

Empowering the Preschool Children: A Service Platform Design Aiming at the Communication of Balanced Diet Information

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Abstract

Childhood obesity increases the risk of obesity in adulthood and is associated with cardiovascular disease risk factors. The prevalence of overweight and obesity is increasing in China. It is necessary to develop an intervention project for preschool children. Based on a service design project aiming at the communication of balanced diet information to the preschool children in China, this paper discusses how to take advantage of the digital platform and game-based learning to empower the preschool children. It argues for the importance of the DIKW hierarchy for empowerment. It also proposes an innovative model to involve new stakeholders into the whole system and to improve the viability of the project.

Keywords: Service Design; Obesity; Game-based Learning; Healthcare; DIKW Hierarchy; Preschool Children.

As the world's most populous country and the largest developing country, China has a large population that accounts for one-fifth of the global population. With impressive economic developments over the past three decades, Chinese people have experienced many dramatic changes in lifestyles, which are often associated with an increase in obesity and chronic disease. This paper discusses a service design project proposed to tackle this healthcare problem in China.

Background

The Prevalence of Obesity in China

With impressive economic developments over the past three decades, the lifestyles of Chinese people change dramatically thanks to an increase in family income and an increasing availability of food owing to advances in agriculture and increased global trade. Wang, Mi, Shan, Wang and Ge (2007) studied the nationally representative data between 1992 and 2002, and found that the prevalence of overweight and obesity increased in all gender and age groups and in all geographic area. Using the World Health Organization body mass index cut points, the combined prevalence of overweight and obesity increased from 14.6 to 21.8%. The Chinese obesity standard shows an increase from 20.0 to 29.9%. Wang et al. (2007) also found that with the increase in overweight and obesity, obesity-, and diet-related chronic diseases also increased over the past decade and became a more important preventable cause of death.

Besides the overall data, some scholars focused on childhood obesity. Dietz (1998) found that childhood weight affects adult morbidity and mortality. According to his study, approximately 50% of obese adolescents with a body mass index at or above the 95th percentile become obese adults. Furthermore, the risk factors for adult disease that are associated with obesity in children and adolescents persist into adulthood or increase in prevalence if weight gain occurs. Chu, Rimm, Wang, Liou, and Shieh (1998) evaluated the clustering of cardiovascular disease (CVD) risk factors among obese schoolchildren in Taiwan, and confirmed that childhood obesity increases the risk of obesity in adulthood and is associated with cardiovascular disease (CVD) risk factors such as hypertension, diabetes mellitus, and dyslipidemia. He, Ding, Fong, and Karlberg (2000) identified the risk factors of obesity in preschool children in China, and suggested children between 3 and 8y of age should be considered as the target group for nutrition/obesity intervention programs. It is necessary to develop an intervention project for preschool children.

The Emerging Generations of Digital Natives

Thanks to the development of the information technology, those who were all born after 1980 all have access to networked digital technologies. Being called as “digital natives”, they never experienced an analog-only world. They didn’t have to relearn anything to live lives of digital immersion. They learned in digital the first time around (Palfrey and Gasser, 2013). The emerging generations of digital natives are familiar with smart phones, tablet PCs and the Internet. Their lives rely so much on the information technology. When the first generation of digital natives becomes parent, they are willing to take advantage of the information technology in their kids’ lives, which also gives their kids more exposure to the digital world. Many kids are enjoying all kinds of applications on their smart phones or tablet PCs. Some of them even become addicted to the digital world, which is drawing more and more concerns from their parents and the society. While people appreciate the magic power of the digital world supported by the information technology, they are becoming more and more concerned with the fact that many children are detached from the physical world. To conclude, it is very powerful to take advantage of the digital platforms to develop an intervention project, but the negative effect of the digital platform should also be reduced.

Literature Review

Design for Healthcare

As the most hands-on of professions and services, healthcare is developing rapidly with the increasing complexity. Design used to make contributions to the creation of the artifacts in healthcare sectors, and now is emerging as a critical role in all types of healthcare services. Jones (2013) believes that healthcare technically entails many wicked problems. Healthcare is a massively complex system that deals with at least two irreducible sources of complexity: the institutional and the personal. Design is challenged to help clinicians and patients navigate complex situations within healthcare systems. Roberts, Fisher, Trowbridge, and Bent (2016) discussed how design thinking can foster new approaches to complex and persistent healthcare

problems through human-centered research, collective and diverse teamwork and rapid prototyping.

