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TECHNOLOGY AND INTERACTION IN THE REALM OF SOCIAL DESIGN: ROLE, INFLUENCE AND VALUE

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ABSTRACT
Social design is the most commonly used term to identify an emergent design area that applies its process, thinking, skills and tools to answer complex social problems. Its practices, methods and outputs are unconventional and probably result today in new ways of working with and using technology. However, there is no tool or way in the design community capable of recognising the actual influence, role and value of technology and interaction, partly due to a generalized lack of research in this domain. So the challenge is to gain deeper understanding on how and why technologies are being used in social design projects. Are they assets or obstacles? Do they slow or speed up processes? Are they means or solutions? How they affect and are affected by this new social context in design? In this paper we analyse several social design projects identifying 'what', 'when', 'how' and 'why' technology and interaction appear or determine these projects. Moreover, we aim to build a pre-model analysis capable of recognising the influence and value of technology in the social design realm.

Keywords: Social Design, Technology, Interaction, Social Design Projects

1 INTRODUCTION

The relationship between technology and society has long been studied. Recently, authors have been arguing that technology provides instrumentalities and potentialities for social change, because the way they are created, developed and used always involve social choices [1]. Struggles, negotiations, compromise and delegation among interested parties – inventors, designers, investors, competitors, users, agencies of government, the media, and other people, actors or entities – shape the history of how a technology will develop [2][3][4]. Whether a success or a failure, 'the result could always have been otherwise if the trade-offs had proceeded differently' thus similar technologies 'may have different histories and uses in different nations' [2][3]. This 'indeterminacy of technological change', as opposed to the 'technological determinism' that marked earlier theories [2][5], is also based on a 'social constructivist' view emphasizing 'human agency and intentionality': 'as much as people adapt their lives to the changed circumstances created by a new technology, they also adapt that technology to their lives' [2]. So instead of being determined by technology, people manipulate, adapt and use it for numerous purposes even ones that were not foreseen or desired by its producers – in our case specifically, the designers [2][5]. Thus, the prevailing idea today is that society and technology are both phases of the same essential action of reciprocal definition [6][7] and dialectic interaction [5] – in which technologies (objects) are defined by people (subjects) and people by technologies. 'Designers have always created bridges between society and technology' authors state [8]. While creating and re-designing artefacts for society, some more meaningful than others, they have been looking mainly and primarily in the opportunities offered by the technological evolution [8][9]. Although, for the same authors this remains valid in design, they argue that the 'bridge also has to be trodden in the other direction: to look at social innovation, identify promising cases, use design sensitivities, capabilities and skills to design new artefacts and to indicate new directions for technical innovation [8].' Indeed, instead of using technological advances as starting points, some designers have been successfully combining 'normal technologies' in new ways for original purposes [8]. Along the last 60 years the essence of design – solving human problems – had different materializations and ways of action on the part of designers. Eventually, they realised they could not avoid the systemic implications of their actions and that social context was crucial to the meaning and success of their solutions [10][11]. But for some designers the social context also became the primary reason to design [12], applying their

design skills, processes, thinking and tools to solve more socially and human relevant problems and priorities, usually more complex than the market-oriented ones [11]. Nowadays, we call this Social Design: multiple practices in which designers are creating, working, testing and proposing new models and alternative solutions together with all stakeholders – actors and people who possess the diffused human ability to design without being experts [8][13] – able to answer real human needs and change critical situations into more desired and sustainable ones [8][10][14]. On the course of this research we noticed that little has been found about how these designers use, create and work with technology, moreover its influence, role and value in the social design realm. Therefore, we propose to look at social design projects that used and created technology and begin to understand this relation.

