

the
little
book of

Design for Health in Latin America

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Global Health
Sig





Editors of this DRS SIG Little Book:

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ISBN: 978-1-86220-400-3

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The Little Book of Health Design in Latin America

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Acknowledgements

This book is an outcome of the collective efforts of the Design Research Society (DRS) Special Interest Group (SIG) in Global Health and the DRS Latin America Design (DILA) Network. We thank the DRS as well as all the members of our SIGs and all the contributing authors to this volume.

¹See <https://www.designresearchsociety.org/cpages/sig-global-health>

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Little Book Editorial

By all editors

Welcome to our third Little book in the series of Design for Global Health and the first in the series of Design for Health in Latin America.

The global challenge of maintaining population wellbeing and fostering health prevention has begun to emerge, and thus the role of designers whether in supporting the promotion of healthy lifestyles or in their contribution to wellbeing. Works in this space (Chamberlain et al, 2015; Tsekleves & Cooper, 2017; Nusem, 2018) have demonstrated the propensity of design to contribute significantly in health and wellbeing.

The general state of health and wellbeing conditions in Latin America has shown signs of progress over the last decade, nonetheless, these improvements also evidence strong ties with inequality challenges in the region, among and within countries (OECD/The World Bank, 2020).

Within a similar timeframe, the general understanding of the field of design -as perceived by the population and other disciplines- in the region presented a progressive shift towards complex problem-solving, decision making, strategic thinking, and innovation, applied in a variety of contexts involving products, experiences, services, and systems (Inter-American Development Bank, 2015). This shift has ultimately expanded the impact and relevance of design in relation to tackling complex societal challenges, such being the case of the health sector.

For these reasons the editorial team developed an open call seeking short case studies (written in Spanish, Portuguese or English) demonstrating the use of design for health in Latin America. A total of 20 case studies were received and reviewed from across Latin America (predominantly from Brazil, Chile, Colombia, Mexico and Peru). 13 case studies were selected and are included in this Little Book.

Although these do not account for all the design for health projects taking place in Latin America, they do provide a representative sample of the main areas of research and interest in this field. Looking at the geographical

distribution of the accepted case studies, two are from Mexico, two from Colombia, one from Peru, two from Brazil and five from Chile. In terms of the design research areas these are also diverse, covering product design, service design, spatial design, systems design and design for behaviour change. The health areas explored by the case studies include primary care, outpatient health, public health, neonatal health, mental health and wellbeing, dental health and obesity.

In author alphabetical order, below we offer a brief summary of the case studies included in this Little Book.

Aceves-González and Galindo-Estupiñan explore the use of service design to evaluate and redesign outpatient services for people living with dementia in Mexico. This case study resulted in the implementation of some changes that did not require a solid economic investment but had an immediate positive impact on the operation of the service.

Amenabar et al outline the design and application of antimicrobial materials to prevent fomite transmission. This case study from Chile, promotes the development of products made in the country that contribute to the control and prevention of the pandemic through the combination of two of the main raw materials found in the country.

Anabalón's case study presents a commercial product design, a Neonatal Environment Stimulation Technology that helps premature babies keeping connected with their mothers. Although the product design started in Chile, the commercial product was developed in collaboration with countries outside Latin America and is now available worldwide.

Barragán-Romero and Lange-Morales present a neonatal transport incubator developed in Colombia that allows neonates to be safely transported to medical centres where they can receive adequate medical attention. The team employed several design research methods, such as User-centred design, Ergonomics, Ethnographic approaches and Participatory Design, for designing the product.

Bravo presents in his case study evidence of sensing and thinking in students of Design in tertiary education in Mexico during the COVID-19 pandemic.

Ciravegna and Signerez explore in their case study the role of design

in improving people's emotional well-being. They developed 'emergency kits' to help people cope with difficult emotional situations generated by risk events or unforeseen circumstances in everyday life.

Escandón et al outline how to apply behaviour change theories in proposals related to obesity. The case study presents two design for behaviour change strategies that help improve decision-making in food choices and physical activity.

König's et al case study explores the opportunities for design in improving service accessibility within health services provided in Brazilian Hospitals, in terms of their architecture and interior space design.

Mollenhauer et al present a case study where they developed a distributed innovation system that enables makers to use service design methodologies (i.e. Platforms, Toolkits and Strategic Design Guidelines) to help public, private, and civil institutions of design, production, and transfer, to better offer solutions technology for the Chilean health sector in crisis situations, eventual pandemics, or future disasters.

Montt et al, designed a new web-mobile platform that acts as a teaching tool for the study of Sectional Anatomy. The MedicineHub tool has been already tested in eight Universities in Chile.

Reyes et al, employed research through design to redesign the public healthcare organisational system operating in a Primary Care Center in Peru. The case study explored different aspects of the public health infrastructure including the administrative and medical digital platforms, internal processes and protocols, and the physical spatial design of the care centre.

Sisto et al. employed an exploratory design-based research approach to develop a product, a kit for people waiting for a dental implant in the Chilean public health system. This allows them to maintain the health of the rest of the teeth until the dental implant can be installed.

Vasconcellos and Goldchmit present a product design concept to help older patients of the primary care in the Brazilian Public Health System to adhere to medication.

As part of the case studies we asked authors to answer two questions. One that reflects on the value of including designers/design researchers in healthcare projects and a second one on a suggestion they would offer to a designer/design researcher interested in entering the healthcare sector. Below we collate several of the responses to these questions and discuss further.

Benefits from including designers/design researchers in health-care projects

Empathy and enhanced adoption of health interventions and programmes, as typically in the healthcare sector, tend to be designed from a very distant perspective from the people who would benefit and /or carry out the implementation of these on a daily basis. Design with service users to better understand needs and increase adoption of developed products and services.

Involve health practitioners in the design phases so that they can experience and better appreciate the value of design in health.

Develops insights by bringing together information from different areas of the health sector.

Facilitates a timely and appropriate response to the constant needs of the health discipline, allowing rapid and comprehensive prototyping, testing and validation.

Imagines futures that better address the needs of the different stakeholders in relation to improving population health and wellbeing.

Facilitates the adoption of a holistic person-centred approach, with a more systemic perspective that incorporates emotional well-being too.

Enhances the integration of the disciplines, especially when working with a participatory approach that recognises the users and gives them a voice throughout the process.

Suggestions to designers/design researchers interested in entering the healthcare sector

There are countless interactions to be designed, in the health sector, especially as it represents an area that historically has not incorporated design as an improvement strategy.

It is essential to understand the legal regulations that apply in the sector, as well as all the ethical protocols for operating with people.

It is important to develop strong communication and relationship building skills to be able to engage with healthcare professionals and to communicate the value of design research in the areas of health and wellbeing.

Operate at a macro and micro level to understand the dynamics of the system, the various stakeholders involved, and their needs, motivations, concerns, as well as power relations, in order to generate proposals that are in tune with the real context and have a positive impact on it.

Be ready for lifelong learning and an ever-changing innovative environment. Delve into theories and specific studies of design for health, which includes theories of behaviour change in health sciences. Explore organisational design and policy design, which can widen the potential for health benefits beyond individual behaviour.

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Product Design for Health Case Studies

Babybe, helping premature babies by keeping them in touch with their mothers

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Abstract

A Neonatal Environment Stimulation Technology that allows parents to control the incubator's mattress with their Heartbeat, Breathing, and Voice, turning any incubator into a family-centered care isle that keeps preterm infants and parents connected. Designed by Camilo Anabalón, developed by Babybe GmbH, and sold to Natus in 2020.

Keywords – Family-centered care, Medical Device, Premature Babies, Patents, Medical Design, Startup.

Project Description

The objective of the project:

Helping premature babies in NICU to get better sooner by keeping them connected to their mothers throughout the artificial incubation process).

Key actors involved:

Users: Patients (premature newborns), Parents, nurses, and doctors.

Decision makers: Chief nurses, Neonatologists, hospital financial department, hospital technical department.

Supporters: Key opinion leaders, Venture Capitalists,

Partners: Contract Manufacturers, Clinical researchers, health insurance

Process:

Iterative rapid product development based on multilevel progressive validations (Usability, clinical, technological, commercial).

The initial research showed that mothers had limited access to their child while they were in the Neonatal intensive care units (NICU) and the limited connection between babies and Mothers had a negative impact in the early physiological and neurological development of premature babies. Once the need was established, we started an iterative process of development in tight connection with medical staff and parents. This led to identify the main stimuli that will positively influence the patient and the optimal ways to deliver it. From there, multiple development cycles were executed to reach prototypes that will allow us to bring the product to clinical, technical, and commercial validation and eventually to the market.

Babybe, started as a Master thesis that evolved into entrepreneurship and then into a VC backed Start-Up active in Chile, Germany, USA, and China

Result:

A patented and CE approved medical device that included hardware and digital components that allows mothers to send their heartbeat, breathing motion and voice remotely to their premature child inside the incubator. The product was sold in the European Union as well as in USA before the company was acquired by Natus Medical in November 2020.

Reflections

The Babybe system was thought from the very beginning as a patient centric design that aimed to improve the clinical outcome of premature babies by integrating the family, especially the mother, into the medical care of the patients. The approach to create such an interface was directly derive from the replication of human interactions between mothers and their babies, this meant using the variables of human contact as treatment. This path for the development of the product turned out to be quite far removed from standard R&D practices in the medical industry as well and in the medical business, creating major challenges for the product to be validated and accepted into the medical community. To overcome those roadblocks the project had to rely on extensive clinical studies, stringent certification, continuous engagement with key opinion leader and risk capital funding. Nevertheless, once the product reached the Neonatal intensive care units (NICU) both, the medical staff and the parents of the patients reported great benefit not only to the health of the patients but to the workflow of the whole unit.







INNEO: Neonatal Transport Incubator for Use in Precarious Conditions

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Abstract

INNEO is a neonatal transport incubator that works properly in precarious conditions and allows neonates to be referred to medical centres where they can receive adequate medical attention. It was developed by applying the Double Diamond Design Model, Design Thinking, User-centred design, Ergonomics, Ethnographic approaches and Participatory Design.

Keywords: -Neonate, Transport Incubator, User-Centered Design.

Project Description

According to WHO (2018) figures, 1.1M newborns die annually due to preterm birth complications. Neonatal mortality in Latin America is 35 times higher (Ministry of Health, Colombia, 2010). These figures are associated with precarious conditions and poor access to health systems. The precarious conditions include complex access from rural populations, a shortage of medical equipment, and specialised personnel in neonatal care. Three-quarters of these deaths could be prevented with current and cost-effective interventions.