Empowerment in Health Promotion Interventions

Thanks to the Alma Ata Declaration (WHO, 1978) and the Ottawa Charter for Health Promotion (WHO, 1986) published by the World Health Organization, the concept of empowerment has been used frequently in the field of health promotion. In the literature, empowerment can be viewed as a process, or an outcome. Zimmerman (1995) distinguished empowering processes from empowered outcomes. Empowered outcomes are one consequence of empowering processes. As an outcome or goal, empowerment concerns the individual's (or group's) control over his (their) life. As a process or means, empowerment is about letting the client, group or community have as much control as possible over the change process they are involved in (Tengland, 2008), including goal/problem formulation, decision-making and acting. Many health promotion programs have implemented the empowerment approach. Researches on the evaluation of the empowerment have increased.

Data-Information-Knowledge-Wisdom Hierarchy

Jones (2013) proposed four levels of Clinical Design: from 1.0 to 4.0. He argued that a design process should match the level and variety of a context to accommodate its complexity. He analyzed the context of care information which follows the Data-Information-Knowledge-Wisdom hierarchy (Figure 1). The DIKW hierarchy is one of the fundamental, widely recognized models in the information and knowledge literatures. It is believed that the first appearance of the hierarchy was in T. S. Eliot's poem *The Rock* in 1934. Ackoff (1989) developed the DIKW schema for management applications. He proposed a hierarchy with five levels: data, information, knowledge, understanding and wisdom. In Ackoff's hierarchy, understanding was included, but more recent commentators have disputed that understanding is a separate level. The DIKW hierarchy has been extended to knowledge management and, more recently, design research analysis.

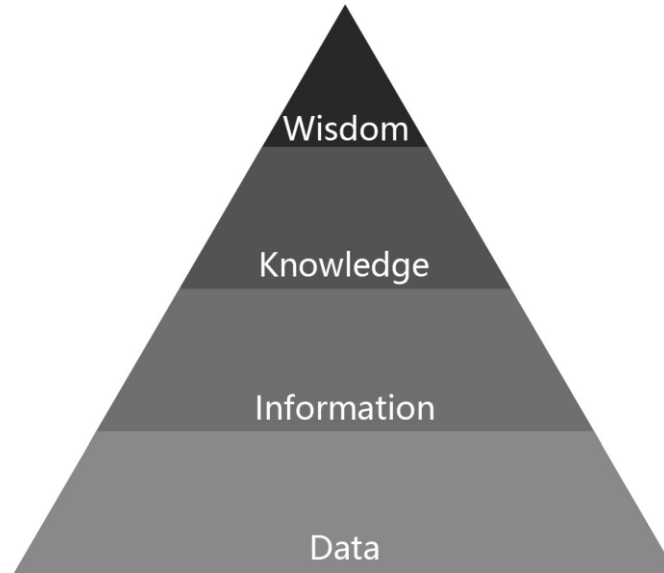


Figure 1: the DIKW hierarchy

Research Methods

In this project, desk research, observation and interview were carried out to collect the domain knowledge, discover the design challenge, and gain insights on the users and other stakeholders.

Desk Research

In this step, we collected the related information. All the related information could be classified into three groups. The first group is the literatures about the obesity problem in China. From the literatures, it is obvious to observe the prevalence of obesity in China. Some scholars have done some studies on children obesity. It is confirmed that childhood obesity increases the risk of obesity in adulthood and is associated with cardiovascular disease risk factors. It is necessary to develop an intervention project for preschool children. The second group is the literatures related to the healthy diet. Appointed by Ministry of Health of China, Chinese Nutrition Society published the Chinese Dietary Guidelines and created the Chinese Dietary Balance Pagoda to better deliver the concept of balanced diet. However, it is still difficult for children to learn such information from a thick book. The third group is all the information about some intervention programs. For example, the Fitwits program designed by Carnegie Mellon University also focused on the obesity problem. It included participatory workshops and tools aiming at helping physicians start conversations with families about obesity.

Observation

To understand how the preschool children interact with different digital products, five on-site observations were carried out. We recruited five families with preschool children in Beijing and

did a home visit to each family. A two-hour on-site observation was carried out in each family. According to the observations, we found that preschool children in these families were quite familiar with different digital products including smart phones, tablet PCs and TVs. They played digital games, listened to the music and watched cartoons on these digital products. They had no difficulties in interacting with different digital product. (Figure 2).



Figure 2: A three-year-old kid interacts with different digital products (Family A)

Interview

During on-site observation, we also interviewed the parents of the five families. A semi-structured interview was carried out in each family. Through interviews, we aimed at learning about their lifestyles, attitudes and concerns, which helped us formulate our insights. According to the interviews, these young parents were willing to take advantage of the digital products. They cared about the health of their children and tried to help them form good habits. They concerned about the food safety and some families turned to organic food after their children were born. They also had concerns on the addiction to the digital products. They tried to help their children balance between indoor and outdoor activities.

