Design for Transfer

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H8: Design Research in Health Education: Don't Jump to Conclusions

Lessons Learned From Digital Innovation in Health in The Netherlands

Abstract

In recent years, a number of design research projects relating to digital innovation in health and welfare have been carried out within the NHL Stenden University of Applied Sciences. These design research projects included a fall prevention game for the elderly (HaSeGa), a game to prevent lower-back injuries for caretakers (iLift), an app for psycho-education in social limits for young people with a mild intellectual disorder (MATTIE) and a vitality game for the elderly (Fox hunting). Even though the project teams, target groups, and project objectives were different in all projects, the analysis showed that there were strong similarities in the lack or even absence of attention for the importance of social system development. Although all projects resulted in a prototype or artifact that had been enthusiastically responded to during the design research processes, the artifacts themselves never became integrated into the socio-technical contexts for which they were designed.

This article aggregates lessons learned from those projects, addresses the problem of the classical conception of implementation in design projects and offers a framework for future design research projects for digital innovation in health. Moreover, designers of health curricula as well as educators in health innovation are called upon to address the transformation of the social system as an integral part of a design process for a successful integration of the developed artifact.

Keywords

1 Prelude

The aging of society and the decline of the birth rate will be the primary reasons for the rise in care and support requests in the coming years. Greater medical knowledge has led to an ever-increasing life expectancy in the Netherlands [1]. Far-reaching changes in the organization of care and welfare support have been adopted in answer to these developments. Take, for instance, the decentralization of care, the transition of youth care to the municipal authorities, the step-by-step design and arrangement of the Social Support Act and a growth in the number of activities focused on prevention [2]. There seems to be little discussion about the opportunities and need for information technology to meet these challenges. Home automation, telemedicine, and online support are becoming increasingly common. Yet there are countless examples of digital innovations that do not make it into daily practice and run aground in development or implementation [3].

The emergence of information technology has been one of the most important advancements of the last century. It was widely accepted, with hints of skepticism, that the role of technology, and of computers, in particular, would be inescapable in our daily lives, revealing unlimited possibilities. More so than with the launch of earlier technological innovations, such as the printing press, electricity or television, information technology has had an impact on the social system. The social system may have reacted out of fear or resistance to the unknown in the past, but the so-called disruptive nature of the continued advancement of information technology has definitely led to a wide range of challenges. Now, in the 21st century and especially in the world of care and welfare, we would, therefore, expect greater interest in these socio-technological challenges, not least in the light of the developments around eHealth.

In contrast to printed books or the first motorized coach, information technology is not just one single concept: the development of information technology (abbreviated to IT, often referred to in the Netherlands and Belgium as ICT) has also expanded its definition. While Van Dale, the Netherlands' foremost dictionary, still describes IT as 'everything to do with the automated acquisition and processing of information', there is a noticeable shift towards psychometric characteristics [3,4] often expressed in terms of adoption [5] and acceptance [6]. This article explores observations made in a number of so-called 'games for health' IT projects of the iHuman research group [7–11] in which the social component of technological innovation has proved to be the biggest challenge, both among end-users on an individual level, but also on managerial and cultural levels as well.

1.1 Affinity

In the 1990s, implementation was often the final stage in a development process, particularly in terms of technical expansion. The final user only became acquainted with the artifact through an on-screen tutorial or a user manual. For the rest, the implementation focused on the installation of the artifact and efficient operation. When problems arose, they truly were of a tech-

nical nature and could only be solved by the software vendors themselves. This is where the current uncertainty with regard to technology in the areas of Health Care and Welfare springs from. Problems with technology are interpreted as a personal shortcoming: technology is difficult and intended for boffins, end users may find it puzzling or have no affinity with it.

In this day and age, this reflex can no longer be said to be entirely justified: new iterative development methods have made it possible to remove teething problems from software at an early stage and if something does not work correctly, the supplier has simply not done his job properly. Technology is here to stay. The issue now is whether the technology does the right things correctly, or rather, whether it's well-designed. The latter is crucial: as long as the healthcare or welfare professional continues to approach IT as something out of their control, opinion or input, implementation will remain the highest achievable feat. Lack of affinity with technology as an excuse not to interfere in the development of new applications could be interpreted as unprofessional behavior.

