allows religion, not vice versa. Poetry allows the language and the peasant shoes reveal and define the nature of the farmer.

In his book The Structure of Scientific Revolutions, Thomas Kohn argues that the paradigm not derived from previous knowledge; it is not a linear progression. It is a jump. Moreover, Kohn claims, that new paradigms are groundless if not, they would not be able to break the old. Paul Feyerabend adds to this theory the lack of dependence on the method itself. The requirement to place theories that are independent of the previous method, not only in the paradigm. If they are constitutive, they are shifts rather than innovations.

Let us take a moment to look at this idea soup: if art created the artist, but the artist created the art and paradigma jumps must happen in order to achieve scientific revolutions, but if they are not dependent on the method, then can it be that the art created the designer, and the designer created the iPhone?

Could it be that the iPhone is the artwork that Heidegger is looking for?

Designers, naturally engaged in phenomenology. We can not create the design without the user. The understanding that design is rooted in the historical experience, relatively new concepts of scientific philosophy, has grown hand in hand with design disciplines. The term Industrial design coined at about the same time as phenomenology, but the aesthetic experience, one of the focal points of design, is no longer center player. The Design experience has long changed into a variety of phenomena that serve human consciousness. Design is no longer an aesthetic experience. If this is right, it will be please Heidegger, most of the book is trying to eradicate the private aesthetic experience from the Art.

Heidegger also talks about the “equipment” the same tools that Heidegger sets in two situations, and for the first time, distinguishes between their Present-at-hand and their Ready-to-hand. The vessel disappears in use, and when the vessel disappears, the material disappears.

in phenomenological terms. The intention to act conceals the material; there is no struggle between the earth and the world as Heidegger describes it in the Roman temple. There is no presence here at all. Don Heidi adds the “multistability” structure which I will address later.

The iPhone is not a casual choice for this lecture. I could choose the cellular culture, apps, the various designs of the new phones in general, but this is no different from Heidi’s talk about the ATM and the weather application. However, the iPhone, in my opinion, is a clear marker, perhaps a source, of the theory I want to present. All point to a source, in Heidegger, Descartes is a reconfigurer, Kant is an articulator. Kuhn has a long list of thinkers such as Newton and Einstein. In Feyerabend, there is an ocean of world ideas that all have there own historical context .

As Kuhn and Feyerabend argue, at the beginning of a new paradigm, there will be no common denominator with the old. Kuhn, like Popper, weaves a line linking the paradigms, The scientific method, while Feyerabend discards any connection.

The iPhone, although we are all young enough to know its direct and indirect roots, serves me for this purpose. Not only it is marked as a source, its influence, as Heidegger claims about art, is what creates the artist as well.

The prevailing view today is that technology precedes science. The scientific theories related to technological development, beliefs, prior to technology. With Heidi too, Multistability stems from the role of the device. However, in Ihde's examples, the ATM, the car, and the app, all have concrete usability. When the Sineal Design the Step-on scale. He created the Hermeneutic relationship between man and the world; one can also say, with a great deal of chronological precision that maturation of industrial design is similar in some sense with what described by Heidi in human relations to technology. Design, since the dawn of history, began is function with the embodiment relation, the tools, the weapons, all those instruments, industrial or artistic, are the continuation of man. "The Hermeneutic" interpretive attitude, most of which was born at the beginning of the Industrial Revolution with household machines. "The other," the device that communicates with the person, comes to us with the increasing importance of the user experience. Last but not least, "the background ratio" is almost the last stage in the design world. Understanding that in a multi-state world of things, the presence of the device has meaning. This also owes much to a small LED lamp on the front of Apple's computer. W e have thus far described the course of design versus the phenomenological, post-phenomenological, and technological theory. In order to strengthen the connection to the argument, we move to the material field. Material is swallowed up in the usability act, its usefulness in which the instrumentality immersed cover signs of the material struggle, the fracture reveals the material. When we examine the cellular devices today, we can already distinguish without further thought, vagueness in its definition as a tool. Is it possible to analyze the materiality of modern design in terms of intent, content, and erosion? Content skips from device to device. , as long as technology fails to beat it, is no longer graduate to function.

Moreover, the intent, the most fundamental concept in the design, what nail we knock with the phone? Usability forces itself on the plot of land that the designer has cleared. However, when we look at the design act today, we see another struggle. In less dramatic terms than Heidegger's descriptions, The designer's attitude toward the design of the iPhone is a relation of exposure. It is not the material-shape ratio determines the tool's usefulness, nor the technology in its design. The last sentence is the one that needs the most explanation. Designers have taken the view that we are giving shape to technology. Technological advances open up new options for our applications and products, as it were, the technology itself is useless without the connection to the user. However, today, and this is a relatively new trend in the philosophy of science and technology. We know how to separate the theories so that they do not talk about the "scientist" and the "technologist." Under the title of the profession, there are several completely different methods. Both the design and the designer's role have such a breakdown. Some if not most of the object surround us keep this relation. However, as argued, there is a new role to play. In part of the new role, we create, in a different way than in the past, a structure that does not exist technologically. As in science updated approach, this role will take an increasingly significant role in the designer job. All that is needed is a gradual release from old paradigms and an attempt to cast the new paradigm on new ideas and designs.

The usefulness, as has been the case so far, fills every void. If not all, then at least the successful spaces that designers have uncovered. Try to imagine a phone without a screen, or an only screen phone. If that is not far from today, then imagine a huge hole in the middle. The very use of the word telephone limits the thought. Try to imagine.

The use of Heidegger for this lecture is part of what trying to demonstrate. I do not like him very much, his philosophy is egocentric, and some of the facts are not true. The story he spins around the peasant's shoes and the truth they reveal is not valid. In the Netherlands, Van Gogh's homeland, farmers work with wooden slippers, some of them do so to this day. The shoes in the painting are Van Gogh's shoes. However, despite this, and all his erroneous assumptions about art. It appears that it was a more significant opening than many others in the present era. The iPhone is not a work of art; it is not even a successful design, in my opinion. However, if you think he is, the next thing you design might be a real work of art.

REFERENCES

1. Heidegger, M. (2002). Off the beaten track.,3
2. Kuhn, T. S. (2012). The structure of scientific revolutions. University of Chicago press.,Op. Cit., 11.
3. Feyerabend, P. (1993). Against method. Verso.,24
4. Heidegger, M. (2002).,50
5. ibid,24
6. א ידייא,(2016) ד-טסופ עדמוננכטו היגולונמונפ, גנילסר תאצוה,18
7. Kuhn, (2012),6.
8. Feyerabend, P. (1993),13.
9. Kuhn, (2012),138.

MASS-CUSTOMIZATION IN THE FIELD OF ASSISTIVE TECHNOLOGY

Development of an autonomous anatomic seating system, customized to the clinical and functional needs of users.

Alexander Geht
Design Graduate Program, Design-Tech Lab, Faculty of Architecture and Town planning, Technion.

Cofounder abililab - custom made solutions , Haifa, Israel
alexgeht@gmail.com

ABSTRACT

Assistive Technologies are specialized products aiming to partly compensate for the loss of autonomy experienced by disabled people [1]. Earlier studies suggested that proper seated position is the main goal to normalize the muscular tone, improving the optimal function[2]. Additionally, proposed that adaptive equipment which is provided to CP children should be customized individually according to the child's functional and contextual needs[3].

Mass-production assistive-technologies, usually designed, general and adjustable, to fit the large market as possible. As a result, off-the-shelf products are too general and did not fit the individual need. Custom-made products fit precisely to the need of the individual, by being design accurately for the body measures and personal needs. There is a fundamental need for custom products, whether, for luxury fields such as sports, military, or space, where optimal performance is essential. But moreover for disabilities field, where custom solutions are critical to assist in activities of daily living (ADL) and rehabilitation. However, custom made products are expansive and not achievable in most cases. At the same time, craftsmen who make the custom solutions, are disappearing, and with them, disappears the professional knowledge.

We are developing and designing parametric anatomic seating system, based on clinical and craftsman praxis, providing a fully customizable product, adapted for digital-manufacturing tools (laser cutting, CNC milling, 3D printing). In this way, we can produce every product unique for every individual function and need. Additionally, we preserve craftsman knowledge, serving people with disabilities needs. Our goal is to develop products, that enables the clinical staff as a physiotherapist, occupational therapist, etc., to create anatomic solutions at the push of a button — reducing the time between the measuring and the final product.

The lecture focuses on the possibilities of digital-manufacturing technology at assistive-technologies field, looking into the gaps and the challenges, also talking about the transaction between rapid prototyping to the real product, using large-scale additive manufacturing (LSAM) technology.

REFERENCES

1. Plos, Ornella, Stéphanie Buisine, Améziane Aoussat, Fabrice Mantelet, and Claude Dumas. "A Universalist strategy for the design of Assistive Technology." International Journal of Industrial Ergonomics 42, no. 6 (2012): 533-541.
2. El Shemy SA, El-Fattah HMA. Effect of Vestibular Stimulation from Selected Head Positions on Fine Motor Skills and Pinch Strength in Children with Hemiparesis. Int J Ther Rehab Res 2017; 6: 60-9.
3. Hong S. Assessment for and provision of positioning equipment for children with motor impairments. Int J Ther Rehab 2005; 12: 126-31

DESIGN AS A VISUALIZER

Recently developed tools of design such as parametric design and digital sculpture help designers to visualize complex realities and apply those to objects in the real world. New visions of aesthetics create new objects that combine shapes and structures which have never been conceived before with classic tools of design. Generative design and autonomous designers will expand our vision into the future of almost everything.

LIVING SOUNDS: SONIC MAPPING OF EVERYDAY INTERACTIONS AT THE ELDERLY HOME

Marine Zorea
Design and Architecture Department
Kyoto Institute of Technology
Kyoto, Japan
marine.zorea@gmail.com

Katsuhiko Kushi
Design and Architecture Department
Kyoto Institute of Technology
Kyoto, Japan

Kanako Kuroyanagi
Design and Architecture Department
Kyoto Institute of Technology
Kyoto, Japan

ABSTRACT

With nowadays smart and sensible objects, digital interfaces shift from the screens. This invites us to explore sonic interaction design, and sound's intuitive qualities. A growing population worldwide, the elderly can assist smart objects in their home. However, current digital interfaces are often difficult for them to use. If so, can we utilize sound to design usable interactions for the elderly?

Working with 70-85 years old Japanese urban residents as participants (3 males, 6 females), we used Human Centered Design research methods as interviews and observations to understand their interpretation of everyday sounds. Participants understood sound best within a sonic context: continuous sounds evoked mental representations of continuous events, as the rise in audio frequency representing a rise in water temperature when boiling. Many elders experience a decline in memory, affecting their ability to memorize digital interfaces. But when the relationship between the interface's controls and functions was coherent, participants reported it was easily operable. Such mapping of an interface to the elderly's mental representations can be done using continuous sounds, as participants seemed to map them spontaneously to continuous interactions.

This practice-based research proposes a method for continuous sonic mapping of everyday interactions at the elderly home. We identify continuous interactions in elders' everyday living and map them to sonic variation criteria, using sound synthesis and music symbolism. Prototyping and testing various sonic objects, we finally evaluated the method by creating and testing with elder participants 3 smart home objects with a sonic interface: a pillbox, supporting medicine count with a musical chromatic scale, an air-conditioner remote controller with a distinctive sonic feedback for temperature and wind adjustment, and a planter, indicating its humidity level by granular synthesis.

Lastly, we created a playful sonic guide, to encourage designers to explore continuous sounds and integrate them in their work.

Living Sounds proposes memorable and joyful experiences for elders interacting with their home objects. Further experimentation and testing of continuous sounds may lead to a comprehensive understanding of continuous sonic interactions. Revealing their relations to visual, tactile, and verbal modalities, we could design holistic experiences for the elderly.

1. INTRODUCTION

The ever-advancing 21st century has introduced to our everyday smart objects ('Internet of Things', IoT). Given this new generation of intelligent and sensible objects, digital interactions aren't longer restricted to devices' screens. This context invites us to discover sound, and the meanings, memories and emotions it communicates to humans. A growing portion of the worldwide society, elderly can assist smart objects in their everyday, for living independently in their home. Nevertheless, many of them find current digital interfaces difficult to learn and use. If so, may we benefit the intuitive qualities of sound, to create meaningful, memorable and joyful interactions? In this research, we sought to understand how do elderly perceive and interpret sound and unravel its intuitive potential. We finally suggest a sonic interaction design method to be applied in elders' smart home, for creating meaningful everyday interactions.

2. BACKGROUND

2.1 The aging population and the smart home

The aging population is growing worldwide, posing unprecedented social and financial challenges in its demand for care and support (United Nations, 2017). While 'Aging in place' (living independently in one's home) was found to contribute to elders' physical and mental health (Ahn, 2017), such lifestyle might be challenging for many. One major reason for that is elders' decline in memory capacity, which interfere with their performance of everyday tasks (Hedden and Gabrieli, 2004). Researchers and designers have pointed out the potential of using smart home devices to support elders' aging in place' (Demiris and Hensel, 2009). Unfortunately, many of them choose not to use such products, partly because their decline in memory capacity interferes with learning new digital interfaces as well (Wu et al., 2015). This demographic context is an opportunity for designers to research and design intuitive and memorable interactions.

2.2 Sonic Interaction Design

The world's soundscape is continuously changing. In the past 200 years, mechanic sounds gradually took over most of our audible day to day (Schafer, 1993). Seeking to restore rather natural communication patterns, the digital revolution in the late 20th century brought about the practice of sonic interaction design - the research and design of sound as a medium to convey information in interactive contexts (Franinovic and Serafin, 2013). Sound interaction practitioners introduced to our everyday interfaces auditory icons - audio samples from the everyday, and earcons - sonic information units made of pitched tones in a rhythmic sequence (Sumikawa, 1985), speech-based voice controllers and other audible information units.

2.3 The Potential of Sonic Context

Amid nowadays rich sonic scenery, one might wonder: do individual sound units as auditory icons, earcons or words, prominent in current sonic interaction design, fully recreate our audible experience of the world? Auditory context, as the location, environment, event sequence, and sonic sequence in which a sound is heard, was found to be highly beneficial for our recognition of sound and music by psychologists and design researchers (Geschwind, 1978; Rocchesso et al., 2009). Such findings highlight the design potential of auditory context and its relevance for the field of sonic interaction design.

3. RESEARCH

3.1 Aims

3.1.1 Elder's everyday soundscape

We sought to understand the elderly's perception of sound and their relation to it: how do they attach meaning and emotion to sound? What patterns can be found in their everyday soundscape? What are the elderly's practical and emotional relations with them? What activities in the elderly everyday living could benefit the integration of sound interaction design?

3.1.2 Elderly's interaction with digital technology at home

As smart objects are the focus of this research, we sought to understand the elderly's relations to current digital interactions and their usage context: what design principles make a digital product user-friendly for them? What activities in elder's everyday living could benefit the integration of smart objects?

3.2 Research participants

The research addressed elders who confront the challenges of aging, while still being capable of living independently at their home. The focus was thus narrowed to urban dwellers at the ages of 70-85 years. The research group included 6 participants (3 males, 6 females) residing in Kyoto City, at the ages of 70-84 years.

3.3 Data Collection

We applied HCD methods, namely observations and video ethnography (at participants' home), semi-structured interviews and contextual inquiries. As part of the interviews conducted, we used the 'Sonic Incident Technique' (Caramiaux et al., 2015) in which participants were asked

to recall and report sounds they remember strongly, in attempt to track sounds patterns that leave a significant impression as well as the reason for this significance.

3.4 Results and analysis

3.4.1 Elders everyday soundscape: continuous sounds are memorable

Data regarding elders everyday soundscape was summarized and grouped, with an emphasis on the generation of meaning from sound. While individual sound units were difficult for participants to interpret (a beeping notification from a phone or beeping feedback from the airconditioner were unclear), participants could understand a sequence of multiple sound units spanning over a temporal axis (continuous sounds) rather easily. Elderly spontaneously attached meaning to continuous sounds, like the ascending sound frequency corresponding with a rise of water temperature. Such continuous sonic elements, like the sound of pouring water, intuitively evoked mental representations of sequential events and actions (figure 1). These findings suggest that a sonic context contributes to sounds' meaningfulness and memorability.

3.4.2 Elderly's interaction with digital technology: mapping proved efficient

The decline in memory capacity is a prominent reason for elders' avoidance of new digital interfaces. To be useful and attractive for the elderly, digital interfaces should be easy to encode and retrieve (learn and recall). **Mapping** is one tool for creating memorable interactions, by indicating clearly the relation between the interfaces controls and their effects (Norman, 2013). Observing the elderly interacting with digital interfaces, we found that interfaces in which mapping was applied were easier to learn and remember (as the washing machine in figure 2, of which buttons' spatial order corresponds with the washing process). Elder's spontaneous attachment of mental representations to continuous sounds suggest that such sound elements may be easily mapped when designing memorable interfaces.

