Chapter 3
Design Principles in the Development of Digital Health Applications

ABSTRACT

The roles of patients and healthcare professionals have evolved with the digital age. The convergence of digital technologies with health and healthcare services has led to the birth of disciplines such as digital health and pharmaco-cybernetics. Development of digital health innovations and mHealth applications need to be useful and user-friendly. For example, ease-of-use associated with mobile app interfaces can be more important to patients than the number and type of functionalities. Therefore, the application of health behavior theories and patient-centered approaches is needed to develop clinically relevant digital health systems and mHealth apps. This chapter introduces the pharmaco-cybernetic frameworks that are relevant for designing digital health innovations and an Intervention Mapping (IM) framework that can help inform behavioral change techniques. Concepts such as the Pharmaco-cybernetic Maxims, user-centered (UCD), experience-centered (ECD) and activity-centered designs (ACD), and the Ecological Systems Theory applied to technological and mHealth systems will be described. In addition, the consideration factors for technological product design based on UCD, ECD and ACD, as well as for iOS and Android platforms will be discussed.

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INTRODUCTION

In traditional medical practice, healthcare professionals have always played active roles in the care of patients. Doctors tell their patients what is wrong and how to get better, while pharmacists dispense and counsel patients with regards to their medications. In addition, patients are usually given supplementary materials such as pamphlets as part of their education. However, the patients' understanding of their medication therapies is limited to the time during each counseling session, and the frequency in which they re-visit the clinic for follow-up. Thus, their knowledge on their medications may be limited, particularly for those who are on their medications for the first time or if they are on complex regimens. The lack of knowledge or misinterpretation of information about the drug or its use can affect patients' compliance to their medication, which may consequently lead to the patients suffering from drug-related problems (DRPs) such as under- or overdosing, or potential drug-drug, drug-food or drug-herb interactions (American Society of Hospital Pharmacists, 1993).

The roles of patients and healthcare professionals have evolved with the digital age. Internet and informatics technologies brought about by the cyber era have been critical in transforming the public's attitudes towards healthcare and medicine. The advent of the World Wide Web has led to the creation of many web publishing platforms. Patients are becoming more well-informed about health-related and drug-related information over the internet. In recent years, the internet connectivity of mobile phones has also become popular. Nowadays, it is not uncommon for patients to search for online health-related information using their mobile phones. However, operational and technical problems experienced by internet users have led to the need to develop common standards for data, information and software applications for the World Wide Web (Internet Society; Jean-Guilhem). Through these standards, users are able to navigate through vast amounts of health-related information on cross-platform mobile browsers and interact with complex web documents through features such as buttons, tables, scroll lists and pop-up menus. The integration of interactive media technologies has further enhanced the communication and interaction among internet users. Users can now learn about health-related and medication management information and gain knowledge through a variety of digital media channels – including text, audio, video, graphics, images, animations and even games (Liaskos & Diomidus, 2002). For example, WarfarINT (Kevin Y. Yap et al., 2009) was a