The objective of the project:

To propose a neonatal transport incubator for use in precarious conditions, which facilitates the accessibility of these medical devices in hospitals that provide outpatient services and care for second-level pathologies (paediatrics, gynaecology-obstetrics, internal medicine and surgery).

Key actors involved:

Public university, a private company, and public and private health sectors.

Process:

Following the Double Diamond design process (Design Council, 2019), the market was analysed, and existing incubators were evaluated to determine the market gap. Fieldwork was carried out with an ethnographic perspective (ANGROSINO, Michael, 2012) with health personnel (neonatal doctors, nurses, paramedics and nursing assistants), manufacturers and distributors of medical devices. The design process included five iterations, making use of sketching, rapid prototyping and ergonomic tests before arriving at the final conceptual result.

The different types of tests included: 1) physical evaluations [anthropometrics, biomechanics, manoeuvrability, manual handling of loads, and user and patient safety (Trujillo-Suárez et al. 2016)]; 2) cognitive checks [usability tests with nurses and doctors, virtual (render) and physical (prototype) model testing for semiotic analysis (understanding of physical signs of the product and its operation), user feedback, colour psychology checks and user experience and user interface test to the control screen. Health personnel was engaged throughout the design process, participating in product testing and providing feedback and their work experiences.

Result:

Inneo is a compact, practical and low-cost incubator. Due to its price, a health centre can acquire multiple incubators and thus serve more patients. It allows the newborn to be safely transported and survive until receiving

the healthcare and treatment. Inneo provides a controlled environment of warm air and readings of oxygen saturation in the blood and heart rate.

Reflections

Design can contribute to reducing social inequity through projects that help mitigate health systems' precariousness. In this case, the safety and transport of the neonate is possible practically anywhere.

Why does the health sector benefit from/need the inclusion of designers in its work teams?

Products and services aimed for the health sector require very high interdisciplinary technical knowledge. The inclusion of the designer enhances the integration of the disciplines, especially when working with a participatory approach that recognises the users and gives them a voice throughout the process.

What suggestion would you give a designer interested in entering the healthcare sector?

Learn ethnography, rigorously document the design process, and develop strong communication and relationship skills.

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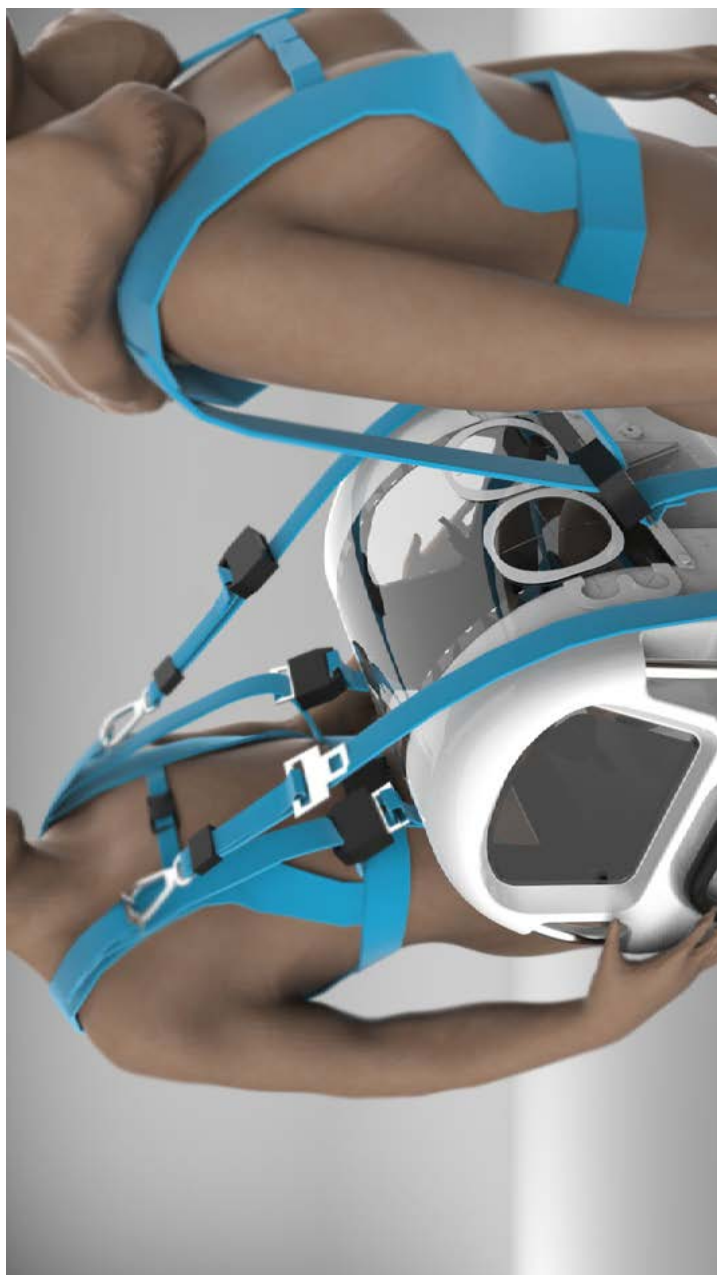
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MIO (IntraOral Maintainer): Interdental Device for Temporary Rehabilitation of Patients in Public Health

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¹ Design of Spaces and Objects, Universidad del Desarrollo Santiago de Chile

Abstract

Temporary rehabilitation system for patients with dental loss waiting for treatment within the Chilean public health system. A biocompatible device customized by the user maintains the missing tooth's space until the patient can have definitive treatment.

Keywords – Public health, Tooth loss, Waiting list, Dental prosthetics, Rehabilitation, Innovation

Project Description

This case study started as a final undergraduate project of the Design of Spaces and Objects major at Universidad del Desarrollo. We found a massive problem in the Chilean public health system that led to an excellent opportunity to contribute to many people exposed to a harmful wait for medical care. We chose an exploratory design-based research approach to develop the project.

The product design is a kit for people waiting for a dental implant in the Chilean public health system, which allows the user to remain for a long time while maintaining the position of the rest of the teeth.

This project was a finalist in the Diseño Responde contest, Latin American Challenge Index Award + UDD, and the National University Entrepreneur Impact Contest.

Project Objective:

Generate a temporary rehabilitation system for patients with dental loss awaiting treatment in public health.

Critical actors involved:

The public health system, the Government of Chile, and foundations.

Process:

The process was based on 3 main pillars: Research and Definition, Ideation and Prototyping and finally Testing.

Research and Definition

Initially, it was determined that one area with a longer waiting list in the Chilean public health system is oral health, specifically dental implantation. The main problem is that the patient, on waiting lists of more than 6 months, suffers morphological changes in his mouth due to the absence of the dental piece that would maintain the position of the rest of the teeth.

At the time of identifying the problem, there was no temporary device that would support the distribution of the other teeth for so long.

Ideation and Prototyping

To design the product, we researched references of oral maintainers, but none met the requirements. However, thanks to these initial exploration, small approximations were achieved. During the prototyping stage, we designed and modelled a 3D prototype that could maintain the position of the teeth without compromising them, and that was affordable and made of a biocompatible material, so that it would not generate any adverse response to the patient who was going to occupy it.

Testing

Finally, the pieces were tested in a model mouth to verify adherence issues pros, and cons of each piece, which we later reformulated to obtain a model which can be tested on patients.

Result:

As a result, we created MIO (Intra Oral Maintainer), which consists of a pack that includes 6 biocompatible pieces to be exchanged monthly. The system allows the user to easily mold and adjust them to their mouth, without the need for major orthodontist intervention. It is a low-cost product, which does not seek to replace the function of the implant, but rather, to maintain the health of the rest of the teeth until the definitive treatment can be carried out.

MIO is in the Minimum Viable Product stage that must be certified by a specialized scientific entity to approve its use in patients.

Reflections

Why does the health sector benefit from/need the inclusion of designers in its work teams?

Design can be an articulator between scientific research and patients. More than a highly technologically sophisticated solution, it is the result

of a product that responds to the user's need in a certain context, thus responding in a "simple" way to a complex problem.

What suggestion would you give a designer interested in entering the healthcare sector?

In general, there is a certain prejudice from the health area towards projects from a discipline such as design, which generates skepticism about the functionality and feasibility of the solutions. For this reason, it is advisable to open up the possibility of collaboration with experts in the area.

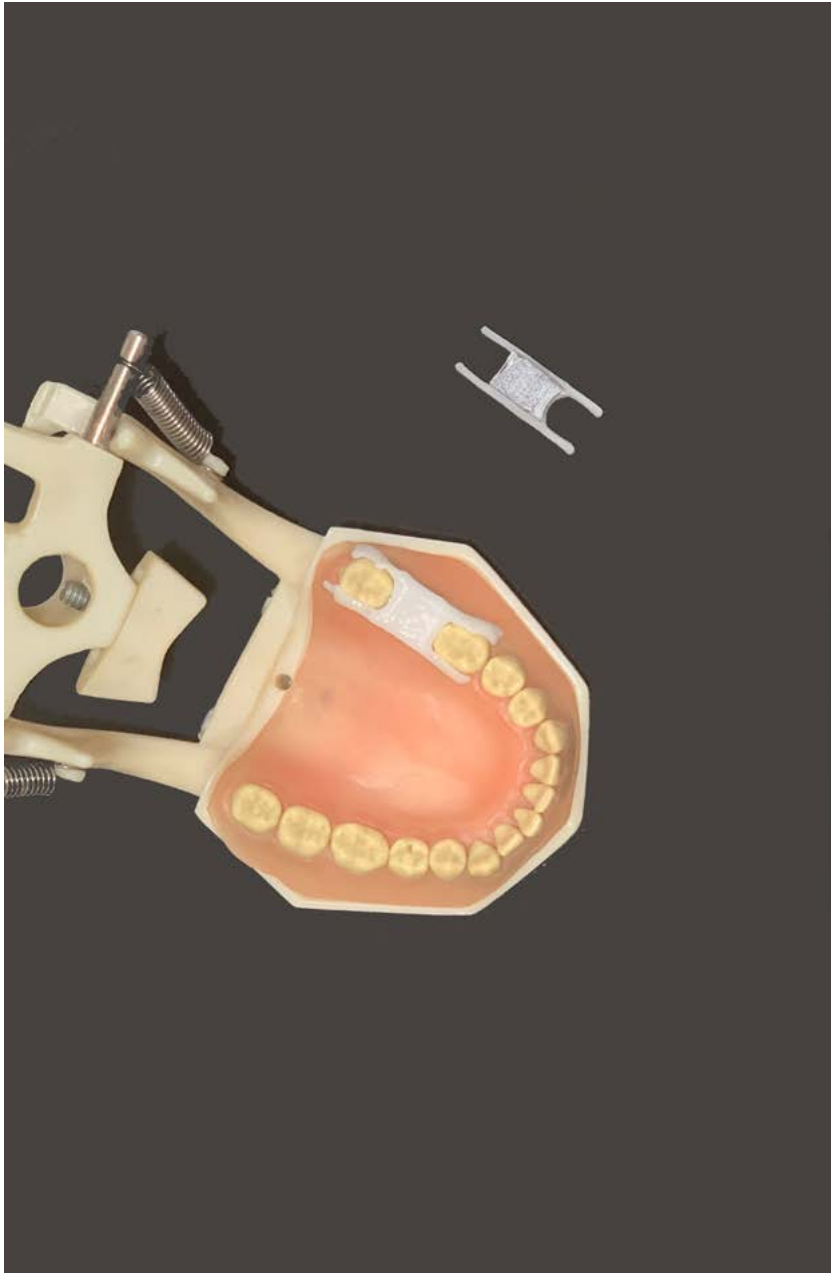
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MANTENEDOR INTRA ORAL





