



## Product and service design for patient centered diabetes care

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### REVIEW

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Please cite this paper as: Varadarajan S, Fennessy L and McLean H. Product and service design for patient centered diabetes care. AMJ 2009, 1, 13, 216-219. Doi 10.4066/AMJ.2009.117

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### Abstract

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Design plays a marginal part in the discourse of diabetes care, mainly in visualizing the form and packaging of medical technologies. The authors however have a practice that advocates that design orientated solutions can add much needed dimensions to problems that have traditionally been the exclusive preserve of expert discourses. This position has for long been a validated and largely accepted approach in design's engagement with issues in sustainability and development studies. A similar approach in the area of medicine has been constructed by the authors and marks out a position of advocacy where the designer takes on agency to intervene on behalf of the user community. This position contains a healthy critique of the traditional approach of product design for manufacture while simultaneously amplifying a desire to intervene and make a substantial improvement in the quality of life of people with diabetes. This article first opens out contemporary diabetes care as a contested domain and then goes on to sketch out the key aspects of a design practice focussed upon delivering positive health outcomes in diabetes care. The specific context of discussion for this article is the practice of teaching in design studios where students of design listen to the voices of people with diabetes and visualize ways for design to provide products and service solutions that transform the lived experiences of people with diabetes.

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#### Background

The dramatic transformation of primary health care over the past two decades has been accompanied by a rapid adoption of new technologies, such as health informatics, diagnostics and medical imaging, for the delivery of effective health services. The look, form and shape, of the products that have housed these technologies have been significantly defined by the industrial design profession. Much of this activity has been centered on designing global products for multi-national medical technology

companies and the complex regulatory and clinical frameworks to which medical products must adhere. This area of medical product design has been deeply influenced by a discourse of universal design. Born out of ergonomics, universal design focuses on making products as accessible as possible to the widest of user groups. While universal design in the realm of health care advocates for legitimate inclusion of the diverse contextual and physical capabilities of globally distributed user groups, it retains that production and client is central to its discourse. It privileges a generality of user and use logic. This construct of design practice strives to attain satisfactory closure of products within a context of design for manufacture and the regulated patterns of use within clinical environments. While this perspective is valid for training designers to work within technical product manufacture, medical or otherwise, it comes unstuck when considered in a problem-solving construct where need, such as an individual's experience of difficulties, is privileged over means, such as the commercial imperatives of product manufacture. A peek into current practices in medical product design follows to contextualise our discussion about a model of design practice that crosses into expert discourses, a strategy traditionally not employed in the design domain.

Current social networking technologies have brought the voice of the community of people with diabetes into public view and, therefore, into the research remit of new product development. A sweeping criticism by Amy Tenderich from her blog the Diabetes Mine illustrates the power of this voice:

*"Medical device manufacturers are stuck in a bygone era; they continue to design these products in an engineering-driven, physician-centered bubble. They have not yet grasped the concept that medical devices are also life devices, and therefore need to feel good and look good for the patients using them 24/7" [1].*

This quote from Tenderich's open letter to Steve Jobs at Apple set a challenge for the design community. One response to this challenge was Adaptive Path's *Charmr* concept, a yet to be engineered device that purports to assist users in self-managing their diabetes. The concept is simulated in a scenario construction [2] and returned to the public realm as a proposition to people with diabetes, design and medical communities through a video on YouTube. This approach to design emanates from the specialized industrial design field of interaction design and focuses primarily upon the user experience of interacting with physical artefacts, sensing technologies, digital information, and graphical user interfaces and data oriented networked service systems. It is an example of a wider



practice of user centered design that explores new practices and models of care. By speculating upon object mediated methods of health management, interaction design redefines the scope and context of practice of conventional industrial design and medical product design by transgressing upon medical territory to demonstrate the value of a design orientated solution to a medically defined regimen of care.

Another example that illustrates current medical product design practice concerns the monitoring of blood glucose levels (BGL), the essence of contemporary diabetes care. The popularity of electronic BGL monitoring devices and the practice of blood testing outside hospital environments has been claimed to be related to disease management processes pushed by insurance companies aiming to reduce the risk of complications and exorbitant medical costs for insured people with diabetes [3]. However, from a perspective of people with diabetes, strict control of BGL, while attempting to closely emulate healthy pancreas function, has its problems. Sociologist John Law juxtaposes the regime of BGL control with the continual stresses of the patient who snacks regularly to keep readings up and then worries about weight gain [4]. He cites the increase of "hypo incidents" and speculates that they are connected to the tighter control regime where "recent clinical trials - and the standards that have followed from them - actively produce hypoglycaemia" [4].

