Prospectus

Kinetic Art Clock
(Technical Topic)

The Personalization of Timekeepers in the 19th to 20th centuries and its Effect on Behaviour and Perception in Europe
(STS Topic)

By

David Xiao

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Technical Project Team Members: Zach Rosen, Chris Fitzpatrick, Alexander Rudin, Harrison Sublett, Eric Tang, Conner Caruso, Trevor Stutzman

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Signed: David Xiao

Approved: _____ Date _____
Benjamin Laugelli, Department of Engineering and Society

Approved: _____ Date 11/20/2019
Gavin Garner, Department of Mechanical and Aerospace Engineering

Introduction

Time has intrigued humans for millennia. From sundials to atomic clocks, the measurement of time has changed drastically over history. However, the need to accurately measure and record time was not always as prevalent in the past as it is in the 21st century. Why was there such an increase in demand for time measurement devices in the past two hundred years? Why has the accuracy and precision of measuring time been the focus of technological advancements instead of the quality of the time spent? How has the technology of time measurement influenced and been influenced by society's need to remain punctual? These are the questions I will attempt to explore in my technical and STS projects.

As our accuracy of measuring time increases, so does the societal pressure to be on time. Numerous technologies and products have been created in order to help us be more efficient and punctual, such as calendars in email software, scheduling applications on smartphones, and various types of alarm clocks. Being late is associated with disrespect and unprofessionalism, and may incite a frustrated exclamation containing the phrase "waste of time." My team and I will be designing a clock in order to address this issue.

There are many complications and consequences when we overvalue punctuality. By focusing on the quantity of time and whether we are on schedule, time becomes a commodity that has a fixed value per unit of measurement. Instead of analyzing quality and effectiveness, the focus is placed on the quantity and efficiency of the time we spend. We have neglected to recognize that the value of time changes based on what is completed during that time, and when we relate time to money, we ignore the intrinsic unquantifiable value of something we cannot replace. We have focused so much on the technical problems of how to measure time accurately that we miss the social aspects of how we value time. To explore these issues, I will examine

how the personalization of timekeepers in 19th- to 20th-century Europe changed the behavior toward and perception of time.

Ultimately, because these issues are sociotechnical in nature, we need to consider both the short-term solution of building a clock to satisfy our need to be on time, but also consider that the long-term solution may be intertwined with social factors.

Technical Project

Kinetic art is any form of art that moves, often lending itself to having a helpful function through this motion. Kinetic art clocks are often built from mechanical linkages in order to give timekeeping an aesthetic appeal. However, the accuracy and ability to calibrate these clocks is compromised due to the mechanical nature of the design. Although these kinetic art clocks are aesthetically pleasing and sought-after in universities, the inaccuracy of their timekeeping causes students to be late to class and professors to lecture past the class end time. Additionally, the designs of previous kinetic art clocks were often too loud to be used in classrooms. The core idea of our capstone project was to create a kinetic art clock that is easily calibrated to keep accurate time and that mitigates the issues regarding sound, and that shows the flow of time more fluidly than rigid mechanical linkages. The clock should have aesthetic appeal, but also incorporate the same functions as other digital clocks, such as the ability to have the time reset in case of Daylight Savings Time or a power loss. The goal is to display the clock on the second floor of the Mechanical and Aerospace Engineering building at the University of Virginia. The clock should be able to be powered by a standard 120V AC wall outlet. In order to accomplish the aesthetic appeal, the clock would use a reservoir of beads to fill slots organized into the form of digits. The slots would open or close based on the desired digit to be displayed. Additionally, as

much of the mechanism not involved in the actuation of the slots and reservoir should be visible to add visual interest to the piece.

The clock will be controlled using a Parallax propeller microcontroller chip. Utilizing features of parallel processing and an internal clock, the propeller chip will be used in conjunction with I2C protocol to allow the 28 servomotors controlling the magnets to be run using only one propeller chip. These servomotors would control the opening or closing of a slot on a digit, and 4 motors would control the pouring of the beads from the reservoir.

The original strategy devised by the group was to make iteratively larger and more complex prototypes. First, a prototype of a single section of a digit would be made, followed by a prototype of a full digit, then all 4 digits, then finally the finished product. Key to success in this project will be the utilization of Computer Aided Design (CAD), advanced manufacturing techniques such as 3D-printing and laser cutting for the purpose of rapid prototyping, and the use of iterative design techniques to overcome challenges as they appear.

This project will add value to both the Mechanical and Aerospace Engineering department as well as the educational development of team members. The department will have a functional and beautiful art installation that will service students and faculty for years to come. Group members will gain skills and knowledge in additive manufacturing and other advanced manufacturing techniques. They will practice hands-on design, groupwork in a diverse engineering team, and leadership and presentation skills.

STS Project

Timekeepers have been utilized since the time of Plato (Olseson et al, 522) and come in all shapes and sizes. Before watches were common, public clocks such as those in London were

the main source of timekeeping (Ogle, 127). The tracking of time was primarily a focus of the railroad and government rather than the public, and since there was no global time, "'as long as traffic from one place to another was slow and the exactitude of determining time only low, local times…were sufficient for every single locality'" (Ogle, 3). As time has passed, the use of clocks around the world has increased drastically, and the use of personal timekeepers has surpassed that of public ones. How did this trend begin? In my STS research topic, I plan to research how personal timekeepers became increasingly popular among the public and how it changed the perceptions of time and behavior towards time.

Personal timekeepers had become increasingly sought-after by Europeans in the 19th- to 20th-centuries. Watches and clocks had represented "flashy gadgets of modernity" (Ogle, 128). Even the papers wrote about King Henry IV's clock which only needed winding once per year (Ogle, 128). The perception of watches and personal clocks had been influenced by the technology, and the technology became a symbol of fashion and status.

There are complications to the personal timekeeper's influence on human perception. Those who lived in Europe in the later 1800s and early 1900s began to change their attitude toward time. This is seen directly through their language. As time became a more prevalent concept in people's minds, phrases such as "too fast" and "too slow" became colloquial (Ogle, 129). The most striking example of this change in mindset is shown in an Arabic-French language guide, saying, '"I need it as soon as possible since I can't be without a watch," and "My work forces me to carry a watch every day."' Humans were developing a dependence on timekeepers. Even more striking is how they were trying to attribute this dependence to their jobs rather than their attitude toward time and timekeepers.

There are consequences in this shift in attitude and behavior. The mechanical device that measures time suddenly becomes more valuable than the time itself. The precision of the device is associated with desirability and money, while the very thing being measured is neglected. The intrinsic value of time that cannot be quantified is given a unit of seconds, minutes, and hours, and the quality of the time spent is ignored.

Although the technology of timekeepers is important, it's important to explore how this technology mediated human behavior and perception persuasively.

Conclusion

The technical work will deliver a fully-functioning clock to be displayed in the University of Virginia Mechanical and Aerospace Engineering building. The STS work will deliver a research paper on how the personalization of timekeepers in the 19th- and 20th-centuries mediated perception of and behavior toward time. The results of these projects will address the broader socio-technical problem in different ways. The technical project will give a short-term solution by satisfying our need to be punctual. The STS project will point out how we become unnecessarily dependent on technology and how the focus on quantity and efficiency decreases the quality and effectiveness.

References

Ogle, V. (2015). *The global transformation of time: 1870-1950*. Cambridge, Mass: Harvard University Press.

Olseson, J. P., Sherwood, A. N., & Humphrey, J. W. (1998). *Greek and Roman Technology: A Sourcebook: Annotated Translations of Greek and Latin Texts and Documents*. Routledge.

[Quality over Quantity]