Informational System for Elderly Medication Self-Management: Designing in the Brazilian public health context

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Abstract

Senior patients with chronic conditions face several difficulties regarding medication adherence. This study aimed to investigate this issue from the users' and stakeholders' perspectives in the context of primary care in the Brazilian Public Health System (SUS) and then develop a solution to help mitigate the problem.

Keywords – Medication Adherence, Ageing, Brazilian Public Health System, Information Design.

Project Description

According to the Global Health Estimates (World Health Organization, 2020), 7 out of 10 leading causes of death worldwide are non-communicable chronic diseases (NCDs). Despite the change in the epidemiological profile due to population-ageing, models of care are not yet adapted to emphasise the prevention and self-efficacy of chronic conditions. Medication adherence is a significant and multifactorial challenge with severe consequences for the individual and a burden on the health system (Bosworth et al., 2011).

Different factors may impair medication adherence by the elderly, such as lower cognitive function, memory, behaviours and socioeconomic factors (Yap et al., 2016). To aggravate, in Brazil, the official labelling guidance for generic drugs may result in similar packaging designs that are difficult to differentiate by patients in many cases.

Project Objective:

The objective of this study was to investigate the routine of doctors, pharmacists, and senior patients living with chronic conditions regarding medication prescription, medication acquisition, information comprehension, daily organisation, and regimen adherence. Then develop a solution that could foster elderly autonomy and improve medication self-management.

Stakeholders Involved:

The study was conducted at the primary care outpatient clinic UBS Vila Ramos, in São Paulo, part of the Brazilian Public Health System (SUS). Users, caregivers, doctors, pharmacists, and healthcare managers were the main stakeholders.

Process:

Firstly, an exploratory literature review was conducted on design for health, Brazilian Public Health System, medication adherence by elderly with

chronic diseases, and information design. Subsequently, a benchmarking process took place, during which images and categorisation labels were used and laid out on a Miro board.

Field research was carried out at UBS Vila Ramos, using qualitative methods such as observation, semi-structured interviews with patients, doctors, and pharmacists, and shadowing during consultations. Interviews were recorded and transcribed, followed by thematic analysis. The emerging pattern of verbal data led to design requirements for patients, pharmacists, and the healthcare system. Divergent and convergent thinking generated the final design solution. The study was approved by the Casa de Saúde Santa Marcelina Committee for Medical and Health Research Ethics (Ref.: 4.654.782). Each participant signed informed consent.

Results:

The solution is an informational system to organise the most currently used medicines by patients with chronic diseases in treatment at SUS. The idea is to gradually replace the current improvised solution carried out by the pharmacist on duty, which consists of handmade boxes using empty medicine packages and handwritten information assembled in a very time-consuming process. The new designed system consists of various elements: two different-sized packaging with detachable parts; adhesive cards for identifying medicines, schedules, and quantities; and a designed medical prescription. Discarding the original generic medicine boxes and employing a system of blisters organisation by colours and drug names should be safer for patients. The central part of the system is a customisable box that the pharmacist must assemble during the patient's appointment, tailored for the patient's needs. Systemic thinking considered pain points, stakeholders' needs, available materials, large-scale application, and industrialisation.

Reflections

A user-centred and design-oriented approach when dealing with health-related challenges is crucial. There is a vast demand for efforts that prioritise patient understanding in primary care and more careful

screening and follow-up of patients, especially those with NCDs.

Lastly, although the prototypes indicate a feasible design solution, further validation with health professionals and usability testing of the final product in the SUS environment are the following steps to assess the product's performance to improve elderly medication self-management.

Why does the healthcare sector benefit from / require the inclusion of designers in their teams?

Designers have an inherent creative approach to problem-solving, which is extremely valuable when dealing with problems faced by the healthcare sector. In addition, people-centred systemic thinking and a participatory approach rather than a hierarchical one – all of these good design practices – would also be valuable to the healthcare system.

Which suggestion would you give to a designer interested in entering the healthcare sector?

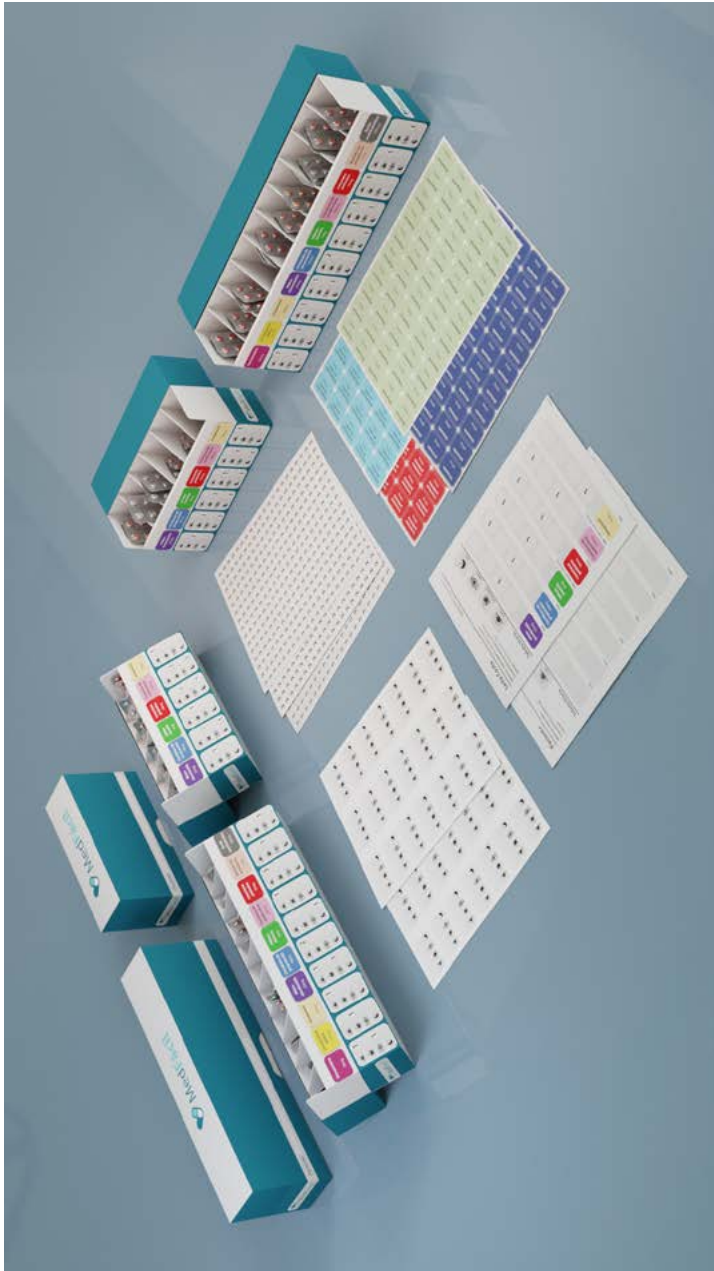
Resilience, curiosity, and sensitivity are imperative when dealing with the healthcare sector. Be ready for lifelong learning and an ever-changing innovative environment.

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Service Design for Health Case Studies

Designing More Effective and Inclusive Health Services: A Case Study of an Outpatient Service for People with Dementia

Carlos Aceves-González¹, Zuli Tatiana Galindo-Estupiñan²

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² Coppel, México

Abstract

An evaluation of a consultation service for people living with dementia was carried out from the perspective of Design of Inclusive Services (Aceves-Gonzalez, 2014) to identify the problems faced by users and health personnel. We used the data to design a blueprint that enables discussion of strategies for service improvement.

Keywords – Design of Inclusive Services, Health Services, Blueprint, People with Dementia.

Project description

Project objective:

This project aims to contribute to evaluating and redesigning outpatient services for people living with dementia through the Inclusive Service Design approach.

Key Actors Involved:

1. Ergonomics Research Center, Universidad de Guadalajara, México. (Education)
2. Master in Ergonomics, Universidad de Guadalajara, México. (Education)
3. Department of Neurology, Centro Médico Nacional de Occidente, Mexican Social Security Institute, Mexico. (Gobierno)

Process:

The process consisted of three stages: (1) carrying out a diagnosis through structured interviews with health service personnel, review of formal documents on the operation of the service, and direct observation. (2) Socializing these results with some members of the service through a participatory exercise and creating a blueprint to represent the current state of the service based on the data identified in the previous stage. A service blueprint is a detailed visual representation of the service over time, showing the user journey, the different touch points, as well as the behind-the-scenes parts of a service that make it work (Design Council, 2013); (3) Evaluation of the blueprint and discussion of strategies for the redesign and improvement of the service.

Result:

A thematic analysis identified the stages of the service, the users' journey, the points of interaction or touch-points (Meroni & Sangiorgi, 2011), and the main problems faced by both users and health personnel. Visualizing

the data through the blueprint gave the health personnel a visual platform for discussing the areas of opportunity and the strategies to improve the service. This case study encouraged implementing some changes that did not require a solid economic investment but had an immediate positive impact on the operation of the service. For example, the exchange of information to make an appointment was improved. This gave the patient and their relatives greater certainty of the date and place to assist, and the staff members could contact the patient in case of any change or additional information necessary for the appointment.

