

Design of Creation of the GANGL Workload Management System

Final Report for SYDE 161 Design Project

Group Number 2

Samuel Robens-Paradise, ID: 20709541, 1A

Ellen McGee, ID: 20710373, 1A

Aaditya Sondhi, ID: 20671649, 1A

Enoch Tang, ID: 20720705, 1A

Ryan Gangl, ID: 20737072, 1A

Nicholas Varabioff, ID: 20702729, 1A

Faculty of Engineering
Department of Systems Design Engineering

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Course Instructor: Professor M. Borland, PhD

Situation of Concern and Situation Impact Statement

A survey conducted by the Gangl team in Early September at the University of Waterloo concluded that close to 90% of students are stressed out by academic requirements. More specifically, 67% of those students said that academic workload was their greatest cause of stress[2]. As a result of the survey, the Gangl team chose to address stress caused by workload on Canadian University students. The Gangl team conducted research to gain the necessary information to create the ideal solution to the problem of stress caused by workload. It became relevant that the most ideal solutions relied on accessibility, ease of use, and consistency in the way information was delivered. An in-depth study done by Microsoft Corporation in 2015 showed that the average human will search for information on the internet for approximately 8 seconds[6], which means that the system had to be efficient and easy to access, otherwise users will not take the time to use the system. A study conducted by The University of Dammam analyzed 219 students, showing that roughly 92% of students used electronic, application based technology in Universities[3] which inspired the idea of a digital system.

The Gangl team also considered the many constraints that exist in an academic environment. For example, the system had to be able to be used in a library, classroom, or lecture hall environment and the system had to be accessible in under 20 seconds. This number was derived from the 8 second constraint concluded in the 2015 Microsoft Corporation study combined with an estimated 12 seconds devoted to access and service authentication. Although the Gangl team conducted research, there were many assumptions made that were only later verified or falsified in prospective user-feedback sessions and more in depth research. One such assumption that proved to be true was that Canadian Universities and Colleges were in need of a workload management system. The team also assumed that many users would use a technology-based design solution. Based on these assumptions, the Gangl team drafted a list of questions that needed to be answered in the design process, many of which were addressed through user feedback sessions and testing. Given the constraints that are established in the academic environment present at Canadian Universities combined with another study showing that 32% of users will abandon a webpage or application if their desired information is not presented within 5 seconds [10], the Gangl team was able to develop a concise and concrete situation impact statement. The team's situation impact statement was to:

Design a workload management system to be used by upper-year undergraduate students to lower stress caused by excessive workload in Canadian Universities/Colleges that must be consistent in its ability to present information, allow the user full control, be accessible in under 20 seconds, and not cause the user more stress.

Users

The Gangl Workload Management System is primarily designed to be used by upper year undergraduate students enrolled in Canadian Universities and Colleges. Realistically, the system would be able to be used by all University/College students because it is designed to assist in the way they receive and access academic information. The information presented on Gangl includes: assignments, lectures, homework, projects, announcements, and class schedules. The system is also heavily based on the user interface. Users can input their personal notes and reminders and customize their workspace, increasing their productivity and overall satisfaction [12].

Professors and Teaching Assistants do not directly access the Gangl system, however they are directly affected by it because of their students use and are thus considered secondary users. Professors and course instructors continue to upload course information to D2L (Desire to Learn) and other academic sites continue to be used the same way. The difference is that the information is taken from those sites and presented in an easily accessible, user friendly manner to students. This reduces the stress in students by increasing the organization of the essential information they access daily. Therefore, Professors and TA's (Teaching Assistants) are affected by the change in their students work habits and organizational skills.

The tertiary users for Gangl is the design team as well as software developers. These members create and maintain the program, however they are not the intended users of the system. The interface of Gangl was created through research and user testing, which was conducted by the design team and software developers in a search to design the best possible User Interface (UI). Also, like other applications, there is maintenance and updates that will follow as bugs are found in the system and new ideas are incorporated or the software is required to be updated in order to support new technology and systems.

