

Designing a Minimal-Friction Informatics App to Identify and Reflect on Root Causes of Burnout

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1. INTRODUCTION

Finding exhausted and depressed people at companies, schools, streets, and everywhere in the city is easy nowadays. Work and life balance are now regarded as an essential factor that impacts one's both mental and physical health. However, most people are failing to properly balance them due to personal, economic, and other sociolegal reasons. One of the consequences due to that failure is burnout. Burnout is generally known as a logical syndrome caused by getting overwhelmed and continuing stress from doing work. People who are burned out tend to be extremely exhausted, depressed, and anxious as they are so stressed about doing any kind of work. In other words, they are not willing to work diligently anymore. Gallup's survey has shown that 76% of the people responded that they experience burnout at least sometimes during work while 21% of the entire group even mentioned that they experience burnout very often. [1] This result with notable numbers clearly shows that burnout is not a small issue anymore and it is causing a problem right now. Burnout can have a massive impact not only on one's productivity but also on the development of the entire society if more and more people are burned out. Since the number of people experiencing burnout has been increasing continuously, there should be some action to prevent burnout for the entire society. To solve this problem, it is important to figure out the features and patterns of burnout as well as effective methods to prevent and cure burnout.

1.1 Impact of Burnout on Personal Level

Being burned out, one can experience a drastic downfall in various aspects of one's life. Most of the people who are experiencing burnout are typically depressed, exhausted, and discouraged. Those negative feelings or emotions are, either directly or indirectly, related to one's productivity. Burnout ultimately causes mental illness, and that makes one not only lose ability to finish the work but also to lose ability to ensure quality of the work. [2] What "productivity" means, in this case, is not only limited to work or study in general but also includes health preservation, socializing, and other various aspects of life. Failure to maintain work productivity after experiencing burnout pushes one to complete extra work, which can result in a cycle of stress. Socio-organizational activities, which require complex psychological and sociological practice, also make one stressed or depressed. Thus, burnout not only distracts oneself from achieving goals or finishing notable tasks but also discourages one from maintaining mental, physical, and social health. Considering these facts, it is certain that preventing burnout is important for promoting the well-being life of individuals.

1.2 Impact of Burnout on Social Level

Even if the burnout of one person will not have a massive impact on society in most cases, it will be different if the total number of people experiencing burnout increases rapidly. Possibly, the entire society could be depressed and discouraged due to burnout. Regardless of importance and area, each person in society has own unique role. If all software engineers in the world decided not to work due to burnout, so many products and services in various industries will not function properly. If all college students decide not to study for the same reason, all educational institutions and educators will be affected. Decreased productivity of one industry will not only

cause discomfort in our daily lives but also discourage other industries. Thus, if a notable number of people experience burnout and lose productivity, the overall productivity of the entire society will be decreased. Various components of society, including economics, culture, politics, and science, will not develop steadily anymore. That situation will not only distract human beings from ultimately developing themselves but also undermine the benefits of maintaining society. Therefore, even at the social level, preventing and managing burnout is an important issue.

2 RELATED WORK

There are several approaches to measuring burnout utilizing survey methods: the Maslach Burnout Inventory, single-item surveys, well-being index, Stanford Professional Fulfillment Index (PFI), and the Oldenburg Inventory. Each tool was designed to quantify the burnout in employees, students, educators, etc. The MBI and Oldenburg Inventory are multi-item surveys that cover areas such as emotional exhaustion, depersonalization, and sense of personal accomplishment [3][4][5]. The Oldenburg Inventory is an improved survey from the MBI but still requires users to answer several questions [5]. The PFI was designed to be an improvement to the MBI and OBI [6]. It covers the professional satisfaction of workers which the authors claim is intrinsic to working in medicine. Responses for the survey are done through a five-point Likert scale for professional fulfillment, work exhaustion, and interpersonal disengagement. The authors reported that compared to MBI, the PFI scale identified burnout with an AUC of 0.85 [7]. The single item survey is a question, “Overall, based on your definition of burnout, how would you rate your level of burnout?”, addressed to users and for which the authors reported an AUC of 0.93 [7]. The well-being index was built for measuring medical student mental health and measures domains of burnout, depression, stress, fatigue, and mental and physical quality of life. Through seven yes or no items, the participants get a score of 0-7 by adding up the number of “yes” answers. Scores greater than 4 identify students more likely to have recent suicidal ideation or thoughts about dropping out. The seven-item test is a useful screening index for physicians with distress and reports sensitivity metrics like other survey items [8]. Although each approach has its strengths and weaknesses, the results of the single item survey are intriguing. Our team believes that short item surveys will be comparable to the long item surveys like the MBI and the Oldenburg Inventory when measuring factors of burnout, as opposed to burnout itself. Our work will develop a series of these single-item measures to understand the users’ burnout across multiple dimensions.