Reflections

Why does the health sector benefit from/need the inclusion of designers in its work teams?







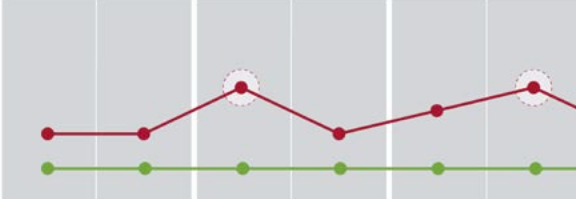






This evaluation exercise was carried out in a health service where the importance of design as an improvement strategy is not traditionally considered. Consequently, it represented a challenge to access the health system to carry out the study. However, the health personnel who participated were delighted with the possibility, on the one hand, of participating and being taken into account and, on the other hand, of having the possibility of suggesting strategies for improvement.

What suggestion would you give a designer interested in entering the healthcare sector?

It is important to consider and understand that everything is design, everything is designed, or that everything can be designed. In this sense, the health sector represents a magnificent opportunity for design and designers, since there are countless interactions to be designed, in addition to the fact that it is an area that historically has not incorporated design as an improvement strategy.

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ETAPAS DEL SERVICIO		Transición entre el Hospital de zona y el CMNO		Llegar al Hospital de Especialidades - CMNO		Ir al control asignado para la consulta	
ESCAMPIO	ACCIONES DEL USUARIO	Ir a consulta al Hospital de zona 	Llamar para saber sobre la cita asignada 	Acceder al Centro Médico CMNO 	Reconocer la entrada de consulta externa 	Pedir indicaciones para llegar al control 	Trasladarse hasta el control 
	Estimación de la dificultad para la interacción de los usuarios con el servicio desde la percepción del staff						
	PUNTOS DE CONTACTO	Instalaciones del hospital de zona Pase a tercer nivel	Información obtenida vía telefónica	Banquetas, caminos de acceso. Elementos de apoyo: sillas de ruedas, camillas	Nombre de la sección de consulta externa Información sobre el Centro médico obtenida previamente	Señales dentro del hospital	Señales dentro del hospital Información dada por otras personas
Evidencia física							
Acciones del personal	Médico adscrito al hospital de zona 	Personal administrativo del Hospital de zona 	Personal de salud (enfermería) 		Guardias de seguridad -Asistentes TAOD 	Personas dentro del hospital 	

DISTRIBUTED INNOVATION SYSTEM: Using Platforms, Toolkits and Strategic Design Guidelines

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Gerardo Pérez¹, Sara Riveros¹, Cala del Río⁶, Esteban Millar¹**

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Abstract

During the pandemic, the maker ecosystem faced various challenges in developing solutions for the health sector. In this paper, gaps were identified through Service Design methodologies and criteria were determined for a solution system that develops and facilitates action in the event of future emergencies.

Keywords – COVID-19 Pandemic, Personal Protective Equipment (PPE), Strategic Design, Digital Manufacturing, Distributed Design, Toolkit.

Project description

The COVID-19 Pandemic forced Design, and in particular the ecosystem of distributed manufacturing, to leave behind the comfort zone—creating solutions at low production scale—and start exploring solutions for massive populations at risk. The world-wide emergency required groups to redefine their work, in a highly centralized context, adding further complexity to work based on distributed innovations. Chilean maker and Fablab groups, were obliged to reorient their capacities and forms of collaboration, to face the shortage of medical supplies, and respond to the needs of the communities. The required shifts revealed the lack of a scientific-productive matrix that efficiently responds by coordinating actions in the event of future emergency situations.

The Project “Towards a National Strategy for the Promotion of Collaboration Networks and Technological Developers in Chile: Study and Platform for Distributed Design and Production in Emergency Contexts”, was financed by the National Research and Development Agency (ANID), and focused on the study and characterization of the groups, associations and networks of makers and manufacturers—either independent and/or belonging to universities, organizations, small and medium-sized companies—who in a self-organized and collaborative manner came together to develop, manufacture and distribute technological solutions for the health sector, facing the pandemic generated by the COVID-19 Pandemic.

The Project allowed for the study of logistical, technical, political, regulatory and/or infrastructure factors that impact on the processes of co-design, distribution, adoption, use and implementation of the developed technologies, as well as the identification of obstacles and facilitators for the development of Personal Protective Equipment (PPE).

Project objective:

The general objective of the Project is to contribute to the development of a scientific-productive matrix, which contributes to face future emergencies in an efficient and coordinated manner.

More specifically, the Project seeks to improve—on the one hand—the processes of co-design, distribution, adoption, use and implementation of

the technologies developed, helping public, private, and civil institutions of design, production, and transfer, to better offer solutions technology for the Chilean health sector in crisis situations, eventual pandemics, or future disasters. On the other hand, the articulation and definition of standards, helping public, private, and civil institutions of design, as well as those of production and transfer, manage to offer technological solutions in crisis situations. Lastly, to design a digital and interactive platform, focused on users, which will contribute with a toolkit and a matrix of recommendations for a national strategy.

Key Actors Involved:

The project had the participation of three large groups of actors: members of the maker ecosystem, actors from the health system and articulators of initiatives to support the pandemic.

On behalf of the maker ecosystem, managers from independent digital fabrication laboratories (Fablab Antofagasta, Santiago Makerspace) and University Fablabs (Universidad de Aysén, Universidad de Talca, USACH, Universidad de Chile and the Pontificia Universidad Católica de Chile) participated in the project. From the health sector, hospital staff such as administrative deputy director, department heads, supply managers, biomedical engineers, and others who participated in digital manufacturing initiatives, participated in the Project. And lastly, among the articulators, the participants included founders and directors of Fablabs, academic members of working groups for the pandemic organized by the state and actors from the public system such as a division head from the Ministry of Science, Technology, and Innovation and an official from the service of health of the Region of Magallanes.

Process:

From a design approach, the project used Public Service methodologies through the application of the Triple Design Diamond of the Public Innovation Laboratory (LIP, 2017), both in phase one of diagnosis or needfinding, and in phase two of proposal and implementation of the solution. For phase one, qualitative techniques were applied that allowed

analysis of logistical, technical, political, regulatory and infrastructure factors. Although it was found that associations of collective makers and Fablabs in Chile have the capacities and potential to respond in a resilient manner to crisis situations, “break points” were also identified between health personnel, makers, and decision makers. decision during the design of the solutions. The difficulties and obstacles of these development organizations in Chile were identified and understood through the analysis of logistical, technical, political, regulatory and/or infrastructure factors that impact the processes of co-design, distribution, adoption, use and implementation of the technologies developed.

For phase two, the application of co-creation techniques for the design of the service allowed the development and validation of three interfaces that finally became the components of the IDI solution system.

The approach of the project, from a service design perspective, allowed that in both stages the actors of the ecosystem and users of the potential solution participated horizontally, that all voices were heard, and the different contributions valued in equal conditions. This allowed potential users of the solution to recognize it as their own, allowing for future implementation.

Result:

Distributed Innovation Systems (IDI) seeks to propose guidelines and tools for the articulation, promotion, and transfer of technological solutions to the social, environmental, and productive problems that the country faces in relation to potential future crises.

The resilient and transformative potential of science, technology and knowledge requires an articulation that goes beyond the simple financial dimension. Distributed Innovation System (IDI) guides the efforts and facilitates tools for cooperation based on five axes:

1. Collaborative: the innovative potential of collaboration based on the co-production of knowledge and solutions is recognized, where collaborative work structures favor creativity and participation, where the actors concerned are not only summoned to give an opinion, but also to share -build the development and design of solutions.

2. **Distributed:** especially in times of emergency, the value of activating heterogeneous and geographically distributed work networks is recognized, where the free exchange of knowledge and the involvement of different communities, knowledge and capacities are encouraged. Decentralizing capacities is a condition to face future challenges in a sustainable, collaborative, and transdisciplinary way.
3. **Located:** The importance of developing solutions and designs that recognize the specificities and situated needs of the territories is recognized, allowing the interpretation of socially diverse realities and the development of in-situ solutions coherent with the communities and requirements of the recipients.
4. **Open:** The need to promote innovations and solutions oriented towards open access to knowledge is recognized, fostering experiences and projects that accelerate the transition towards a social economy of distributed, open, and shared knowledge.
5. **Resilient:** The importance of developing ecologically sustainable solutions that consider the ecosystems (environmental, economic, social, cultural, political) in which they are inserted is recognized, emphasizing design as a regenerative and resilient catalyst towards more sustainable and inclusive futures.

The first component of the system is an online platform with the purpose to facilitate the interaction between the actors (Vivanco et al, 2021). The second component is a toolkit oriented to the actors in the world of distributed digital manufacturing (Mollenhauer et al, 2021). And the third component is a matrix of recommendations that seeks to project a national strategy for the incorporation of an active scientific-technological productive matrix in situations of emergency (Vivanco et al, 2021).

The first component, the articulation platform, has the purpose of activating, connecting, and promoting a distributed and collaborative community of enterprises, actions, and projects with social impact, where collective intelligence and the open exchange of ideas are at the service of common goods. Through the promotion of multisectoral cooperation linked to the world of technological production and knowledge (technology transfer hubs, cooperatives, community organizations, R&D laboratories,

hospitals, Fablabs, etc.), this platform seeks to contribute to decentralizing innovation poles, providing strategic, technical, and informative support to the networks of technological developers in our country.

The objective is to promote dialogue between innovative platforms, communities, and laboratories, as well as the development of technological solutions that allow addressing the current challenges linked to the socio-ecological transition, decentralization, digital transformation, and the increase in social inequalities. In this way, the platform seeks to respond to the needs of different communities and territories, emphasizing collaborative, distributed and sustainable work between different sectors of society, promoting the democratization of knowledge, innovations, and technologies.

The collaboration toolkit proposes a systematization of productive stages, revealing turning points, critical interactions and providing tools to facilitate the experience in emergency situations of its users: maker groups, public and private institutions, and civil society. Lastly, the matrix of recommendations proposes guidelines so that state agencies can project the incorporation of a national scientific-technological productive matrix, based on co-design strategies, distributed digital manufacturing and regulations for adaptation. The results of the project can be found at <https://innovaciondistribuida.cl/>

Reflections

Why does the health sector benefit from/need the inclusion of designers in its work teams?