Based on prospective user feedback the Gangl Team found that one important design aspect to users was control over the system. Potential (primary) users of this project voiced their need to have complete control over the system. They did not want a system that organizes and plans every second of their day based around when they need to finish a certain project or when to study for an upcoming test. Potential users believe that having something planning their lives for them would actually cause them more stress[13]. Users told the Gangl team they liked add things into their own to-do lists when they want to do their work. In 2013, a study was done at Gensler (a design and architecture firm) that looked at the power of choice in workplaces. It was shown that when employees were given choice about their space in the office (and choice in general), happiness, motivation and performance were increased [12]. This was applied to the

workload management system. By giving users a choice about what they want the system to do, they were more likely to use the system.

Another need the users expressed was flexibility. Although the users needed control over the system, they were not opposed to the idea of the system doing some planning for them. They expressed an interest in the ability to turn "on" and "off" different functions of the system based on how much control they were willing to give to the system. Users requested a system that was flexible and could change based on what the user wanted it to do. As a result of the feedback from primary users, we chose to develop a system that, if the user were to give "power", it could do a lot; however, ultimately the user decides how much the system is allowed to do.

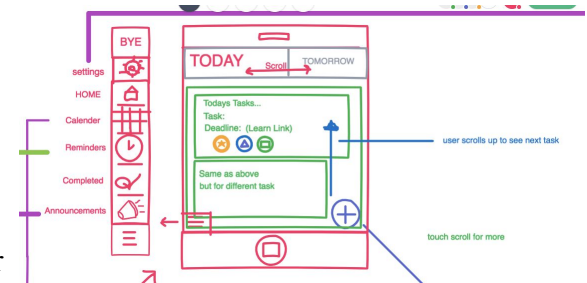
Users also voiced that consistency in the way information is presented and received was a fundamental aspect of the design. One example, given by potential users, is the different deliverable structures of different courses. An assignment given in one course should be presented in the same format as an assignment from another course. Users did not want to have to search for a due date or grade and should not have to login to different websites; they should be able to find all the information they need in the same place, in the same way, each time. This will make finding information much easier and less stressful for students.

Lastly, users verified the Gangl teams research about the importance of accessibility with verifiable feedback. The Gangl team concluded that the system had to be available to all students, not just a certain population of students. It had to be free to get access to, and to use. It had to be quick to access, and take less than 20 seconds to reach the desired information. If something is not free or is hard to access, students will not spend the time trying to find it [4]. The 20 second constraint was created based on the 8 second attention span humans have while on web pages [6]. Another 12 seconds was added, assuming it would take a person time to physically gain access to the service.

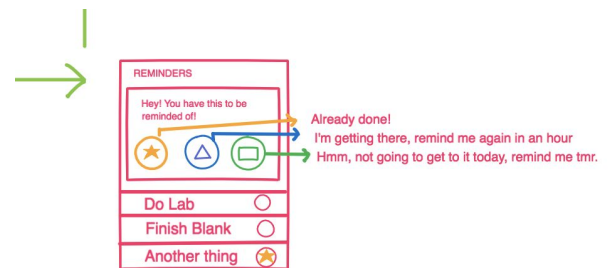
Based on user feedback as well as prospective user feedback from our primary users, we were able to make design decisions based on verifiable feedback about the needs of the users and the aspects that they felt should be incorporated into the design. We were then able to go on and confidently design the user interface and prospective functionality in our high fidelity prototype.

Final Design Solution

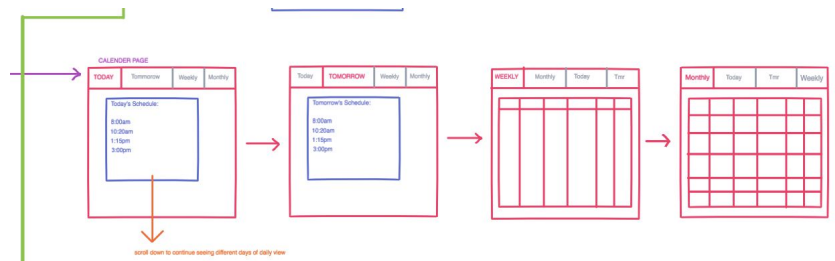
The final product is designed to be a mobile application that lets users access critical academic information in a consistent manner. Gangl scrapes data from several academic sources such as D2L, Slack, and UW Portal. The app takes this information, sorts it and then presents it in an organized user interface that is both, easy to understand and easy to interact with. This includes organizing data into a calendar, to-do list and a dedicated announcements page. Gangl gives the user the ability to create a personal account that they can access on any device with internet access. This allows users to customize their experience by changing the physical appearance of the app, add or remove features, and manage notifications.



