

Interdisciplinary Approach to Healthcare Design Project: Exploring Designer's Role in Collaborative Settings

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학제간 접근법을 통한 헬스케어 디자인 프로젝트: 협업 환경에서 디자이너의 역할에 대한 연구

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Abstract As demands for health and wellbeing in the ageing society have grown, complex problems involving diverse stakeholders arise in the healthcare environment. The objective of this study is to identify roles and abilities of designers in a healthcare setting where professionals from different disciplines collaborate to achieve a common goal. Case studies on healthcare design projects adapting interdisciplinary approach were explored to find which methods and processes were implemented effectively. Results are based on three research questions that lead to analyzing multifaceted roles of designers regarding process facilitation, manage relations, visualization, and imagination.

Key Words : Healthcare Design, Interdisciplinary Approach, Collaboration, Role of a Designer, Product and Service

요약 고령화 사회에서 건강과 웰빙에 대한 요구 수준이 높아짐에 따라 의료 환경에서는 다양한 이해관계자가 얽힌 복잡한 문제가 발생한다. 본 논문의 목적은 여러 분야의 전문가들이 의료 환경에서 공동의 목표를 달성하기 위하여 협업하는 상황에서 디자이너의 역할과 능력을 알아내는 것이다. 학제간 접근법을 도입한 헬스케어 디자인 프로젝트에서의 효과적인 방법과 프로세스를 파악하기 위해 사례 연구를 진행하였다. 결과는 세 가지 연구 질문을 기반으로 프로세스 퍼실리테이션, 관계 관리, 시각화, 상상력과 같은 디자이너의 다면적인 역할을 분석하였다.

주제어 : 헬스케어 디자인, 학제간 접근법, 협업, 디자이너의 역할, 제품 및 서비스

1. Introduction

1.1 Background and Objectives

Human needs are becoming more complex and diverse along with the emergence of new

global challenges in various fields related to the environment, economy, new technology, etc[1].

The need for multidisciplinary collaboration has grown as complexity of the problems we face requires various perspectives, rapid change, and innovation[2,3]. In line with social changes, the

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roles of designers are expanding with diverse meanings[2,4]. As the world enters an aging society, health and wellbeing became one of the areas influencing the expansion of designer's roles to go beyond the aesthetic and styling activity[2]. In healthcare institutions, interactions and communication between health professionals, administration staffs, patients, and caretakers are carried out on a daily basis[3], thus creating problems within the relationship of these various stakeholders. As such, the rise of new problems calls on the flexibility of hospital's systems and work processes to reinforce services toward a patient-centered hospital[5].

The purpose of this study is to find out the extended role of design in the multidisciplinary team and how designers work within healthcare settings to improve related products and services for a better patient and worker's experience. Through the case study analysis, we investigated methods and processes that multidisciplinary teams worked with in order to effectively practice interdisciplinary approach in healthcare design projects. These projects (conducted in the UK or Canada) are selected to discuss the successful factors leading toward efficient communication and innovative solutions in situations where diverse disciplines collaborate to achieve a common goal. The significance lies in exploring the possibilities of design application in the complex environment and identifying the skills and attributes of designers.

1.2 Scope and Methods

We have conducted literature review and searched papers offline and online on the keyword 'healthcare design projects' and investigated four case studies that are related to product and service design in the healthcare industry. The case studies were chosen as they all describe the whole process of the project from background, problems, processes, methods to

solutions, and influential impacts they bring to the society. Designer's skills, methods, attributes, and capabilities will be importantly discussed throughout the paper to understand how contemporary understanding of design is applied in practices.

2. The Changing Role of Design

2.1 The Meaning of Design

Ever since the first industrial revolution, from the invention of steam engine, mass production of goods and services, computers and information technologies to a convergence of all digital interactive sources, the meaning and function of design has been changing and expanding throughout the history[6,7]. As the mass production led the focus towards the physical appearance of commercial goods, the conventional meaning of design emphasized the aesthetical aspects of products[1,2,8]. Now, with "the new role of design and technology in contemporary culture[9]", design not only acts as a styling tool for the creation of artefacts, but also serves as a central element in making concepts, plans, processes, and implementation stages[10].

