PERSONALIZATION IN CIRCADIAN RHYTHM-BASED EVENT SCHEDULING

HEALTHCARE INNOVATION AND PATIENT TRUST IN THE UNITED STATES

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Systems Engineering

By

Sean Conway

May 12, 2023

SOCIOTECHNICAL SYNTHESIS

With technological innovation comes results of success and benefit for many, especially in healthcare where lives and wellness are at stake. This technical research report explores developments as a preventative health measure utilizing biological clock systems in one's daily life, and how it may translate into care alternatives. With data collection and interaction with care systems imperative for this technical research to be of use, it is important to additionally research technological growth within healthcare, and how patient trust is affected on a sociotechnical level. Emphasis is placed on trust due to the notion that less patients overall will seek necessary treatment for their needs in a system that they trust less, leading to a less effective care infrastructure regardless of innovation. Both this technical and STS paper link in the way that they are cause and effect, that a system like circadian rhythm screening cannot exist for the greater public without ethical review of accessibility, treatment, implementation, and research within every facet of healthcare in the United States.

Circadian rhythm study contributes towards general wellness and preventative health measures as biological rhythms are a significant factor in detection and onset of many diseases and disorders within the human population. To utilize this system, develop three circadian-based activity schedules that are increasingly personalized: (1) common activity timing according to circadian rhythms research, (2) timing curation according to sociodemographic context (via general survey), and (3) timing adjustment based on individuals' specific constraints and context. Events were assigned in categories of physical, social, and cognitive tasks, and conclusions were drawn based on subject feedback and statistical analysis through each weekly iteration.

Results show that participants were able to follow more of the activity recommendations as the level of personalization increased, but they reported the greatest improvement in wellbeing

when following the population-based schedule rather than the highest level of personalization (week 2 vs week 3). These results demonstrate the benefits of following a circadian-aware schedule and can be used as a basis for future rhythm-aware recommendation systems.

From these systems arises this STS research question, how does healthcare innovation affect patient trust in the US? With the current challenges of accessibility and affordability issues, data security and privacy, and pivoting services post-pandemic, future innovation should take extra care into human factors and ethical review of pricing, policy, research, and development to prioritize patients and their trust in the system. SCOT framework and Actor Network Theory are utilized to explore the greater context of system implementations in healthcare, analyzing the effect of 3rd parties and policymakers on price, safety, and privacy.

Within the context of hospital and treatment pricing, a vast network of actors are involved within both the research and review process. Influence such as health insurance, corporate hospital network systems, policy makers, research review boards, political actants, and financial stakeholders significantly influence the pricing, distribution, and implementation of technology in healthcare responsible for the lives of patients. Considering this, greater legislation should be put in place to regulate this influence, with emphasis on those on the grass roots level (public organizations, physicians, patients) affecting this process rather than the macro-contextual influence playing into the system currently.

Technology in medicine has the potential to contribute toward anything from general wellness and preventative care to the next life saving treatments for currently incurable diseases. Utilizing a more utilitarian approach to patient wellness and trust will bolster the system both in effectiveness and accessibility for the greater public, benefitting all involved.

TABLE OF CONTENTS