The to-do page is designed to allow users to visually assess their workload for a given week as it organizes the tasks by “today”, “tomorrow”, and “this week”. The users also have the option to prioritize their tasks based on importance which will then make Gangl reorganize the list in terms of priority.



Apart from creating a to-do list, Gangl has the ability to present deadlines and tasks in a daily, weekly, and monthly calendar view. This will let users plan their schedule ahead of time in order to optimize their workload. Gangl also integrates announcements taken from D2L and slack, instantly notifying the user of any changes made to deadlines and/or important information sent by the instructors.



The application is always collecting data on the user's activity on the system. It uses the information to then suggest priorities on new tasks. It also scrapes D2L for assignment weightings to help create suggestions on priorities. The application also uses data of previous assignments and time taken to complete them to make suggestions. Additionally, the application looks for inconsistencies in the information across the sources and flags them for the user to correct them.

Final Prototype

The first part of our final prototype of Gangl is an app created with the prototyping software Marvel. Marvel allows you to create the user interface for the different pages of the app and then link them all together. Although Marvel does not give the app any real functionality, Marvel gives an accurate representation of what the app will look like once functionality is added.

The main page of our app is the to-do list. (*Figure 1*) By default, the to-do list is organized by date. There are “Today”, “Tomorrow”, “This Week” and “Someday” headings. Items are displayed in the to-do list with the item’s name, description and date “to-do”. In addition, it will also display the priority of the item as either high, medium or low priority with a corresponding red, yellow or green circle. On this main page, there is a button that allows you add items to your to-do list. Each item on the to-do list also has a checkbox, that when you check it off you get a fun, encouraging completion, message. (*Figure 4*)

The add page lets you add a new item to your to-do list. You can add a description, date and time and a priority. You can also set up a reminder. (*Figure 2*)

The announcements page displays any notes from professors, TAs or others. Like the other information, they are taken from external sites that students use like Desire to Learn or Slack. (*Figure 3*)

The setting page gives the user the ability to pick some of the functions and features they want the app to have. The user can change the colour scheme, turn on and off notifications, and choose the way the to-do list is displayed (date or priority).

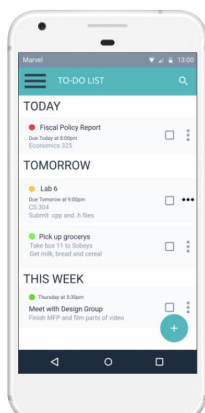


Figure 1: Main Page

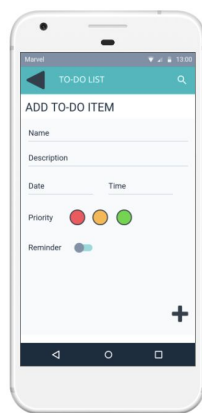


Figure 2: Add Items

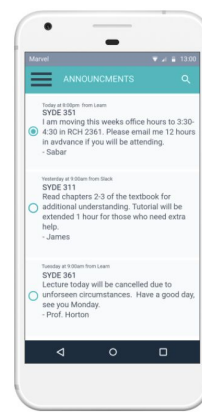


Figure 3: Announcements

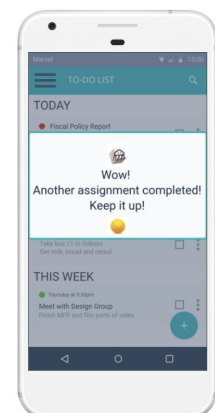


Figure 4: Completion message

The second part of the main prototype is the app made with Android Studio. This app has a similar layout to the Marvel prototype but has actual functionality. There is a database that stores accounts with the different to-do list items. Users have the ability to add and delete to-do list items. The items will be displayed in the app once they have been added. This prototype has actual functionality unlike the Marvel app, which only has a user interface.

The user testing of these prototypes involved showing the apps to potential users and getting their feedback. Some of the feedback that we were given was that the colours used for priorities are too similar in colour (specifically the yellow and green) and are not differentiable for someone who is colourblind. Some other feedback was that the priority feature was a really nice aspect of the to-do list and something that would definitely be used. We plan to incorporate the feedback we were given into updates to the prototype.

