# Effective Planning

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**ABSTRACT**
This paper discusses tools for the visualization of assignments. We will look into current methods of planning as well as features people are looking for in assignment planning software. Specifically, we will explore methods to calculate and encode assignment priorities. We will report the results of our surveys and user studies and discuss methods to resolve current issues with planning software and devices.

**Keywords**
Effective planning, prioritization, stacks, calendars, quick comparison, annotation.

**INTRODUCTION**
The capacity of the human brain to perceive and process data is finite. According to the Model Human Processor, the half life of the human visual image store is about 200ms with a storage capacity of 17 letters [1]. This means that in order for one to compare multiple items, one must first understand what he sees and commit the data to semantic memory. As data sets grow, it is harder to track all of the information, much less make comparisons between them.

This is often the case when planning a schedule. Different events and assignments have varying priorities based on its deadline, importance, and length. The task of deciding which assignment to approach first is a difficult issue itself. The different properties of the assignment must be weighed and each of these properties from each assignment are compared against every other assignment when choosing an assignment to complete first. Thus, in choosing a task, we not only have to be able to store all the information from the assignments, but we also have to process that information.

By considering such factors as due dates and grade weight, it is feasible to associate these factors with a priority level. For example, an assignment due in one day may have a higher priority than an assignment due in a week, in which case one will typically complete the assignment due in one day than the assignment due in a week. However, when multiple factors are introduced, the difficulty of assigning priorities becomes less trivial.

Our discussion of effective planning has very practical applications. Every day, we are posed with multiple tasks; Sometimes there are too many tasks to memorize and requires the assistance of an external device such as a paper notebook or software application. In either case, the medium helps us organize our thoughts. Our aim is to take this organization further and facilitate the prioritization process and display the information in an intuitive fashion that conveys the importance as well as important details of the tasks. By automating the priority rating phase and displaying this information clearly, users can spend more time efficiently completing tasks rather than wasting time deliberating the optimal approach to his set of tasks.

**RELATED WORK**
There are several available tools for task planning and organization. These include but are not limited to Microsoft Project, Microsoft Outlook, Google Calendar, and rememberthemilk.com. These tools all have the common feature of providing the user with a concise organization of assignment data. They provide various ways of organizing the raw data. It is done in one of two fashions: a list or a calendar.

This layout of data lends itself towards a temporal view where time/due date is the primary factor in prioritization. While time is a major factor, it is not the only factor to be considered. They each offer features to remind the users of various tasks to perform and integrate themselves with other

applications. However, they all still lack the ability to prioritize the tasks.

## METHODS

To better understand the way people approach task prioritization decisions, we conducted various studies. From basic surveys to low fidelity prototype and evaluation cycles, we analyzed the way people responded to methods of task organization and presentation.

### User Studies

Our initial round of user studies involved basic surveys. We wanted to get a sense of what methods of planning people currently use as well as the features they look for when using them. We found that 35% of the surveyed used a pen and paper notebook planner while 40% used Google Calendar.

Reasons for using a pen and paper notebook planner are centered on portability and comfort. A notebook is light enough to carry around at all times at a relatively low cost to obtain. And children are taught to keep assignment logs in their notebooks throughout their K-12 education, which makes it a familiar medium to manage.

When asked what features they desired in a planning device, it was important to have a basic listing of assignments, a calendar, sorting/filtering features, and internet accessibility. Although automatic priority calculation did not top the list of features, we attribute the shortcoming to not having a working example to demonstrate. If users really understood how this process works and had time to familiarize themselves with such a feature, we expect that the response in favor of automatic prioritization would significantly increase. It also becomes apparent in our discussion of our low fidelity prototype that a priority view is a beneficial addition to typical planners.