The design discipline went from operating as a service discipline to becoming a transformation discipline. Its ability to operate and develop solutions in complex and multidisciplinary environments is essential when intervening in areas or industries where the articulation of different actors, regulations and technologies is required. In this sense, we identify three great benefits:

1. The design facilitates the gathering of information, the coordination of specialists and innovation, since the focus is on people in the health sector, and the sector constantly faces complex problems that demand to be at

the forefront.

2. Design methodologies allow for a short-term response to the constant needs of the health discipline, allowing rapid and comprehensive prototyping, testing and validation.

3. Design, by facilitating the co-creation of solutions between different actors, allows integrating within its processes, the specific knowledge of the health area, as well as the diversity of its specialists.

What suggestion would you give to a designer interested in entering the health sector?

As a basic suggestion, given that the sector promotes the health and well-being of people, it is essential to understand the legal regulations that apply to all processes in the sector, and, simultaneously, all the ethical protocols for operating with people. Once both dimensions are understood, the designer must know technical and scientific aspects that allow them to interact and integrate the different actors in the area in the best possible way. Lastly, the designer must be aware of the cutting edge of technological advances and new materials.

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Figure 1 : Designing and Developing Personal Protective Equipment (PPE)



TOOLKIT DE COLABORACIÓN

Esta guía se estructura de acuerdo a las 12 etapas del proceso de innovación distribuida, entregando diversos tipos de información para la consideración de los tres tipos de actores del ecosistema. Para cada sub-etapa se proponen un conjunto de actividades, contenidos, recordatorios, instrumentos, links y recomendaciones.

[Ver más](#)



MATRIZ DE RECOMENDACIONES

Esta matriz, propone directrices para que organismos del estado puedan proyectar la incorporación de una matriz productiva científica-tecnológica nacional, basada en estrategias de co-diseño, fabricación digital distribuida y normativas para la adaptación.

[Ver más](#)

Figure 2: Collaboration Toolkit and Matrix of Recommendations available at *IDI System Web Platform*

Spatial Design for Health Case Studies

Health services in Brazil: opportunities for design to improve accessibility aspects

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Abstract

The Brazilian Public Healthcare System has equity as one of its guiding principles, so the elimination of obstacles in the use of services is important. Observations were carried out in two Brazilian hospitals, identifying barriers to accessibility in services, as well as opportunities for design.

Keywords – Accessibility, Health Services, Design, Brazil.

Project Description

Project Objective:

To identify opportunities for design to improve accessibility aspects in two Brazilian hospitals.

Stakeholders Involved:

Public/private hospital institutions; government and master's students at a federal health university.

Process:

The Brazilian Public Healthcare System (SUS) has equity as one of its guiding principles (Viana, Fausto & Lima, 2003). In this sense, the elimination of obstacles in the use of services is important, so that equitable possibilities are offered to all (Castro et al., 2011), regardless of physical or cognitive conditions. Through non-participant observations, carried out in two hospitals located in the southern region of Brazil, barriers to accessibility in services were identified, which can negatively impact patients' access and experience.

Results:

Hospital Institution A has a circulation of more than 25 thousand people per month, while Hospital Institution B has more than 8 thousand. Both are a reference in their region and have a hospital complex composed of interconnected structures in a significant physical area.

Focusing on issues related to accessibility, this study analyzed the external access spaces, defined as the place that the user needs to go between the point of arrival at the institution to the place where the services are provided. These accesses should lead the patient to the service he wants to reach in an easy way, without impediments or barriers. However, failures concerning information and mobility aspects (locomotion/accessibility) were identified, evidencing barriers for people with disabilities, reduced mobility, and even cognitive limitations.

There is no clear signage directing the patient to where he is and where he should go in many of the entrances. There are no direction maps or professionals to help and guide people on the way. More than that the existing signage is not prepared, considering the demographic diversity that characterizes the Brazilian population.

In general, there are architectural barriers in the services, especially for patients with physical and sensory limitations. There are informational barriers, especially for elderly and cognitively impaired patients. There is a high flow of people, cars, buildings, and paths, but poor accessible communication, which highlights communication and physical barriers. It is important to highlight that the construction of the buildings of both institutions took place gradually, aiming to meet the increased demand for health services. This fact corroborated the barriers identified in the structures.

Reflections

Given the above, opportunities can be identified for the implementation of design tools in order to bring about improvements in accessibility aspects, which currently make it difficult for certain patients to access autonomously and safely, thus impairing their experience. The design efforts required for the identified barriers are mainly in the area of architecture. The solutions depend on the reformulation of physical aspects in the environment that are able to organize it, making the structures accessible, inclusive, and safe for all.

Why does the healthcare sector benefit from / requires the inclusion of designers in their teams?

The healthcare sector requires the inclusion of designers in their teams because the view of the health professionals is very focused on care aspects. The designer is then able to assist the health manager in the implementation of innovative solutions that improve the experience of using the service, considering health services as much more than a service that only cures the disease.

Which suggestion would you give to a designer interested in entering the healthcare sector?

We would say that knowing the perspectives and interests of stakeholders is essential. A health service depends on the action of many people, with different attributions, but trying to ensure that healthcare is delivered in the best way to the patient. So, before starting any implementation of innovation, the designer must understand the attribution of each health

professional, each employee, each supplier, etc., to plan considering the views of each one in the environment, in addition, of course, from the user's perspective.

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Figure . This image depicts institution A addressed in this case study. It is a very unstable environment through which thousands of people and cars circulate daily. It is also noted that the buildings are undergoing renovation, making mobility even more difficult.



Figure 2. It depicts institution B addressed in this case study. It is a very unstable environment through which thousands of people and cars circulate daily. It should also be noted that access to the buildings does not have adequate signage (considering the different needs of patients), protection against sun/rain, as well as disputes for space with the circulation of vehicles, making mobility even more difficult.

UneSalud: Redesign of the Comprehensive Operational System of a Public Health Center

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Abstract

UneSalud is a comprehensive system focused on improving the efficiency and quality of the public health service in a Primary Care Center located in the southern side of Lima, in Peru, in response to the high demand for healthcare from the population, aggravated by the covid-19 context.

Keywords - Systems Design, Public Health, Health Center, Health Infrastructures.

Project Description

The case study will be presented, explaining the proposed objectives, the stakeholders involved, the process employed and the results obtained.

Project Objective:

In Southern Lima, the absence of projects focused on public health has generated a high rate of patient desertion, inefficiencies in the distribution of medicines, and scarce internal technological renewal for administrative and medical purposes, which hinders medical care processes, added to a lack of infrastructural support for remote care; all these, limiting conditions for offering appropriate care to the wide demand of insured patients at the only Primary Care Center in this area of the city.

Therefore, the objective of this project was a comprehensive the redesign of the operational system of the Primary Health Center located in Southern Lima, in order to respond to:

- 1) a context where demand is usually excessive, and which has been aggravated by the covid-19 scenario;
- 2) the cultural, age and specific need diversity, characteristic of patients residing in Lima; and
- 3) the challenges of the digitalization of internal support processes to allow for the implementation of remote care services.

Stakeholders Involved:

Academia: Pontificia Universidad Católica del Perú

- Industrial Design Program students
- Industrial Design Program professors

Government: EsSalud

- Primary Health Center located in the southern area of Metropolitan Lima

Process:

An analysis of the current status of the primary care center in Southern Lima was carried out, in addition to a revision of existing theoretical approaches, and the state of the art regarding systems, services, and physical and digital products. These studies led to the identification of

opportunity areas for intervention with potential for innovation and impact. In terms of the redesign itself, diverse inductive, conceptualization, participatory, and validation studies were implemented.

Results:

The project was developed over the course of one year, and culminated in the development of implementation guidelines for the various areas of the proposed integral system. The development of each proposal was carried out under legal, theoretical and in-field validations, to ensure the possibility of a physical-digital transformation process in the future for the healthcare center. The project implementation is expected to take place once the state of emergency caused by the pandemic diminishes.

Reflections

This research-through-design project enabled the design researchers to study, understand, and positively impact the internal socio-technical dynamics of the healthcare center which used to originate problems in the administrative area being later reflected in the performance of the medical staff and finally impacting over the quality of care perceived by patients.

Why does the healthcare sector benefit from / require the inclusion of designers in their teams?

Many of the difficulties in the implementation of systemic improvement programs in the health sector are due to the fact that these are usually designed from a very distant perspective from the people who will finally carry out the implementation of these programs on a daily basis. The inclusion of designers in the team would significantly increase the level of adoption and appropriation of these initiatives by workers and patients, while it would greatly reduce risks and errors of human origin.

Which suggestion would you give to a designer interested in entering the healthcare sector?

To always keep in mind that design projects in the health sector fundamentally require critical, systemic and participatory approaches. It is key to operate at a macro and micro level to understand the dynamics of the system, the various stakeholders involved, and their needs, motivations, concerns, as well as power relations, in order to generate proposals that are in tune with the real context and have a positive impact on it.

UneSalud

Hipótesis

UneSalud es un diseño de sistema enfocado en mejorar la eficiencia y calidad del servicio para responder a la alta demanda de asegurar y procesos gestionados en el Centro de Atención primaria en Lima Sur.



Concepto: Coherencia

Relación lógica entre varias partes y elementos de un sistema, convierten entre sí y se alimentan una de otra

El sistema propuesto abarca los problemas específicos encontrados desde diversas perspectivas, buscando así una solución integral que se traduce en productos físicos y digitales que influirán en el desempeño tanto del cuerpo médico como del área administrativa y en la experiencia del servicio de los pacientes del centro de salud público.

Por un lado, se realizó una propuesta de **imagen institucional** que regirá el lenguaje estético de todas las propuestas en conjunto. Asimismo, dichas propuestas están divididas en las categorías de **diseño enfocado en pacientes** y **diseño enfocado en la organización interna**.

Figure 1. General approach of the new UneSalud System



Figure 2. Redesign of the spatial distribution, physical elements and face-to-face interaction of both the patient care area and the administrative area

► ESSI y la plataforma de Teleconsulta en uso



Figure 3. Redesign of the administrative digital platform and design of a digital teleconsultation system that includes a web platform and a mobile application

Method, Materials and Tools for Design for Health Case Studies

Design and application of paper with copper particles with potential use as a surface barrier for fomite transmission

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Abstract

The development of antimicrobial materials to prevent fomite transmission has attracted great relevance, especially in a pandemic. The opportunity to contribute arises from the design discipline by proposing various products based on two of the country's primary raw materials, copper and cellulose.

Keywords: Copper, paper, cellulose, fomite, antimicrobial.