As for performance testing, the actual functionality of our prototype is still in the beginning stages. Once more functionality is added to the app, we would performance test by testing all the different features and make sure they accurately perform the function they are supposed to. We would also test the app for bugs and try and do things that the app is not meant for, to make sure it will not crash.

The safety assessment of Gangl involved us making a Project Failure Modes Analysis Chart (Figure 5). In this chart we worked through different ways the app could crash and different ways it could fail the user. Some failures include if the app doesn't sync with the external sites, or if the app is not up to date and cannot interact with external sites. This could fail the users as they would be receiving accurate information or any information at all. Another failure would be if the app is not accessible. This could be caused by the phone battery dying, a user forgetting their phone or the app crashing.

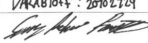
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PROJECT FAILURE MODES ANALYSIS CHART						SAMMY ROBENS-PARADISE ELLEN MCGEE RYAN GANGL ENDOH TANG
FUNCTION PROCESS OR STEP	FAILURE TYPE	POTENTIAL IMPACT	SEVERITY	POTENTIAL CAUSES	RECOMMENDED ACTIONS	
SYNC FUNCTION	STUDENT CANNOT ACCESS LEARN INFO.	STUDENT CANNOT ACCESS INFORMATION LIMITED FROM LEARN	5	POOR INTERNET CONNECTION STUDENT DID NOT PAY FEES	- ADD ANTIFRAUD PRECAUTIONS - PROMPTLY ACTION REQUIRED FROM USER	
PHONE BATTERY	PHONE RUNS OUT OF BATTERY	STUDENT CANNOT ACCESS APP	3	PHONE WAS NOT PROPERLY CHARGED	CHARGE DEVICE & PROPERLY CHARGED	
CRITICAL APP CRASH	CRITICAL LOSS OF INFORMATION	USER LOST ALL INFORMATION PERSONAL, SCHOOL DAMAGE - STUDENT INFORMATION	7	OVERLOOKED WARNING - OVERLOOKED FILES - VIRUS - HACK	CREATE CLOUD BACKUP FROMAL - CREATE INTERNAL SYSTEM FIREWALL - CREATE AUTOMATIC EXIT FAIL-SAFE - TO ENSURE NO DATA LOSS	
UP DATE	APPLICATION IS NOT UPDATED	LOSS OF FUNCTIONALITY USER CAN NO LONGER ACCESS INFORMATION	5	APPLICATION WAS NOT SET TO AUTOMATICALLY UPDATE	INFORM USER OF AUTOMATIC UPDATE FEATURES	
LOGIN FUNCTION	LOGIN INFORMATION DOESN'T WORK/IS INVALID	USER CANNOT ACCESS APPLICATION USER DOES NOT KNOW HOW TO LOGIN/REMEMBER USERNAME/PASSWORD	5	APPLICATION LOST USER INFORMATION USER FORGOT USERNAME/PASSWORD LOGIN CANNOT BE USED	INFORM USER OF AUTOMATIC UPDATE FEATURES FORGOT PASSWORD FORGOT TO SEND LOGIN CANNOT BE USED USER CANNOT BE USED TO SECURE CLOUD	
SAMMY ROBENS-PARADISE : 20109541 ELLEN MCGEE : 20110573 RYAN GANGL : 20137012 ENDOH TANG : 20107015 NICK PARABLOFF : 20102729						PRESENTATION STYLE - QR CODE TO DOWNLOAD APP
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Figure 5: Project Failure Modes Analysis Chart

Future Work

Moving forward with the project, there are definitely improvements that can be made to the design. As we focused primarily on the user interface design of our system, the main areas of improvement would be in functionality of the application. This would include improving features such as settings, notifications, and the functional to-do list, as well as adding important features like the ability for the system to gather and organize data from other sources. Additionally, we would like to develop an iPhone app as well as a website after the Android app is completed.

Some of the first things we would implement in the next round of updates to our design is accessibility features. Based on user feedback we need to make it a more friendly interface for colourblind people. We would do this by not relying on colour to represent important concepts. Instead we could use symbols or find colours that meet webpage design colour standards.

