Productivity Visualization: Tower of Eisenhower

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ABSTRACT
In this paper I investigate the visualization of productivity. I analyze current research on procrastination, analyze visualization techniques, brainstorm and sketch solutions, and make an attempt at a solution. From the research of procrastination I learn how procrastinators think and behave to find patterns I can exploit for the solution. From my study of Information Visualization I learn how to optimize information understanding and clarity. In the brainstorming process I thought of different features to include in the solution and omitted unhelpful features. From there, I attempted to create the solution tool.

Author Keywords
Information; procrastination; gamification; visualization.

AUTHOR
One problem that many suffer from is procrastination, which is "the voluntary delay of an intended action despite knowing that one will probably be worse off for the delay"[?]. One study of over 200 undergraduates found that about 30% to 60% of undergrads suffer from regular procrastination.[?] This is a widespread problem whose consequences include increased health risks, compromised performance and progress, decreased learning, lost opportunities, and strained relationships. Additionally, negative feelings such as regret and despair can take its toll on the psychological health of the person procrastinating.[?]

Procrastination can be a huge issue because it can be an addicting. Receiving positive feedback while completing assignments close to the deadline can create a reinforcing feedback loop; if one performs well while barely finishing on time, they may procrastinate even more the next time in order to test their limits. My web application, the Tower of Eisenhower is an attempt to help procrastinators, especially college students, with overcoming procrastination and developing better work habits. The application works by providing the user with positive reinforcement when tasks are performed ahead of deadlines. By game-ifying task completion, the Tower of Eisenhower makes the application itself entertaining to use and presents the user with gratification in the form of points and visual upgrades to their virtual castle.

RELATED WORK
There is plethora of formal work done on information visualization, and a similar lot of work done on the psychology of procrastination. However, currently, there is very little work done on these two fields in conjunction.

Regarding procrastination, a study done in 2011 by Rabin, Fogel, and Nutter-Upham on diverse group of 212 college students was the first to show a correlation between executive cognitive functioning and procrastination. Their results showed a significant associations between procrastinators and nine clinical subscales of executive functioning. The clinical subscales of executive domain functioning measured the following catagories: impulsivity, self-monitoring, planning and organization, activity shifting, task initiation, task monitoring, emotional control, working memory, and general orderliness. This work is important because it gives a neuropsychological understanding of what is happening in the mind of a procrastinator.

Another study on procrastination done in 2004 by Sirois and Pychyll on 80 students discussed the emotional and mood aspects associated with procrastination. They found that procrastinators had a tendency to make statements that made them feel better for the short term, (e.g. At least I got to the doctor before it got worse), rather than statements that attempt to draw insight from the tension, (e.g. I should have gone to the doctor sooner.) This study suggests that procrastinators prefer to choose short term emotional satisfaction over long term emotional satisfaction. Later, Sirois and Pychyll wrote a paper in 2013 to support this suggestion. They argue that procrastinators have a disjointed their current and future selves, and mainly cater to their current self's emotional needs, treating their future self as an idealistic hardworking good version of themselves that they can hand more work to. Sirois and Pychyll's work is important in understanding the emotional and temporal thinking of a procrastinator.

METHODS

There were four main parts to this project:

1. Research
2. Brainstorm
3. Sketch
4. Execution

Research: The goal of research was to understand the problem of procrastination and how procrastinators think. I searched online for studies and papers done on procrastination and learned about the neuropsychological, temporal, and emotional aspects of a procrastinators thinking from the studies done by Rabin, Fogel, Nutter-Upham, Sirois, and Pychyll.

I additionally researched current solutions to procrastination available now. I searched for popular productivity applications specifically marketed to aid against procrastination. 3 notable applications were Procraster, (10 +2)x5, and EISENHOWER.

Procraster was notable due to its leverage of short term rewards. After a 25 minute timer goes off, you reward yourself (like eating candy or buying coffee). One problem I noticed with Procraster is that there is no prioritization of work done. You cannot record and weigh options of what needs to be done.

(10+2)x5 is similar to Procraster in idea. It utilizes a timer and Merlin Mann's technique of 10 minutes of work, 2 minutes of break, repeated 5 times over an hour. During break, one can do whatever they wish like rest, get coffee, or play a short game, similar to Procraster's short term reward system. This method is meant as a sort of "training wheels" approach to developing good work habits, as the time allotted for work and breaks are meant to be changed. Eventually, the goal is to skip breaks/take them sooner, and work for longer/shorter depending on how you feel.