Project description

All animate or inanimate, porous, or non-porous surfaces are called fomites when they are contaminated with microorganisms such as viruses, bacteria, fungi, or parasites. They serve as a reservoir and vector for transmitting the said pathogen from one individual to another. Currently, the impact of fomites on our lives has become tangible with the arrival of SARS-CoV-2 and the various ways to clean surfaces to avoid contracting the COVID-19 disease. However, certain materials, such as cellulosic materials, are widely used in multiple formats and contexts which cannot be adequately disinfected. Due to their hydrophilic characteristics and glycosidic composition, they suffer partial or complete degradation and promote the fomite transfer of various saprotrophic microorganisms. The SARS-CoV-2 virus has been reported to persist for up to 24 hours on cardboard (Guo et al., 2020) as opposed to inactivation in less than 1 min on copper surfaces (Bryant, Sandra A., & Keevil, 2019). Macroscopic copper surfaces offer indisputable antimicrobial efficacy, but their widespread applications are limited by their high cost.

This study aims to develop a production process for the paper generation with copper particles with potential applications as a surface barrier for fomite transmission.

The generation of paper with copper particles contributes to the manufacture of antimicrobial materials (Contreras et al., 2020), offering application possibilities in various environments and formats, such as boxes, tickets, printing papers, and masks, among others, highlighting its usefulness given the pandemic context we are currently experiencing.

This project arose in the Design School of the Universidad del Desarrollo to promote the development of products made in the country that contribute to the control and prevention of the pandemic through the union of two of the main raw materials in the country.

Project objectives:

- Develop a production process to generate paper reels with copper particles with potential applications as a surface barrier for fomite transmission.

To fulfill the general objective, the following secondary objectives were developed:

- Optimize and correlate copper particle content with paper properties
- Design and evaluate a production process for manufacturing paper reels with copper particles on an industrial scale at Papelera Forestal and Papelera Concepción (FPC).
- Making a coil of paper with copper particles.
- Evaluate the antimicrobial activity of paper with copper particles.
- Design potential applications of paper with copper particles.

Key Actors Involved:

Academic Researchers: Alejandra Amenábar (Architect and Dean of the UDD Design School), Paulina Contreras (Designer and research director of the UDD Design School), Sara Ramírez (Chemist and researcher at the UDD Design School), Nataly Silva (Chemist, researcher of the materials line of the UDD Design School and director of this project), Jessica Martínez (Biologist, research professor at the UDD School of Medicine and alternate director of the project). In addition, Víctor Apablaza (Physicist and Operations Manager of MatGeo) and FPC, where the material generation is carried out.

Process:

The optimization of the PCu content in the paper was carried out in the FPC Quality Control Laboratory. PCu were incorporated into a sheet former, and the physical-mechanical properties were subsequently evaluated. Additionally, microbiological studies were conducted at the Beekeeping Research Laboratory, UDD.

Regarding the design and evaluation of the production process for manufacturing paper reels with PCu on an industrial scale in FPC. Different proportions and incorporation strategies of PCu were evaluated. Then, microbiological tests were conducted to assess different bacterial and

fungal strains.

Finally, the Design of potential applications of the paper-PCu was carried out by the design students of UDD, who designed a value proposition that contributes to reducing transmission via fomite.

Result:

The objective of the project has been fulfilled since paper reels with copper particles have been generated on an industrial scale. This paper has been analyzed from different aspects. First, the distribution of the copper particles in all its extensions has been evaluated, determining that the pulverization provides a correct way of incorporation. In addition, the physical, chemical, and mechanical properties have been evaluated to observe if it maintains the intrinsic characteristics of the paper generated in the plant. The results suggest that, although there are modifications in the original values, these are insignificant in terms of the applicability of the papers. All these results have been complemented with antimicrobial tests that allow the results to be correlated based on the distribution and concentration of copper particles. Offering the possibility of predicting the biocidal behavior of the material based on the concentration of copper incorporated.

Finally, the versatility of applications is empirically evidenced when the Spaces and Objects studio and the Packaging course at the Design School of UDD used this material to propose real solutions to challenges imposed in the same courses.

Reflections

After having experienced a global health emergency, which has revealed multiple opportunities, the health sector takes on particular relevance. Several creatives worldwide have developed ideas and projects that have contributed to improving processes, providing better services, devising new products, and exploring the possibilities of new materials that will enhance people's well-being. In the health field, design efforts can be oriented in four areas: prevention, services, cure, and care for people.

Why does the health sector benefit from/need the inclusion of designers in its work teams?

Developing projects in the health sector requires skills that must be developed in the project stage, which strongly includes the ability and willingness to learn and communicate, as well as observe and interact with patients.

The presence of design in health is a reality today, not only in the ideation of new products or projects but also in the services of health organizations: patient experience, innovation departments, design of spaces, and infrastructure, among many others.

What suggestion would you give a designer interested in entering the healthcare sector?

Designers are capable of imagining what does not exist. The challenge for them and the discipline is to lead the conversation of possible future scenarios to project a better life. In this sense, design must open its borders and conquer new territories. This necessarily implies getting involved with other disciplines and working collaboratively.

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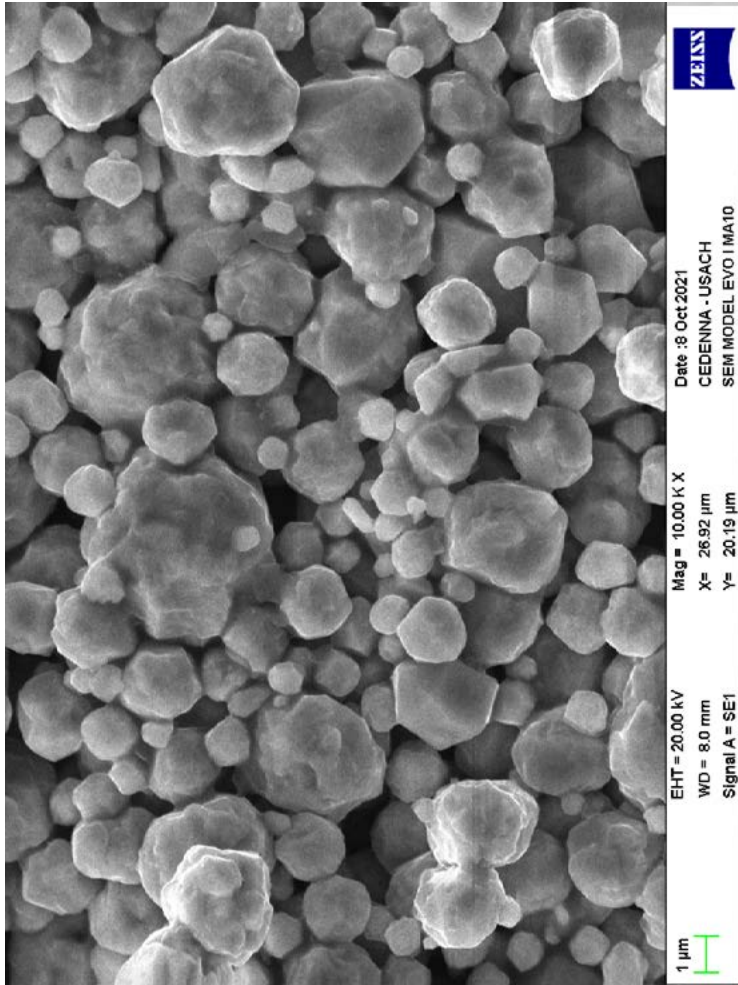


Figure 1 : Scanning Electron Microscope (SEM) micrograph of Copper particles

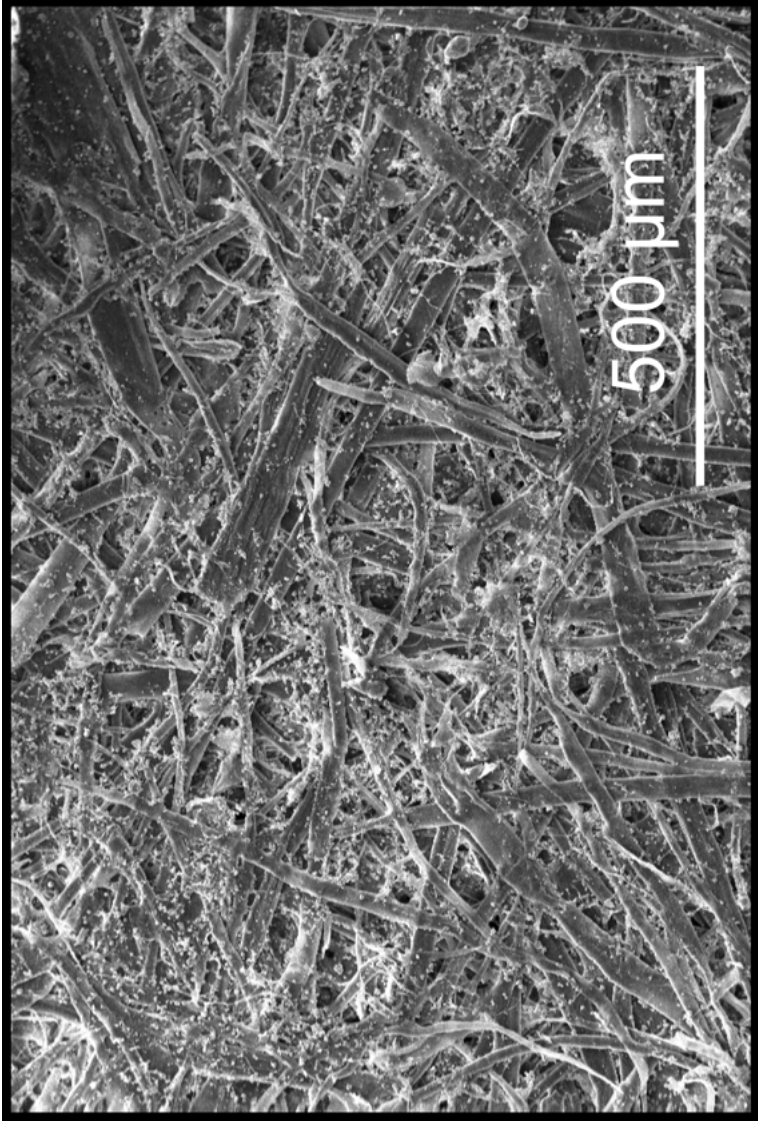


Figure 2: SEM micrograph of Copper particles on cellulose fibers



Figure 3. Paper reels with Copper particles

Design for Well-being: Kits for Emotional Emergencies

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Abstract

At the Pontificia Universidad Católica de Chile, a didactic experimental project has been underway since 2015 to explore the role of design in improving people's emotional well-being. Outcomes include 'emergency kits' developed to better cope with difficult emotional situations generated by risk events or unforeseen circumstances in everyday life.