We also conducted situational test evaluations. We created hypothetical situations of varying assignment grade weights, due dates, and estimated completion time and asked users to rank each assignment in the order they would complete each set of tasks. An example of such a set of tasks is as follows:

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Sample Event: Given the tasks below, please rank the tasks in the order you would complete them. 1 being the first task to complete and 4 being the last task. (Note: there is no right or wrong answer)

- Assignment A: **Due in 3** days. **Worth 5%** of your grade for **Course V**. Will take about **1 hour** to complete. Will be used by Assignment D
- Assignment B: **Due in 3** days. **Worth 25%** of your grade for **Course X**. Will take about **6 hours** to complete
- Assignment C: **Due in 5** days. **Worth 15%** of your grade for **Course Y**. Will take about **4 hours** to complete
- Assignment D: **Due in 6** days. **Worth 20%** of your grade for **Course V**. Will take about **6 hours** to complete. Depends on completion of Assignment A.

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From these tests, we were able to conclude an order of importance. We found that Due Date was the most important, followed by Grade Weight, and with expected completion time being the least important factor.

The result is a priority rating calculation in which the highest priority task has the highest priority rating given by

$$\text{priorityRating} = \frac{(1.0+\text{grade})\times\text{gradeMultiplier}}{(\text{time Left}\times\text{time LeftMultiplier})} + \text{length}\times\text{lengthMultiplier}$$

where xxMultiplier variables are arbitrary adjustments to the importance of each parameter to make the equation reflect the correct prioritization.

### Low Fidelity Prototype and Heuristic Evaluation

To pinpoint problems with current assignment planner solutions, a qualitative study was conducted. Three solutions to assignment planning were evaluated following methods described by Jakob Nielson's online writings on how to conduct a heuristic evaluation [2]. Two were popular

current solutions: a physical planner and Google Calendar. The third was a low-fidelity prototype of our proposed solution. Three evaluators were involved. In each evaluation, we played role of the observer, writing down the comments and problems each evaluator found. The evaluators were told to look for usability problems as well as visualization problem pertaining to the task of assignment planning.

To assist the evaluators with evaluating the three different solutions, a list of ten generic heuristics (written down by Jakob Nielson) and a scenario were provided. The scenario gave a list of courses and assignments details from each course; its purpose was to give the evaluators an idea of the sort of assignments to plan.

When all three evaluations were completed, a list of usability and visualization problems was compiled. Then a questionnaire was created for the evaluators to rate the severity of each problem in the compiled list.. Once all three evaluators finished filling the questionnaire, the mean severity rating was calculated for each problem. When calculating the mean, the floor of the mean was taken. For example, if the scores were (3, 2, 3), the calculated mean is 3.

The severity scale used was:

- 0 = I don't agree that this is a problem at all
- 1 = Cosmetic problem: need not be fixed unless extra time is available on project
- 2 = Minor problem: fixing this should be given low priority
- 3 = Major problem: important to fix, so should be given high priority
- 4 = Catastrophe: imperative to fix

The compiled list and average severity ratings are as follows:

Physical Planner

- Legibility: Not a problem (1)
- Overview: Minor problem (2)
- Search: Major Problem (3)
- Tediousness: Minor Problem (2)
- Space Limitations: Minor Problem (2)

Google Calendar

- Text customization: Minor Problem (2)
- Duplicate assignment entries: Minor Problem (2)
- Lack of assignment status: Minor Problem (2)
- Lack of redo/undo: Minor Problem (2)
- Only "event" abstraction: Minor Problem (2)
- No linking of related assignments: Cosmetic Problem (1)
- Overflow of events: Minor Problem (2)

Low-Fidelity Prototype of Proposed Solution

- Tweaking of priority factors: Minor Problem (2)
- No indication of how priority is assigned: Minor Problem (2)
- Does not convey amount of free time: Not a Problem (0)
- Lack of a view displaying times during the day: Cosmetic Problem (1)

The most severe problem appears to be “Search”. The “Search” problem deals with finding a specific assignment, or number of assignments. In the physical planner case, there is the worst-case time scenario of flipping through every page in the notebook. There are numerous minor problems involving having overviews, assignment statuses, and tediousness. “Overview” refers to having a view that offers a general picture of the quantity and description of the assignments. “Assignment statuses” entails indicators of much work has been done on an assignment; the indicators should be able to make apparent whether an assignment has been completed, or whether it has even been started. “Tediousness” refers to having to copy down the same assignment repeatedly in different places. This is apparent in a physical planner; to indicate if an assignment occurs weekly, or if an assignment written down last week still needs to be done this week, the assignment is written down again during the current week. This is a tedious and error-prone task.