3.4.3 Elders' everyday activities that could benefit sonic interaction design

When asked about their everyday living, participants seemed to struggle with activities concerning **health and safety**, reporting they often forget whether or not they turned off the stove or took their medical pills. Continuous sounds could be applied to support such activities as a memorable confirmation for important actions. Participants also struggled with **home maintenance** activities involving electric appliances, reporting difficulty to follow interaction flows (as in the washing machine) or making settings adjustments (changing temperature or mode on the air-conditioner remote controller). Continuous sounds could be used as memorable feedback for such activities. Participants tended to report sound expressions of living entities (as the sound of rice-cake pounding from the neighbor house), suggesting the medium of sound associated with vitality. Leaning on such assumption, we may use sound for creating communicative, lively experiences and enrich the elder's **leisure**.

4. HYPOTHESIS AND GOAL DEFINITION

4.1 Concept and hypothesis

Our concept is a continuous sonic mapping of everyday interactions. Certain sonic sequences evoke mental representations of continuous events or actions (continuous

interactions). By uncovering matches between sonic variations and continuous interactions, we aim to design continuous sonic interactions, which are memorable, meaningful and joyful. The research hypothesis suggests that continuous sonic interactions, in which continuous sounds are mapped to continuous interactions, would be memorable and joyful for elderly users.

4.2 Initial goal definition, prototyping and testing

The initial goal of the research was finding several matches between sonic variations and continuous interactions, based on which we will create:

- **An interactive sonic guide** of continuous sonic interactions for designers to explore.
- **A series of representative sonic objects**, demonstrating the matches found in the research.

4.3 Prototyping and testing

4.3.1 Prototypes and test methods

For the initial prototyping, we asked 3 elderly (2 females, 1 male, 72-84 years) to use 3 objects and perform the following tasks: a kettle (1, task: pouring water in milliliters), pillbox (2, task: counting pills), and a shutter switch (3, task: turning on-off). Each task corresponded with 3 different sounds, from the following groups: an original audio sample (a, audio sample), music succession symbolizing the interaction (b, music symbolism namely a musical diatonic scale or a chromatic scale), and a digitally fabricated augmentation of the original sonic interaction (c, sound synthesis namely pitch shifting). The participants performed each task 4 times, each time with a sound from a different sound group (9 combinations of sound-task in total). For the physical objects we used ready-made products. The sonic output was played from a personal computer in real-time. The computer also served as a sound output medium (figure 3, 4).

4.3.2 Test results

Test participants preferred sounds from group b (music symbolism) and c (sound synthesis) over sounds from group a (audio sample), as they evoked clearer mental representations (figure 5). Participants assisted the attached sounds mainly for maintaining information in their short-term memory (ex. how many milliliters were poured so far) and for confirmation (ex. the light is turned off). However, the sonic interaction was not automated and therefore didn't match perfectly their actions. As a result, the sound-task matches were difficult to evaluate.

4.4 Final goal definition

Following the prototyping and test results, we revised the initial goal definition:

- **An interactive sonic guide** of continuous sonic interactions for designers to explore. The sounds will take inspiration from audio samples' patterns, and will be created using sound synthesis and music symbolism.
- **A series of 3 sonic objects**, demonstrating the matches found in the research. Rather than fully working prototypes, each object will constitute a sonic prototype: by sensing the interaction and produce a corresponding output from a connected speaker.

5. RESULTS

5.1 Continuous sonic interaction method

Based on the research hypothesis, we created a method for designing continuous sonic interactions: we examine continuous sounds which evoke mental representations among the elderly; we detect the sonic element leading to the mental representation (**varying sonic element**) within these sounds (for example, pushing a switch shutter on-off produces a change in frequency); the varying sonic element is reproduced by as a synthesized sonic variation (**sound synthesis**) or as a musical succession (**music symbolism,** for example, pitch shifting); we look for other everyday interactions which may be associated (form a match) with this varying sonic element. While the varying sonic element shall be preserved in order to convey the meaning, other sonic parameters may be altered (for example, the output instrument). So far, 6 sonic variations were examined and tested: pitch shifting (a gradual frequency rise of 60.58 Hz in total), granular synthesis (a track reproducing an original audio sample in 8 voices, gradually overlapping each other from 1 second gap to 0 seconds), musical diatonic scale (C major scale), musical chromatic scale (C chromatic scale), chord progression (C-G-C chords) and frequency gate (gradually allowing higher frequencies to be included in the tone, 6.72 kHz-130 Hz gate). Matches were found with 6 continuous everyday interactions: onoff, up-down, empty-full, hot-cold, weak-strong, interaction step-based process (figure 6).

5.2 Home Sound Kit: an interactive sonic guide

URL: marinezo.github.io

Medium: web-app

Function: Home Sound Kit is an open platform for designers to learn about continuous sonic interactions, explore and experiment. It is designed as a matrix, where the user can uncover matches between sonic variations and everyday interactions.

Design: Inspired by sound sampler kits, the layout design is playful and hints the guide's relation to sound. 36 square elements are distributed within a 2-dimensional matrix, of which categories are **continuous everyday interactions** (up) and **continuous sonic variations** (left). Square elements representing a match stand out in their different color. By clicking on them, the user can hear the continuous sound. Clicking on the "see more" link within the square, an explanatory modal with explanations regarding the continuous interaction, the sound variation, and the sonic interaction samples and parameters will show. As sonic variations may be unfamiliar for non-musicians, we created an icon for each sonic variation, making the guide engaging for beginners as well. Links to external information sources can be found within explanatory modal, for those who would like to further learn about sound (figure 7).

5.3 Sonic object prototype series

A series of 3 sonic objects were created, each demonstrating one or more continuous sonic interactions based on the matches found in the research. The objects correspond with three activities in elder's everyday living which could benefit the memorability and liveliness of continuous sounds. As the objects' purpose is testing and evaluating continuous sonic interaction design, all objects include a system which senses a pre-indicated interaction and

produce a corresponding sonic output. Nevertheless, the objects do not include other functions (and therefore are partially-working prototypes).

5.3.1 Air conditioner remote

Measurements: 117.8mm x 57.8mm x 20mm Medium: plastic, Arduino uno, electronic buttons, amplifier, speaker, AA batteries, Continuous sonic interaction design: (a) on-off interaction: pitch shifting. (b) up-down temperature: diatonic scale (c) wind weak-strong: frequency gate. Function: using buttons and in-product power supply, the remote is a portable sonic object. The user can distinguish easily between the different button and confirm his actions directly through sound (figure 8).

5.3.2 Pillbox

Measurements: 259.3mm x 46.6 x 50mm Medium: plastic, acryl, Arduino uno, load cell, load cell amplifier Continuous sonic interaction design: add-subtract pills: chromatic scale. Function: using a weight sensor to detect the addition or subtraction of pills, the pill organizer helps to count, confirm and monitor medicine consumption (figure 9).

5.3.3 Planter

Measurements: 104.8mm x 87.29mm x 87.29mm Medium: plastic, Arduino uno, humidity sensor, distance sensor, load cell, load cell amplifier Continuous sonic interaction design: (a) humidity low-sufficient: chord progression (b) filling water - empty-full: granular synthesis. Function: a humidity sensor continuously samples the plant's humidity. A distance sensor indicates if someone is nearby. When approaching a 'thirsty' plant, the planter will call out for the user to give him water (sound output creates harmonic tension). While watering, a granulation sound will be output, indicating how much filled the planter is. Finally, the planter will notify the user when full with a harmonic chord (figure 10).

6. EVALUATION

6.1 Evaluation settings

2 objects were tested (remote controller, pillbox) by 4 participants (3 female, 1 male, 72-84 years). The testing method was a free use of the product, followed by a discussion (figure 11, 12).

6.2 Continuous sonic interactions were memorable and playful

Participants approved of the sonic interaction design, finding the use of distinctive sounds helpful for action's confirmation and recollection. Moreover, the sonic interface seemed to add a playful dimension to mundane actions (hearing the sonic output, participants smiled and 'sang' with it). Participants expressed their motivation to try new sonic interfaces, and their interest in integrating sonic interaction design to their everyday living. In this sense, the objects fulfilled their design goal of providing a memorable interface and a joyful experience.

6.3 Acoustics, output timing require improvement

Some participants could not hear well the sonic output. Acoustical values as volume should thus be considered carefully. In additions, delays happening from time to time between user's action and sonic output (namely, a gap of approximately 0.5 seconds between pill addition and the pillbox sound) had faulted the action-sound association in participants' perception, affecting the validity of the sonic interaction.

7. DISCUSSION AND FUTURE WORKS

Having an initial validation for 'Living Sounds' project, the research can be expanded and elaborated as follows:

7.1 Further identification of interactions in elderly everyday living

A larger sample of elderly participants will allow uncovering more continuous events and actions in elderly's everyday living.

7.2 Further identification and refinement of continuous sonic interactions

Further examination of sound, its perception and fabrication methods is needed. Such examination contribute to the refinement and the accuracy of the **varying sonic element** in the continuous sonic interactions found in this research. Multidisciplinary examination of sonic interactions by sound engineers, psychoacousticians and creators would be beneficial.

7.3 Consideration of multi-modal interfaces

What is the relation between sound and matter? How may we create a coherent object? As shown in the evaluation, poor temporal correlation of tactile-sonic feedbacks flawed the product's validity. Using technologies such as Sonic-Pi (sonic-pi.net, 2019), which allow triggering sound synthesis by various sensors, a rather accurate action-sound correlation can be designed, leading to a coherent experience. In addition, with the increasing presence of voice controllers in humans' life, a proposal for the integration of oral and continuous sonic interaction would be valuable, as it would allow creating a holistic sonic experience.

7.4 The future continuous sonic objects

What technologies will be integrated in the future elderly home, and how may we use continuous sonic interactions to create a dialogue with the user? By examination of emerging technologies in robotics, medical devices and AI, a compelling proposal may be composed for the future of continuous sonic experiences.

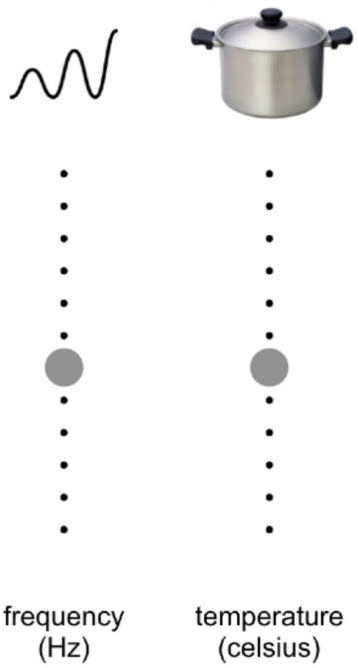


Figure 1. Continuous sounds are spontaneously mapped to continuous interactions by the elderly, as the sound of rising temperature in boiling water.

Figure 2. Footage from a video ethnography session with Misako (female, 78). She shows full literacy using her new washing machine, and explains the reason for it is the buttons spatial order, which corresponds with the washing

Figure 3. Kazuko (female, 72) tests a shutter switch (task: turning on-off), with an original audio sample as a sonic output.

Figure 4. Misako is testing a kettle (task: pouring water in milliliters), with a music succession symbolizing the pouring interaction as a sonic output (diatonic scale).

	Group A: Audio Sample	Group B: Music Symbolism	Group C: Sound Synthesis
Object 1: Kettle (task: pouring water in mililiters)	✕	○	△
Object 2: Pillbox (task: counting pills)	✕	○	○
Object 3: Shutter Switch (task: turning on-off)	△	△	○

Figure 5. Initial prototyping test results. Circle mark a clear association between sound-interaction, triangle a partial recognition, and an ex no recognition. Participants preferred sonic variations as music succession (group b) and sound manipulation (group c) over the original audio sample, as sounds from these groups evoked clearer mental representations.

	On-Off	Up-Down	Empty-Full	Hot-Cold	Weak-Strong	3+ Steps
Pitch shifting	○	○		○		
Granular synthesis			○		○	
Diatonic scale		○	○			○
Chromatic scale		○	○			
Chord progression	○					○
Frequency gate				○		○

Figure 6. Matches identified using the suggested continuous sonic interaction design method. Top to bottom: sonic variation criteria, left to right: continuous interactions in elders' everyday living. Circles mark a match.

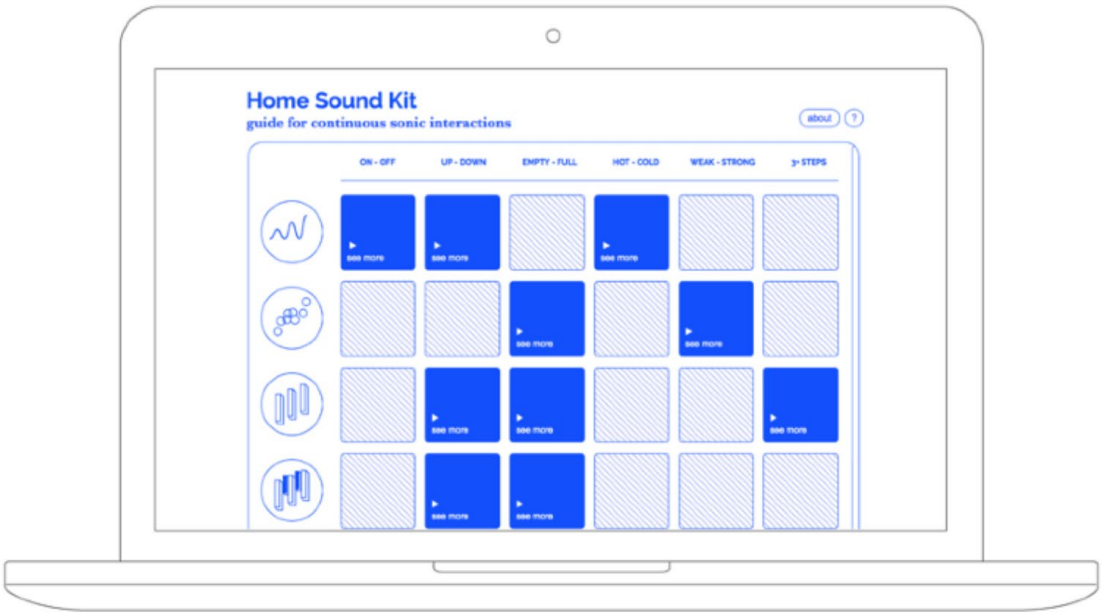


Figure 7. Home Sound Kit, an interactive sonic guide and platform for designers to learn about the project and the suggested method (main page).

Figure 8. Product series: air conditioner remote controller. Supporting adjustment of temperature (musical diatonic scale), wind mode (frequency gate sound filter), and on-off modes (pitch shifting).

Figure 9. Product series: pillbox. Supporting pill counting with a musical chromatic scale.

Figure 10. Product series: planter. Indicating insuffciency and suffciency of humidity lever in the plant (chord progression), and indicate that water is being filled (granular synthesis).

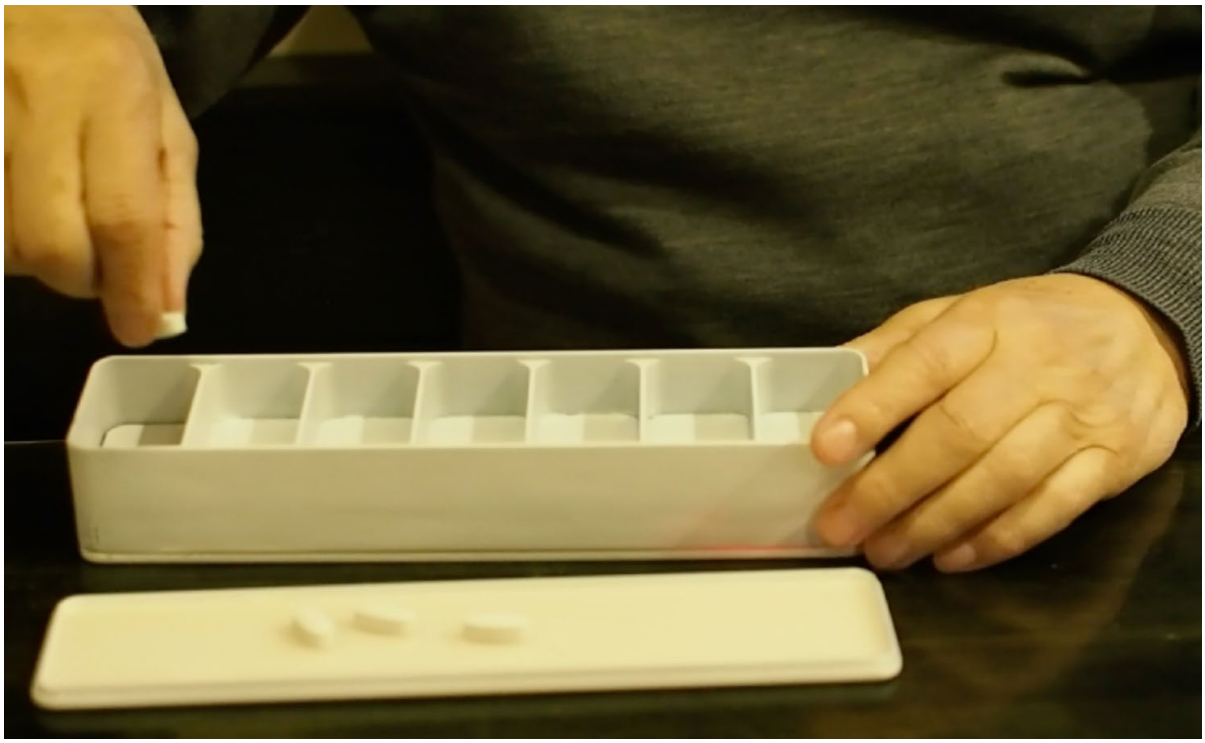


Figure 11. Product series test: pillbox. Test participant: Seki (male, 82).