Keywords - Design for Well-being, Emotional Emergency, Person-Oriented Approach, Packaging Design, Art-Based Techniques, Didactic Experimentation

Project Description

Since 2015, research work has been carried out at the School of Design of the Pontificia Universidad Católica de Chile on design for emotional well-being. To apply theoretical concepts to design practice and, at the same time, bring reflection into the educational sphere, this research work has led to an experimental didactic project with undergraduate and postgraduate students. Among the results obtained so far, it is worth mentioning the 'kits for emotional emergencies' developed in an elective course of the Master's programme in Advanced Design (MADA) during

2015-2017.

Project Objective:

The experimental didactic project aimed at exploring the role of design in improving the people's quality of life, with a particular focus on supporting individual emotional well-being by amplifying the informative, narrative and symbolic dimensions of everyday objects.

As a privileged testing ground, the postgraduate elective course 'Methods for Packaging Design' was experimentally turned into a space of reflection and practice for students. Participants were tasked to design packaging solutions for 'kits for emotional emergencies': sets of products that would metaphorically act as 'first aid kits' or 'care-packages' to help users cope with emotional crises generated by emergency situations, triggered by risk events or unforeseen circumstances of everyday life.

Process:

The students' exploratory work focused on the needs of individuals when faced with emotionally challenging situations, such as discomfort and even shock after experiencing a condition of danger or distress.

The challenge was to propose design solutions to support people's well-being after specific types of 'emotional emergencies', caused by critical situations that users may face, either in everyday life or in exceptional events, such as medical urgencies or natural disasters. As significant factors in these critical settings, human variability and the existence of 'frailties' in user groups such as children, the elderly and the people with disabilities, were also considered.

Methodologically, besides adopting principles of user-centricity and inclusion, students experimented with art-based techniques, derived from the performing arts. These techniques complemented traditional design methods, providing a more divergent and creative approach, as well as allowing - thanks to physical improvisation and interpretation - a deeper understanding of users' needs.

Results:

The project resulted in a series of experimental 'kits for emotional emergencies'. Each package was conceived to be enhanced not only as an object of use, but above all as a means of communication, reinforcing its informative and rhetorical dimensions. Besides bringing together a set of products that can be useful in case of emergency, each solution was designed to guide users' actions and, moreover, deliver messages of emotional support in critical situations.

Reflections

The experimental didactic project empirically demonstrated that design is, indeed, a useful strategic tool for improving the people's quality of life and that through everyday objects it is possible to meet both user's physical needs and those related to their emotional well-being.

User-centred perspective was challenged in favour of a more holistic 'person-oriented' approach, integrating psychological health among the key aspects to consider in a design process.

From an educational point of view, students were provoked to reflect through creative practice, to go beyond conventional definitions of design and to rethink the scope and fields of action of the discipline, adopting a caring attitude and an ethical stance on their role as future designers.

Why does the healthcare sector benefit from / requires the inclusion of designers in their teams?

In recent years, most interventions in the healthcare system have been based primarily on utilitarian requirements, driven by functionality, ease of use and cost-effectiveness; however, while undoubtedly valuable, these solutions have mainly focused on curing people rather than taking care of them. Including designers into the healthcare sector might actually facilitate the adoption of a holistic person-centred approach, with a more systemic perspective that includes emotional well-being as a significant component of life. Also, design may act as a mediator and an articulator of all the complexities of the healthcare system, so that more efficient and effective products and services can be ensured as well.

Which suggestion would you give to a designer interested in entering the healthcare sector?

Despite the clear benefits of a holistic perspective for the development of person-centred products and services, its application in the healthcare sector is still relatively new. Few organisations are yet willing to deeply involve patients in their innovation processes or to take into account aspects such as people's emotional well-being in their healthcare products and services, but numbers are growing. Therefore, although there can be difficulties in entering such a conservative sector, designers have the opportunity to help drive this change and understand its relevance, by offering a systemic and integrative approach, as well as methods and techniques of need-finding and problem-solving, in order to effectively deliver significant solutions and experiences for people.

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Design for Behavior Change Applied to Strategies for Addressing Obesity

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Abstract

This project was developed with researchers in design and health, applying behavior change theories in proposals related to obesity. Two strategies focused on improving decision-making in food choices, and physical activity were designed, which evidenced the potential of design applied to health.

Keywords – Design, Health, Obesity, Behavior Change, System Thinking.

Project Description

Project Objective: Propose and evaluate methods and principles of design for health through the exploration and application of design for behavior change, persuasive rhetorical appeals, and fundamentals of behavioral economics to develop obesity control strategies in Manizales, Colombia.

Stakeholders Involved: Universidad de Caldas, Ministerio de Ciencia Tecnología e Innovación, Assbasalud Manizales Colombia.

Process:

The project consisted of three phases: context analysis, design for health, and experimentation. During the first phase, the problem was studied in the regional context, including qualitative interviews with people with obesity and co-design workshops with patients, health professionals, and designers. This analysis allowed proposing basic alternatives and design requirements. In the second phase, two strategies focused on the rational and intuitive ways of thinking studied by Kahneman (2011) were developed and tested, also following what was proposed in design theories for behavior change (Ludden & Hekkert, 2014; Niedderer et al., 2016) and the behavioral change model applied to health (Prochaska & Diclemente, 1986). The proposed strategies consisted of two digital applications, one with a rational educational approach and the other applying intuitive cognitive biases. These proposals were evaluated in the third phase in two groups through an experiment that consisted of a randomized controlled study, to validate the effectiveness of the two prototypes focused on influencing or changing purchasing decisions in the city's supermarkets.

Results:

During the development of the research study, co-design activities were carried out that led to different approaches to the problem of obesity in Manizales. A guide was created for administrators of health programs and projects in the region and the country, with the findings of the context analysis and prevention alternatives for obesity and related diseases (Mejía et al., 2018). Likewise, undergraduate and postgraduate theses were developed where guidelines were established to take advantage of and reflect on emerging theories in design and their application in health in general (Velásquez, 2016, 2020; Vargas-Ramírez, 2017; Escandón, 2019; Roldán, 2019). The understanding of the context from a disciplinary perspective allowed the development of two strategies, which were tested

in two versions of a mobile application whose intention was to share information about food and physical activity, as well as to influence the decision to purchase healthy foods, the randomized controlled study did not determine which of the two rational or intuitive strategies was more effective.

Reflections

Theoretical approaches of behavioral economics, rhetoric, and design for behavior change applied to health, allowed us to reflect and propose strategies focused on obesity. In the specific context of the city of Manizales - Colombia, it was possible to understand specific behaviors associated with the problem and propose strategies to mitigate them. Obesity is a critical challenge in Latin America, itself a growing public health threat; its approach from an interdisciplinary perspective promises the generation of innovative solution alternatives. From the reports and publications generated, a better understanding of the factors associated with obesity, and a collaborative workspace is opened to generate strategies and solutions from the design.

Why does the healthcare sector benefit from / requires the inclusion of designers in their teams?

The design has allowed for decades to imagine and project environments and artifacts that improve people's lives and health. Besides benefiting from a traditional approach, the new forms of interdisciplinary and collaborative design have allowed proposing comprehensive strategies. These strategies also help to understand the health needs of communities better and to imagine healthier, more sustainable and more resilient systems.

Which suggestion would you give to a designer interested in entering the healthcare sector?

Traditionally, designers have been trained from the academy with a focus on human factors, which allows a general understanding of the physical and cognitive aspects of people. In addition to this knowledge, it is necessary to delve into theories and specific studies of design for health, which includes theories of behavior change in health sciences. Designers

should also develop skills for co-design and interdisciplinary work with expert professionals who understand the particular and complex issues related to physical and psychological conditions of people. Considering future projects, we suggest exploring systemic design practices such as service design, organizational design, or policy design, which can widen the potential for health benefits beyond individual behavior.

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*Figure 1: Co-creation workshop health professionals, patients, and designers.
Elaboration of the authors*



Figure 2: Mobile applications, rational and intuitive. Elaboration of the authors

Design Education for Health Case Studies

Sentipensante (sensing/thinking) assessment in the context of the COVID-19 pandemic

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Abstract

This work aimed to provide evidence of sensing and thinking (sentipensar in Spanish) in students of the Faculty of Design, characterised by a personal-reflexive practice, through an exercise of writing, allowing for the identification of emotional aspects related to the social contribution of design in the context of the COVID-19 pandemic, the emotional-rational subjective assessment in confinement, and the effects of distance learning.

Keywords: Sentipensar, contextual research, subjective living experience, reflection, teaching design

Project description

All areas of life have been disrupted by the COVID-19 pandemic suffered worldwide. This fact substantially modified the practices, forms, ways and manners through which we have been living and leading daily life.

Within this general context, the actors involved in this teaching-learning process have had to face and adapt to various social, technological, and epistemological circumstances, and above all, to the meaning life in general has acquired after this event, in which a new way of demonstrating “a strange communion of destinies” (de Sousa, 2020, p. 23) has been disrupted and fractured, requiring to reconsider the social and proximity interactions to which we were used to.

Evidence of the difficulties and negative effects of this context may contribute to an analysis of the prevailing relationships between professional training, the social implications of the design profession and the experience of this pandemic. Hence, this will also be an important and special time for approaching the vision some design students have concerning these issues. The beginning of the August-December 2020 semester has been the chosen period to gather information towards the outline of personal and subjective aspects of the participants which could be associated with a *sentipensante* (sensing/thinking) assessment (Fals, 2009, Escobar, 2014, 2016, Galeano, 2019 and Botero, 2019).

Achieving the acquisition of elements for a subjective assessment of the students’ *sentipensar* (sensing and thinking) requires placing them ‘in situation’, this means recovering their lived experiences through the use of language, in this case, through written language.

Project objective:

To understand, through the application of subjective assessment and analysis tools, the meaning of what is expressed by students through writing, assuming that their written statements contain rational and emotional elements.

Key Actors Involved:

The key actors involved were students from the Design Faculty of the De La Salle Bajío University in the city of León, Guanajuato, Mexico. Mainly students who, at that time, were studying the seventh semester of the Industrial Design Degree and the third, fifth and seventh semester of the

Environmental and Space Design Degree. A total of 107 participants.