One of the largest factors of our design that differentiates it from other systems is the ability to draw information from external sources. We need to develop the code to draw, read and format information coming from those outside sources. We also need to develop relations with owners of those external sources so that we have the ability to provide the information needed.

We would also add more customizability and features to the interface, including movement of widgets, more colour scheme selection. We would test these new features and the functionality of the app by having upper year students try our app as their main form of workload information and organizer for a set period of time. We would then collect feedback from the users and determine further changes that could be made.

Conclusions

The Gangl design project was based around core deadline and the goal of having a partly functional application to demonstrate for the Systems Design Engineering Design Fair on Friday December 1st 2017. The Gangl team was able to produce a conceptual design using Marvel Design Software that mimics the user interface of the Desired Gangl Application. Additionally, the Gangl team developed the Gangl Application with a functioning database and TODO list using the development tools available in Android Studio. Given our initial development goal of having a partly functional prototype in time for the presentation, the Gangl team was successful in meeting our expectations. While the Gangl team did develop a functional application with a working to-do list, the functional application did not feature a completed, or the desired user interface.

Additionally, there were some aspects of the design that did not meet the user specified requirements. One user requirement, and ultimately design constraint was that the system (Gangl) had to be accessible to all users. During the Design Presentation however, the Gangl team received user feedback about the user interface, that the design was not suitable for those who are visually impaired because the UI relied heavily on the use of colour. In conclusion, while the Gangle team met its anticipated goals the application was not at its exceptional and most ideal stage (largely due to time constraints and software bugs) and could have featured a more complex and “finished” UI in the android functional application version of the prototype.

Individual Reflections

Questions:

A: What was the most challenging aspect of the design project? Explain why it was challenging with examples from your project.

B: What was the most important thing you learned?

Nicholas Varabioff, ID: 20702729

A: In my opinion, the most challenging aspect of the process was creating and deciding on an idea. Health and Wellness is quite a broad topic; it includes both physical and mental health, which each include a huge number of subtopics. Eventually, even after we decided to address the area of school-related workload, there were a large number of paths our design could've taken. Also, after we chose to create a software, there were multiple other options including a book or notes sharing website or tutoring organization service.

B: The most important thing I learned was how important planning is and how much planning is required before the beginning of the construction of the physical design. I've never really considered planning to be a big part of the design process since the actual product wasn't being constructed. Through the design process in SYDE 161, I realized that rather than simply jumping into the construction of a project, each aspect of the design process must be carefully considered. Huge amounts of time can be lost from realizing a fundamental flaw in the design partway through the project, and that is something I have not really considered before.

Samuel Robens-Paradise, ID: 20709541

A: I believe that the most challenging aspect of our design project was not as much the project but rather the topic we chose to address. Stress, is a very large, very ambiguous idea, and it affects people in many different ways. I found that developing a solution to our design problem was the most challenging because we (as a team) wanted to do things, and create solutions that were beyond the scope of a first year engineering design project, and most relevantly, beyond the scope of our skillset. Specifically, our "ideal design" has the ability to extract and restructure information from academic sites into a concise and readable intuitive interface for the user. This ability however, requires programs and code that are beyond our experience and coding ability. We wanted to create the ideal situation and I found that our ideas often grew beyond the scope and realistic constraints of our design environment. It was thus challenging to "do less" not because we wanted to, but simply because we did not know enough to do more.

B: Prior to this design project I did not appreciate the importance of the iterative design process to the extent that I do now. I believe that the most important skillset that I learned from the Gangl design process was how to sympathise with users. I also found that there are numerous ways to effectively quantify design, something that is a critical skill for any engineer. In all, the most important skill that I learned was how to effectively implement a design as a team, and quantify our feedback and results.

Ryan Gangl, ID: 20737072

A: The most challenging aspect of our design project was creating a product that would actually change something in a positive manner for upper year undergraduate students in Canadian Universities/Colleges. 'Mental Health and Wellness' is a vague term and therefore could be interpreted many ways. We surveyed to find the major struggles encountered by upper year students and settled on managing workload, but we still needed to be more specific. We created a QFD to ensure that any design we created would be a plausible solution to the problem at hand. Our initial thoughts included a physical device: wearable tech i.e. a watch with calendar and organization capabilities. Potential primary users rejected this idea and suggested to have a software product instead. This is when we began brainstorming LFP ideas and used various

methods (5 Whys, situation of concern chart, user testing, etc.). That initial process of choosing a product to prototype was the most challenging and time consuming.