1.2 Implementation

A frequent term, which seems to have replaced implementation, is 'the rolling out of an innovation, strategy or software package'. This metaphor may at least address the insight that implementing is a process, but also raises questions. Freshly laid tarmac is rolled out with a roller, a roll of carpet just gives the floor a new look. You could argue that when there is an update of an alarm system or when it comes to the commissioning of new coffee machines in the office canteen, one could well speak of rolling out. But when an innovation comes with a different way of working or has a substantial influence on an existing way of thinking, the term 'rolling out' is almost disrespectful and at the very least naive.

Expectations and insights regarding the possibilities of technology rarely correspond with reality, and the projected promises often fail to materialize. In that sense, the experiences with eLearning in the world of education spring to mind. The most important similarity in our view is the perspective from which the potential innovation comes 'flying our way'. Logically, the existing reality is taken as a given and the artifact itself takes precedence. The use of the inescapable word – precondition – is typical. The organization standing on the edge of the

forthcoming challenge is seen as a condition. The preconditions are presumed and the innovation must take place within these frameworks. In this article, we want to make a distinction between the development of the artifact (a serious game, app, e-health application) and the development of the social system (services, culture, department) for which the artifact is intended [12].

2 The DIS/DIL Perspective

2.1 Design-in-the-Small

The design-in-the-small (DIS) [13] is a phase in the design process, with the instrumental perspective as its core, and the aim of iteratively arriving at a design of an artifact. It is iterative in the sense that the artifact grows into a fixed form by means of prototypes (predecessors). An artifact is a product consciously created by human action in the broadest sense of the word: it can be a traffic square, a mobile application, a service, a building or a law, for example. In this phase, an artifact is developed to improve, or better understand, a situation. The DIS, as shown in Figure 1, ultimately leads to a prototype of a certain justified 'completion' (artifact β), mature enough to be tested autonomously as an intervention in the

social system for which it was developed. It is emphatically not the intention that the artifact is implemented or judged by means of an impact study: the design process is still ongoing. The DIS takes artifact α, and through prototypical research arrives at artifact β.

2.2 Design in-the-Large

Like design-in-the-small, the design-in-the-large (DIL) is a phase. The DIL [13] deals with the further development of the prototype towards finalization, but in conjunction with, and fed by the social system. As said: at the start of the DIL, the prototype is still under development, but refined enough to be tested live. What is special is that at the moment it occupies its position in the social system, the artifact becomes, and evokes, more than can be expected from the prototype. In this situation, it can be said that the medium is the message [14]. The experienced artifact grows into an intervention (Figure 1), and with all its systemic affordances [10] the message is received more broadly and possibly explained differently than intended from its DIS. Meanwhile, the various actors within the social system experience the prototype as a joint, negotiable zone: they attribute meaning to the artifact from their own cultures. The artifacts arising from the design activ-