2 SOCIAL DESIGN PROJECTS

The rationale for the selection of the projects was to gather a sample that first and foremost would characterize the nature and scope of social design. So we looked into multiple social design practices and in the work of its respective practitioners and found a range of projects in which various kinds of technologies appear and play different roles. Since 'needs are the central driving force uniting technology and business' [15] we also wanted projects to address diverse societal issues, thereby dividing them into seven broad categories which represent the main problem addressed by designers, taking into account they cross several of them simultaneously: Communication, Culture, Economy, Education, Environment, Living and Mobility. Dealing with Communication are: **2 de Maio todos os dias: Na minha rua**, a wall painted map of the neighbourhood in which inhabitants can mark occurrences and describe them to the project's team, who then reports to the City Council's website **Na minha rua** since the majority of them doesn't have internet access1. **Google Health,** an online personal health record service which provides additional information about 'health conditions, medications, and lab results'. **Make it work,** a network of public sector organizations designed for them to work together and coordinate services to support unemployed people in Sunderland, England, and offer schemes suitable for their specific needs. **Project Mwana** which uses a RapidSMS system to deliver immediate infant HIV test results to mothers living in rural areas in Zambia. And **Young people's use on the Tax System,** a series of audio recordings reporting the young people's experience using the Danish Tax Authorities (SKAT) online system and services. Projects related with Culture are: **A Gente Transforma: Várzea Queimada,** a project where designers and local craftsmen combined both their technologies and shared technical knowledge to design two product collections. **Hövding,** a cycle helmet worn around the neck with a changeable shell in numerous colours that conceals an airbag system triggered by sensors which monitor the cyclist movements. In Economy are: **Prove 'Promover e vender',** a Portuguese example of the many European initiatives and projects connecting farmers directly with consumers which distributes local and organic products in a short market circuit fostering closer relationships between them via communication technologies. **We are the Million,** a crowd funding website for small businesses in London to raise funds from their loyal customers, and crowds of other 'online' supporters, so they can create new jobs or improve their services. Related with Education are: **2 de Maio todos os dias: Football Nets,** a workshop session with children to produce and personalize street football nets using the Rapid Prototyping Machines at the fab lab of the Faculty of Architecture. **Jerry the Bear,** an interactive toy for children with type-1 diabetes to learn and practice medical procedures. **One Laptop per Child,** a project to distribute laptops with educational software for schoolchildren in 'developing countries' [16]. And **Wheelchairs in Guatemala,** a one year workshop with industrial designers and technicians from a local organization specialized in producing wheelchairs for children to perform a design project: develop a wheelchair adapted for its users – children – and the context of use. Related with Environment is **Film Farming,** a project which combines membrane technology with hydrogel (a technology found in children diapers) to replace the soil on any surface and grow sustainable and high-quality vegetables and fruit. The Living category includes **Giradora,** a blue bucket with a spinning wheel that works as a washing and drying machine operated by pedals. **Kinkajou,** a microfilm projector that is able to both illuminate and support teachers' work in night time adult literacy classes in off-grip rural areas of west Africa. **Moonlight,** a students' project in Design for the Base of the Pyramid Program at the Faculty of Industrial Design Engineering, TU Delft, consisting in a portable solar-powered light for people in off-

[1] **2 de Maio todos os dias** is a project that works on multiple – social – issues in *Bairro 2 de Maio,* a disadvantaged neighbourhood with high unemployment rate in Lisbon.

grid areas of rural Cambodia. **Na minha rua,** a website where citizens of Lisbon can report street occurrences to the City Council. And **Pump Away,** a vacuum pump truck with an omni-injector to empty and maintain good performance of pit latrines in Zambia. Related with Mobility is **Boleia.net,** a Portuguese car-sharing website to connect people interested in sharing car trips and its expenses or simply to communicate with others who share similar interests (networking).