Figure 12. Product series test: pillbox. Test participant: Misako (female, 78).

REFERENCES

1. Ahn, M. (2017). Introduction to special issue: aging in place. Housing and Society, 44(1-2), pp. 1-3.
2. Caramiaux, B., Altavilla, A., Pobiner, S. G., and Tanaka, A. (2015). Form Follows Sound: Designing Interactions from Sonic Memories. Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15). ACM, New York, NY, USA.
3. Demiris, G. and Hensel, B. (2009). "Smart Homes" for Patients at the End of Life. Journal of Housing For the Elderly, 23(1-2), pp.106-115.
4. Franinovic, K. and Serafin, S. (2013). Sonic Interaction Design. Cumberland: MIT Press, The.
5. Geschwind, N. (1978). Music and the Brain: Studies in the Neurology of Music. Neurology, 28(7), pp.740-740.
6. Hedden, T. and Gabrieli, J. (2004). Insights into the ageing mind: a view from cognitive neuroscience. Nature Reviews Neuroscience, 5(2), pp.87-96.
7. Norman, D. (2013). The Design of Everyday Things. New York: Basic Books.
8. Rocchesso, D., Polotti, P. and Delle Monache, S. (2009). Designing Continuous Sonic Interaction. [online] International Journal of Dsign. Available at: http://www.ijdesign.org/ index.php/IJDesign/article/view/620/271
9. Schafer, R. (1993). Our sonic environment and the soundscape. Rochester, Verm.: Destiny Books.
10. Sonic-pi.net. (2019). Sonic Pi - The Live Coding Music Synth for Everyone. Available at: http:// sonic-pi.net/
11. Sumikawa, D. (1985). Guidelines for the integration of audio cues into computer user interfaces. Davis, Calif.
12. United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Ageing 2017 - Highlights.
13. Wu, Y., Ware, C., Damnée, S., Kerhervé, H. and Rigaud, A. (2015). Bridging the digital divide in older adults: a study from an initiative to inform older adults about new technologies. Clinical Interventions in Aging, p.193.

ARAVRIT: ONE SCRIPT, TWO LANGUAGES

Liron Lavi Turkeinch
Independent researcher &
typeface designer
Haifa, Israel
hello@lironlavi.com

ABSTRACT

This talk is about letters and words, and mostly about life and opportunities. It is a story of utopian nature which presents a new writing system: Aravrit, hybrid letters merging Hebrew and Arabic.

Each new letter is composed of a top part of an Arabic letter and a bottom part of a Hebrew letter. Thus, allowing people in Israel to read the language that they feel most comfortable with, without ignoring the other one, which is always present.

Through letters and language, the daily tools that communication is built upon, Aravrit sends a powerful message that transmits to hopeful life in Israel, side by side.

The design process of Aravrit text is long and thorough, aiming to have every word in each script very clear and legible. However, the result is simple. The viewer reads the words without any effort while feeling the ease of the possibility of a life together.

REFERENCES

1. https://www.aravrit.com/
2. https://www.youtube.com/watch?v=-3ENdZeWWDI

AN APPROACH TO DESIGNING ARCHIVES IN THE DIGITAL AGE

Kartikeya Date
Faculty of Architecture and Town Planning, Technion
Haifa, Israel
kadate@campus.technion.ac.il

Yael Allweil
Faculty of Architecture and Town Planning, Technion
Haifa, Israel
allweil@ar.technion.ac.il

ABSTRACT

An archive is a curated collection of objects. Archives related to the built environment have traditionally consisted of documents - drawings, photographs, diagrams, sketches, models, letters, review reports and others. Constructing an archive requires developing an approach to categorization and classification. Classifying and categorizing buildings and elements of buildings has a long history in architectural scholarship, starting from the classical orders to the work of historians Wittkower, Pevsner, Bannister-Fletcher and Frampton, urban planners like Lynch, Krier and Habraken, and mathematicians like Alexander. The desire to identify abstract relationships underlying the specificity of multiple buildings has motivated these efforts. Such efforts to identify forms, patterns and types are marked by subjectivity and specific cultural standpoints. The most widely prevalent archival mode in architecture today is the monograph. Advances in digital image production generated by user with using digital cameras, or by systems like google streetview creates new opportunities for architects and designers. In this paper, we propose an approach to constructing archives for architects and designers using convolutional neural networks (CNN). We present a case study of post-modernist buildings in Tel Aviv and identify a set of features which distinguish these buildings as postmodernist to demonstrate the possibilities and limits of such an approach.

The domain expertise of the architect and designer is essential to developing the feature sets, either as a simple list of features or as some hierarchical combination of features. The method demonstrated in this paper is extensible to other types of problems such as the development of case studies for design problems, or the evaluation of aspects of the built environment which are not directly related to building form, provided appropriate features sets can be devised by designers and other experts. This method provides architects and designers with a new way to construct archives from the largest set of images of the built environment yet produced - photographs.

REFERENCES

1. Doersch, Carl, Saurabh Singh, Abhinav Gupta, Josef Sivic, and Alexei A. Efros. 2015. “What Makes Paris Look Like Paris?” Commun. ACM 58 (12): 103–110.
2. Frampton, Kenneth. 1992. Modern Architecture: A Critical History. Thames and hudson.
3. Krizhevsky, Alex, Ilya Sutskever, and Geoffrey E Hinton. 2012. “ImageNet Classification with Deep Convolutional Neural Networks.” In Advances in Neural Information Processing Systems 25, edited by F. Pereira, C. J. C. Burges, L. Bottou, and K. Q. Weinberger, 1097–1105. Curran Associates, Inc.
4. Mathias, Markus, Andelo Martinovic, and Luc Van Gool. 2016. “ATLAS: A Three-Layered Approach to Facade Parsing.” International Journal of Computer Vision 118 (1): 22–48.
5. Xu, Zhe, Dacheng Tao, Ya Zhang, Junjie Wu, and Ah Chung Tsoi. 2014. “Architectural Style Classification Using Multinomial Latent Logistic Regression.” In Computer Vision – ECCV 2014, edited by David Fleet, Tomas Pajdla, Bernt Schiele, and Tinne Tuytelaars, 600–615. Lecture Notes in Computer Science. Springer International Publishing.

PoetAR

Exploring parametric typography in Augmented Reality

Merav Perez
Senior Lecturer, the Program of Master Degree in Design
Shenkar
Ramat Gan, Israel
meravper@shenkar.ac.il

Matan Zohar, Creative Engineer, Snap Inc.
Daniel Grumer, Type Designer, Adjunct Lecturer at Bezalel Academy for Art and Design, Jerusalem, Israel
Ben Nathan, Variable Type Designer, Adjunct lecturer at HIT Holon, Israel

ABSTRACT

PoetAR is an on-going research project exploring parametric and responsive typography in Augmented Reality (AR), led by a group of individuals with theoretical and practical knowledge in design, creative coding, performance art, and typography.

If two human voices never sound the same, why must typography always look the same? With the growing demand for responsive design tools, we are aiming to develop a responsive visualization tool that translates vocal input situated in space into expressive visual outputs, resulting in immersive experiences of text and context. To explore the potentially prolific meeting point between sound and image making, we are developing real-time and site-specific typographical interpretations of poetic texts and spoken-word practices in AR.

Since the very nature of poetry reading (aloud) is temporal, ephemeral, and spatial, we are looking for new visual tools within AR that could capture the uniqueness and transiency of every poetry reading. By bringing these into the public realm we aim to offer new immersive experience for poets, spoken-word artists, readers and Poetry lovers alike. We align ourselves to the growing community of creative and poetic code developers on one hand, and to the evolving field of variables fonts, on the other hand. We are highly motivated and intrigued by the possibility to propose a contemporary cultural and technological reinterpretation of early performative Sound Poetry attempts.

For the conference in the Technion, alongside our presentation we would like to propose a visual demonstration which will discuss three pertinent aspects to the project: (1) its roots in the Avant-Garde tradition of Futurism and Dada Art Movements and their explorations of Sound and Concrete Poetry forms; (2) The technical aspects and challenges of developing and prototyping Augmented Reality platforms, using Unity environment as the graphic engine and combining diverse visual components in the real world; (3) Visual research of different typographic parameters in order to create a rich dynamic typographic system, that will generate unique visual AR experiences.

Finally, since the nature of the project is spatial and temporal, we will invite the audience to experiment with a dedicated version of the app that will be exclusively developed for the conference venue at the Technion.

REFERENCES

1. Bishop, C. (2012). Artificial Hells: Participatory Art and the Politics of Spectatorship. London, UK: Verso.
2. Bohn, W. (1993). The Aesthetics of Visual Poetry, 1914-1928. Chicago, IL: University Of Chicago Press.
3. Kaye, N. (2000). Site-Specific Art: Performance, Place and Documentation. London, UK: Routledge.
4. Novak, J. (2011). Live Poetry: An Integrated Approach to Poetry in Performance. Amsterdam, NL: Rodopi.
5. William R. S. & Alain B. C. (2019). Understanding Virtual Reality: Interface, Application, and Design. Cambridge, MA: Elsevier.

COMPOSITE DESIGN

1+1=3

Blonder Arielle
Faculty of Architecture and Town Planning
Technion, Haifa, Israel
arielleb@techion.ac.il

Shoval Shira
Department of Textile Design
Shenkar College of Engineering, Art and Design
Ramat-Gan, Israel
shira.b.shoval@gmail.com

ABSTRACT

Composite materials are the combination of two distinct and different elements that together make a novel third material with enhanced capacities. In the industry, fibre composites are known as advanced materials of high performance - fibres and polymer resin unite in order to make materials which are lighter, stronger, resistant and versatile.

The principle of composite materials, where each player contributes its unique qualities to make a whole of a different nature and enhanced capacities, can be transposed onto a 'composite approach', to processes, peoples, places and materials; it suggests the notion of composite thinking, beyond industrial materiality.

This 'composite approach' may offer new opportunity and insights for designing today, enabling expression, originality and innovation in a time of overwhelming amounts of information, technologies and complexity. 'Composite design' can be seen as a strategy for enabling interdisciplinary and transdisciplinary collaborations, between different fields in design, art and science.

Anni Albers (The Pliable Plane: Textiles in Architecture, 1957) writes: "If the nature of architecture is the grounded, the fixed, the permanent, then textiles are its very antithesis. If, however, we think of the process of building and the process of weaving and compare the work involved, we will find similarities despite the vast difference in scale"…

Albers' approach will be examined through the suggested notion of composite thinking; it will be elaborated and demonstrated by the joint work of the authors, a textile designer and an architect. Combining textile thinking and parametric logic, structure and surface, micro and macro, these collaborative projects bring together the unique perspective of each discipline. These design experiments involve different techniques and materials, from textiles and flexible membranes, to composites and ceramics. The notion of craft is central to all works, combining manual work with digital fabrication tools, exploring and designing materiality.

A 'composite approach' may also encourage collaborations and relationships between designers and scientists, enabling the designer access to the lab and the scientist access to the studio. While each side brings their profession and knowledge, by experimenting together, new knowledge can be created, as well as new materials, methods and applications – thus further developing and even expanding each participant's field of research. This approach will be demonstrated by transdisciplinary projects by the authors, in collaboration with different scientists. These explore materiality and material design through different lenses, offering new opportunities for all members involved.

The paper will begin with the definition of "composite design', in the context of contemporary global trends, followed by examples of our joint material research as architect and textile designer. The paper will then extend the idea of composite thinking to discuss the collaboration with scientists, through our experience of material exploration.

REFERENCES

1. Albers, Anni. 1957. 'The Pliable Plane; Textiles in Architecture'. Perspecta 4: 36–41. https://doi.org/10.2307/1566855.
2. Lynn, Greg, and Mark Foster Gage. 2010. Composites, Surfaces, and Software: High Performance Architecture. New Haven, Conn: Yale School of Architecture.
3. Winton, Deborah Schneiderman and Alexa Griffith. 2016. Textile Technology and Design. 01 edition. London ; New York: Bloomsbury Academic.

IMPACTFUL DESIGN: HOW DOES GEOMETRY OF SPACE AFFECT OUR EMOTIONS?

Avishag Shemesh
Faculty of Architecture and Town Planning,
Technion, Haifa, Israel
avishagsh@campus.technion.ac.il

Moshe Bar
Brain Research Center
Bar Ilan University, Israel

Gerry Leisman
Faculty of Social Welfare and Health Sciences
University of Haifa, Israel

Ronen Talmon
Faculty of Electrical Engineering
Technion, Haifa, Israel

Ori Kats
Faculty of Electrical Engineering
Technion, Haifa, Israel

Yasha (Jacob) Grobman
Faculty of Architecture and Town Planning
Technion, Haifa, Israel

ABSTRACT

An ongoing research suggests a new approach that examines the connection between perception, human feelings and environment. It aims to demonstrate that the emotional reactions to various types of space designs can be empirically measured. To accomplish this, we have been combining new VR techniques, physiological sensors, brain sensors and advanced data analysis. This approach aspires to add a new dimension to the way in which environment is being designed and evaluated, one that takes human feelings into account.

Perception of geometry has so far been mostly investigated in 2D, which is naturally less ecologically valid and thus there is a fundamental need to expand our studies to 3D. Virtual environments allow researchers and designers to manipulate variables of interest while keeping design features constant. Our developed methodology uses qualitative and quantitative research methods via virtual reality setup, in which we are able to examine perception of different shapes of spaces, while participants physical and mental reaction towards these shapes are recorded, analyzed and compared.

The preliminary results show a connection between the properties of space and human emotions. Criteria of curvature, proportion and scale were found to be influential. Indices of eye-tracking, galvanic skin response, electrical brain activity, as well as questionnaires, show different stimulations of arousal as well as different levels of interest and positive and negative sensations.

Conclusive results in this research may enhance our capabilities to provide users costumed designs- both real and virtual, which is one of the main goals of designers, architects, urban planners, VR developers and UX software developers. The human parameter, which until recently seemed too elusive to study, is available for our evaluation, quantification and prediction.

HOLISTIC INFORMATION, KNOWLEDGE AND DIAGNOSIS SYSTEM FOR CAM

Ute Hilgers-Yilmaz
School of Creative Arts
Hochschule Macromedia
University of Applied Sciences
D – 50667 Cologne
u.hilgers@macromedia.de

ABSTRACT

The National Center for Complementary and Alternative Medicine (NCCAM) defines complementary and alternative medicine (CAM) as “a broad range of healing philosophies (schools of thought), approaches, and therapies that mainstream Western (conventional) medicine does not commonly use, accept, study, understand, or make available” (National Center for CAM, 2002)

CAM covers a wide range of therapies and practices popularly referred to as simply “alternative” or “complementary” medicine. It includes acupuncture, herbal medicine, homeopathy, traditional Chinese medicine (TCM), and a host of other practices. (David J. Owen, 2003)

CAM is often times criticized from the point of view of evidence-based medicine (EBM) on the grounds that there is not enough evidence to support the claims of the CAM measures in question. (Kovic, 2016), The amount of reliable information available for complementary and alternative medicine (CAM) is limited, and few authoritative resources are available (2003, David J. Owen). This project has the approach to systemize and categorize the CAM in a worldwide Information, Diagnosis and Evaluation System for CAM and Ethomedicine. By this also the lack of evidence in CAM should be closed.