With the current landscape of burnout survey tools, there are no companion tools available for users on their phones. Identifying burnout quickly is important so maintaining a tool that users can carry with them is vital to solving the problem. Tracking personal health information on a phone allows users to easily access their previous inputs. Our tool will be easy to use as it will have only 6 questions to answer. These single item surveys approximate the tracking of informatics data about the user to reduce the amount of work from the user. Without the cumbersomeness of manual tracking, our tool will be easy to use and maintain data.

3 PRELIMINARY SYSTEM DESIGN

To inform the design of our system, we set out to articulate clear design goals. First, our system needs to support reflection-in-action, defined as contemplation while performing an activity [9]. In conjunction, our system needs to support reflection-on-action, defined as later contemplation after an activity concludes [9]. Furthermore, the system must minimize friction and maximize intuitiveness. Lastly, the system should nudge users toward actionable insights on healthier behaviors to prevent burnout.

There is a challenge in defining what data should be collected, which is exacerbated by the multifactorial nature of burnout. No one single factor can wholly explain why an individual experiences chronic exhaustion; rather, it is the case that an intersection of multiple variables all contribute toward a holistic understanding of burnout.

3.1 User Stories

We developed a series of preliminary user stories and a map of a user scenario to better understand our problem space and identify areas we could make an impact on (see Figure 1).

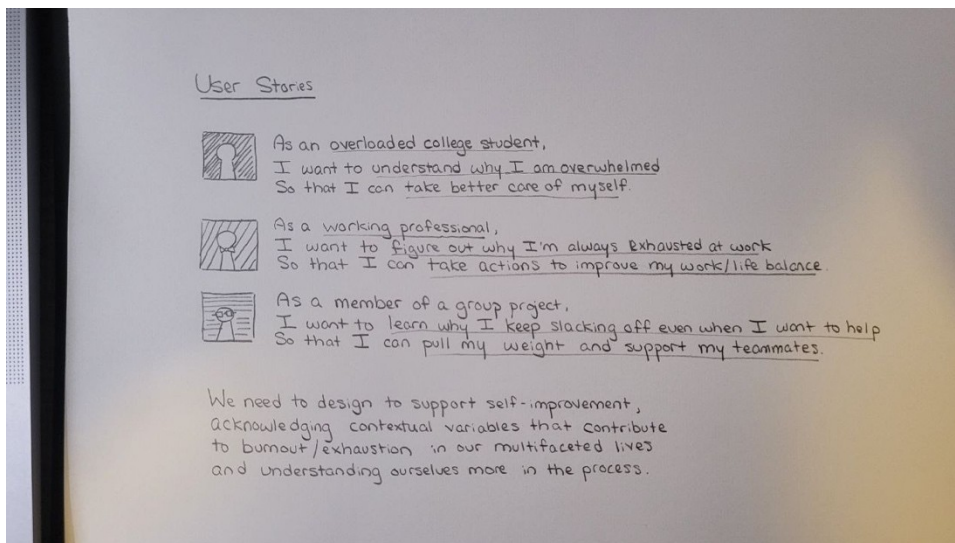


Figure 1 – User Stories

A pattern of behavior became evident for each of the scenarios outlined in Figure 1. Each user desires a specific outcome, but the existence of burnout creates significant friction between their current state and their desired state.