2.1 The Inquiry: What, How, Why, When, Who

For most people, still, technology is *material* – 'machines', 'mechanisms' or 'mechanical modes' [1]. However, as we witness in the XXI century, its physical aspects are increasingly the surface and/or interface of more crucial and complex technologies, ones that are *immaterial*, or as some authors call 'intellectual' [1][5]. 'Technology' comes from the Greek term *techne* meaning 'art, craft, skill' and *logia* meaning 'word, knowledge' and its defined as the set of tools, machines and instruments and also methods, knowledge and processes that belong to any art, craft or technique or can be used, made or modified to perform specific functions, solve particular problems or achieve determined goals [17][18][19]. So, *what* are the technologies identified in our sample: *material* (tangible things, tools, instruments) or *immaterial* (methods, knowledge, process, programming, linguistics, algorithms and other internet related tools)? *How* they occur in the projects: are they *used, created* specifically, or *extended*, in Bell's notion of 'extension technology' as providing additional scope to an existing technology? *Why*, or for what purpose they appear: to *solve* (solution) or *support* (a means to an end) the project? *When* they appear: in an initial, intermediate or final stage of the process? *Who* directly interacts with it to fulfil its role? These were the questions of our inquiry to the social design projects and in Figure 1 below we can see the answers.

		Technology	What	How	Why	When	Who
1	**2 de Maio todos os dias: Na minha Rua** Ongoing, Portugal / U:iclc	Neighbourhood Map	M	Extended	Support	●—	U + D
	Google Health 2009-2011, Global / Google	Online Record System	I	Extended	Solve	—●	U
	Make it work 2013, U.K. / Live | Work	Online Network System	I	Extended	Solve	●—	O
	Project Mwana 2010, Zambia / UNICEF	RapidSMS System	I	Used	Support	●—	O
	Young people's use on the Tax System 2013, Denmark / Mindlab	Audio Recorder	M	Used	Solve	●—	D
2	**A Gente Transforma: Várzea Queimada** 2012, Brazil / Rosembaum	Craftsmanship	I	Used	Support	●—	U + D
	Hövding 2005, Sweden / Cityfabric Labs	Airbag System	M	Extended	Solve	—●	U
3	**Prove: Promover e Vender** 2006, Portugal / EQUAL Initiative	Online Ordering	I	Used	Support	●—	U + O
	We are the million 2013, U.K. / Participle	Online Crowdfunding	I	Extended	Solve	●—	U
4	**2 de Maio todos os dias: Football nets** 2014, Portugal / U:iclc	Prototyping Machine	M	Used	Support	●—	U + D
	Jerry the Bear 2009, U.S.A. / Design for America	Interactive Toy	M	Created	Solve	—●	U
	One Laptop Per Child 2005-2009, U.S.A / MIT Lab	XO Laptop Computer	M	Extended	Solve	—●	U
	Wheelchairs 2011-2012, Guatemala / Design without Borders	Design Process	I	Used	Solve	●—	D + O
5	**Film Farming** 2013, Japan / Dr Yuichi Mori - Mebiol Inc.	Membrane Technology	M	Used	Support	●—	D
6	**GiraDora** 2011, Peru / Master Students - Art Center College California	Washing Machine	M	Extended	Solve	●	U
	Kinkajou 2004, Mali / Design that Matters	MicroFilm Projector	M	Extended	Solve	—●	U
	Moonlight 2009, Cambodia / Master Students - TU Delft	Portable Lamp	M	Extended	Solve	—●	U
	Na minha rua 2013, Portugal / Lisbon City Council	Interactive Website	I	Used	Support	●—	U + O
	Pump Away Ongoing, Zambia / IDEO	Omni-Ingector	M	Extended	Solve	—●	D
7	**Boleia.net** 2013, Portugal / Lindoweb	Community Web Portal	I	Used	Solve	●—	U

1 COMMUNICATION 2 CULTURE 3 ECONOMY 4 EDUCATION 5 ENVIRONMENT 6 LIVING 7 MOBILITY —— MATERIAL [M] IMMATERIAL [I] USER [U] DESIGNER [D] ORGANIZATIONS [O]