The system to be developed shows all aspects of different CAM in sense of user/patient centered diagnosis and solution. It informs, builds connections between causes and symptoms. As a consultant it suggests different methods and approaches to solve the patients sickness taking the different medical types into account. Infographics and videoclips helps to understand the context better. It’s a a database to collect data and brings desease patterns to ligth. Features could be a rating system for the healer, to rate the used medical method and its success in healing process with the intention, to collect data in a sense of evidence. As an information system it collects and offers „old knowledge“.

Methodically, we follow the “design-thinking” approach of IDEO, which is known as a pioneer of human-centered design — putting people at the center of work. (IDEO, 2017).

The project starts on a strategic level and follows the iterative process. We will start with expert interviews from different alternative medical directions to define needs and gain insights. Also patients will be asked in a quantitative survey to find out their perspective in applying CAM. Afterwards the interaction design, information architecture, visual design and prototyping will be done.

INTRODUCTION

The National Center for Complementary and Alternative Medicine (NCCAM) defines complementary and alternative medicine (CAM) as “a broad range of healing philosophies (schools of thought), approaches, and therapies that mainstream Western (conventional) medicine does not commonly use, accept, study, understand, or make available” (National Center for CAM, 2002)

STATUS QUO

CAM covers a wide range of therapies and practices popularly referred to as simply “alternative” or “complementary” medi-cine. It includes acupuncture, herbal medicine, homeo-pathy, traditional Chinese medicine (TCM), and a host of

other prac-tices. (David J. Owen, 2003)

There are estimates that in the US in 1990, 427 million people have already used the CAM. In 1997 there were already 629 million patients. (Flexicon)

There is a high interest or demand on complementary medicine. A study of the health insurance Pronova BKK shows, that already 55% woman in Germany have used homeopathy.

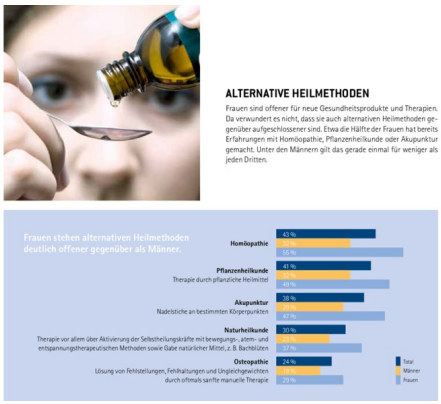


Fig 1: https://www.pronovabkk.de/downloads/973749ab67bf0227/profil-Winter-2018_11.12.18-1.pdf

The CAM market is immense and is expected to grow even further. The global complementary and alternative medicine market size was valued at USD 59.76 billion in 2018 and is anticipated to expand at a CAGR of 17.07% during the forecast period. Increasing awareness regarding traditional therapy methods is projected to drive the growth. In 2018, it was estimated that more than 60% of global population use some or the other form of traditional medicine. (Comple-mentary and Alternative Medicine Market Size, Share & Trends Analysis Report By Intervention (Botanical, Acupunc-ture, Mind, Body, Yoga), By Distribution (Direct Contact, E-training), And Segment Forecasts, 2019 – 2026).

PREVENTION THROUGH EDUCATION AND MINDFULNESS

People start to act health conscious and responsible. There are also trends that show distrust to corporations. Many turn to natural healing methods and are skeptical about the pharma-ceutical industry (Pharmaceutical technology, 2018). This movement/search for authenticity is a development that corresponds to the general evolution from Web2.0 to Web 3.0. There is a desire for enlightenment, for truth, and self-determination.

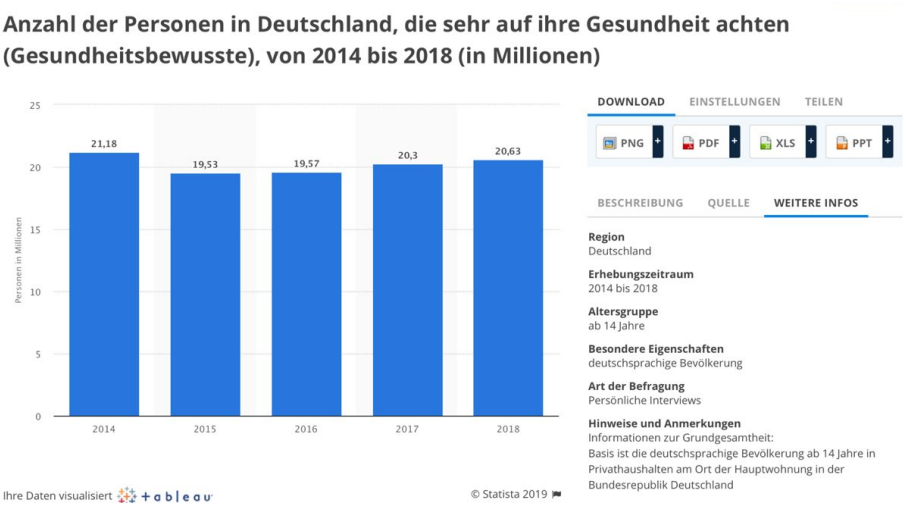
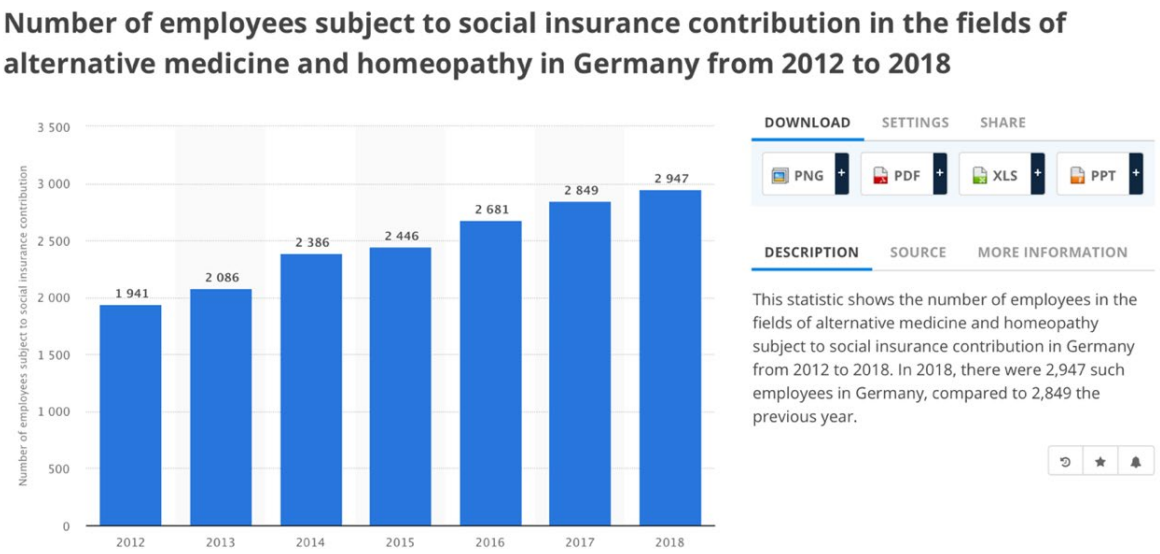


Fig. 2: The number of people, taking care about their health is constantly at around 20%. https://de.statista.com/statistik/daten/studie/272609/umfrage/gesundheit-anzahl-der-gesundheitsbewussten-in-

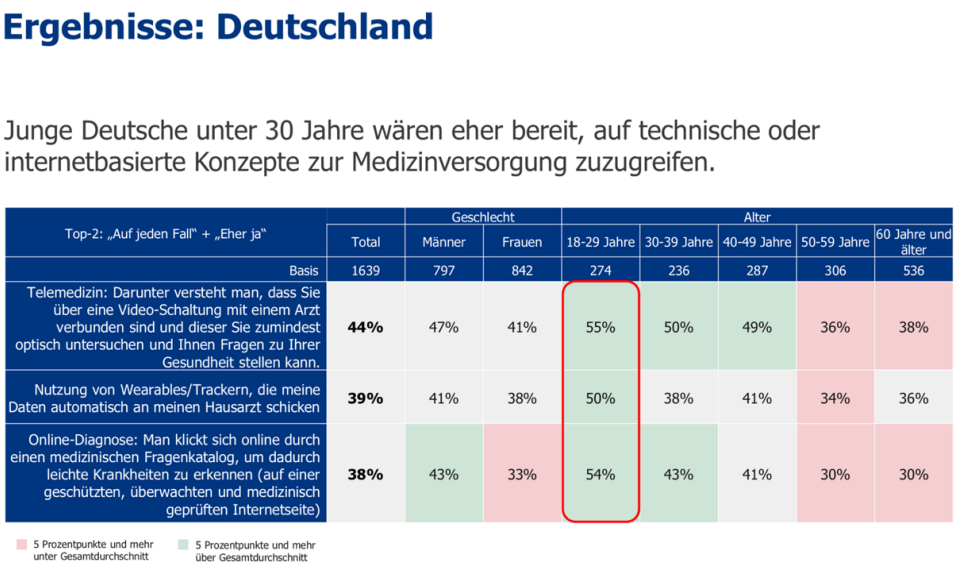


The number of employees subject to social insurance contribution in the fields of alternative medicine and homeopathy in Germany has constantly grown from 2012 to 2018.

Fig. 3 Statista: https://www.statista.com/statistics/593396/employee-numbers-germany-alternative-medicine-homeopathy/

At the same time, with the opportunities of digitization, habitual processes which e.g. also allow existing scenarios to rethink. So it could be in the future that the visit to the doctor via video therapy enjoys great dissemination.

A study by the health insurance Pronova BKK shows, that young germans under the age of 30 are more willing to use technical, internetbased concepts of medical care.



Ergebnisse: Deutschland

Junge Deutsche unter 30 Jahre wären eher bereit, auf technische oder internetbasierte Konzepte zur Medizinversorgung zuzugreifen.

Top-2: „Auf jeden Fall" + „Eher ja"		Geschlecht		Alter				
	Total	Männer	Frauen	18-29 Jahre	30-39 Jahre	40-49 Jahre	50-59 Jahre	60 Jahre und älter
Basis	1639	797	842	274	236	287	306	536
Telemedizin: Darunter versteht man, dass Sie über eine Video-Schaltung mit einem Arzt verbunden sind und dieser Sie zumindest optisch untersuchen und Ihnen Fragen zu Ihrer Gesundheit stellen kann.	**44%**	47%	41%	55%	50%	49%	36%	38%
Nutzung von Wearables/Trackern, die meine Daten automatisch an meinen Hausarzt schicken	**39%**	41%	38%	50%	38%	41%	34%	36%
Online-Diagnose: Man klickt sich online durch einen medizinischen Fragenkatalog, um dadurch leichte Krankheiten zu erkennen (auf einer geschützten, überwachten und medizinisch geprüften Internetseite)	**38%**	43%	33%	54%	43%	41%	30%	30%

5 Prozentpunkte und mehr unter Gesamtdurchschnitt
5 Prozentpunkte und mehr über Gesamtdurchschnitt

Fig. 4 https://www.pronovabkk.de/downloads/d7d821ef22e61f70/pronova-BKK-Gesundheitsversorgung-2016--1-.pdf

PROBLEM

Yet complementary and alternative medicine (CAM) is often times criticized from the point of view of evidence-based medicine (EBM) on the grounds that there is not enough evidence to support the claims of the CAM measures in question. (Kovic, 2016)

The amount of reliable information available for complementary and alternative medicine (CAM) is limited, and few authoritative resources are available (2003, David J. Owen).

The researcher Edzard Ernst has checked the benefits, risks and costs of the most popular therapies - from Bach flowers to cupping.

Scientifically meaningful data are available for applied kinesiology, hair analysis, iris diagnostics, Kirlian photography, commuting, pulse diagnosis and vegatest. For none of these methods is the validity proven; on the contrary, the majority of studies argue against the value of these procedures. One of the risks of non-validated diagnostic methods is that, in the case of false-positive diagnoses, unnecessary treatments are performed which, in the worst case scenario, also cause unwanted, unnecessary side effects. (Edzard Ernst, 2005)

The efficacy and plausibility do not show clear results for the alternative methods. Nevertheless, they are enjoying ever increasing popularity. (Spiegel, 2018)

Some universities try to approach the topic.

With the establishment of a professorship for alternative healing methods, the University of Tübingen even goes a way in the direction of alternative medicine, even if it is internally controversial. “We only want one medicine: one that is effective, safe, and appropriate for patients, that is, evidence-based and value-based,” says Autenrieth. “If new methods come into play that are effective and safe, then that can only be good, and ecology scientifically means the biological interactions between organisms and their natural environment, including humans and the environment, as well as disease - that is part of our holistic approach Medicine.” (Sueddeutsche, 2018)

Many advocates of alternative medicine claim - without giving a firm justification for why this should be - that the efficacy and safety of their concepts can not be tested with evidence-based medicine (eg randomized, placebo-controlled, double-blind clinical trials), and therefore refuse such methods. Instead, they argue with anecdotal case reports and theoretical assumptions that are in part contradictory to the modern view of anatomy, biochemistry or physics. (M. Angell, J. P. Kassirer, 1998)

RESEARCH QUESTION

What could be done to support CAM Medizin and if there is a certain perceived amount of healing process, how can we visualize this healing process and proof, that it’s really and collectively there? How can we use the techniques of digitalization and the internet to collect insights, experiences about CAM Methods or healing successes, either local or in best case all over the world, to strengthen this type of Medicine and by this, save important “old” know-ledge, based on “experiences” about alternative, nature based medicine, which has been used effectively over centuries.

This project hast the approach to systemize and categorize the CAM in a worldwide Infor-mation, Diagnosis and Evaluation System for CAM and Ethomedicine. By this also the lack of evidence in CAM should be closed.

The system to be developed should show all aspects of different CAM in sense of user center-ed/patient centered diagnosis and solution. It should inform, build connections between causes and symptoms. As a consultant it should suggest different methods and approaches to solve the patients sickness taking the different medical types into account. Infographics and videoclips should be used to understand the context better. It should be a a database to collect data and brings desease patterns to light. If this vision of a system can be realized technically and legally - still needs to be tested and evaluated. This prestudy should be the first step to evaluate the general possibilities, the market situation and especially the users needs.

Because it is a prestudy, there only few results, the insights from several expert interviews and a benchmark across existing websites for CAM. Therefore, recommendations for product development are gathered from the collected insights and other sources.

METHOD

Methodically, we follow the “design-thinking” approach of IDEO, which is known as a pioneer of human-centered design — putting people at the center of work. (IDEO, 2017).

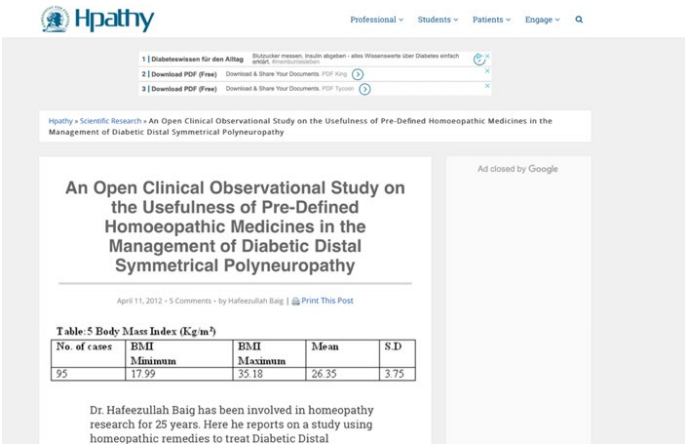
The project starts on a strategic level and follows the iterative process. As a first step expert interviews from different alternative medical directions were conducted to define needs and gain insights. Also existing websites in that field but also successful features from web 4.0 are adapted. A second project step will be to conduct patient needs and interests in a quantitative survey, to find out their perspective in applying CAM. Afterwards the interaction design, information architecture, visual design and prototyping has to be done.

CURRENT STATE OF RESEARCH / BENCHMARK

There are several systems/websites for complementary medicin worldwide. We had a focus on german market, but also some international websites.