These examples of diabetes care demonstrate that within a realm that is commonly assumed to be the preserve of medicine, diabetes has generated two distinct orientations of engagement, namely a product economy and a social ethnography. Interestingly neither the design activity nor the critiques of people with diabetes and sociologists deal directly with the medical, rather the concern is with the institutions of health management and concepts of ownership of the problem of diabetes. This context raises possibilities for the potential and diverse roles that design can play in diabetes care and medical product improvement [5]. To probe these roles, we constructed diabetes as a learning space for students by using a range of visualized design projects for them to explore the design of new products and services that are framed by issues of self-management of diabetes.

Our teaching approach differs distinctly from mainstream design practice in that we elevate the social and political over notions of manufacture and market by orienting design as an agent for constructive intervention. It is from this ideology that we draw our views of privileging the marginal discourses of a problem as locations for innovation. This approach has been tested and refined through design studio projects about diabetes as a generative mechanism that aims to amplify the disregarded and faint voices of the people with diabetes and to make explicit those voices through design propositions. Research within projects are characterized by reliance on a variety of methods to commence a participatory process, usually focussing upon use of different types of meetings, group activity, and information-gathering techniques such as mapping (6, 7).

Along with student project work, other outcomes of these studios include presentations and publications as well as a large multidisciplinary collaborative design learning and teaching project funded by the university. The following section describes the approach of the broad project of diabetes that we have realized over four years using successive iterations as a reflective process, and goes on to open up the three key themes that have been explored with students.

### **The Approach**

The learning spaces of the diabetes project are based on the studio based learning model where students learn to design products and services by working on hypothetical projects. Studio projects are typically a set of particular methods of work, specific problem contexts and disciplinary demands that students have to address over a semester long period. A characteristic of the diabetes studios has been the requirement that students adopt a people-oriented practice by placing the people with diabetes at the centre of their design projects, thereby pushing issues of manufacturing and medicine to the periphery of the design process. Students are encouraged to engage in learning that allows them to fully explore possibilities for change, not by disregarding the range of expertise present in the complex area of diabetes, but by momentarily putting aside field knowledge that is assumed and accepted to find innovation in alternatives.

The absence of a prototype artefact that is subject to redesign or a concrete need requiring a focus on design intervention presents unique problems for students to navigate their learning. In seeking to understand the situation of diabetes outside the conventional manufacturing context the construction of scenarios and story telling becomes the dominant artefact for a design project. Students are provided a framework to theoretically locate individual projects by using a series of dichotomous project typologies, for example, short-term / long-term, transverse / longitudinal, new / re-design product / service. As students often experience high levels of uncertainty when developing their projects, this framework helps them to define their work and position as designers within the space of diabetes. The three key thematic areas that have been explored through these design studios, are rethinking care, the home and the remote-transnational context. These themes have been encountered by students over the past four years and their resulting projects are described in the following sections.

### **Rethinking Care Models**

The contemporary practice of design has a strong focus upon Service Design where a significant part of design work is in the non-material solution. Diabetes has a service face too and in design practice this is represented as a 'model of care' and the delivery of care defining thus a territory of solutions that extend beyond the narrow material or product focus of traditional design practice.

The paradigm of diabetes care in Australia and developed countries is defined by self-management and training for



better health outcomes [8, 9]. The first project conducted in 2006 was a fourth year thesis project concerned with individual self-management of diabetes. It focused on developing designs that were empathetic to the people side of diabetes rather than concerned with technology. To construct user narratives, students listened to the little things that people with diabetes found irritating in negotiating their everyday lives. These narratives became the criteria by which design decisions and concepts were evaluated by students. The outcomes concentrated on self-management using multiple management models, including co-management as an option to orient service design.

Throughout this first project we were conscious that designers are not experts in health or medicine. However, designers are experts in synthesizing and abstracting the complexities of people, conditions, technologies and materials into tangible and communicable articles. This realization had a strong influence in shaping the pedagogical and disciplinary approach of subsequent projects where a method of design that develops products and services with an authentic focus upon the individual's experiences displaces the primacy of the medical gaze [5]. In order to help shift students' conceptions of the "right way to design" we borrowed principles from interaction design, namely that a design solution is a disruptive innovation that changes the status quo, and that a conventional focus upon manufacturing is erroneous when dealing with an experience rich design context.

#### ***Diabetes and the home***

Design discourse is contextual and conventionally has been located in the manufacturing contexts of 'what can be made' followed by 'what can be sold' indicating a second location as that of the shop where the object is sold. The appropriate object that ought to be made, in the functional discourse, is thus mediated by a desire to continue the existing paradigm, and plays a partial role in defining the design. In the diabetes project we centre the home as the primary site of concern and this informs the design goals and decision making significantly.