The design ladder developed by the Danish Design Centre[11] shows four different levels of how design is incorporated in companies: design is not involved in any part of the organization; design is considered as styling to add an aesthetical finish of a product; design is implemented as a process in the early stage of product development; and design is treated as innovation where designers collaborate with the owner or management to bring value to the future business[12]. In this regard, organizations from diverse cultures will accept and adopt design differently in their own ways. The downside of this difference is that it can create

a gap on the interpretation and application of design between design academics and design practitioners[2]. However, due to technological advancement and ever-growing consumer desires, the rise of complex social problems influenced design to become a thinking process that fulfills various cognitive activities[2]. By understanding design as a process or as an innovator, in recent several decades, the expanded meaning of design also “contribute[s] to the intangible aspects of the environment and changing human behaviors to enhance the quality of life[13].”

2.2 The Evolution of Design

In general, there are three significant causes that influenced the transformation of design in the 21st century. First, unprecedented rate of development in technology created the emergence of new challenges in society opening up new areas of application in the design field.

Second, multifaceted aspects in the system that require different understandings and contributions of design depend on the context of a specific project. For instance, in the early 2000s, manufacturing organizations across Australia expected industrial designers to improve the appearance and quality of a physical product[14]. However, national survey targeting UK industry in 2015, showed a contrasting result in which the top definitions of design were ‘a creative process’, ‘a means to improve consumers[sic] experience’, ‘a problem solving process’, ‘an interface with users’ needs[2]. Design can have different meanings and can be applied in various ways depending on the context of its use[2]; thus, it is crucial to remove preconceptions within the minds of business owners and professionals from other fields to utilize design effectively in a broader sense.

Third, the need for eudaimonic wellbeing of one’s life is becoming important in shaping

positive human experience through fulfilling happiness and meaning[15]. As our life expectancy increased globally, lack of societal resources regarding physical and subjective wellbeing is negatively influencing seniors’ quality of life[16]. Demand for the chronic healthcare services and optimized long-term solutions or alternative activities for wellbeing is accelerating[17]. Consequently, professionals from diverse areas of expertise should collaborate to provide better ways of living in a holistic sense.

2.3 The Expanding Role of the Designer

The role of the designer is not only about making things pretty and pursuing styling of a physical object[8]. It is to understand user’s needs, replenish health and wellbeing of human life, comprehend complex social and market situations, and also take responsibility in designing products and services with ethical and ecological thoughts behind that specific subject area[18,19]. With changing perspectives toward the use and understanding of design in the age of convergence, designers must consider the impact of their creations upon consumers, social and environmental settings[13].

According to the online survey conducted by Hernandez, Cooper, and Jung (2017) the importance of 60 key design concepts were rated by design academics and practitioners[2]. The following three concepts, in a decreasing order, were selected as the most important ‘skills and methods’ or ‘attributes and capabilities’ of designers: identity (ability to identify and solve problems), communication (employing communication skills - including visual, verbal, and written), and creativity (being creative - creative thinking)[2]. Other concepts, such as employing divergent and convergent thinking skills, “understanding how design operates in a wider social, cultural, and economic systems”,

and using ethnography to do design research, were also rated more than moderately important; but, there was a significant difference in choices between design academics and practitioners[2].

2.4 Disciplines of Design and Healthcare

Buchanan (1992) introduces the four areas where design is implemented in contemporary life: “the design of symbolic and visual communications, material objects, activities and organized services, and complex systems or environments for living, working, playing, and learning[9].” In reality not all designers are expected to practice interdisciplinary approach to every project and to become an integrator[14]. However, there is a clear difference in the final result depending on whether designers became an integral part of the team from the start or not[20]. This idea works efficiently within the context where “wicked problems[9]” constantly emerge as a norm. There has been no such period when the needs of personal wellbeing and healthcare services have become a priority concern to humanity. People’s demanding needs and desires towards health services led to a paradigm change in focusing on the patient experience that naturally relates to service improvement[21]. According to Macdonald (2017), designers working in healthcare settings could adopt a number of positions. 1) act as sole designers, consulting as required; 2) involve and empower other, non-designers, to design alongside themselves, thereby extending the design team; 3) relinquish their own involvement, provide the tools and processes they use and let others, non-designers, get on with the designing[22].

Case studies have been issued where five traditional design disciplines (architecture, communication, product, service, and behavior) and four categories in healthcare (public health, acute health, chronic health, and ageing well) to

show the value of design as a tool for innovation in healthcare[23]. (Fig. 1.)