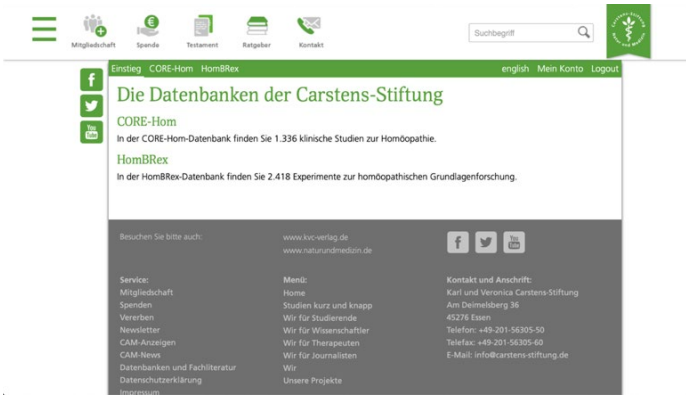
www.hpathy.com

Hpathy.com is the world's leading Homeopathy Resource, which provides high quality content and services to millions of homeopathic doctors, students and patients every year. Hpathy.com is online since 2001 and develops free, professionnal content and services for the homeopathic community.Source: www.hpathy.com



https://www.carstens-stiftung.de/databases/#/corehom

It contains the CORE-Hom-Database with 1.336 clinical Studies about Ho-möopathy as well as the HomBRex Databasewith 2.418 Experiments to homöopathic Basic research.



www.igm-bosch.de

The IGM has the world's largest specialized library on the history of homeopathy and a considerable amount of books and journals on medical history in general and on the social history of medicine in particular (now more than 50,000 units). The IGM is thus one of the largest medical history libraries in the Federal Republic. Particularly attractive is the IGM library for researchers in that the electronic catalog (WEB-OPAC) is accessible via the Internet and thus allows easy access to the catalog data with targeted thematic research.

Approximately 9,200 volumes belong to the field of homeopathy and form the special collection of the institute, which is unique in the world. The inventory is international and contains the entire history since Hahnemann. In order to fulfill the tasks of a special library, the stock is constantly being expanded by the purchase of new publications as well as by acquisitions. (www.igm-bosch.de)

https://www.phytodoc.de/

The interdisciplinary team consists of naturopathic physicians and scientists from the fields of pharmacy, biology and nutrition and the system contains a lot of information about phytotherapy and medical plants.

https://www.naturheilkunde.de/naturheilverfahren.html

Naturopathy Journal shows natural ways to health and quality of life, reminiscent of proven home remedies from grandmother's times, takes natural remedies under the microscope and answers frequently asked questions around the topic of natural health: exercise, nutrition, natural medicine and much more. (www.naturopathy.de)

The Association of German Non-medical Practitioners shows a page that is divided according to target groups patients and naturopaths. There are listed both therapy methods, as well as a non-medical practitioner search by method and zip code listed.

Within the page in the field of expertise, or the method, the method is described briefly and systematically. There are only general informations about the method and a search engine to find a practicioner.

https://www.anme-ngo.eu/de/camineuropa/forschung/evidenzbasierte-medizin.html

Anme is committed to the recognition, promotion and preservation of Complementary, Naturopathic and Alternative Procedures (CAM) and their Remedies in Europe.

It stands up for the promotion of self-responsible holistic health care of the population in the European countries of origin of the members.

(Anme: Association for Natural Medicine in Europe, 2018)

Own Summary

All of these portals or websites have a certain specialization. Some of them explain the methods, some give hints about usage of drugs. Information is either on a very general level or explicitly deep and written for professionals. None is showing the connection between the different types of methods (e.g. TCM, Ayurveda, Yoga, Hildegard von Bingen medicine, phytotherapy). We could say, none is built in the sense of “Semantic Web” whith connections and informationclusters. Multimedia is used very slightly, some portals are full of information, but not having many infographics or additional videos. Some are even not responsive neither international.

If we look from the perspective of semantic web 3.0, it makes sense to make the meaning of information usable for computer and arrange it automatically for the interested users in the course of a query. And the user could be interested not only in one method but in several, if they are connected subject wise. If we had a setup in sense of an “Answering machine” instead of a “search engine”, as it is right now, as a result of a question about a desease, several information, therapies and further links could be given instead.

INTERVIEWS / METHODS

After the review of several websites in the field of CAM, “Heilpraktiker (CAMPractitioners)” or doctors in the field of CAM were contacted. Within the survey period from 30.04.2019 until 13.05.2019, it was possible to conduct a total of 6 interviews with experts, which serve the basis for the analysis. All in all, surprisingly many people have followed the call for the interview. The interviewees were assured of an anonymisation of their statements, however, only one person insisted on it, all others reported openly on the topic.

The interviews included several blocks such as “needs and intentions” of a CAM system, evidence in the CAM, forms of presentation and features. The collected material was subsequently evaluated in terms of content (compare Mayring 2010, 2010: 67–85, 98–101).

INTERVIEWS / RESULTS

What kind of information should be included within this system?

Many interviewees supported the idea to explain in detail the therapy methods to give the patient a holistic view to the different fields and a tool to find the right decision for his problem.

Most interviewees requested informations and a search for “symptoms, therapeutic approaches or promising therapies, with or without accompaniment of active ingredients, also in combination with conventional medical treatment methods” (00:08:34, Mahlzahn2.wav). One has even has limited that information to additional specifications like “Effects or assumed effects of a drug” or “How scientific or how provable something is at the moment” or “where are the weaknesses of the current data or study situation” (00:07:57, Trotta.wav). Also “links to ingredients with similar effects”.

Further informations like “literature references” should be included, combined in a function like in Amazon “different clients, who were interested in this, also were interested in …”.

Beside informations about the medical subject or symptom, information in a commercial sense like “contact to an

appropriate therapist" (00:06:23, Trotta.wav), "further links" were proposed.

Information should be offered for laymen/patient as well as for professionals, probably there must be different versions not to "confuse" the patient with professional informations.

A "login" should be included.

Video lessons

One interviewee told, that she could imagine, showing videos about a certain Methods like "Urine-function diagnostics" (00:00:11) or subjects like "Change in the test tubes after a bloodletting" (00:02:14, Köse_3.WAV), so transferring old knowledge, which is not published or shown collected in one place any more.

How could the evidence of CAM be supported?

The majority of interviewees responded to the question of evidence, that it was difficult to obtain study design in the sense of conventional medicine with evidence in the CAM, because CAM is essentially based on experiences. Some even questioned the results of clinical trials, because humans are individual and each case and result is different. As a result, the majority expressed, that it would be very useful to exchange experiences or gain experience through such a system. When asked, whether evaluations could be used as a method in this context, the majority answered in a positive way, but with the restriction that evaluations should only be carried out by experts or professionals.

In particular, the legal position with regard to remote treatment has been referred several times, as in an extreme case, it could have fatal consequences due to incorrect diagnosis or treatment. Therefore, this point should be taken into account in the product development and clarified by the most accurate legal. Presumably, appropriate

references to risks or referrals to resident therapists must be given.

Professional judgements – power of the crowd

Many answered, that they can imagine to work with judgements, to find or weight a certain method/drug e.g. With the power of the crowd and a limited access to the assessment option an empirical quantitative result could be produced in the field of CAM.

One interviewee specified a "judgment could be one point of reference in the overall evaluation of a method" (00:21:13, Trotta.WAV). Additionally an information like "80% of the patients said, this therapy/treatment/drug has helped me" (00:21:13, Trotta.WAV).

Distance treatment / remote diagnostics

Many interviewees didn't agree with working with distance treatment, video-/Skype based. Only in a context of further educations, online-workshops or for information videos and infographics were accepted. Even if the personal visit of a professional will still be the most important way to help people, the information portal can be used for patients as a learning platform, to start taking care about their own bodies and health. Some professionals answered, that their patients have lost connection to their bodies and souls with the result of sickness. With certain simple, understandable informations about methods or drugs, patients could start to take care about their health and get sensitive to the subject CAM and the strength of nature.

Grandreviewresearch (2019) predicts a small decline of direct contact methods in the CAM:

"The key element of complementary and alternative medicine lies in the delivery of the therapy to the individual. Most of these treatments are delivered through direct contact such as acupuncture, energy healing, naturopathy, and others. This includes the application of particular naturopathic treatment on the individual. Direct contact method of delivery has occupied the major market share of around 74.0% in 2018. It is likely to witness slight decline in near future due to the integration of distant healing and many other technologies eliminating the need for direct contact with individual."

How can different CAM Methods be connected in sense of building covers inbetween different complementary medical directions?

A system that looks at symptoms or diagnoses from different directions is interesting in the opinion of one interviewee.

What else should be used to sensate the users or patients for CAM?

Many interviewees answered, they'd like to have infographics or videos to show certain complex informations or generall informations about a CAM-Type (like TCM, Yoga, …).

One interviewee suggested to include a recommendation system, as a tool to find a practitioner of your choice (like “jameda”, a portal to asses doctors).

Open information

The majority of interviewees could imagine to work as authors for such a system, in sense of sharing their knowledge for the next generations.

The information should eventually be offered on a “Open data concept”, regarding to the thought, that human should have access to use the ressources of the nature, but only for healing purpose, not for business.

Design

Several expected a “simple, appealing interface”, which is a guide to informations about the method or therapy. Information about the adequate therapist were seen in a subordinate priority and counted more or less as “commercial information”.

LIMITATIONS & SUGGESTIONS

Complexity of information could be a problem as well as information structure. It will only be scalable and actionable with a database as a base. Funding the development of the system could be a problem as well as putting it on an international level. But this could maybe also a chance to collect worldwide knowledge of nature, therefore understand and save our oecosystem better, until it will be totally destroyed by mankind.

OUTLOOK

Beside working on the paper, I have contacted a management consultancy to apply with this project for funding. One way to force a build-up could also be to get the federations together for a common project. But that can of course also cause conflicts of interest between different groups. My intention is to create a neutral, non-commercial platform, like Wikipedia but with limitated access for professionals. Therefore, I hope to win EU funding or international crowdfunding.

CONCLUSION – FROM WEB 1.0 TO WEB 3.0/4.0

With the change from Web 1.0 to Web 3.0/4.0, the users need and intention has changed as well. The users want to get involved, they are looking for serious articles without economic interests and they like the idea of a noncommercial sharing of experience. Users are working collaborative, social, information is relevant and will be offered automatically/ on demand.

Ideas get spread, if the users are highly envolved and exited, everything counts on the „positive user experience“. They are not only readers but take part of the process as authors by writing own statements. At the same moment they want to transport expertise and transfer knowledge/experiences.

We use existing successful functionalities from Web 2./3.0 and try to adapt those innovations to the new digital product e.g.:

We use the “power of the crowd” as well as “video-tutorials/video learning”. One approach in this context to obtain measurability is to work with ratings.

According to Tripadvisor, ratings play a crucial role in hotel choice for 93% of respondents. 53% of them would not book a hotel without first reading the reviews. This shows how important guest feedback is for the next customers. Ratings have become THE value indicator for hotel guests. http://www.tourismusdesign.com/2017/02/online-reputations-management-hotels/

It is conceivable that, similar to services like holidaycheck, tripadvisor or kununu, reviews or ratings can be made for alternativ healing methods, treatments or drugs as well, as long as the evaluators are serious and evaluations not manipulated.

Different to commercial services, the rating of e.g. a treatment or a drug should only be done by an “elitist” experts crowd, namely the non-medical practitioner or doctors, acting in the field of alternative medicine. However, it remains to be seen whether the assessment of less critical remedies (such as teas or home remedies) could not be subject to the assessment of the entire mass, including laymen.

Applying this scheme to evaluate the effectiveness of a CAM method in the context of a particular symptom, it would

require the “Power of the Crowd”, namely to identify a trend which methods may be more or less effective with respect to a particular symptom. The idea is to provide the possibility of a rating only to specialists through a limited access (e.g. proof of license, approbation). An example of a similar procedure is the medical network portal DocCheck, with a limited access for medical professionals – with more than 1,200,000 registered DocCheck members – one of the largest community of medical professionals in Europe. https://www.doccheck.com/welcome

E-training is another significant method of treatment delivered through various technological media like telephonic medication, video therapy, and others. Various governments offer distance courses to improve the exposure of the practitioners to various therapies. This factor is projected to bode well for segment growth in the forthcoming years.

https://www.grandviewresearch.com/industry-analysis/aternative-medicine-therapies-market

We can say, that the “experiences of many” – of course you’ll need a critical mass – can be used to get closer to an assumed truth in sense of proofing the effectiveness of a method or a administered drug.

“Open data” is the idea that some data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control. A piece of data is open if anyone is free to use, reuse, and redistribute it – subject only, at most, to the requirement to attribute and/or share-alike. https://en.wikipedia.org/wiki/Open_data

Experts say that Web 3.0 is a data-driven and semantic web. The user will type a query on the web; the web will understand the context and essentially will meet the needs of the user. (https://hackernoon.com/embracing-web-3-0-the-new-internet-era-will-begin-soon-630ff6c2e7b6)

On the one hand we can expect enlightened, interested patients, on the other hand professionals have an intention to exchange and share their experiences. The idea of “Open Data” and “sharing experiences” addresses these needs and should therefore also be a prerequisite for the dissemination of this system.

REFERENCES

1. Anlauf, M. (2015) Complementary and alternative drug therapy versus science-oriented medicine. GMS German Medical Science - an Interdisciplinary Journal
2. M. Angell, J. P. Kassirer, 1998. Alternative medicine–the risks of untested and unregulated remedies. In: The New England Journal of Medicine. Band 339, Nummer 12, September 1998, S. 839–841, ISSN 0028-4793. doi:10.1056/NEJM199809173391210. PMID 9738094.
3. Edzard, E. (2005) Komplementärmedizinische Diagnoseverfahren. In: Deutsches Ärzteblatt. Band 102, Nr. 44. Deutscher Ärzte-Verlag, 4. November 2005, S. A-3034 / B-2560 / C-2410
4. Kovic, M. (2016) Evidence-based vs. complementary and alternative medicine: It’s about epistemology (not about evidence)
5. Owen,D.J. (2003) Information-seeking behavior in complementary and alternative medicine (CAM) an online survey of faculty at a health sciences campus
6. Mayring, P. (2010) Qualitative Inhaltsanalyse: Grundlagen und Techniken. 11. Aufl., Weinheim, Basel: Beltz Verlag.

Internet sources

1. https://www.anme-ngo.eu/de/anme/ziele-aufgaben.html
2. https://www.doccheck.com/welcome
3. http://www.tourismusdesign.com/2017/02/online-reputations-management-hotels
4. Ernst, Edzard 2018. Methoden der Alternativmedizin im Check
5. https://www.spiegel.de/gesundheit/diagnose/alternativmedizin-methoden-im-check-a-1222992.html (accessed: 5. Mai 2019)
6. Ernst, Edzard (2018) Homöopathie ist reine Placebo-Therapie
7. https://www.sueddeutsche.de/gesundheit/lehrstuhl-komplementaermedizin-homoeopathie-1.4186658-2 (accessed: 28. October 2018)
8. Flexicon, DocCheck AG. https://flexikon.doccheck.com/de/Complementary_and_Alternative_Medicine_(CAM)#Definition (accessed: 6. Mai 2019)
9. Grandviewresearch (2019) Complementary and Alternative Medicine Market Size, Share & Trends Analysis Report By Intervention. https://www.grandviewresearch.com/industry-analysis/aternative-medicine-therapies-market (accessed: 5. Mai 2019)
10. IDEO (2017) “About IDEO”, available at https://www.ideo.com/about (accessed: 1. March 2017)
11. National Center of Complementary Medicine (2002). What is complementary and alternative medicine (CAM)? Bethesda, MD: The Center. http://nccam.nih.gov/health/whatiscam (accessed: 4. Mai 2019)
12. Pharmaceutical Technology, 2018. The People vs Big Pharma: tackling the industry’s trust issus. https://www.pharmaceutical-technology.com/features/people-vs-big-pharma-tackling-industrys-trust-issues/
13. Smit, M. Embracing Web 3.0: The New Internet Era Will Begin Soon
14. https://hackernoon.com/embracing-web-3-0-the-new-internet-era-will-begin-soon-630ff6c2e7b6 (accessed: 10. Mai 2019)

LET'S READ A STORY

talking to children's books using semantic similarity

Itay Niv
ITP (Interactive Telecommunications Program)
New York University -- New York, New York
itayniv@nyu.edu

ABSTRACT

Let's Read A Story is an exploration on how computers and technology can turn children's 'story time' into a conversation between parents, children and a computer. Using the corpus of Aesop fables, the project explores possible connections between different characters and ideas from the original stories, utilizing machine learning language models. The result is a new, refreshing and fun format to read stories.

"Deeper meaning resides in the fairy tales told to me in my childhood than in the truth that is taught by life", reading this quote by the poet Friedrich Schiller reminded me of my childhood and the memories of children books my parents had read to me, before there were any screens in our lives.

The simple pleasure of browsing through pages of children's books, the smells and textures, the colors and sounds that lived once when we were kids. For children, a story is an interactive experience—as a story progresses and develops, children ask questions. This is a great learning activity, kids learn to associate images in the book with the story and this develops their visualization capacity and imagination. They learn how to read and imagine. So I got to think of what has changed in the last 30 years since I was a child. How will my child explore the stories, sounds and textures of fairy tales and other children's narratives?