Process:

This research followed a mixed-method approach. General aspects were identified via a numerical weighting related to the emotional valuation expressed by the participants, through the use of a questionnaire, structured under three axes: disciplinary, the current pandemic and the training of future designers.

The sampling method was 'convenience sampling', which means that the participant selection criteria was determined by the accessibility to them. The participants constitute a non-probabilistic sample, including 107 participants, of which 90 are women, and 17 are men.

The use of the software called "sentistrength" provides data to evaluate the emotional valence, whose value of five (5) means extremely positive and minus five (-5) is extremely negative; a neutral score is zero (0), and, in some occasions, the participants' statements have both a positive and negative emotional valence. In these cases, a positive and a negative numerical weighting will appear, greater than > or less than <.

Result:

Students identify that the discipline of design can contribute socially to benefit society. Likewise, it can be established that the confinement experienced by the participants, beyond the negative aspects, is a space that enables reflexivity on aspects they otherwise could not notice. Hence, they recognise that this confinement time has served as a form of self-knowledge, to build empathy towards others and promote resilience. This fact, in particular, draws attention since it is clear evidence of the accelerated type of life of the students and whose slowing effect has fostered their personal knowledge. On the contrary, it was also possible to identify that prolonged confinement is considered a contingent form of control, prescription and conditioning of activities for which there was freedom of choice. Still, it has been taken away from them by the fact of remaining at home. They identify positive and negative emotions

associated with the change in social activities and aspects within the family, recognising and establishing new emotional ties. Although less prevalent, there were some critical cases of students showing problems of depression, anguish and hopelessness, as well as family conflicts due to the lack of bigger living spaces.

Reflections

The writing process presented evidence aspects of *sentirpensar* (sensing/ thinking). Valuing written language as a powerful, unique, and personal way of self-reflecting on particular issues, concerns, and ideas that are otherwise more difficult to identify in any other way.

Understanding that sensing and thinking could be a more human way of approaching experiences, framing this exercise as an empathic form of understanding, identification and joint construction of experiences. Research work sustained over time is required to identify the participants' emotional experience, evolution or change.

Why does the health sector benefit from/need the inclusion of designers in its work teams?

The degree of complexity involved in the design task is an important characteristic that can complement the health sector. In this sense, the designer may be contributing to visualising alternatives or other routes for solving problems in the field, since understanding multiple phenomena and how these are interrelated gives the design discipline a pivotal role. This means that the relevance of design relies upon the articulation it produces and the effect for the benefit of various groups.

What suggestion would you give a designer interested in entering the healthcare sector?

Understanding that design is a discipline linked to all areas of life, in this sense, approaching the health sector implies understanding the possibilities and benefits that design entails for the various forms of life. In this sense, it is necessary to understand design in terms of the effects produced by what is designed and how it contributes to improving the quality of life, in which health plays a crucial role in favour of life.

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1.- De acuerdo con tu experiencia ¿Cómo definirías al diseño?
Es una manera creativa de realizar o diseñar cosas o espacios.

2.- Dentro del contexto de esta pandemia, ¿Cuál es el mayor aporte del diseño a la sociedad?

El diseño acorde a las necesidades que van surgiendo actualmente como esta los espacios de un hospital, los objetos o instrumentos utilizados acorde a lo que estamos viviendo.

3.- ¿Cuál consideras que ha sido el mayor reto o dificultad que has vivido con esta pandemia y qué aspectos pedirías que se cuidaran para disminuir o aminorar sus efectos negativos?

Creo que hablando como estudiante mi estudio ha sido de lo más afectado ya que no se aprende igual que de manera presencial. Y fuera de lo académico igual mal porque bueno estar encerrado en un mismo lugar por mucho tiempo si llega a fastidiar y más por no poder ver a tus amigos y salir a divertirse o pasar. etc. Lo principal sería que la gente tome en serio lo que está pasando y tome las medidas adecuadas cada vez que sale y evitar salir de viaje para aminorar los contagios.

4.- Dentro del contexto de esta pandemia, ¿Cuáles consideras que han sido los mayores aprendizajes que has tenido?

Principalmente agradecer por lo que tengo porque sé que hay mucha gente pasando bien ya que perdí su empleo o no tienen los mismos ingresos para seguir pagando la escuela, comida o servicios y la manera de organizarme para que funcionen mis clases no estando en la universidad ya que es nuevo para mí

estar en clases en línea en especial en la tarde.

5.- ¿Qué consideras que se puede mejorar dentro del a enseñanza del diseño realizada a distancia?

Yo creo en la parte del uso de softwares de los que estamos viendo que su explicación sea de lo más claro y con ejemplos.

6.- En este contexto de pandemia, ¿Cómo consideras que el diseño debería contribuir en beneficio de las personas?

Trabajar dentro de lo que es mi carrera, en una capacitación un mal diseño puede generar problemas en las personas psicológica y emocionalmente. Yo séo porque distribución del espacio no fue el adecuado, no entra demasiada luz natural, etc.

7.- ¿Qué esperas que aporte el profesor a tu aprendizaje?

Nuevos conocimientos y como llevarlos a cabo.

8.- ¿Cuáles podrían ser los 3 aspectos más importantes a considerar para un mejor desarrollo de la materia?

Participación, dinámica e interesante.

9.- En el contexto de esta materia, ¿Cuál es tu expectativa en relación a la misma?

Bueno nunca he llevado esta materia, espero aprender y saber cómo se llevaría a cabo la sociología en el diseño.

Figure 1: Example of a questionnaire applied to students.

Medicine-Hub: A New Teaching Tool for the Study of Sectional Anatomy

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Abstract

Medicine-Hub is a platform that integrates analogue and digital components, specially designed for the visualization of -and interaction with- high-fidelity anatomical structures matching the reality of a cadaveric preparation. This project presents a solution to the inequality gap generated by the scarcity of cadaveric dissections available for health career students.

Keywords – 3D Modeling, Reasoning, Anatomy, Didactic Material

Project Description

The study of human morphology presents the challenge of bringing students closer to the topic through dissections or models of the body, towards a good understanding that promotes anatomical reasoning, essential for the proper exercise of any profession in the area of health. The problem of scarcity of cadaveric material for teaching

is a reality that has permeated academic institutions in Chile and the world, whether due to cost or legislative issues, there is currently a gap in terms of accessibility to cadaveric material.

The universities that train their students with only plastic samples in anatomy assignments have an academic performance well below the universities that employ cadaveric samples, since the former are far from being a reliable reflection of the patient (Inzunza H, 2008). This could lead to medical malpractice and originate negative effects on the health system (Hamasaki et al., 2008). However, this situation presents an interesting challenge for the discipline of design, so as to propose an alternative solution that manages to democratize access to cadaveric preparations as an educational resource.

In this context, MedicineHub is proposed, a web-mobile platform that provides educational resources that support the teaching of human morphology. Through recording employing photogrammetry and 3D modeling, it has been possible to create high-fidelity printed anatomical replicas that allow an accurate representation of human anatomy on a real scale. Its materiality (sandstone) and printing process allows for a product with a duration 3 times longer than that of a cadaveric preparation. Additionally, the kit considers a Digital Anatomical Atlas, which allows the visualization of -and interaction with- structures in corresponding anatomical maps, labeled in detail with anatomical metadata, providing access to a better learning experience for students.

Project Objective:

The general objective of Medicine-Hub is to promote anatomical reasoning through the design of digital and analogue didactic resources, which democratizes the access to cadaveric preparations for students in health-related careers.

Stakeholders Involved:

Medicine-Hub was born from the interdisciplinary collaboration of Design, Medicine and Computer Science Schools and Departments at the

Pontifical Catholic University of Chile (Oscar Inzunza, Andrés Neyem, Iván Caro) and the support of the National Research and Development Agency of Chile.

Process:

The project's development process allowed us to see how design attributes could broaden the understanding of human anatomy through the integration of metadata, images, frames and approximation tools (such as rotation and zoom) which allow for a better transition from 2D (medical images) to 3D (human morphology). Our material enables an interactive approach to anatomy, improving the understanding of anatomical structures and their relationships.

Results:

In our validation with health care students at 8 universities in Chile, it was possible to verify that the recognition of anatomical structures with Medicine-Hub is the same as that achieved with real cadaveric sections, and that it performs better in the case of the identification of anatomical structures in clinical images. The design attributes most highlighted by students were the high credibility of the models, considering the physical characteristics of shape, color, topography and texture, in addition to the value of having the same cadaveric section in digital and analog format of a real corpse, unlike alternative solutions which employ representative models.

Re lections

Given the complexity of the multiple factors that influence people's health, design's integrative approach can be key in articulating solutions that transcend disciplinary fields. Design facilitates the process of reflection and critique over the practices within the field of healthcare, through a vision that integrates creation into its procedures. In this way, it is possible to imagine futures that better vinctuate the needs of each of the stakeholders related to the improvement of the well-being of the population.

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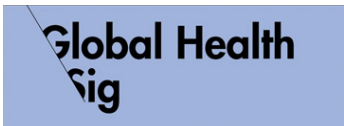
Summary

By the Editors

This Little Book presents different projects that illustrate the role and impact of design research and practice in improving Healthcare in Latin America.

The thirteen case studies grouped into five clusters have shown the diversity of areas in which design research can help to face the specific region (wicked) healthcare challenges. A commonality between the cases demonstrates the urgency of design for equity in healthcare. Product design cases evidence the need to ensure access to healthcare infrastructure that is safe and efficient. Urgencies remain in accessibility in a rural context and self-management of long-term conditions. Service design cases offer a perspective into inclusive design and decentralised design practices. Both cases review processes and determine how to minimise barriers that prevent access to care and collaboration. Spatial design studies exemplify the potential of design to improve the accessibility and the experience of navigating a commonly fragmented healthcare system. The cases in the method, materials and tools section provide practical applications of materials and toolkits that could enable healthcare interventions at different levels. Finally, the design education cases bring attention to a critical aspect of nurturing the future generation of designers with the skills and motivation to support healthcare challenges and how to facilitate the training of medical students.

The editors of this Little Book hope and envisage these study cases inspire designers to bring their expertise to the health sector and to motivate policymakers and government to value design as an opportunity to tackle the urgencies of healthcare differently. Ultimately, we believe this Little Book could foster a synergy between design, public health and policymakers in Latin America.



The Little Book of Design for Health in Latin America