Design Implementation

We concluded all the insights we got from the research, and converted insights to design principles, reframed assumptions.

Framing Concept Space

The concept is aiming at the communication of healthy diet information to preschool children. Digital products could be used as the communication platform. For preschool children, game-based learning is a suitable way for communication. While taking advantage of digital

products, the negative effect of the digital platform should also be reduced. To be sustainable, the viability of this project should also be considered.

Overall Concept

Through discussion and analysis, we decided to develop a digital service platform based on iPad. The name of the App is Foodie Kids. (Figure 3) The App has three modules. The first module is a game aiming at introducing different food such as vegetables and fruits to the kids. The second module is a game aiming at delivering the concept of balanced diet. The third module is a service platform including three different parts, which includes new stakeholders into the system to provide offline services and increase the viability of the project.



Foodie Kids

Figure 3: The Icon of Foodie Kids

The First Module of the Concept

The first module of the concept is a game aiming at introducing different food such as vegetables and fruits to the kids. By interactive communication, it tells the kids where the food comes from and how the whole growth cycle is. For example, kids can learn how the tomatoes grow from seeds to fruit. (Figure 4) By doing so, it can introduce the whole growth cycle to the kids and improve the understanding of the specific vegetable.



Figure 4: The First Module of the Concept

The Second Module of the Concept

The second module is a game aiming at delivering the concept of balanced diet. In this module, we convert the Chinese Dietary Balance Pagoda into a game, which let the kids select different food and make a balanced meal by themselves. (Figure 5) By trial and error, kids will finally get

the concept of balanced diet. Compared to the original Chinese Dietary Balance Pagoda, game-based learning let the children adventure by themselves and finally learn such a complicated concept by playing interesting games.



The third Module of the Concept

The third module is a service platform including three different parts. (Figure 6) The first part involves the organic farms into the system. It provides the organic farms a new platform to offer potential customers farming experience. Through this platform, on one hand families with children can have access to different farming activity provided by organic farm nearby, on the other hand the organic farms can connect to their potential customers. The second part is an e-commerce platform focusing on board games. Board games similar to the online games can be designed and sold through the platform. With similar board games as the digital ones, children can still be connected with our system while they are away from the digital products, which will also relieve the concerns of the parents. The third part is named as Little Urban Farmer, which is an urban farming promotion platform. It provides information on urban farming and sells toolkits. It will offer the children in the city valuable farming experience. All the three part in this module include new stakeholders into the system to provide offline services and increase the viability of the project.



Figure 6: The Third Module of the Concept

Discussion

Integrating Online-to-Offline Services by Digital Platform

In this project, we designed a digital solution to intervene the obesity problem in China. However, the digital solution doesn't only serve as an online service. It also acts as a platform to integrate the online services with the offline ones. With this platform, customers can have a whole integrated experience. The digital platform provides the potential customers a new touchpoint to the offline services. It is very useful for traditional industries to provide a new digital touchpoint to their customers, and it may also bring in new customers.

DIKW-Hierarchy-Embedded Software Architecture

To empower people, the DIKW hierarchy should be embedded in the whole logic. The software architecture of this project follows the DIKW hierarchy. The first module introduces different food to preschool children, which provides them with sufficient data and information about the food. The second module delivers the concept of balanced diet, which includes knowledge about how to select and make a balanced meal. The third module provides preschool children with multiple options to form their own wisdom. By building connections between their personal lives and the community, it helps them to shape their own value systems. With DIKW-hierarchy embedded, the whole service becomes more logic.

The Benefits of Game-based Learning

To communicate complicated concepts to preschool children, game-based learning is very useful. In this project, we convert the Chinese Dietary Balance Pagoda into a game, which allow children to learn by playing. By trial and error, kids will finally get the concept of balanced diet. Besides, some research has found evidence for improvement in cognitive processes through game-based learning. For example, Green and Bavelier (2003) compared the visual abilities of those who played action games to non-players by conducting five experiments. Improvements were found in different indices of visual attention for the players.

Conclusion

This paper makes three contributions. First, we proposed an intervention project aiming at the obesity problem in China. With a digital platform as a new touchpoint, online and offline services are integrated into a unified whole. Second, this paper argues in order to empower, the DIKW hierarchy should be carefully considered. A theory-embedded service will be both logic and meaningful. Finally, this paper exemplifies how game-based learning could be utilized while communicating complicated concepts to preschool children.

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