In recent years there has been a rise in popularity of smart devices and speakers using advanced NLP technologies. With applications Intended for preschoolers available on various platforms, children are talking to technology and technology is starting to talk back. Does this mean we can start talking to books? Using machine learning models to analyze a given corpus on the sentence level, I convert texts into high dimensional vectors. This is used for semantic similarity, clustering, and other natural language tasks that help facilitate a conversation between the computer and the reader, and to build a new story narrative based on various parameters from the original story progressions that is analized.

REFERENCES

1. Universal Sentence Encoder - https://arxiv.org/abs/1803.11175
2. A Neural Representation of Sketch Drawings - https://arxiv.org/abs/1704.03477

DESIGN AS A LEADER

The field of design finds itself in the service of new territories that were never previously open to the discipline. The role of Design with a capital D, and ‘Design-Thinking’ as its ambassador, gives design the opportunity to be an integrator, forecaster, motivator, and collaborator, and act as a leader. These new capacities of Design serve to connect it to Science, Sociology, Psychology, Management, and Education.

FLEX AR CASE

Avner Sadot, Yoav Dracher, Ori Jacobi, Raz Elias, Geva Segal, Guy Dvir, Noam Bernstein
and the rest of the Nekuda team in Tel Aviv
NekudaDM
Tel-Aviv, Israel

ABSTRACT

1.Preface:

a.On the continuum of Science -> Technology -> Product, design is traditionally considered a product discipline, applied to aesthetics, interfaces and integration.

b.As technology increasingly interfaces humans in physical, psychological and social aspects, more complex non-linear sets of requirements emerge, requiring a multi-disciplinary, human centered approach, also to technology R&D.

c.This is apparent in AR VR device design, in which human vision and comfort are direct tradeoffs with technology performance, weight, and heat.

d.In this case, Nekuda was invited into the technology specification phase of an Industrial grade AR Device Development.

2.NekudaDM's Design's involvement in the technology was at several levels

a.Framing user centered requirements including use cases and environments impacting product as a system and technology subsystems.

b.Anthropometric study analyzing implications of fitting 100% of global adult population - human head forms and eyes variability.

c.Ergonomic invention, design and engineering of one-size-fits-all, easy-to-don, stable, comfortable, weight bearing head harness.

d.Creation and Integration of opto-mechanical, electro-mechanical, and thermal solutions.

e.Designing the product – industrial design and mechanical design

3.What can be learned from this NekudaDM case:

a.Designing systems with humans in the system:

i.Integrate design's human-centered expertise to resolve complex human needs

ii.Distinguish requirements from solutions, in thought, planning & communication.

b.As designers:

i.Think "big D" - fit the design to the specific requirements, company, sector.

ii.Learn enough tech knowledge overlapping engineering for balanced discussions

iii.Balance logic with intuition to have respected position at table

c.Design builds confidence along the process; build mid-process design deliverables, but beware of mis-interpretation of maturity.

4.More broadly, for Design & Tech:

a.Build rounded R&D individuals

i.Treat people as sets of capabilities, not just as disciplines.

ii.Recruit and grow a broad base of creative, analytical, process, communication and management skills.

iii.Demand from all: ownership, teamwork, respect others, risk awareness, excellence.

b.Build R&D team that "owns"

i.Plan to be one team with the customer.

ii.Build your own team to all own all requirements and solutions equally.

c.Building the methodology

i.Nekuda methodology is visual & transparent to minimize natural mis-interpretations which are risky to execution.

ii.Framing with user centered perspective enables cross-disciplinary tradeoff management for entire R&D team to work by.

AN EXPLORATION FOR VALUE CAPTURE MECHANISMS IN PLATFORM-ORCHESTRATED NETWORKS

Philip Meier
Innovation and Entrepreneurship Research Group, Alexander von Humboldt Institute for Internet and Society, Berlin, Germany
philip.meier@hiig.de

Christoph H. Wecht
Faculty of Technology & Business
New Design University
Sankt Poelten, Austria

ABSTRACT

Ecosystem design is a young topic combining interdisciplinary approaches from management science, entrepreneurship research, and information science. A significant manifestation of business ecosystems is described by platform-orchestrated networks (PONs) (Jacobides et al., 2018). A PON can be illustrated as a system in which different actors strive for compatibility and integration (Eisenmann et al., 2011). As architect of the system, the orchestrating actor, so-called platform sponsor, must design, manage and alter conditions and mechanisms for collaboration (Teece, 2017). Considering a PON as an integral system to be designed, it is particularly important for the sponsor, to achieve economic viability with a sustainable business model (Teece, 2017; Brown and Kātz, 2009). We consider the value capture component to be the least understood for the subsequent business model and ecosystem design. Due to the lack of existing research about value capturing in business ecosystems and the novelty of the business model perspective in PONs, a grounded theory methodology is chosen to inductively develop theory from rich empirical data (Corbin and Strauss, 1990). Therefore, we analysed 51 privately held companies located in the USA, in Canada or in Europe acting as PON sponsors. We identified 10 unique value capture patterns which are applied individually or in combination to one or more ecosystem actors.

REFERENCES

1. Brown, T. and Kātz, B. (2009). “Change by design: How design thinking transforms organizations and inspires innovation.” New York: Harper Business.
2. Corbin, J. M. and A. Strauss (1990). “Grounded theory research: Procedures, canons, and evaluative criteria.” Qualitative Sociology,13(1): 3-21.
3. Eisenmann, T., et al. (2011). “Platform envelopment.” Strategic Management Journal 32(12): 1270-1285.
4. Jacobides, M. G., et al. (2018). “Towards a theory of ecosystems.” Strategic Management Journal 39(8): 2255-2276.
5. Teece, D.J. (2017). “Dynamic capabilities and (digital) platform lifecycles.” In Furman, J., Gawer, A., Silverman, B.S., Stern, S., (eds.), Entrepreneurship, Innovation, and Platforms, Advances in Strategic Management 37, 227-297.

THE DESIGNER, AS A TECHNOLOGY STRATEGIST

"Augmented Reality", Unfulfilled Promises?

Safi hefetz
Industrial designer
Chair of the industrial design department "Bezalel" jerusalem.
Cofounder-i2d design consultancy Tel aviv.

ABSTRACT

In the fertile technology field in Israel, many unique startups seeds, are rising and growing. One of the new and promising action fields that were born here is the field of augmented reality. Israel has become one of the leading countries in the field. Lumus company that works from 2000 until today is One of the primary companies in the field, in Israel and in the worldwide.

One of the unique roles of the industrial designer Is to formulate a vision and product strategy for the companies he works for. A strategy that leads and connect the start-up companies to the commercial world. One of the most significant and useful tools is "Design Thinking". This method is a holistic tool that enables the designer to meet a variety of needs; from strategy to design solutions.

For almost seven years, we have accompanied Lumus as a team, whose role is to formulate various product strategies, and on the other hand to implement it. Over the years we led the design and developed 5 different types of systems.

The lecture focuses on some interesting questions that came out of the various processes that we went through, from which one can learn of the increasing degree of influence that the designer has, and the need to form a leading spine and plot through. The designer is obliged and has the ability to confront the integration of technologies, needs, customer, product, engineering, materials, production and more.

For the various and complex processes of design and development, it is necessary to study the wide range of varied territories, each and every time. The designer is required to study and examine various fields that will be used as parts of the end vision building blocks. This is to serve important reference points and try to bridge the gaps that exist between ideas and technological development. In addition, to formulate the practical match for the commercial world, when one of the designer's roles is Formulating the vision but also creating the product.

KNOWLEDGE SHARING: A TOOL TO EMPOWER FUTURE EXPERTS IN INNOVATIVE TEAMS

Design management and Life Long Learning in the Israeli hi-tech industry

Tamar Yehezkel
Industrial Design, Design and Innovation Management
Bezalel Academy of Arts and Design, Jerusalem, Israel
tamar.yehezkel@gmail.com

Roee Bigger
Industrial Design, Design and Innovation Management
Bezalel Academy of Arts and Design, Jerusalem, Israel

ABSTRACT

In the knowledge economy, the organizational knowledge base is built on individuals constituting an important part of the organization's advantage driving it to thrive in a volatile and competitive market. Success lies in the organization's ability to use information in solving complex problems and innovation. For people operating in multidisciplinary innovative teams, there is a need to constantly adapt, thus, Life Long Learning programs are a necessity.

Design management has become a strategic tool for business, solving 21st-century problems. It promotes more "Designerly" ways to innovate and implement human-centered design at the forefront of the innovation process. However, one of the challenges design management faces in such an environment is information overload, scattered over various tools and formats. Since today's high-tech industry, lacks an effective platform to support informal knowledge sharing between professionals.

Findings from this research, illustrate that informal peer learning is the 'magic' enabling flow of new ideas and drive personal innovation, required for entering new fields of knowledge. Further findings point on an existing gap between the practice of self-management skills and the constant absorption and sharing of new knowledge. Moreover, interpersonal knowledge sharing was found to lead to more relevant information faster, than searching for new information online under content overload.

A personal peer network creates strong connections between professional skills development and knowledge frontiers.

This research includes key insights regarding two motivations of experts; Life Long Learning to stay updated with the 'broad' information, alongside with skills practice through problem-solving tasks. Informal knowledge sharing is key to create new knowledge for both consumers and providers. There is a clear need for experienced professionals and experts to continuously reach relevant content, through other people, effortlessly and anytime.

This research concludes with a proposition for a collaboration tool to help designers in leading multidisciplinary teams through connecting human values and technology, while demonstrating creative confidence in volatile environments through, embracing diverse voices and informal knowledge sharing.

1. INTRODUCTION

The rate of changes in the creative economy affects changes that will redistribute power, prosperity, competition and opportunities around the world. With the rise of new industries, businesses and companies, new models are created to address the needs, production and consumption that lead to a new order of life and work (PwC, 2014). The rapid evolution of information has changed the way in which companies innovate and generate value for their customers (Calabretta and Kleinsmann, 2017). Creativity becomes a transformative innovation force (Florida, Mellander, King, 2015), raising the value of design as a catalyst for innovation. It leads businesses to interweave design into their organizational structures, processes, and strategies (Gaby, 2019). Yet, for people in multidisciplinary teams, solving complex problems, need to innovate part of their daily work and will continue to influence our daily lives (Florida, Mellander, King, 2015). For them, Life Long Learning is part of the norm, driven by people and made possible by professional networks, companies and communities in and outside of work (Parker, Ann, 2016). Experts must still reinvent themselves in line with the pace of

the changes around them. Therefore, the business' ability to exist depends directly on the employment of the experts who have the right knowledge, skills, and professional network, coupled with an understanding of the changing business objectives (Hoffman, Casnocha, 2012).

1.1 The changing job market

The global economy and today's capitalism are in the transitional phase between the industrial model period and the knowledge economy period. Nowadays knowledge, innovation and talent are taking the lead (Florida, 2014). The fourth industrial revolution, that has been characterized as a fusion of technologies that is blurring the lines between the physical and digital (Schwab 2016, Ferrari, 2017), opens wide access to exponential technologies. The ubiquitous connection between people and machines, and data, in real time, that defines the fourth industrial revolution, will be governed by Moore's Law. Accelerating the cycle of innovation, thereby, poses a much bigger challenge for society.

Over the next ten years, the factors that will have the greatest influence on the way we work are the ability to adapt to a fast-changing world and the flood of information. Companies that foresee change are trying to grow and control the global market. In a world where consumer preferences receive center stage, the model required to meet these goals is built around flexibility, effectiveness, efficiency and a short time-to-market. Competitive pressure in the market comes from both existing competitors and new aggressive startups that are trying to lead by innovation (PwC, 2014). Today companies who are not constantly changing will devalue and these fluctuations will have a direct effect on people's employment and careers (Giudice, Ireland, 2014). In the knowledge economy, the problems are changing. The technologies from which one can build solutions are changing. Machine learning, data, AI, and blockchain are getting more important (Budds, 2017). While revolutionary technologies take place, creativity arose as a significant economic force (Prisecaru, P. 2016). In order to hold these positions, it is necessary to acquire skills, knowledge for creative problem solving, that the labor market is willing to pay for (Florida, Mellander, King, 2015). The question is whether technological progress and strong productivity growth will produce more wealth or more unemployment and social inequality (Prisecaru, P. 2016). Therefore, for design to be relevant it must be as close as possible to the edge of where technology meets society (Budds, 2017).

1.2 Creativity and skills for innovation management

Technology is a powerful driver for change (Norman, 2013), alongside it stands talent, in the form of human capital. Capitalism in the creative age is thus organized around places that attract and mobilize talent and technology (Florida, 2014). Creativity is increasingly the cornerstone of innovation and a transformative force. It is not a stock or supply of things that can be depleted, but an infinite resource that can be continually replenished and deepened. Creativity offers opportunities for knowledgeable experts and it evolves via the combination of three parameters: education, work experience and encouragement through social interaction (Florida, Mellander, King, 2015). We must free ourselves from the notion that creativity is a born skill, and acknowledge that all people are creative (Gaul, Patty, 2016). Creativity is a practice, not just a talent you are born with. Gaining creative confidence - the natural ability to come up with new ideas and the courage to try them out, it is essential for success in any discipline and business (Kelley T, Kelley D, 2012, 2013).

The rapid evolution of information has changed the way in which companies innovate and generate value for their customers (Calabretta and Kleinsmann, 2017). In the field of digital consumer technologies, design has become a strategic tool for business, helping to translate technological innovation into user values, creating compelling products and service experiences that leading firms have, in turn, transformed into business value (Gruber, de Leon, George, and Thompson. 2015). Design presents an interplay of technology and psychology and the designers must understand both (Norman, 2013). Design has also evolved in order to better support companies in dealing with the pace and complexity of technological, economic and societal change. Particularly, while core design principles of human-centeredness, collaboration, use of prototypes and visualization have remained the same over time, the way in which they are put into practice has been adapted to the innovation challenges. Moreover, design practices support the digital and physical continuum in a holistic manner, transforming from being a tactical tool for improving product performance into a strategic tool for value creation throughout the entire product lifecycle, right at the heart of the business capability. While big data usage entails challenges related to ethics, trust and privacy in big data usage, design practices are more advanced in this regard. The concepts created by designers are grounded on the core principle of betterment, the ethical debate in the design community is more advanced and recently a code of conduct for digital innovation has been recognized (Calabretta and Kleinsmann, 2017). Innovation means new uses and forms of products. Products require acceptance by consumers in order to be adopted. It is largely the designers' role as arbitrators, in the context of the overall development effort, to translate and

to interpret the functionalities that provide them into product technologies. Products developed with a strong focus on the user are likely to be embraced more easily since they are consistent with users' evolving needs (Veryzer and Borja de Mozota, 2005). Designers are the ones that are frequently going to have access to the people who are going to use the product (Katz, 2015). Therefore, the value of design as a catalyst for innovation leads businesses to interweave design into their organizational structures, processes, and strategies (Gaby, 2019).

In recent years, leading companies such as Google, Amazon, Apple, and others have been delivering compelling consumer experiences, enabled by digital technology, and have thus seized market share from competitors unable to respond. These companies adopted the value of a more "designerly" ways into the development process and "design thinking" as a tool. A human-centered approach puts the observation and discovery human needs - often highly nuanced, even tacit - right at the forefront of the innovation process (Gruber, de Leon, George, and Thompson. 2015). Another example is 'Design sprint' a collaborative design tool developed by Google, a rapid five-day team process for answering critical business questions through design, prototyping, and testing ideas with customers (Knapp, 2016). Furthermore, since 2015 over 60 design-related companies have been acquired by leading corporates to be integrated and lead in business, engineering and design innovation process (Maeda, 2019). What distinguishes these companies is a seat at the table for designers and engineers together from the beginning to the end (Katz, 2015). The moment when an organization no longer compromises on well-designed user experiences Jared M. Spool describes this as the 'UX Tipping Point', when design has become an embedded part of their culture and DNA. Instead of talking about great design, but still ship a mediocre experience, startup companies like Uber and Nest they integrated great experiences from their very first day (Spool, 2014).

In tech companies, it requires interdisciplinary collaboration and communication, decentralized decision making, information sharing and teamwork, all of which are key to innovation (Gaby, 2019). For professionals practicing these key 21st century skills, success lies in being able to share and use information to solve complex problems and in being able to adapt and the power of technology to create new knowledge (P. Griffin et al. 2012). Critical thinking, problem-solving and Lifelong Learning skills help make connections between information and arguments; as well as analyze and evaluate alternative points of view. Collaboration is an essential aspect of the designers' daily work, therefore, collaborative design as knowledge-sharing and knowledge-integration processes, are critical to the success of the process in a multidisciplinary team (Kleinsmanna, Dekena, Dongb, Lauchec. 2012).