3.2 Identifying Tracking Dimensions

We examined an example of a user behavior we sought to correct via the guidance of our system (see Figure 2). This scenario is modelled off of our own experiences with burnout. In the beginning, the user is stressed out by how much work they need to accomplish. Due to the stress, they are too exhausted to complete the work. Due to the exhaustion, the user distracts themselves

with self-destructive behaviors like browsing social media. Due to the distraction, the user fails to complete their work on time. This sequence is a causal chain. In order to effectively address user needs, it is imperative to consider interventions at each stage: “how can we change this?”. The analysis arrived at five trackable dimensions of burnout management from this scenario, which we identify as time management, nutrition, sleep, exercise, and digital use tracking. These tracking dimensions neatly map to the existing literature on strategies for preventing burnout [11], giving us confidence on the validity of these metrics.

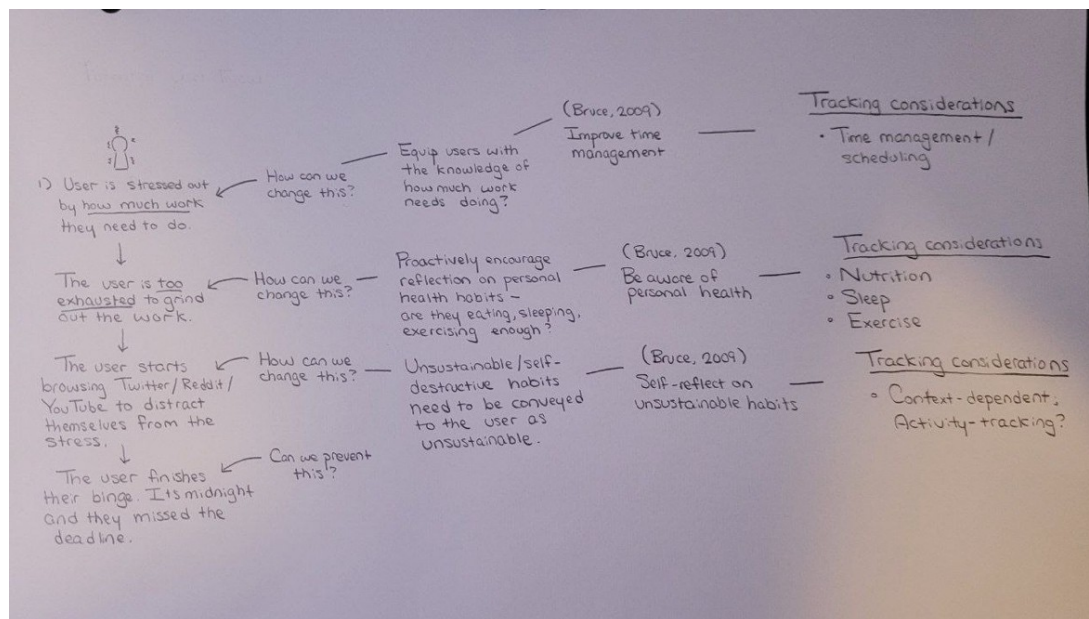


Figure 2 – Coding tracking considerations by dissecting user behavior.

A significant caveat to these identified dimensions is that tracking multivariate data quickly becomes cumbersome. While a fully automated tracking approach relieves capture burden and supports long-term tracking [10], this is not feasible across dimensions like nutrition, where calories, macronutrients, and micronutrients need to either be manually inputted or retrieved from an existing database (with varying degrees of nutritional accuracy). Furthermore, automated systems lack the awareness and engagement afforded by manual tracking [10], where users have the conscientiousness to reflect on their data while they are inputting it. We place high priority on reflection during data input as a method of supporting reflection-in-action, while recognizing that expecting burned-out users to input large amounts of manual data is not feasible. This study aims to design an informatics reporting system that reconcile these competing interests.