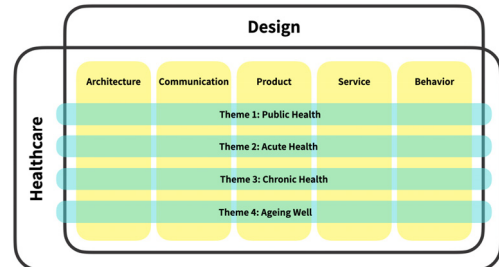


Fig. 1. How design and healthcare overlap[23]

3. Healthcare Design Projects

This chapter will analyze healthcare design projects within the two categories of hardware design and software design. Projects regarding hardware design provides physical products as an outcome; while software design related projects improve intangible services and communication. The selected case studies were processed through an interdisciplinary approach with a multidisciplinary team, which mainly involves designers, clinicians and administrative staffs in hospitals. Also, patients and care takers, who are considered as end users, played an important role by participating during the process. Before engaging in an interdisciplinary approach, it is imperative for designers to acknowledge the advantages and challenges when facilitating healthcare related projects (Table 1). Another major problem of designs used in healthcare environment is that the complex procurement process prevents designers from participating on the front line; therefore, making it difficult to investigate the whole process or imagine the end-user scenarios[24]. A brief introduction of the case studies is organized in Table 2. The next sub-chapters will discuss the three following research questions based on the processes and

results of each case study.

- 1) How did an interdisciplinary approach positively influence the project?
- 2) Which methods or processes were used successfully within the multidisciplinary teams?
- 3) What is the role of the designer?

Table 1. Enablers and barriers of healthcare related projects[19]

Enabler	Barrier
Facilitator role	Time and cost
Organizational support	Lack of management, support, and trust
Narrative-based interaction	User recruitment and retention
Active participation of clinical staff	Staff resistance (extra work)
Opportunity to adopt alternative mind-sets (patient-centered view)	Conflicts between differences of opinions
Improve relationships between patients and staff (provide valuable patient experience)	Lack of tools for overcoming structural and interpersonal barriers

3.1 Potential Benefits of an Interdisciplinary Approach

This chapter explores the benefits of practicing interdisciplinary approach in healthcare design projects. First, as an individual perspective, it is important to learn about other fields (usually about the context surrounding the project) to broaden knowledge and devote oneself into the project. This learning process will eventually come around for the team's improvement. As diverse backgrounds of team members view the same environment, context, and process differently, it is crucial to agree upon a clear methodology accepted by all parties for team coherence[24]. In case A, a multidisciplinary team initially mapped out the process together, attended life-support courses to learn about the process of resuscitation, and co-designed new concept trolleys that brought "success of the process-based approach to design in healthcare[24]". Moreover, case B shows highly collaborative performance that leads to process innovation where all team members, depending

on their expertise, are involved by taking turns on leading and learning in every stage of the process[24]. As illustrated in Fig. 2, integrative teamwork allows the engagement of all professionals together during the whole process.

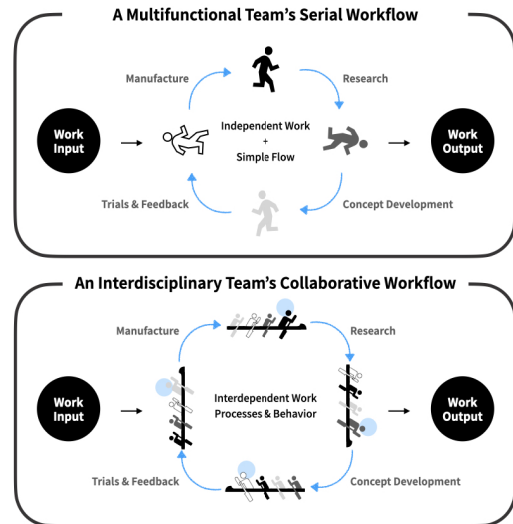


Fig. 2. Relay race analogy for traditional medical design's multifunctional team to rowing boat analogy for interdisciplinary team[3,24]

Another benefit is that an interdisciplinary approach can ultimately improve patient experience and enhance quality and safety of the environment. Notable in case C and D, understanding diverse perspectives of the stakeholders and involving end users to the project process will lead a way to deliver the best solution to the problem[4,25]. Case A showed an example of how viewing the problem from the standpoint of different disciplines can lead to a design that is intuitive to use and satisfies the functional needs of the users[24]. Also, case B indicated that the "collaborative mix of expertise followed for a thorough examination of the design implications of the complicated situation[24]."