Project references (from top): www.2demaio.com; en.wikipedia.org/wiki/Google_Health; liveworkstudio.com/client-cases/415 + (McNabola, A. et al. 2013); www.frogdesign.com/work/portfolio?tid=106 + unicefinnovation.org/projects/project-mwana; mind-lab.dk/en/cases/away-with-the-red-tape-for-young-taxpayers + (McNabola, A. et al. 2013); www.rosenbaum.com.br/agentetransforma/edicao-2; www.hovding.com + designtoimprovelife.dk/hoevding; www.prove.com.pt; www.wearethemillion.com + www.participle.net/projects/view/279/; jerrythebear.com + designforamerica.com/projects/jerry-the-bear; (Kraemer, K.L. et al. 2009); www.norskform.no/en/Themes/Design-as-development-aid/Prosjekter-2012/Rullestolprosjektet/Wheelchair-design-/; www.mebiol.co.jp/en/aboutus + designtoimprovelife.dk/film-farming-with-hydrogel; www.designmattersatartcenter.org/proj/safeaguaperu; www.designthatmatters.org/impact/#kinkajou + http://www.youtube.com/watch?v=5B_RK61NI1Q; (Diehl, 2009) + (Kandachar, 2009); lxi.cm-lisboa.pt/lxi/?application=NaMinhaRua; www.ideo.org/projects/new-options-for-improving-pit-latrine-technology-in-zambia/completed; www.boleia.net.

Figure 1: Technology in Social Design Projects

3 THE ROLE, INFLUENCE AND VALUE OF TECHNOLOGY

As we can see in Figure 1, most of the technologies are solutions because how they appear allows the project to be accomplished, or solved. However, if we look carefully this doesn't mean that the project ends with their creation, use or extension. In fact, the solving technologies appear – *when* – alternately in initial, intermediate and final stages of the project indicating that their role depends on other actants,

sometimes technologies – *material* or *immaterial* – that also play role in the process. Although the 'Interactive toy' **Jerry the Bear** is the solution of the project, many technologies helped in his creation and support its function when it interacts with and by children e.g. the software built by a specific programming knowledge allows children to interact with the toy, the touchscreen serves to activate the software functions, the audio player emits sound expressions for every function performed or activated such as 'Thank you' or 'I'm Hungry', among others. Thus, in every project technologies don't act as separate or individual elements because they need interaction to perform its functions they constitute parts of a whole, system or chain [6][3][17][4] of relations and associations of various technologies and various people, who create, use and interact with them to accomplish the goals of the projects. Consequently, delegation – the 'distribution of competences' between people and technologies [6] – plays a very important role in social design projects. It is decided not only by designers but also by technologies themselves which 'contain and produce a specific geography of responsibilities' or 'causes' [7]. If we imagine what people would have to do in place of a technology we are able to identify delegation and understand the role of the given technology within the project [4]. When women in Cerro Verde, Lima, Peru, delegated the task of washing and drying clothes to **Giradora** they were liberated and no longer needed to make several trips up and down the hills to collect water saving time for other, more rewarding, activities. By using a RapidSMS system, **Project Mwana** was able to effectively replace the postal system that took up to four weeks to deliver the same test results. By delegating to a mechanical solution **Pump Away** largely improved the efficacy and efficiency of the cleaning service of pit latrines that otherwise by hand was too hazardous, time consuming and unsustainable. These three projects happen in similar contexts where people lack basic human needs/rights, living at the 'Base of the Pyramid'. Nevertheless, the delegation present is not, in our view, a process of 'deskilling' [20] nor of 'dehumanization of work' [10] since the substitutions or replacements of people by technology are positive, healthy and the benefits are mainly human, social and cultural. City Management and its state – of cleaning, maintenance, security, etc – is a task which the Lisbon City Council cannot ensure entirely and permanently so it delegated to its citizens the role of actively and permanently detect and communicate street occurrences. The website **Na minha rua** is the bridge between the authorities who have the power and means to control occurrences and the citizens who participate and take responsibility for the city in a more open, flexible and horizontal model of governance [8]. On the other hand, the Council can improve time and resource management, prioritise urgent actions and gain greater control over the city by or through its citizens. Technology is not neutral it embodies the strategy of its 'protagonists', designers who rework or reproduce the existing time and spatial structure of historical, economic, political, technical, and sociological opportunities and constraints [3]. Consequently it is 'inherently political' exerting more or less 'social control' by, consciously or unconsciously, opening or closing certain socio-technical options, patterns or relations, impose certain rules or norms offering immediate rewards or abrupt penalties to 'groom' or 'teach' the users [17][7]. In Sweden, two designers decided to create an urban cycle helmet that people would be happy to wear, even if it was not mandatory. From an user's point of view, the choice for not wearing one has been due to several reasons: not very comfortable to wear, not that protective, resembles the ones used by professional cyclists and mainly the person's hair becomes a mess. However, **Hövding** ends with any excuse for not wearing a helmet because it has a changeable shell that can easily match people's outfit and since it's worn around the neck it doesn't mess up your hair anymore. According to authors, when adopting technology we are opting for far more – economically, politically, culturally – but it always depends on the people's choice and use of technology seeing that when they use it, respond to it, interact with it, they change it. 'So the fate' of technology or its consequences are always 'in the hands of others' [4][10]. Most of the projects *use* or *extend* – adapt, alter or provide additional scope – an existing technology, and very few *create* them specifically. In some projects, this can be due to available means or resources or even the strategy and interest of the State to invest in technological change [5]. Nevertheless this shows that the choice/design of more 'low' or 'high' technologies hinges on local circumstances particularly the need for the part to integrate a whole [8][17]. **Kinkajou** is an example which the combination of existing technology created a new technology. The 'Online ordering' website of **Prove 'Promover e vender'** is the low-cost mediator that enables farmers to reach out costumers and vice-versa. **We are the million** *extended* the crowd funding platform to a more curate, thoughtful and appealing website. Internet platforms work effectively as communication enablers and system organisers however, according to authors, they are still largely unused [8] and could reduce drastically the amount of 'hardware' [10]