3.3 System

We propose the design of a data input system utilizing single-item **7-point Likert scales** to approximate the measure of burnout dimensions. As discussed in Related Works, a single-item measure for burnout served as a reliable substitute to a full-scale questionnaire [7] We hypothesize that using self-report single-item measures for each dimension of burnout may be an

effective method of maximizing the benefits of manual tracking while minimizing the negatives. Our low-fidelity mockup of this system is shown below in Figure 3.

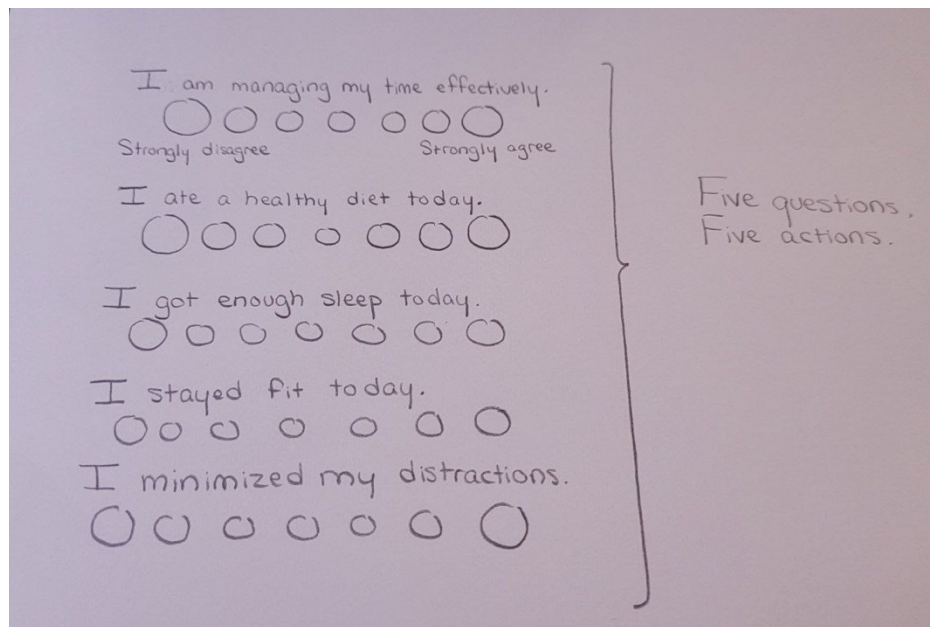


Figure 3 – Low-fidelity sketch of a “snapshot” interface

We call this a “snapshot” approach to self-reporting. This approach has several advantages. For one, the time taken to report data is drastically reduced. Five questions are asked, one per dimension of burnout. For each, the user rates their perception of agreement with the question on a 7-point Likert scale. Next, the user only needs to make five inputs in order to complete data entry, minimizing the burden associated with traditional means of manual data input. Furthermore, the question design is flexible, allowing users to assess their agreement according to their own relative needs. What constitutes agreement toward “*I ate a healthy diet today*” is different for a person trying to gain weight versus a person trying to lose weight, and this line of questioning makes no prior assumptions. This design supports reflection-in-action by deliberately asking the user to reflect on their agreement with each statement. We anticipate that as users enter data, they will evaluate their response with where they ought to be.

In addition to the “snapshot” approach, we also consider asking the user to write down a quick justification for why they selected their response if their answer fell within the “disagree” side of the scale. We anticipate that this will bolster the benefits of reflection-in-action by promoting more thoughtful understanding of their habits – “I rated myself ‘strongly disagree’ on minimizing distractions today *because I kept multitasking and checking Twitter*”. Through this response-justification pattern, users should gain a more conscientious understanding of why they fall short of meeting their desired burnout prevention outcomes.