In all projects peoples with diabetes were the metaphorical clients with needs in the following areas: food and diet, time and data management, incidental and deliberate physical activity, and communication and socialization. While these needs were approached from the experiential perspective of the people with diabetes, students' research and solutions were not exclusively focused on diabetes. We also used the home as a significant site for engagement to look at ways in which households and families relate and manage diabetes. Students considered the social context of people with diabetes by appraising problems in the relational and support network of family, carers and colleagues by mapping a categorization of condition types and modes of acquisition, age and gender, and carer relationships. Importantly throughout this depiction and analysis of issues, the dignity of the individual from the disparate sectors within the community of people with diabetes remained a central concern in students' investigations.

In 2007, a university grant enabled the expansion of the work we had developed by involving a range of disciplines in the collaborative design and implementation of new products, technologies and service systems for people with diabetes. It comprised students and academics from Industrial Design, Computer, Bio-medical and Electrical Engineering, Product Design, and Entrepreneurial Studies. Students worked in multidisciplinary teams to design, develop and plan a business case for the implementation of new products and services in defined areas of need.

#### ***The Remote-Transnational***

The typical structure of a design studio is focused upon defining a location for innovation and often starts with a provocation. This task is easy in the diabetes field as we can point to evidence of a market that demonstrates absence of competition or robust feedback, incidence of inflated prices and paucity of genuine innovation.

The diabetes market has tended to focus on the needs of the affluent and people with Type 1 diabetes and not given much attention to the product and service needs of a huge number of people with diabetes in the poor and remote populations of developing countries. This context was the basis for a design project that we labelled The Remote-Transnational to investigate diabetes in India and China. People from these regions have genetic disposition to diabetes that is compounded by recent, significant changes to diet and routine through the rapid urbanization of populations. We entered these fields separately and in ways that were sensitive to the idiosyncrasies of each region. For instance, approaching private enterprise as an innovation driver occurred in the Indian context and working with local government as an instrument of service delivery occurred in the Chinese context. Projects for diabetes in India began in 2007 with a group of postgraduate management students. The service system that they devised became the basis for detailed product design work for industrial design students in 2008 where students designed the necessary hardware, informatics systems and user interfaces for the implementation of an Indian service system. The Chinese project involved engagement with local government and resulted in students designing a visiting nurse (community health worker based) and diabetes educator service system.

#### ***Significant values in this design practice***

As sites for learning, these design projects were characterized by students closely engaging with authentic problems of others, without the distance provided by the usual abstraction of design problems by conventions of production, market and client. Students often found that learning through the narratives of people with diabetes was accompanied by an awkward negotiation of their roles as designers and learners. This negotiation of roles was considered an important, but confronting learning experience. To mediate this awkwardness, a four-stage design process that we named *ieid(c)* was developed to give students and stakeholders a clear understanding of the scope and outcomes of the design projects [10, 11]. The most significant aspect of the process is that it allowed



students to set aside the *a priori* knowledge of design practice and process. The stages of *ieid(c)* replace structured processes such as research with a requirement of Immersion and Exploration where embodied and experiential knowledge is privileged over the textual and the tacit. A stage of Intervention endorses that project solutions go back into the community for validation for the last phase of Demonstration of a new enterprise that is established to give life to the design solutions.

Much design education offered around the world does not adequately question the early craft and industrial art construct of the profession and is entirely insufficient when design is to be positioned as a problem solver within complex contexts. As design researchers and pedagogues, we have redefined design as an agency and the designer as an agent of transformation. Our teaching is concerned with building capability in design students to enable them to work independently of organisational, economic and trade prerogatives and to bring change into the lives of people. In this redefinition of design practice, our work in the area of diabetes shows a consistent application to realise a design approach that accords with current ethnographic research about the lived experiences of people with diabetes. While the students who have participated in these studios will probably not continue to work in the field of diabetes they have been influenced by the approach to design that we have instilled. We maintain that this design approach is a political and arbitrary construct that is appropriate to a range of contexts where specific privileging exists to ensure the faint voice is heard.

For too long design has restrained itself to manufacture and kept out of expert discourses such as the medical field of diabetes. However the portrayal of diabetes as a condition that generates specific needs of management creates a place for design intervention. The transformation of the disease from a specialised clinical language into an experiential phenomenon offers design an opportunity to visualize, reconstruct and transform difficult situations into products and services that can make everyday living easier for people with diabetes. Design in this way is positioned as a marginal or peripheral discourse in diabetes that is non-threatening yet at the same time acquires agency.

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## PEER REVIEW

Not commissioned; externally peer reviewed

## CONFLICTS OF INTEREST

There are no competing interests to be declared by the authors.