3.2 Methods and Processes Used by Multidisciplinary Teams

There were several methods and processes that





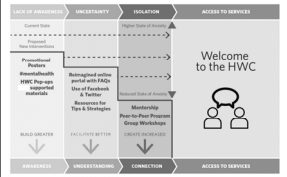
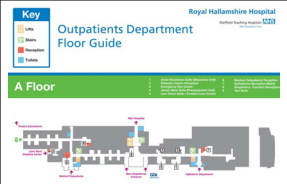
worked well with the interdisciplinary approach. At the beginning phase of case A, observations on the process flow and shadowing of clinicians and staffs helped to understand the project scope. Observation studies of the existing trolley design discovered new problems that were not evident before[24]. For instance, the team discovered that equipment from the trolley were occasionally missing because people took the items and did not replace them in the right spot, which caused a serious problem during emergency situations[24]. In case B, observations near the patient’s bed space were conducted to map the healthcare procedure[24]. As such, this method allowed designers to witness the situation objectively.

Failure Modes and Effects Analysis(FMEA) was used in both case A and B, which made every member of the team understand the problem clearly through this method[24]. It is known as a technique, used by engineering community, of looking at processes to reveal potential errors of

an equipment through a three-variable equation[26]. In case B, FMEA was carried out on the five highest risk processes of healthcare, which were depicted previously by the clinicians[24]. Within the FMEA tool, thorough observations to define each step and to create process map were conducted along with the brainstorming and focus group interview to “identify all of the possible ways in which each process could fail[24].” The important point is that as the team went through each task, they frequently received feedback from all the stakeholders involved in the project to produce the best possible solution to the problem.

In all cases, participatory design, an invaluable approach in healthcare contexts, involved stakeholders into the process to ensure that the outcome satisfies their needs. Interviews and questionnaires were carried out to obtain further information on processes for developing patient journey maps[24]. Especially, focus groups consisting of facilitator, patient, doctor, nurse,

Table 2. Overview of case study A, B, C, D

Project Title	Objective	Team	Before	After
Case A) Hardware Redesigning Resuscitation Trolley[24]	Redesign resuscitation trolley, which carries equipment for emergencies	Designers (Royal College of Art Helen Hamlyn Centre for Design), clinicians (Imperial College London), resuscitation officers, other staffs		
Case B) Hardware Designing Out Medical Error(DOME)[24]	Care for space around patient’s bed	Designers, clinicians, psychologists, business academics from the Royal College of Art Helen Hamlyn Center for Design and Imperial College London, process experts		
Case C) Software Soft Service Design for Campus Mental Health[25]	Propose new service models to help students better access campus service system	Design research team (service designer, researcher), clinicians, staffs *project conducted at OCAD University, Toronto (Health and Wellness Center)	 <p>The diagram shows a process flow from 'GETTING TO UNIVERSITY' to 'ACCESS TO SERVICES'. Key steps include 'PROCESSED' (with 'PROCESSED' and 'PROCESSED' labels), 'INTEGRATED online portal with FMC, UTM & Faculty', 'REQUESTS for Tips & Strategies', 'MONITORING Post-Use-Phase Feedback Group Performance', and 'WELCOME to the HWC'.</p>	
Case D) Software Better Outpatient Services for Older People[4]	Design-led service improvement to understand staffs and patients’ experience of the medical outpatient department of a hospital	Research teams (Sheffield Hallam University), Lab4Living & research teams from National Institute for Health: Research Collaboration for Leadership in Applied Health Research and Care Yorkshire and Humber(NIHR CLAHRC): User-centered Healthcare Design & Telehealth and Care Technologies(TaCT)	 <p>The floor guide is titled 'Outpatients Department Floor Guide' for 'A Floor' at 'Royal Hallamshire Hospital'. It includes a key for 'Info', 'Wait', 'Reception', and 'Triage' and a detailed map of the floor layout.</p>	

and process expert evaluated each previously identified error regarding three different attributes (severity, frequency and detectability) in the map of their potential results. As to provide better patient experience, it is essential to incorporate the stage of empathizing users in the process[27,28].