EISENHOWER is a web application that adheres to President Eisenhower's 2x2 decision matrix. (See figure 1) The first dimension is a binary of importance, and the second dimension is a binary of urgency. Quadrant 1 items are items that should be worked on, Quadrant 2 items are things that should be scheduled to do later, Quadrant 3 items are things that should be delegated (or scheduled if you don't have anyone to delegate to), and Quadrant 4 items are tasks that you should not do. While this matrix is a great way to get things organized and prioritized, it does not take into account the emotional needs of a procrastinator. There are no incentives involved to do important things other than their being labeled as important. Additionally, it has limitations such as being able to only have a maximum of 8 items per quadrant, and that each item has to be manually sorted. Additionally, there is no support for subtasks, which is supported in Procraster.

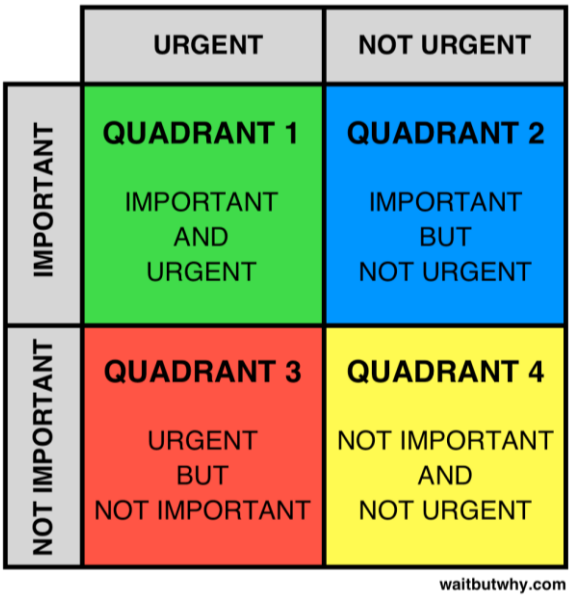

Figure 1. The Eisenhower Decision Matrix

Brainstorm: The goal of brainstorming was to come up with options for solutions to the problem. Based on the research done I set out to design a tool that could be used to keep track of a person's productivity. I brainstormed the following features:

- Gamification: Give incentives and emotional investment
- Competition: Ability to challenge and measure against others
- Profiles: Ability to save information to a personal private profile and review your history
- Rewards: Have visible rewards that is encouraging
- Emotional Feedback: Have short term emotional incentives drive user behavior
- Prioritization Tool: Prioritize tasks in the order that they should be done

Of these features, I decided to omit competition. This is because it can encourage abuse of the system through making and doing tasks one didn't actually do, or inflation of the importance of tasks done.

Sketch:

After deciding on the feature set I started sketching what the tool would look like. I decided that there were going to be three main views to this tool. The Task (see figure 2), Data (see figure 3), and Game (see figure 4) views.

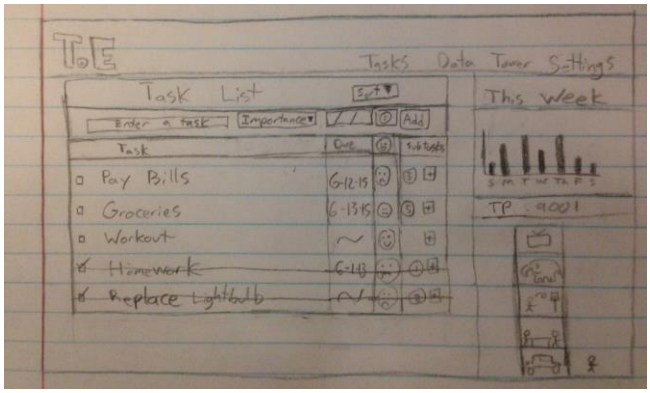

Figure 2. The task view

In the task view the user inputs their task details. Details include task name, due date, importance fun factor, and subtasks. There are links to the data view and game view on the right side and top. The user earns productivity points for completing tasks, which they can spend in the game view.