We note that during our initial pitch, a critique was raised about why we chose not to ask for justifications about responses on the “agree” side of the scale. We agree that this is likely an important consideration. Our user stories had primarily focused on the subset of users who were already experiencing burnout, so our components were designed for this primary user. A

secondary user may be a person who is not experiencing burnout but wishes to remain at a stable level of mental wellbeing. A user who is already burnt out feels more burdened by entering justifications for every dimension. On the other hand, they may identify patterns about days where they experienced high ratings, which could provide reinforcement of the desired outcome.

3.3.1 Dashboard Visualization

The purpose of visualization is to produce insight. The second piece to our system supports reflection-on-action by displaying the integrated snapshots over time in an interactable dashboard interface. The design philosophy for this interface design follows Shneiderman's information visualization mantra: *overview first, zoom and filter, then details on demand* [12]. We aim to minimize information overload associated with some dashboard systems, and support user interactivity to allow data exploration. ~~We aim to solidify our visualization approach in greater detail by the date of the proposal revision.~~

What would this look like? Our Likert-scale data can be evaluated as a 1-through-7 interval scale measurement. Each dimension can be mapped to a red-green color encoding. We will redundantly encode using position on a common scale to reinforce the visualization. Tapping the icon for any given dimension will allow you to see its trends over time through a time series visualization on the top third of the screen, supporting zoom/filter. On the bottom two thirds of the screen will be a view of journal logs from days where satisfaction with that dimension was reported as negative, in time-descending order. These details support reflection-on-action and help users identify patterns for the days they reported a dimension as negative. Figure 4 shows a very low fidelity prototype of what this system may feel like.

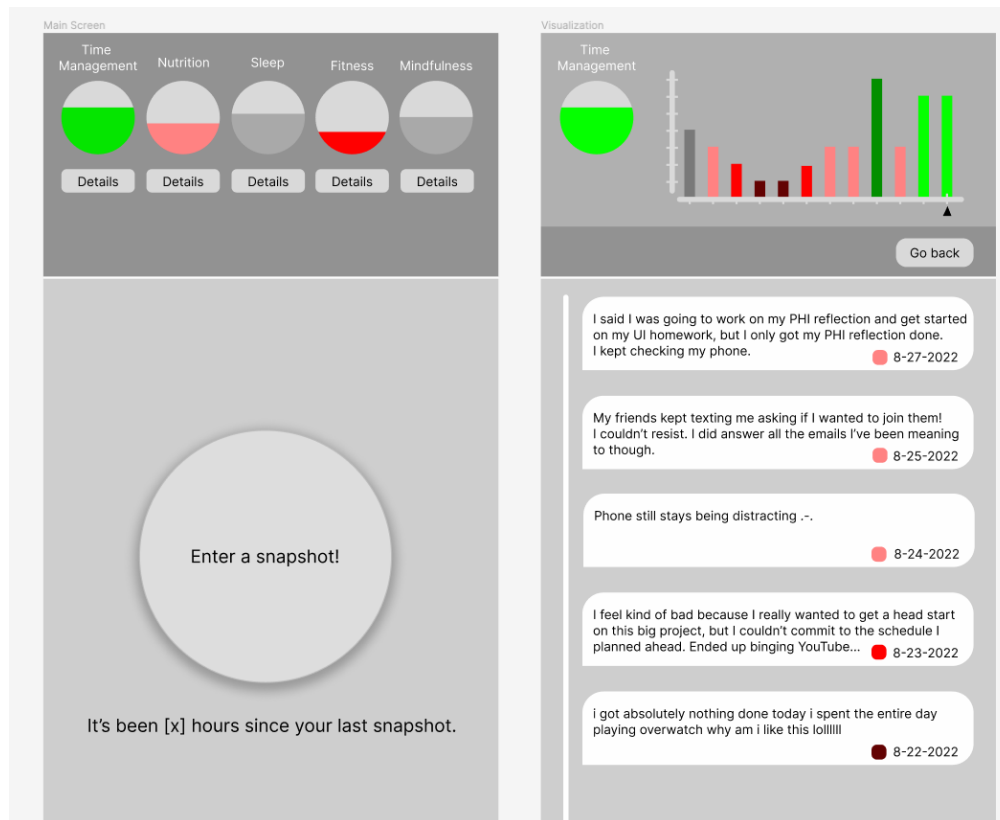


Figure 4 – An early low fidelity prototype of the visualization.