present in our societies proposing sustainable alternatives to current production, logistics, distribution and consumption methods [21]. Social networking services, or 'social media', can be present in any project simply by members of teams contacting each other and sharing information through them. They can also catalyse large numbers of people around common visions, foster peer-to-peer relations and support meetings and efforts 'in the real world' as **Boleia.net** [8]. In the public sector, authors state that design plays a significant role in the introduction of successful technology because it can actively and creatively increase service efficiency, reduce costs in creating, adapting, using, testing and implementing and most importantly better identify and meet real user needs [22]. **Young people's use on the Tax System** and **Make it work** are two examples. In the list of *immaterial* technologies, some of them cope not with the direct creation or application of technology but with the transfer of technological knowledge or skills. **Jerry the Bear** is again an example in which knowledge is transferred and taught by the interaction with the technology. Design interaction is about designing actions or artefacts for intended use and/or to mediate human relations [12]. The projects **A Gente Transforma** and **Wheelchairs in Guatemala** introduce a recent take on design and its knowledge as an enabler for people to re-think, change and improve their own lives and designers as 'people with design knowledge' who aside from designing artefacts can also design interactions and participations [23]. In the first example, designers and local craftsmen were involved in a mutual learning process in which both craftsmanship and design knowledge interacted to create two original and distinct product collections. The designers of **Wheelchairs in Guatemala** though the best way to assure wheelchair technicians would effectively improve their expertise was to perform a design project, from beginning to end. According to authors, 'as individuals work together they are able to build a rapport that facilitates knowledge transfer' and when they 'already share a common language within a domain additional knowledge can be more easily transferred' [21]. In this case the technology – the design knowledge – was the prior solution but only when interaction with it occurred the project's process could develop. Indeed, **Wheelchairs for Guatemala** was not a project about designing technology – the wheelchair for children – but designing interaction – the collaborative process of the design project – with the purpose of technology – knowledge – transfer and learning. During the workshop **2 de Maio todos os dias: Football nets** the children learned how to work with the machines and that was the most exciting part of the workshop as they stated. The fundamental aim of the activity was for them to eventually use the machines in the future, in their free time, for their own projects and needs. For some authors, the transfer of innovative technology – *material* or *immaterial* – has to be 'sensitive to social, cultural and economic differences', based on local priorities, levels of interest, feasibility and 'appropriateness for the community' in terms of infrastructure, environment, waste management [8] and existing human relations and social dynamics since people are often a crucial part of 'what is worked with and changed' [24]. **One laptop per child**, was an example that failed to comprehend the social, cultural and economical context. The XO laptop was seen by its designers as a transformative technology that would change education 'for the world's disadvantage schoolchildren' [16]. Their ambitions were set up high but in our view for the problem they were trying to tackle the XO laptop could never be the solution. In the best case, it would have been a supporting technology because it needed the interaction and involvement of teacher's who were the main characters introducing the technology into classrooms and transferring the knowledge to children. However, they were never involved, nor even trained to work with the laptops [16]. Moreover, the project 'had no one handling marketing, deployment and support' so the cost of the computers ended up being too high for children, and their parents, despite the government's investment [16]. Learning from mistakes and failures, this project whistles the importance of the participation and integration of users, people for whom the solutions are intended, and all stakeholders in the process of designing, implementing, distributing and communicating technology [20]. Especially in large-scale projects, it is important to test and prototype solutions directly with users since the dialectic and iterative approach can assess and anticipate empirical, political, material and symbolic issues simultaneously [20]. Thus, authors state that the designers' ability 'to engage with users, discover their needs and create solutions accordingly is what makes technology into something people can use'. **Moonlight** was considered a successful project that from a design education point of view was more than 'designing a product' it was a process of successfully introducing technology in a specific context and the development of a locally adapted solution through 'Transdisciplinar approach', 'participatory methods' and 'different design knowledge domains like sustainability, user context and business' [25]. For this reasons, authors argue that 'design professionals and educators should invest more in research and education for Designing for the