The business' ability to lead depends directly on the employment of the experts who have the right knowledge and skills, combined with an understanding of the changing business objectives. People's skills are constantly evolving, and they now prefer personal growth over employment security and stability (PwC, 2014).

1.3 Life Long Learning

Technology has been seen as a factor that will simplify our lives, but in today's job market complex skills are needed more than even five and ten years ago. Employees today need to be able to analyze, interpret, and connect what they learned and use the information creatively. Therefore, they need to cultivate the habit of continuous learning at all times. The nature of those who continue learning is characterized by curiosity, confidence in the ability to learn new things, collaboration and communication skills, independently selecting what to learn and self-awareness (Duffy, Robera L., 1999).

Collaborations in digital innovation are diverse and complex. We are moving ahead to more complex interrelation of systems, with the need to understand the systematic perspective is more relevant and designing platforms require teams (Ferrari, 2017). When working on intensive projects, Tim Brown calls multidisciplinary team members who collaborate between fields "T-Shape people". Meaning people with expertise in a specific field of knowledge and additional knowledge that facilitates multidisciplinary collaboration with parties from other fields. These are people who master their skills through broad and in-depth knowledge, increasing their ability to start an inclusive dialog for problem-solving. Instead of the negotiation and representation of fields, there is communication and the construction of new conceptions. Deep understanding enables one to gain the team member's credibility (Brown and Hansen, 2010). When people communicate, tacit knowledge sharing occurs. Peer learning from observation and/or by doing ("know what", "know how") is based on the level of knowledge and experience of people. Tacit informal knowledge sharing encourages reflective communication and thus constitutes a key to creating new knowledge (Skyrme, 2011).

Today, Life Long Learning is a norm among professionals in the creative economy, it is motivated by individuals and is made possible by companies and communities. The new standards for learning should be immediacy, relevance and ease of access in time of need (Parker, Ann, 2016). In order for organizations to lead in their market, they must invest resources in the constant learning of their teams along to work and help them remain relevant (Wadors, Hbr, 2016). Simon

Sinek (2016) says excellent leaders are not those who define themselves as experts, but those who define themselves as constant students regardless of their status.

1.4 The 'Allegiance' and war of experts

The age of information and globalization replaced stability and demolished the traditional employer-employee relationship in the private sector. In places with a high concentration of talented people, like Silicon Valley, managers internalized this and directed their focus to skills, have succeeded in encouraging entrepreneurial thinking and strengthening their employees' loyalty. In order to retain and attract talented people, managers need to keep creating opportunities that have concrete value for employees and allow them to re-evaluate the relationship. Sooner or later most employees will pivot into a new opportunity, both sides recognizing the mutually beneficial relationship, with trust and willingness to provide each other with added value (Hoffman, Casnocha, Yeh, 2014).

Human capital is a differentiator, there is a direct link between responding to employee needs and an increase in loyalty and performance (Schwartz and Porathmay, 2014). In order to get employees to come up with millions of dollars ideas worth, companies must attract experts with the conceptual grasp of founders and adopt their entrepreneurial drive into the company (Hoffman, Casnocha, Yeh, 2014). For experts, in order to succeed in creating differentiation they must put three pieces of the puzzle in order to reposition themselves in the job market: (1) resources; knowledge, skills and contacts. (2) ambitions and values. (3) the market reality - will someone pay for the services the experts have to offer.

Until 2025 millennials will constitute 75% of the job market and they are not motivated solely by financial profit, they seek to find meaning to their work and view it as an opportunity for influence and social change and impact. 90% of millennials are interested in using their skills for positive action (Poswolsky, 2015).

1.5 Communities

Since information is constantly changing, our information management and usage are critical, particularly in a job market where every day is a test of knowledge and expertise through challenges and decisions. Who we know is the information we are exposed to – an 'intelligent network' and in order to absorb knowledge from people, we must map who knows what in order to obtain the information we need (Hoffman, Casnocha, 2012).

The Internet allows rapid learning and communication, opens many opportunities for expanding knowledge and best practices (Prisecaru, P. 2016). The network of knowledge is crucial for reaching new information that is relevant during decision making and when the information age is drowning us with an unprecedented deluge of data that amounts to information overload (Roetzel, 2018). Professional network enhancing personal skills and companies can help both involve inside and outside the company, and this is a measure to examine whether it is worthwhile joining one company or another (Hoffman, Casnocha, Yeh, 2014). The professional network is significant to personal development regardless of seniority and management level (Casnocha, Hoffman, 2012).

2. METHOD

The qualitative research included design and design thinking methods such as 22 in-depth interviews, 3 observations, informal conversations, global trend analysis and prototype testing. The research population included stakeholders in the Israeli hi-tech ecosystem. It examined informal knowledge sharing among experts from three disciplines - technology, management and design - from discipline experts to innovation leaders. The research sought to uncover what is the 'magic' that drives informal knowledge sharing among experts and stimulates a flow of new ideas and imagination. Furthermore, it examined who are the new experts, that are required to frequently enter a new field of information as part of their jobs and hobbies. Therefore, the acquisition of new knowledge that is performed independently, everywhere and frequently, holds a potential key to higher self-fulfillment.

3. FINDINGS

3.1 The future experts

Future experts are under constant testing of their ability to translate the accumulated knowledge into different fields, their flexibility to keep learning, gain new knowledge independently and stay up to date. Employers, colleges, and through social media - the level of expertise is determined by measurable parameters such as; the quality of recent work, the contribution and direct influence on a product and professional network in and outside of work. Added to this is the ability to have an in-depth conversation about a topic of expertise and share their knowledge.

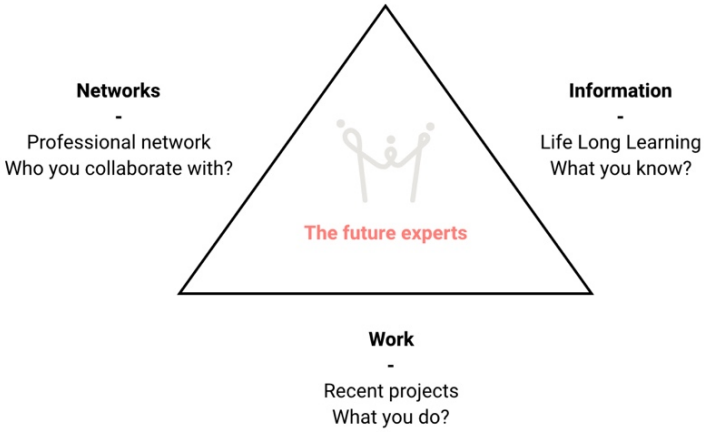


Figure 1: Life Long Learning - measurable parameters of expertise.

3.2 Problem-solving, innovate and personal evolution

A personal toolbox in compiled through the acquisition of new knowledge to meet two different needs; new learning as part of a problem-solving task and continuous learning to stay updated. These motives drive the search for new information.

Peer learning based on experience, as part of a task, appears to be a stepping stone to acquire skills. While continually updating of 'broad' information, it is what experts offer along with a skill set, in their professional ecosystem. These drivers help to stay relevant, to be recognized for expertise and to collaborate with multidisciplinary experts. Millennials look for positions where they can put this into practice, aspiring to grow along with attaining self-fulfillment in both the professional and the personal aspects.

3.3 Workplace, position and reputation

A person's workplace and position are evidence of his or her expertise and knowledge in a specific field. Therefore, both companies and experts can gain mutual benefit from strengthening their reputation. For companies, innovation and teamwork provide a platform to gain experience. At the same time, empowered employees act as ambassadors of their organization. It is a two-way street based on trust, which is shared and translated into a narrative, that can position those who understand it as experts.

The body of knowledge acquired is always personal, therefore, there is no clear separation between knowledge sharing and learning both at work and outside work. This means that, professional experience that is acquired through multiple careers and maintained hobbies, creates a broad array of skills that can be offered in the future. Companies that understand this will try to provide a bridge to the next career step, in or outside of the company.

3.4 Relationships based on shared work are valuable

Peer teamwork communication and collaboration are a basis for building continued mutual enrichment and professional network, that may create additional circles. When entering a new field of knowledge to address a problem-solving task, key people who have knowledge in different fields enjoy mutual help and support. Informal knowledge sharing allows them to 'fast forward' to relevant content, cut through the information overload and save time.

Establishing a network through teamwork is crucial and beneficial for future professional development, and may create future job offers and opportunities.

3.5 Experts always thinking about their next role

Alongside financial benefits, Millennials will prefer to invest in work that contributes to their personal development and interests together, since they see their professional role, free time and hobbies all together as a platform for experimentation and learning. Furthermore, they are constantly looking for their next step, within or outside the workplace that can offer them the next opportunities.

3.6 Storytelling as a tool

Experts are frequently required to have a broad perspective on a given topic, through the processing of their knowledge, summarize it and share it inside and outside the company. Therefore, there are clear benefits for experts that adopt storytelling, so that while working on a product, they share professional content and wrap their personal experience into the story. Moreover, we see that some workplaces provide time and resources for instructing employees how to tell about their work methods, skills and experiences in posts, writing blogs, or present them at conferences or other channels. Professionals who adopt this skill, both formally and informally, will enjoy; the status of professional experts, better networking and even more opportunities.

4. DISCUSSION

From the literature review and design research resulted with findings, it illustrates that informal peer learning is the 'magic' enabling flow of new ideas and drive personal innovation, required for entering new fields of knowledge. Further findings point the characteristics of an existing gap between the practice of self-management skills, the constant absorption and the sharing of new knowledge. Moreover, interpersonal knowledge sharing was found to lead to more relevant information faster, than searching for new information online under content overload.

4.1 People focused

There is a potential for a tool that focuses on people who may move between roles, companies, personal free time and even careers or fields of expertise. Knowledge is flowing and mobile along with people and does not stay in one company's frontier. Witnessing professionals from different fields who will be the content creators, absorbers and connectors who know where to find relevant information for others. There is a constant need for new information, it is crucial to find the relevant information under content overload and access it everywhere. Therefore the people we know are key potential for future information and faster growth.

In the age of knowledge, globalization and open organizations, professional networks have a crucial impact on the content available through experts in various roles, serving as a key potential for personal growth which may lead to new experiences and self-fulfillment.

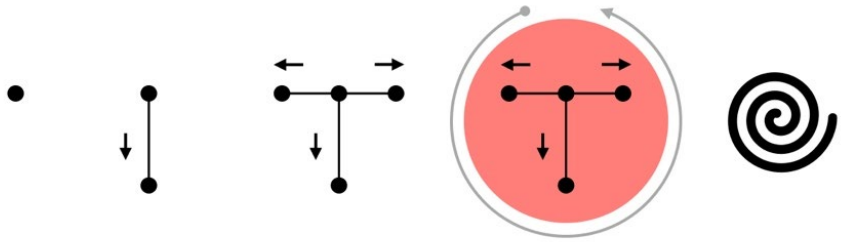


Figure 2: Different levels of professional knowledge and experts' constant growth - Knowledge is flowing and mobile along with people.

4.2 The target audience

Acquiring new knowledge and skills through experiences is crucial in order to have a seat at the table with expertise, hence research shows they should be aligned with a job market demand. In a fast-changing world, as part of experts' daily work for regardless of status, they must continuously evolve to remain relevant. Furthermore, the design role includes responsibility for the techno-social link between the customers, users and product development. Their success relies on getting to the relevant information quickly and sharing it with the team.

4.3 Independent management

One of the most prominent topics discussed by experts is the ability to manage independently at; task management, problem-solving, multidisciplinary team responsibility, staying updated in the field expertise, activity within and outside the organization and maintaining a professional network.

However, they demonstrated a major gap that they experience daily, a gap between the high level of independent management required of experts and the method of sharing and absorbing content in today's everyday life. Due to the numerous different tools, range of formats and overload of information, a need arises for fast screening, independent control over relevant sources of content and consumption time. Research participants preferred to receive filtered content, selected and managed, rather than continuing to struggle with the time invested in scanning information and dealing with the fear of missing out (FOMO).

4.4 Content Through People

When entering a new field of knowledge, virtual searching for information is currently performed through content orientation. Research indicates the real-life difference and the importance of accessing new information through other people. For people in multidisciplinary teams, searching for new information informally through people increases; reliability, openness, accessibility and cutting through irrelevant information - all of these factors directly affect time management. This illustrates a clear connection between who we know and/or identify as experts in their field, the information we absorb and the effect it has on our personal growth.

4.5 Constant students

To stay relevant in a multidisciplinary team means that experts play different roles - serving as information searchers, moderators and/or connectors. All these roles are important for collaboration and for acquiring new knowledge through other people and constantly maintaining a student state of mind.

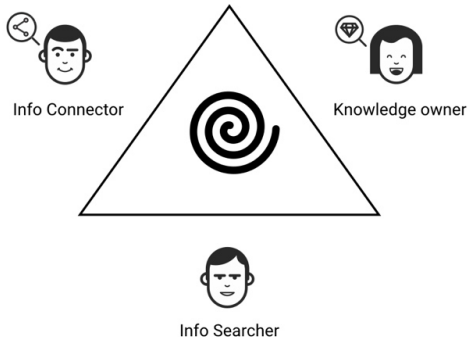


Figure 3: Different roles in multidisciplinary teams - Life Long Learning through knowledge sharing, constant collaboration and communication.

4.6 Content introduction

Life Long Learning in "T-shape" stimulates the need to reach information before diving into deeper understanding. Daily, the new experts are measured on two levels of understanding; the depth and broader familiarity with information, that are two indicators for their level of expertise.

4.7 Informal dialogue

When looking at informal dialogue and thinking about it is a potential tool, we need to differentiate information sharing and dialogue, in the context of knowledge sharing. Dialogue leads to a spiral of knowledge transfer, offers benefits for collaborators and prior positive experiences may lead to continuous collaboration.

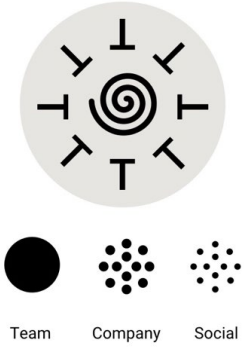


Figure 4: Multidisciplinary team informal knowledge sharing is based on individuals, occurs at work and outside social networks.

4.8 Informal and content formats

Currently, focusing on informal knowledge sharing, today it is being conducted through various formats such as: events (meetups, conferences, hackathons and more), articles (posts, blog posts, stories and more), audios (audiobooks and podcasts) and videos. The variety of formats enables anyone to create and share content quickly and easily. However, it is very difficult to maintain a method to collect, follow and consume the different content by topic, interest, expertise, and relevancy. We now confront a lack of content management, personalization and customization.

4.9 Network, storytelling and reputation

Our network and the people we follow have a crucial effect on the information we are exposed to and the potential of additional professional circles and employment opportunities. Our personal reputation is built through a dialogue about a topic, shared work, shared professional experiences and our take on ideas and new information from others. All this is spread through our networks. Experts who experiment in sharing these in the form of a story of experiences, skills and work methods, can become a channel of information and enjoy personal growth and new opportunities. We are currently witnessing today a blurring of the personal and professional spheres, therefore there is great importance which skill sets we present as part of our own story. Furthermore, there is a potential to encourage quality communication by strengthening those who share quality knowledge and contribute to the development of others.

5 PROPOSED SOLUTION

Based on research findings a prototype was shared with the research population. In order to maintain personal growth in a changing world, experts regardless of their status must constantly combine these three aspects - Life Long Learning, work and professional network. That is crucial for creating an experimental platform to gain and share knowledge, for maintaining a long-term spiral of expertise and offering professional.

New experts are now measured by; 1) Recent work - what you do as a reference for expertise, showing by doing. 2) Where - a reference for the playground and platform, either as an independent or/and as an employee. 3) With whom - a reference for the professional network and level of talent.

Who we know is the information we are exposed to – an ‘intelligent network’, and to absorb knowledge from people we must map who knows what in order to reach the information we need (Hoffman, Casnocha, 2012).

The proposed solution is to focus on how to fill the gap between self-management skills and the way experts need to manage their daily sharing and absorption of knowledge. Research suggests a centralized tool that leads to professional content proposed by other people, based on expertise, with personalization and customization. This potentially helps people strengthen their position, lead in a changing market and achieve higher self-fulfillment. Research suggests a professional informal knowledge sharing environment that enables to follow content through people we know and experts. Through

them, we can access relevant information faster. The proposed solution is to focus on a circle of mutual knowledge sharing and positive action while empowering the individuals by reflecting quality knowledge and relevancy. This kind of tool will need to support the three parts of roles existing in informal knowledge sharing; an information searcher, a content creator who shares knowledge and a connector linking to relevant people and information.