Our low-fidelity prototype of our proposed solution received the fewest problems and the severity of those problems is generally very low. The proposed solution did not reveal a problem concerning search, overview, assignment statuses, nor tediousness.

## RESULTS

Our implementation currently focuses on a stack view to represent an order of priority of assignments. This is a metaphor to an office desk with papers piled upon papers with the next item to be processed being located at the top of the stack.

Courses can be added to the program and visually encoded through colors.

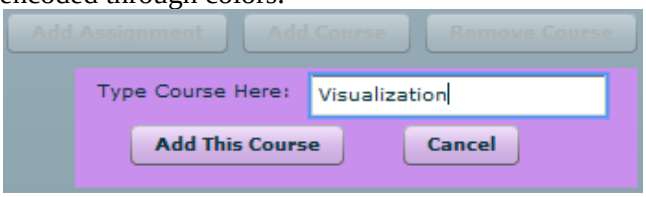


**Figure 1.** Course Input

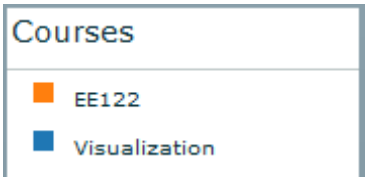


**Figure 2.** Courses List and Color Encoding

Assignment data is accepted as user input where course association can be selected.

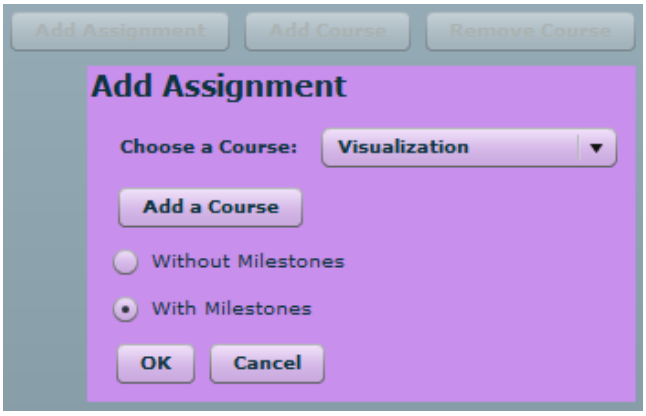


**Figure 3.** Assignment type selection

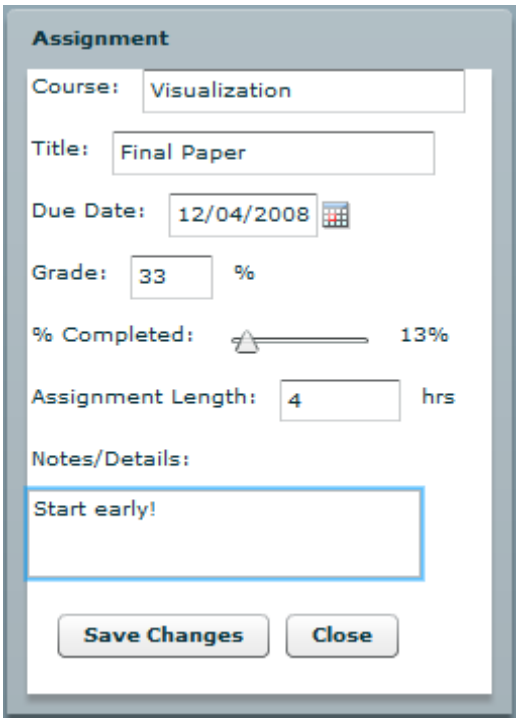


**Figure 4.** Assignment data input.

Upon valid assignment data input, we create a stack element on the priority stack, prioritized based on our priority rating calculations.

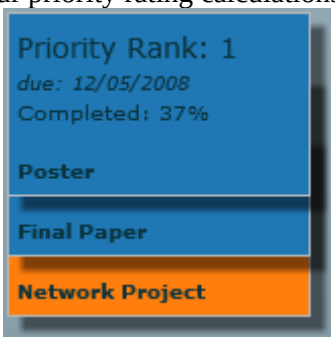


**Figure 5.** Priority Stack

If the user wants to edit the data on an assignment or view more details of an element, a click on the stack element will draw focus to and enlarge the element to be seen clearly.