3.3 The Role of the Designer in Healthcare Contexts

Table 3. Selection of key concepts in design applied to the case studies[2]

Skills&Methods	A	B	C	D
Brainstorming		●		
Focus group(activity, interview)	●	●	●	●
Ethnography(observation)	●	●	●	
Drawing skills(sketch)	●	●		
Craft skills(prototype)	●	●		●
Communication(visual/verbal/written)	●	●	●	●
Interpretation(design situation)	●	●	●	●
Evaluation(test/judgment)	●	●	●	●
Representation(visual/verbal)	●	●	●	●
Design thinking(diverge/converge)	●	●	●	●
Design research(variety of modes)	●	●	●	●
Concept development	●	●	●	●
Design workshops	●	●	●	●
Mapping(structure/system/process)	●	●	●	●
Participatory design	●	●	●	●
Patient/customer journey map		●	●	●
Attributes&Capabilities				
Imagination(imagination drive)	●	●	●	●
Creativity(creative thinking)	●	●	●	●
Innovation(innovative activity)		●	●	●
Complexity(deal with complexity)	●	●	●	●
Visualization(visualize in 2D or 3D)	●	●	●	●
Identity(identify/solve problems)	●	●	●	●
Goal-setting	●	●	●	●
Information(assimilate, analyze)	●	●	●	●
Design teams	●	●	●	●
Design process	●	●	●	●
Integrate stakeholders	●	●	●	●
Create design experience	●	●	●	●
User-centeredness	●	●	●	●
Give forms to functions	●	●		
Increase Usability for users	●	●	●	●
Create meanings for users	●	●	●	●
Improve quality through design	●	●	●	●
Generate change	●	●	●	●

According to the case studies, designer's roles can be categorized into four aspects. First, designers are eligible to organize the project process as a facilitator by planning design research activities and implementing creative techniques that should be used in order to achieve a certain goal. An important condition here is that the designer must have adequate knowledge about the subject and surrounding contexts. In case A, reframing the problem in the initial phase by understanding the user behavior against trolley and the interactive process of resuscitation has directed the team to create an intuitive design[24]. Many of the healthcare problems are interlinked with many other processes, which makes them complex and ill-defined. Designer, in these cases, should construct an accurate brief based on the project purpose and research activities to understand the real problem and to provide value optimized solutions based on new findings. Table 3 implemented the partial list of contemporary key concepts in design, which was developed in Hernandez, et al.'s (2017) research, to the four case studies analyzed in this paper. Skills, methods, attributes, and capabilities considered to represent the role of designers are indicated on the table to show which aspects are actually applied importantly during healthcare design projects within the interdisciplinary contexts.

Second, designers manage relations by naturally communicating with the stakeholders and end users to hear their stories and receive opinions to find out about their unmet needs[4,29]. As in case D, users' involvement through collecting feedbacks via interviews and observations, will have more chances to create a satisfying patient-centric outcome[4].

Third, designers have ability to visualize abstract ideas and transform them into a high quality physical outcome[20]. By using visual methods, such as prototyping, visual narrative, storyboard, and user scenario, designers were

able to find the emotional changes and touch points within the patient journey map[4]. This allows designers to visually communicate with others to share a clearer view of the situation.

Lastly, designers use imagination as a common language and a tool of transformation in making sense of the situation during the design process[20]. By constructing hypothesis in case D, a proposal on possible future scenario could have been tested and recreated to provide patients with improved experience[4,20].

4. Conclusion

Along with exploring the multifaceted roles and abilities of designers, the research focused on positive influential factors that led to the improvement of healthcare related products and services through an interdisciplinary approach. This paper examined the current status of design in other countries to investigate cases where disciplines of healthcare and design engage in a dynamic interplay. Since the research did not involve projects from South Korea, other part of Asia, and the Americas' healthcare industry, the examples and results presented in this paper do not represent global design trends. In regard to this limitation, cross-cultural comparative analysis of healthcare design projects between different countries is necessary as it will show a broader range of various methods, processes, and results. The prospective research is expected to review case studies from South Korea and other countries to indicate the cultural differences and how we can incorporate the positive aspects into Korean healthcare and design industries considering the cultural context. Then by conducting a comparative analysis, it is possible to examine which attempts or improvements, mindsets, skills, and directions designers can effectively use to adapt interdisciplinary approach to collaborate with other fields in the future.

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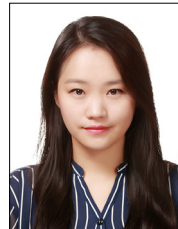
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