BoP' [25]. Indeed, these programs present great opportunities for students to gain hands-on experience in designing – products, technologies or services – for social contexts and are thus potential protected micro spaces of experimentation of social and technological innovation [8]. The **Google Health** project was discontinued for not having the expected broad impact. In our view, the project posed questions of privacy and usefulness for all users – whether doctors and people. Since the data was added voluntarily it was propitious to errors, misunderstandings and incompleteness. Also the centralization and disclosure of information to an online platform as its advantages but also its risks.

2.1 Final considerations

Authors say that technology – or the lack of it – reflects the ability of societies to transform themselves and the uses to which they dedicate their technological potential [5]. Social design projects *use*, *create* and *extend* technology both as means and solutions to human centred problems in various domains of society. Some more complex than others, all of them reflect the principles guiding the work of social designers who instead of designing just another – original, more beautiful, different – lamp, they design sustainable lamps or devices which illuminate and perform other functions simultaneously for where there's no light. Instead of another helmet they think about meaning, relevance, value, ethical intentions and the political strength of *things* – technologies – they create/design. Instead of adding, they question, propose alternatives, and try to change situations, even when they fail. So, although all design is social, not all design is social design. From our analysis technology plays a positive role in social design. Our framework enabled us to recognise its nature, materialization, purpose, timing and operation in each project. However we cannot be certain if this can work as a pre-model analysis for technology in the social design realm. Overall, technology facilitated processes, mediated relations, connected people, enabled communication, organized systems or networks and were delegated to specific functions that otherwise would take much longer to perform or implicate more resources to be done. As knowledge it was transferred, improved abilities, helped and empowered people. Some technologies have potentials that are yet to be explored, especially the ones related with information, communication and networks. Technology itself is not an obstacle but the way it is introduced can lead to its rejection. Therefore, we can say that technology is useful, both technically and socially, for social design projects but we are only in the beginning and much has still to be done.

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