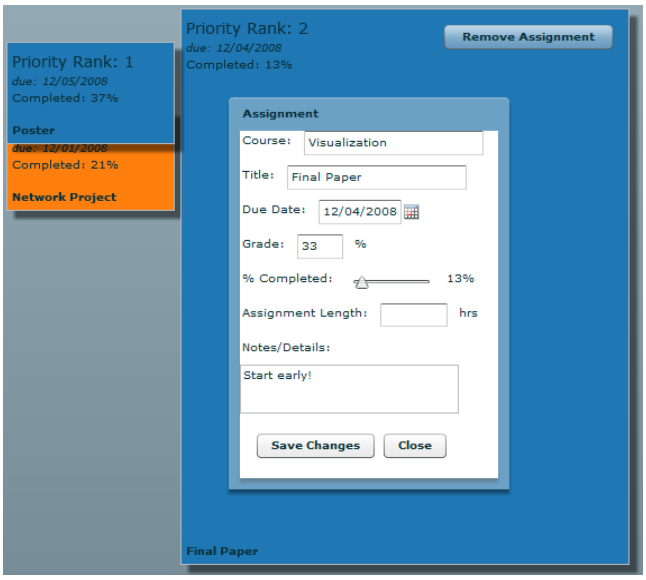


**Figure 6.** Stack element focus.

This implementation of the stack view allows the user to quickly see a general overview of his tasks in order of importance and check individual assignment details and modify them if necessary.

As assignments are completed, they will be displayed in the list of completed assignments. As such assignments are completed, they are of little importance. Therefore a list of such assignments is provided for user reference

List of Completed Assignments

| Course | Assignment Title | Due Date | Grade Weight | Assignment Leng | Notes/Descriptio |
|---|---|---|---|---|---|
| EE122 | Presentation | 12/05/2008 | 33 | | Hard! |

**Figure 7.** List of completed assignments.

## CONCLUSION

In this paper, we have observed the way people prioritize their tasks. As a result, we have formulated a method to calculate and display these priorities in an effective manner. We used a stack view to represent the priority rankings of assignments. Each stack element is one assignment in which the user may or may not choose to look into more closely.

While the current implementation is crude, we hope that the exploration of automatic task prioritization and visualization will be explored further.

Although it is common for people to use calendars and to-do lists, it is possible for them to overlook important tasks because of the limited visualizations of current planning devices and software. There are also situations in which the individual does not realize he has forgotten to complete a task until it is too late. A temporal visualization, such as a calendar, fails to alert the user of an important project that will take several days or weeks to complete until the assignment appears written on the box of the day it is due.

Effective planning is a practical issue that deserves greater recognition. Although visualizations have been developed on a variety of topics, effective planning should not be overlooked. It is a topic which we can all relate to and further research can yield greater efficiency and work quality.

## FUTURE WORK

There are many features that were left unimplemented due to time constraints. To begin, I believe we need to conduct further user studies and surveys to construct a more accurate priority calculation. Since planners are used to track many assignments over large time spans, simple Q&A situational events as we have conducted do not yield an accurate priority calculation, which is the basis for the xxMultiplier variable in the current priority calculation.

We would also like to look into allowing the user to dynamically adjust attribute weights as well as allowing the user input additional constraints to the priority calculations. We realize that we have only accounted for a few of the major constraints, but user customization would allow for each individual to tailor the visualization to account for his needs.

Currently, the milestone assignment type is not fully functioning. The purpose of having milestones is to break down a project into smaller, more manageable segments. By facilitating the milestone breakdown through the user interface, we encourage better project management practices as well.

At this point, the courses legend is merely a legend. However, we would like to develop the

legend into a course filter to selectively show the assignments the user may be interested in.

Adding and parsing external XML files with assignment data is also a direction to look into. If professors can create XML course syllabi with all assignments listed, having this planning software parse and add such data can facilitate effective planning as well.

As you can see, there are many directions to explore and build on. Effective planning and automated prioritization of human tasks is a relatively untapped direction of development.

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