Figure 1: Design-based Research, Design-in-the-Small and Design-in-the-Large, adapted from Klabbers (2003b)
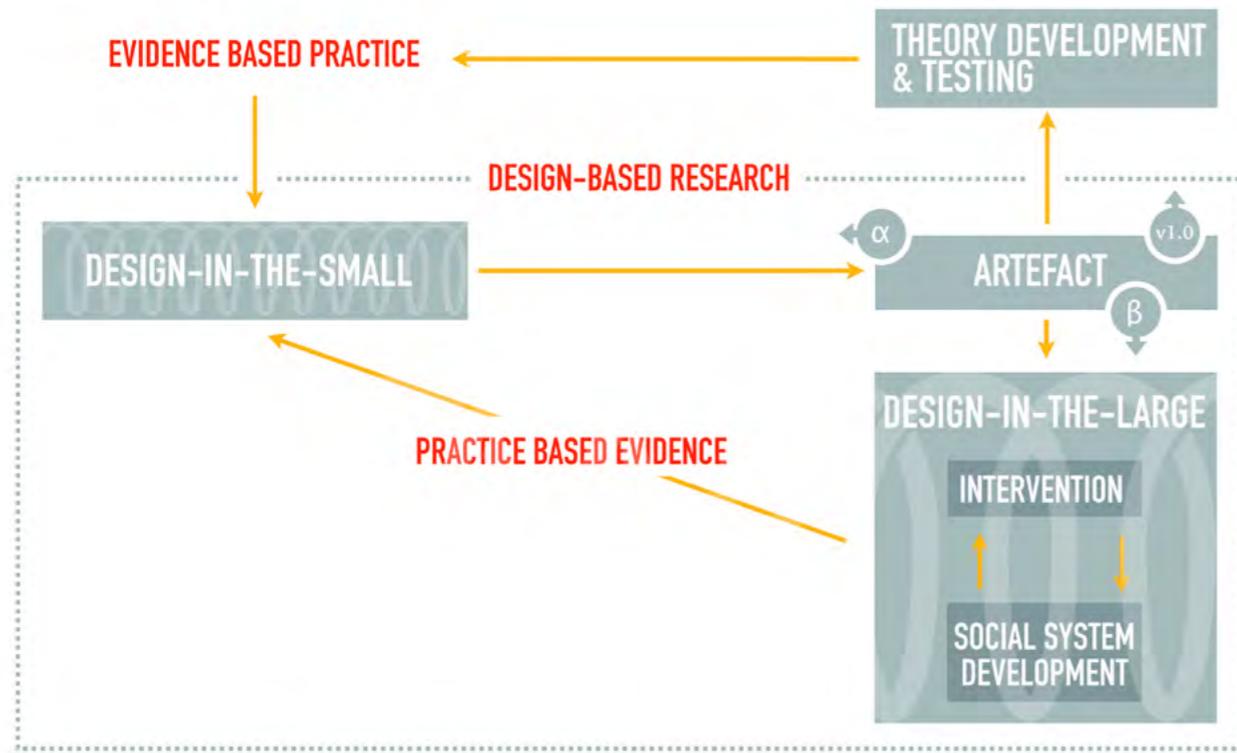
ities become boundary objects [15], which lead to a shared understanding, trust, commitment and ultimately a common language that connects the worlds of the designer and the target context. The social system relates to the prototype and provides new and often unforeseen information that can be used to improve the artifact itself. The artifact is domesticated by the user. The artifact influences the user, and the user determines which elements of the artifact they will employ [16,17]. However, assump-tions made in the DIS may turn out differ-ently, and specific conditions in the DIL may impede on the operation of the artifact. The DIL provides rich insights into the opera-tion of the artifact in situ and will lead to a further honing of the prototype, thus going further than implementation alone [18]. However, the influence described above is twofold: the disruptive nature of innovation means that it is not limited to the artifact alone, but the social system itself is also an object of development. It is designed with

and attuned to, the prototype. Herein lies the basis of social system development: the target context, the large, also changes. It is precisely because of this process, the development of the social system in con-junction with the artifact, that the DIL differs significantly from an implementation phase or roll-out. Through further development of the prototype, through the DIL, the artifact β expands to artifact v1.0.

3 Theory Development & Testing

Within the domains of care and welfare, the terms practice-based evidence (PBE) and evidence-based practice (EBP) provide footholds for the typification of research activities. Figure 1 shows how PBE and EBP relate to the outlined DIS/DIL perspective. The position of EBP is important to clarify. A common discussion during the projects concerns the effectiveness of the digital innovation: how and when do we know if 'it works'? This question on effectiveness of-ten literally results in a jump to conclusions, whereby the design space (see Figure 2) is skipped. This important issue needs empha-sizing when it comes to design research. It is only after its DIS and DIL that an artifact v1.0 is ready to be assessed from an empirical perspective.

3.1 Layers in Serious Media Design

The position of the design study is further explained in Figure 2. The so-called wick-edness of issues [19,20] can be approached systematically by creating clarity as to where in the process the study takes place. Studies in the problem space are about the systematic exploration of the problem, target group and theoretical justification departing from existing interventions and leads to a so-called design hypothesis.