Previously the role of design was a 'link in the chain', moving from that to 'a hub of the wheel', and it comes with challenges and opportunities for designers and business (Katz, 2015). While the designer's role is expanding, this also increases the responsibility to manage complex information and be the techno-social connector in multidisciplinary teams. There is a growing need for a tool that helps to manage content absorption, continuously sharing knowledge with others and therefore creating self-positioning through a larger scale sharing circle. This can help to maintain the status of the expert and assist experts remain relevant.

6. CONCLUSION

Today we are witnessing an increase in informal knowledge sharing among professionals in multidisciplinary teams in hi-tech fields. This trend occurs among people, companies, communities and products developed to meet these increasing needs in the knowledge economy, under conditions of information overload. The growing solutions and people encouraging sharing and exchanging ideas to support the need to stay updated and the need to obtain relevant information, both stimulate and assist in the development of innovative solutions. Experts who choose to work and even lead in hi-tech innovation fields, which constant changing, must adopt the following skills: collaboration, communication, entrepreneurship, personnel management, be open to flexibility and Life Long Learning. Entering new areas of knowledge is part of the daily problem-solving work and of stay updated - both of which are criteria to measure people's level of expertise.

Maintaining these skills and needs is constant work. There is a clear gap in self-management and informal knowledge sharing in everyday life. It is conducted through many different digital tools and a variety of formats and under content overload. This research illustrates the lack of a tool for self-managed, personalized exposure to quality, relevant information through professional networks and experts that can be followed effortlessly and everywhere. What stood out, from the literacy research, interviews and prototype, was the need among experts to control how, when and through whom they consume information in the future while understanding that who we know directly affects our personal growth. At the same time, there is a willingness for mutual sharing in different expert communities for mutual empowerment. This research suggests experts who will manage to consume information, internalize it, improve it and share it with others, may enjoy better positioning, opportunities and self-fulfillment.

REFERENCES

1. Barry M. Katz. Foreword by John Maeda. (2015). Make it new: The History of Silicon Valley Design. MIT Press.
2. Brown, T., Hansen, M. (2010). T-shaped-stars. Chiefexecutive.net.
3. Budds, D. (2017). 9 Ideas Shaping The Future Of Design, According To Ideo, Microsoft, Autodesk, MIT, And More. CO.DESIGN. Fastcodesign.com
4. Design practices: envisioning the role of design in the digital era. Journal of Marketing Management, 33:3-4, 292-304.
5. Dr David J. Skyrme. (2011). Knowledge Management: Making It Work. kmknowledge.com, https://www.skyrme.com/pubs/lawlib99.htm.
6. Duffy, F., Robera L., (1999). The value of lifelong learning: Key element in professional career development. Journal of the American Dietetic Association; May 1999; 99, 5; Research Library, pg. 538.
7. Florida, R. (2014). The creative class and economic development. Sage.
8. Florida, R. (2014). The Rise of the Creative Class—Revisited. Basic Books.
9. Florida, R., Mellander, C., King, K. (2015). The global creativity index. Martin Prosperity Institute.
10. Giulia Calabretta & Maaike Kleinsmann. (2017) Technology-driven evolution of design practices: envisioning the role of design in the digital era. Journal of Marketing Management, 33:3-4, 292-304.
11. Guidic, M., Ireland, C., (2014). Rise of the DEO: Leadership by design. New Riders.
12. Hoffman, R., Casnocha, B. (2012). The Start-up of You: Adapt to the Future, Invest in Yourself, and Transform Your Career. New York, Crown Publishing Group.
13. Hoffman, R., Casnocha, B., Yeh, C. (2014). The Alliance: Managing Talent in the Networked Age. Harvard Business Review.
14. Jake Knapp, John Zeratsky, Braden Kowitz. (2016). Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days. Google Ventures.
15. Jared M. Spool. (2014). Beyond the UX Tipping Point. UIE
16. John Maeda. (2019). Design in Tech Report 2019. Design in Tech Report.
17. Kelley, T., Kelley, D., (2012, December). Reclaim your creative confidence. hbr.org
18. Kelley, T., Kelley, D., (2013). Creative Confidence: Unleashing the Creative Potential Within Us All. New York, Crown Publishing Group.
19. Maaike Kleinsmann, Fleur Deken, Andy Dong & Kristina Lauche (2012). Development of design collaboration skills. Journal of Engineering Design.
20. Marc Gruber, Nick de Leon, Gerard George and Paul Thompson. (2015). Managing by Design. Academy of Management JournalVol. 58, No. 1 Creativity and innovation management.
21. Norman, Donald A. (2013). The design of everyday things—Revised and expanded edition. Basic Books.
22. P. Griffi n et al. (eds.). (2012). Assessment and Teaching of 21st Century Skills. 17 DOI 10.1007/978-94-007-2324-5_2, © Springer Science+Business Media B.V.
23. Parker, Ann. (2016). Built to learn, Talent Development. Talent Development; May 2016; 70, 5; Research Library. pg. 54
24. Peter Gordon Roetzel. (2018). Information overload in the information age. Springer.
25. Poswolsky, S. (2015). What Millennial Employees Really Want. fastcompany.com.
26. Prisecaru, P. (2016). Challenges of the Fourth Industrial Revolution. Knowledge Horizons. Economics, 8(1), 57.
27. PwC, 2014PwC. (2014). The future of work - A journey to 2022.
28. Robert W. Veryzer and Brigitte Borja de Mozota. (2005). The Impact of User-Oriented Design on New Product Development: An Examination of Fundamental Relationship. J PROD INNOV MANAG 2005;22:128–143.
29. Ron Gabay. (2019). Breaking the Wall Between Business and Design— Becoming a Hedgefox. The Design Management Institute.
30. Schwartz, T., Porathmay, C. (2014). Why You Hate Work. NYT.
31. Sink, S. (2011). Start with why. New York, The Penguin Group.
32. Tomás García Ferrari. (2017). Design and the Fourth Industrial Revolution. Dangers and opportunities for a mutating discipline., The Design Journal, 20:sup1, S2625-S2633, DOI: 10.1080/14606925.2017.1352774
33. Wadors, P. (2016). To stay relevant your company and employees must keep learning. Hbr.org.

THE FUTURE IS CREATIVE

Tami Warshavski
Managing Director, The Innovation
Center ACT Shenkar.
Shenkar Engineering. Design. Art,
Ramat-Gan, Israel
tami@shenkar.ac.il

ABSTRACT

The future economy is the Creative Economy. Around the world, creative professionals are taking the reins of innovation: founding companies, leading organizations, and inspiring a new generation to follow in their footsteps.

Yet, in Israel, a legacy of scientific achievements has created an overdependence on technology as the sole engine of innovation. How can the Startup Nation become a Creative Nation? How do we adapt to a changing economy and forge a path for creative leaders to make an impact? How can design innovation be integrated into the DNA of leading organizations?

When the global debate is increasingly dominated by the opportunities and risks created by automation and data, there is a need for deeper exploration of the role of Design and the Creative Industries in the global economic, societal, political and day to day life.

This talk will open the window into the global movement and critical era that we are currently facing. It will explore how academia and business leaders could help the economy be more competitive, more innovative and more creative.

The talk is based on ACT Shenkar intensive work in recent years that connects Israel to the global movement, creating a critical mass of change and bringing design innovation into the Israeli innovation eco-system, securing for the very first time national funding for design and creative innovation and thus ensuring an ongoing commitment to the creative economy.

We will explore how creativity moves the economy forward by developing business innovation and new ways of communication, exchanging knowledge, sharing resources, creating new values, new user experiences, interactions, new functionalities, and new concepts for products and services that help companies in all industries gain new competitive advantage.

There is a huge opportunity to push further the creative potential in the Israeli and the global economy and society. Our mutual responsibility is to build together the right conditions for the economy to grow and flourish in new ways.

REFERENCES

1. ‘The Creative Economy in Israel’, policy recommendation – Tami Warshavski (2018)
2. ‘Interdisciplinary Research and Education Agenda, A Design Driven Perspective’ – Tami Warshavski and Federica Vacca (2016)
3. ‘Design for growth in Israel’, position paper - Tami Warshavski (2013)

ADDRESSING CROSS-CULTURAL DIFFERENCES IN DESIGN

Wendy Ju
Information Science
Jacobs Technion Cornell Institute
Cornell University
New York City, NY, USA
wendyju@cornell.edu

ABSTRACT

The importance of understanding differences in culture have long been known to designers. Interactive technology enables new ways to localize products, but it also moves products into aspects of daily life where the subtle differences in culture become more important and more profound. Today's autonomous cars, for example, are designed to follow the letter of the local law, but do not adapt to regional variations in driving behavior. At scale, this lack of adaptation can cause accidents and cost lives. We will discuss recent research looking at cross-cultural experiments in people's interactions with autonomous driving that were conducted between the US and the Netherlands, Mexico and Japan, and outline an emerging framework for designers to examine cultural differences.

REFERENCES

1. Rebecca Currano, So Yeon Park, Lawrence Domingo, Jesus Garcia-Mancilla, Pedro Cesar Santana-Mancilla, Victor Manuel Gonzalez, Wendy Ju. ¡Vamos! How Pedestrians Interact with Driverless Cars in Mexico. In AutoUI 2018. Sept 23-25, 2018. Toronto, Canada.
2. Yamiko Shinohara, Rebecca Currano, Wendy Ju, Yukiko Nishizaki. Visual Attention During Simulated Autonomous Driving in the US and Japan. In Proc. AutomotiveUI 2017, September 24-27, 2017. Oldenburg, Germany.
3. David Goedicke, Jamy Li, Vanessa Evers, Wendy Ju. VR-OOM: Virtual Reality On-rOad driving siMulation. In CHI 2018, April 21-26, 2018. Montreal, Canada.

EMERGENCY CONNECT

Improving out of hospital cardiac arrest victim outcome
using smartphone mediated emergency communication channel
protocol

Asaf M. Cohen
Department of Industrial Design
Bezalel Academy of Arts and Design
Jerusalem, Israel
asafox@gmail.com

ABSTRACT

Introduction: More than 90% of out of hospital cardiac arrest victims do not survive. Past research shows that most bystanders call emergency dispatch services, however current voice-based emergency health service communications lead to poor quality bystander performed CPR and very low victim survival rate.

The solution discussed in this paper suggests the use of a two-way video-based communication channel mediated via smartphone and emergency dispatch center software to support emergency communications between the field and dispatch center in real time.

Solution consists of a pre-installed app which allows the dispatcher to quickly asses the scenario via the bystander's smartphone camera and dispatch an emergency team. It improves voice-based BLS and CPR instructions by sending a 2-second instructional GIF to the bystander's smartphone screen accompanied by live voice instructions.

BLS efforts can be monitored and adjusted in real-time by transmitting video to the emergency center and receiving professional dispatcher feedback. A machine learning algorithm can analyze chest compression quality from video and provide real-time recommendations which could greatly improve untrained dispatcher support and professional dispatcher's level of confidence.

Method: Preliminary research was conducted with the help of six volunteers (ages 32 ±7) with no formal CPR training. Participants were randomly assigned to two groups: First group received voice-based instructions and the second group received a 2-second instructional GIF delivered to their personal smartphone in addition to the voice-based instructions. Quality of chest compressions delivered to a Little Anne resuscitation doll was analyzed.

Second group received a second condition: real-time smartphone mediated feedback by a professional dispatcher in addition to the 2-second GIF and voice-based instructions. Quality of chest compressions were measured.

Results and conclusion: Second group chest compression quality (measured by compression rate, depth and release percentages as well as overall compression and flow fraction scores) was improved in second group relative to first and significantly improved in second group second condition relative to first condition.

Preliminary results indicate that video-based smartphone mediated communication has the potential to greatly improve chest compression delivery by untrained bystanders in out-of-hospital cardiac arrest situations. Additional research needs to be conducted.

REFERENCES

1. Brandon H. Cherry, N. S. (2014). Neuronal injury from cardiac arrest: aging years in minutes. AGE.
2. Couper K1, K. P. (2016). The System-Wide Effect of Real-Time Audiovisual Feedback and Postevent Debriefing for In-Hospital Cardiac Arrest: The Cardiopulmonary Resuscitation Quality Improvement Initiative. Journal of Emergency Medicine.
3. Emelia J. Benjamin, S. S. (2018). Heart Disease and Stroke Statistics—2018 Update: A Report From the American Heart Association. Circulation - American Heart Association Journal.
4. Max Skorninga, S. K. (2010). New visual feedback device improves performance of chest compressions by professionals in simulated cardiac arrest. Resuscitation.
5. Silverman RA, G. S. (2007). The "vertical response time": barriers to ambulance response in an urban area. Academic emergency medicine: official journal of the society of emergency medicine.

COMMUNITY SURVEILLANCE UNDER THE GAZE OF MASS SURVEILLANCE

Ronen Eidelman
Faculty of Architecture and Town Planning, Technion - Israel Institute of Technology
Haifa, Israel
ronene@gmail.com

David Behar
Faculty of Architecture and Town Planning, Technion - Israel Institute of Technology
Haifa, Israel
davidbe@ar.technion.ac.il

ABSTRACT

Community-based surveillance — collaborative watching, monitoring and sharing - is becoming more widespread and invasive thanks to new and cheaper technologies. This paper investigates the practice of community-based surveillance, its positive potential as well as its dangers. Participation in surveillance itself does not necessarily make the participants' actions more democratic or change the power structure, and it can have a substantial effect on moderating social behaviors, contribute to disciplinary power and even increase social and spatial inequalities. Nevertheless, civilian participation in surveillance can help in providing a secure environment for the community, and be a resource to strengthen social relationships and the sense of belonging in a community, as well as creating a relationship between neighbors and their effort to define the space that they shared. A creation of common space (Stavrides 2015) that houses, supports and expresses the community they participate in.

We conducted field research in public spaces in West Jerusalem. Spaces that are under the citywide surveillance — covered with CCTV cameras and an integrated speaker system. We observed the variety of reactions and behaviors of residents living under this surveillance system: from compliance or even a desire to expand the system to uneasiness and not trusting the system, and towards citizen-led surveillance activities on themselves, neighbors, park visitors, and surveillance of park-related authorities and municipal workers.

Following the field study we explore the possibilities of creating participatory surveillance tools, designing a citizen-operated surveillance system. Through the consolidation of the capabilities of surveillance technology with social media we created participatory video surveillance system, which allows communities to monitor their neighborhood along with their neighbors. A system that allows users to participate in the surveillance of others, but at the same time be monitored and supervised. A participatory design that enables to experience in the impact that surveillance has on their viewers, on the surveilled public and on the public space. Currently we are experimenting with this tool in temporary communities such as participants of art festival, exploring the use of the system, the users reactions and the questions it raises.

REFERENCES

Stavrides, S. (2015). Common Space as Threshold Space: Urban Commoning in Struggles to Re-appropriate Public Space. Footprint, (June), 9–20. Retrieved from https://journals.open.tudelft.nl/index.php/footprint/article/view/896

Closing Notes

THE PARADOX OF DESIGN

Intra-Design approach to the inherent conflict of values between Engineering and Art

Prof. Ezri Tarazi
Design Tech Lab, Industrial Design Department, Faculty of Architecture and Town planning
Technion, Haifa, Israel

ABSTRACT

The rise of technology at the use of billions of people, as we witness today, involved a strong emergence of Design discipline, that could produce successful products and services. Art, as the world that Design emerged from, holds opposing values to Engineering. The Paradox of Design is that it tries to hold both ends at the same time, in order to combine art and technology. Intra-Design is a term that tries to solve the paradox, by producing the balance by the continuance movement forward. Radical changes in values would soon change dramatically both disciplines. The popularity of design, yet the meticulous use of its tools in the hands of the mammoth companies, put in risk the 'Human Centered Design' promise, as a main value of design. One of the main values of Art and Design is the 'hand of the artist', and the specific personal style it can give to a piece of sculpture or painting. In Design, this value started to melt into a design brand specific style that evolved through the hand of many designers. In the age of Intra-Design, and specifically, the generative design, we can predict the absence of the 'designer hand' from the creative scene. Other values such as the iconic, timeless piece of Art, or the 'multiple meanings' are also questioned. Intra-Design is a new approach for the future of design, that will illustrate the way out of our civilizational collapse.

REFERENCES

Victor Margolin, "Design, the Future and the Human Spirit," Design Issues 23, no. 3 (Summer 2007): 4–15

DESIGN TECH2019

International Conference

FOR MORE INFORMATION

designtech@technion.ac.il

designtech.net.technion.ac.il/2019-conference

ISBN 978-965-572-991-7