B: The most important thing I learn throughout this process is that although you may have an idea, it is extremely important to conduct comprehensive testing before creating a final product. Creating and manufacturing a final product prematurely increases the chances of having an item that does not actually suit its users, does not have users, has many flaws, and other fundamental issues. That's large companies spend thousands and thousands of dollars on research and testing before they actually manufacture a final product.

Ellen McGee, ID: 20710373

A: The most challenging aspect of this project was fully understanding the problem. The problem started so broadly and we were able to narrow it down, but it was still a big problem that many different people had different opinions on. Stress caused by workload is something that affects everyone, but each individual person would want to deal with it in a different way. Finding a solution to the problem was difficult at first because we kept changing what the specific problem was. We weren't sure if the specific problem was the way information was presented, if it was the way it was managed, if it was a mix of both or something completely different. For every change in problem space, a new idea would be thought of or a past idea would no longer be applicable. Once we understood what our problem was, we were able to work on finding a solution. It was also a challenge to find a solution that would meet every user's needs. Every user will have a different way that they manage workload, as they have different study habits and current methods. It was challenging finding a solution that would meet the needs of many users.

B: The most important thing I learned is the importance of no biases in design. I learned how easy it is to say, "this is the best choice because I think it is". Designing is about taking feedback from the users and ignoring biases within yourself or within your group. When you design something, you want it to be something the users want to use. You need to test with a variety users, so you get a wide spectrum of feedback. If you only test with a small, similar group of people, then you can still get biases within your data. Getting many diverse opinions helps you to create a better design, and to consider aspects you may have not realized were important.

Enoch Tang, ID: 20720705

A: Personally, the most challenging aspect of the design project is being able to fully understand the problem space before ideating solutions. Tasked to design a solution that reduces upper-year undergraduate stress, I felt that it was difficult to empathize with upper-year students. Being a first-year undergraduate, I was unaware of the university struggles and habits, thus I had

to rely solely on the numbers produced from our survey and the few interviews we conducted. Besides the general research we did online, we conducted a survey in the University of Waterloo and found that 90% of students thought school was the main factor of stress, and 66.7% of those students specified that workload given in school caused them stress. Since we are designing a product used by upper-year undergraduate students in Canadian Universities/Colleges, I think that basing our entire project around that is insufficient. Ultimately, I felt that completely understanding the problem space was the most challenging aspect of the design project.

B: The most important thing I learned was importance of prototyping your product. Thinking back to my grade 12 physics project, I think I would have saved a lot more time if I made low and medium fidelity prototypes. Being unaware of the different prototyping software and techniques, I would quickly jump into designing a final product. In a real life work situation, creating a high fidelity prototype could potentially cost millions of dollars. Thus, the most important thing I learned was the importance of prototyping and the different techniques incorporated into it.

Aaditya Sondhi, ID: 20671649

A: It was a difficult and lengthy process to fully understand our problem space. However once we decided that our solution to the problem was going to be a workload management system, actually building working prototypes was the most challenging part for me. Our vision for the final product included features that were simply not possible for us to develop in our HFP. For example, we expected our solution to be able to collect user data in order to make suggestions to the user. This would involve using Machine Learning concepts which is a concept too advanced for the scope of this first-year design project. Deciding on what functions we could actually build in our working prototype was a difficult process. We made this decision using information from our QFD as well as our personal limitations. Since the major concern for this problem space was the inconsistency in the way information was presented, we decided that focussing on the user interface would help us create an ideal solution given our inability to implement machine learning and other advanced computer science concepts into our application.

B: Through this project, I have learned to appreciate the entire design process, from ideation to testing. This is the first time I have gone through the process in the amount of detail that we did which helped us create a solution that actually helped solve some of the issues we found in the beginning. The most important part of this was the fact that we used iterative design by building prototypes and testing them with our users. This helped iron out any early issues we had with our design. This also really helped us pivot our project in the MFP stage into a mobile application instead of a web app based on the user feedback.

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