4 EVALUATION

4.1 Pilot Study

We plan to conduct a pilot study which will recruit a few of our immediate contacts, and use a basic Google Forms implementation of the “snapshot” system to catalog burnout self-report data over a period of two weeks. We anticipate that each of us will recruit at least 1 of our contacts for the pilot (total $n = \sim 3$), utilizing convenience sampling given the constraints of this class project. We will use this data as the input data for the metrics of our reflection-on-action dashboard visualization. We intend to complete these components by the date of the second progress report. These participants will be anonymized, and logs will be reviewed for any

personally identifiable information in order to ensure confidentiality of potentially sensitive information.

4.2 Recruitment Plan

Once our high-fidelity Figma prototype and our dashboard visualization system is implemented, we will begin to administer usability tests. We intend to bring back the contacts we collected data from during our pilot study to gather their thoughts on the system. Additionally, we attempt to recruit a few participants who were not present during the pilot in order to gain their perspective on the system as well. We will ideally aim to gather at least six participants, or two per project member (total $n = \sim 6$).

4.3 Evaluation Plan

Participants will first be given a questionnaire about their existing productivity habits. Alongside, they will be administered with the Burnout Assessment Tool (BAT) [13] to measure baseline burnout scores. Next, they will be introduced to the system. Participants will input a snapshot and explore the visualization; they are encouraged to verbalize their thought process as they navigate through each step. Researchers will observe user actions and take notes accordingly. Afterward, the user responds to a post-study questionnaire and is asked to participate in a semi-structured interview. Questions include “*What did you enjoy about this system?*”, “*What did you not enjoy?*”, and “*Is this something you can see yourself using?*”. Finally, we will synthesize the data from the study to draw insights, discuss findings, and iterate on our design.

4.4 Measures and Ecological Validity

This study provides validation for our research question by using a mixed-methods approach to understand how users interact with our system. In a full study with a developed system, we would aim to capture app retention rates, upward trends in the snapshots over time, and user satisfaction. However, this is not feasible over the course of one semester. Instead, to measure the effectiveness of our prototype, we will seek to measure the frequency of insight generation as the user interacts with the app. In particular, we want to see the user reflect on behaviors and verbalize those thoughts during the snapshot stage (reflection-in-action) and the visualization stage (reflection-on-action). Furthermore, we will code patterns in the sentiment towards the system to substitute for user satisfaction and retention. Finally, for the participants who were present during the pilot study, we will use descriptive statistics to determine whether a statistically significance change in behavior occurred for each user during the two weeks.

4.5 Timeline

Between now and the rest of the semester, we have a total of nine weeks to administer our project. Our timeline for the completion of this project is as follows.

- Week 1 (10/10) – Brainstorm visualization design and revise our proposal.
- Week 2 (10/17) – Begin our two-week-long paper logging pilot study. Start developing a high-fidelity prototype. *Progress Report 1 is due this week.*

- Week 3 (10/24) - Continue our two-week-long paper logging pilot study. Continue developing our high-fidelity prototype.
- Week 4 (10/31) – Finish developing the high-fidelity prototype. Integrate the data from our pilot study into the prototype. *Progress Report 2 is due this week.* Our system should be ready for evaluation.
- Week 5 (11/7) – Recruit participants for usability tests. Begin conducting usability tests.
- Week 6 (11/14) – Finish recruiting participants. Finish conducting usability tests.
- Week 7 (11/21) – Begin synthesizing data. Work on transcribing interviews. Begin developing final paper.
- Week 8 (11/28) – Finish synthesizing data. Use descriptive statistics to understand if our two-week pilot induced statistically significant behavior change. Use thematic analysis to code emerging patterns from interviews. Continue developing final paper, and create final presentation.
- Week 9 (12/5) – Finish developing the final paper.

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