Figure 2: Layers in Serious Media Design
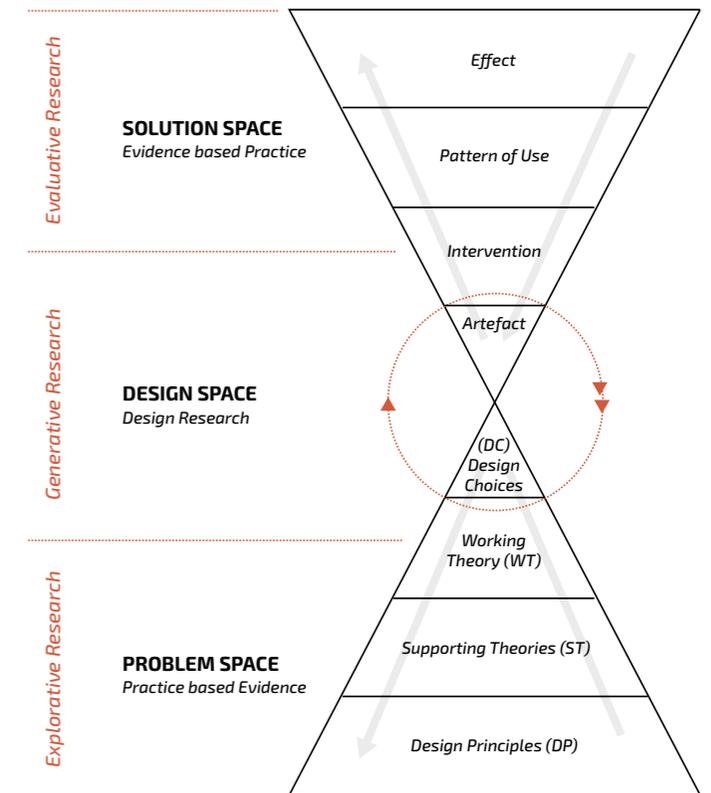
In the design space, the Design Research Framework (Figure 3) becomes the leading framework. In the DIS phase, the design hypothesis is concretized into design principles that are converted into proto-types-of-disposable-quality. In the DIL phase, the artifact grows to a certain maturity at the same time, while its effectiveness and suitability have already been demonstrated to a very large extent. In the solution space, one can use the implemented artifact to research the usage patterns and empirical effectiveness of the intervention.

3.2 Design Research Framework (DRF)

Specific to the design study, within the design space is the Design Research Framework (DRF, Figure 3). This model is based on the Instructional Design Model for rapid prototyping [21], which originates from the field of education. The reflex to think in terms of end solutions (often guiding a design process) is deliberately curbed by the DRF through methodically exploring the existing situation (assessment of needs, analysis of content and context). This almost always leads to a diversion and an in-depth investigation of the initial issue. A common mistake is to interpret the design gap as a single activity preceding the design

Figure 3: Design Research Framework (DRF), adapted from Tripp & Bichelmeyer (1990)

process. The closure of the design gap is the result of framing (Schön, 1983). It is not about pre-determining the current situation versus a desired situation, but about a deep understanding of needs, (existing) content and context. In this phase (DIS), reasoning should be resource-free (without a concrete solution in mind), with the current situation and the desired situation preferably defined from the perspective of the end user.

In the DRF, articulating the design gap coincides with artifact β, a key moment in the design study. This moment seems to be halfway through the project, but this can vary from project to project and depends on the wickedness of the issue at hand. Until then, prototypes are preferable of a disposable quality and do not contain the DNA of the end product. They are used to quickly validate ideas and concepts and serve as in-between objects: after all, the designer's paradox can only be solved through abduction [22]. The DIS works towards an eventually consistent closure of the design gap with a corresponding prototype (artifact β).