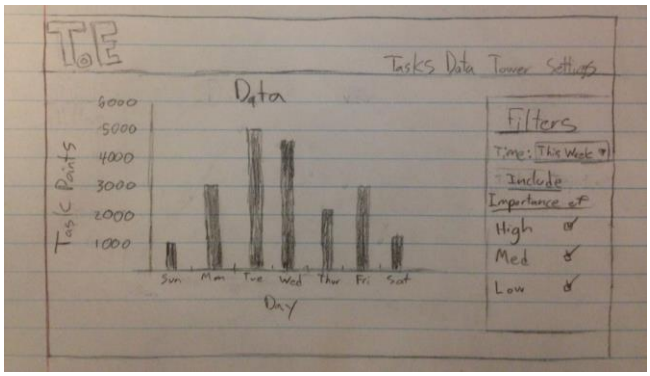

Figure 3. The data view

The data view is where the user can see their historical productivity data visualized through an interactive bar chart. There are filters to see specific information such as date range and points earned from a specific importance.

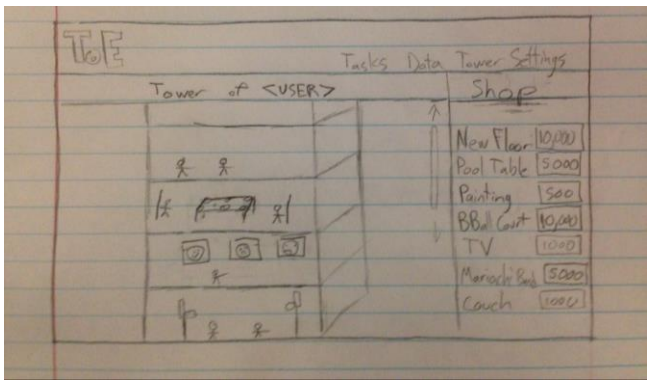

Figure 4. The game view

The game view is where the user spends points earned from completing tasks. With these points, they can build up their tower, buy accessories, furniture, and other goodies. The user is incentivized by this view of their productivity.

Execution: After the sketches and planning was done, I set out to create the web application and put it to the test.

RESULTS

Due to a limited timeframe and labor, the web application was not fully fleshed out to the extent that the sketches envisioned. Currently, the web application has a login screen, task view, and data view. The data visualization in the data view is very fast, and utilizes the D3 javascript library. The data visualization itself is not very complicated, as it currently only shows a bar chart of a person's daily point total. The more days and data the user inputs, the more accurate the data visualization.

I had 5 alpha testers test the basic functionality of the task and data view, and their feedback was greatly insightful. Although I expected to hear certain things since the web application was not fully fleshed out yet, there were somethings I did not expect. They all mentioned how rough the web app looks. This was to be expected since I focused on getting the core functionality down. One thing I did not expect was confusion. 2/5 alpha testers mentioned that they had no idea what they were supposed to do when they were in the task view. Additionally, all testers agreed with the statement that the title made little sense as to the functionality of the web application.

2 users noted that there is a lot of input required by the tool. When told that only the task name and due date was required (everything else has a default value), they noted that that is a useful feature.

Overall, none of the testers agreed with the statement "I would use this almost every day." They noted lack of aesthetic and usefulness of the tool as major contributor to their not wanting to use the application. I expected this, since the game incentives were entirely missing from the web application.

DISCUSSION

The work done here shows attempts to add to the scarce amount of study done at the intersection of psychology, productivity, and visualization. The research done here shows that procrastinators seek short-term emotional gains, and that they suffer from weak executive functioning which leads to impulsive action-taking rather than controlled action taking. The solution proposed here sought to exploit the impulsive short term emotional pleasure seeking procrastinator by incentivizing and rewarding productivity. While the alpha tester's did not like the prototype of the Tower of Eisenhower web app, when introduced and explained the idea of the fully-functional web-app, they said that they would enjoy and possibly using it every day. Unfortunately, limited time and labor prevented me from fully developing the solution, which leaves many opportunities for future work on the application itself.

FUTURE WORK

For future work, one might consider working on:

- How executive functioning affects application use
- Fully developing a productivity visualization tool similar to the Tower of Eisenhower
- An in depth study of how procrastinators use such a tool
- Behavioral change through application use
- Visualization interpretation differences between procrastinators and non-procrastinators
- Gamification effectiveness in behavioral change

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