Figure 3 shows a spiral that interacts with the running phases of the DRF. The spiral represents the iterative and incremental character of the design study. The focus of these iterations is in line with the non-lin-

ear focal areas of design thinking, such as define, iterate, and ideate [23–25]. The framing stage (as part of the DIS) with its analyses has already been described above, as has the importance of social system development (as part of the DIL). The interaction between the construct and utilize prototype stages is the driving force of the design study. Depending on the position in the DRF (DIS/DIL), the prototype is continuously informed by research results from the iterations. It is important that a continuous balance is struck between rigor and relevance here [26] by correctly applying the right methods at the right time.

eHealth projects (like many other design driven projects) are by definition highly complex and bound to predetermined limits by grant providers. Detailed formulations of final objectives and products are almost always demanded in advance, which effectively means that the most drastic decisions are taken when the knowledge available within the project is at its minimum. In practice, these prerequisite learning outcomes are an obstacle to fully exploring an issue, with the result that valuable insights are not investigated or taken into account. A related consequence is the steering towards the end result or intended effects too quickly.
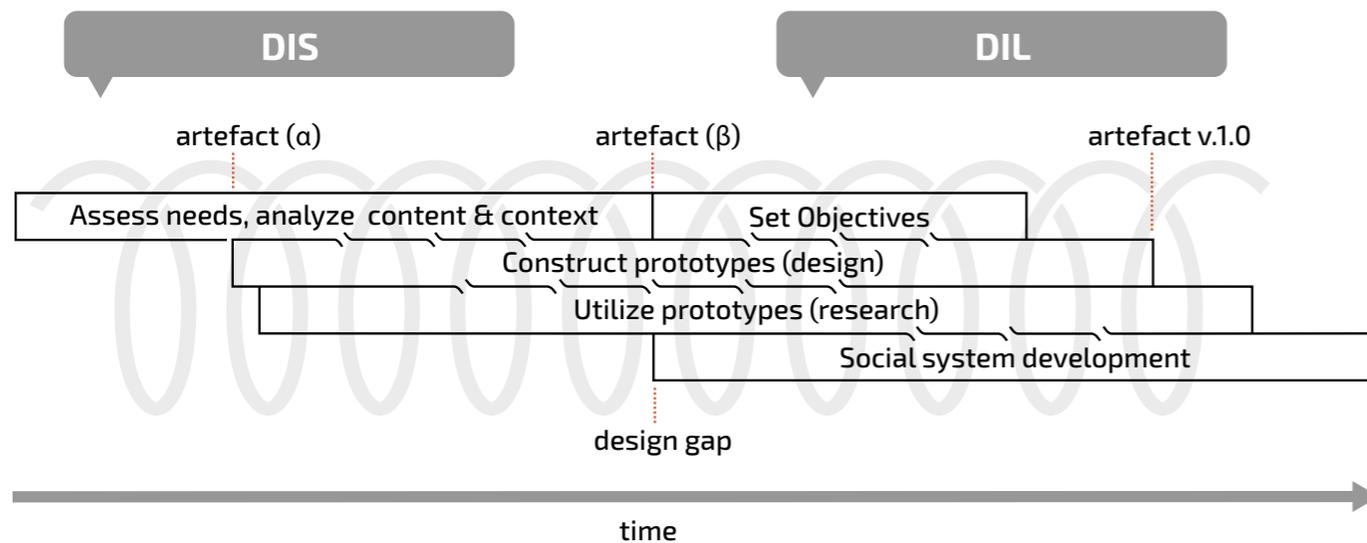
The DRF offers tools (including timing and dynamic role) to bring end-users, designers, producers, and other stakeholders closer together around the innovation of a shared digital future. It clarifies the research and design process and gives something to hold on to in the project organization.

3.3 Design Research in Education

The application of design research in Health Education requires students and teachers to have specific knowledge and skills. Mere knowledge of the DRF or design research, in general, does not suffice. It is the own social system, the educational practice, that needs to be co-developed in order to be able to employ design research in Health Education successfully. A growth mindset [27] also seems to be a necessary condition for teachers to give the design space a place in health curriculums: here, too, design-in-the-large seems necessary.

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Declaration of Interest

The authors report no declarations of interest

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