1 Phase 3: Individual Reflection

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1.1 Introduction

For my final reflection, I would like to seize this opportunity to discuss and evaluate the project management (PM) strategy incorporated by my team and I during Phase 3 of the Praxis III. To complete the prototyping requirements and expectations, my team pursued the Agile Design Project Management strategy. In contrast to the Waterfall PM strategy that offers a more sequential approach, the agile PM strategy obeys an iterative development and adaptive planning.

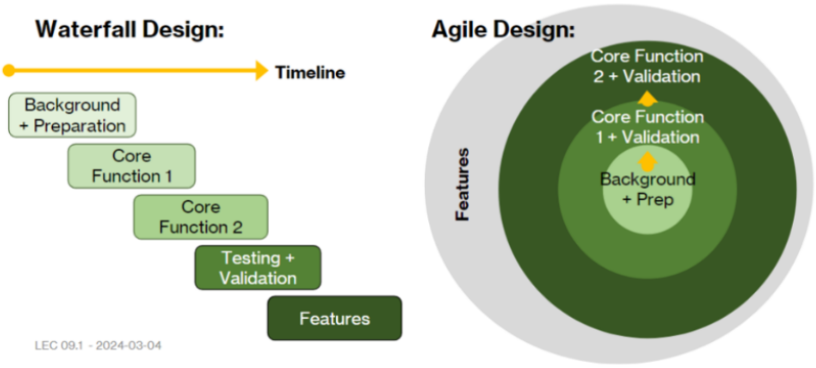

Figure 1: A visual representation of the Waterfall and Agile Design PM strategy from ESC204 Lecture 9.1 (2024-03-04)

1.2 How we incorporated the Agile PM Strategy?

After eliminating the drill sensing probe design concept, we converged to a manual multiprobe sensor, that needs to manually be inserted in soil to record readings, perform data-processing and display results. To incorporate the agile PM strategy (as visualized in Figure 1), my team brainstormed the different features required to consolidate this design concept, we then distributed tasks according to the interconnected core functions and worked on them simultaneously while making iterations. For example, 2 of our team members primarily worked on the CAD modelling, 2 team members worked on the moisture sensor readings and the alphanumeric display, followed by 2 team members who worked on the GPS module and LED display (refer to figure 2 for task allocation). We did not

impose any harsh deadlines on the completion of the prototyping and to accommodate any inadvertent failures and malfunctions, and make iterations as necessary.

1.3 Why was this strategy incorporated?

We adopted this strategy because of the bias for this strategy that propagated from our prior experiences in Design Teams and Clubs. Although Praxis I and II gave me the opportunity to practice the waterfall PM strategy, where we followed a more sequential approach of framing, diverging, converging by systematically distributing tasks with well-defined strict deadlines and progression through the Design framework, we felt that this was not ideal for the prototyping aspect of phase III which desires a lot more flexibility in the design process. From Design Teams, like UTWind and UTAT, we had naturally developed a bias for the Agile PM approach. This was inherent because in UTAT and UTWind controls team, we are taught to be more versatile with other member's interests and commitment levels, and incorporate a lot more iterations in the design work. In my prior experiences, because of this Agile approach, I could work on the python code (for monitoring the turbine speed) individually at my own pace, and make improvements according to my own schedule/timeline. For UTAT, for instance, when designing the air propeller, I could work independently in my own subteam, to lead the propeller design model, without worrying about the other smaller tasks that are conclusive to the overall aircraft design. This allowed me to focus on making more iterations to that one small air propeller design and making adjustments to the dimensions, As such, from experience I know the agile tactic allowed me to be more stress-free and flexible in my production of design work. This allowed us to navigate through eachother's differences (in particular with distinct working hours, commuting schedules, and non-academic commitments). It also offered a lot of agility and freedom in the designing and development of the overall design concept.

1.4 How this strategy impacted my individual contributions?

As a result of using this Agile PM approach, I faced many challenges in prototyping for Praxis III - many of which I did not forsee in my prior contributions to UTAT or UTWind. After distributing all prototyping tasks, I was allocated the task of programming the LCD display and I chose arduino nano microcontroller for operating the LCD display. I debugged my code and programmed the LCD only to later realize that my code was incompatible with the code that my group member used on Raspberry Pico microcontroller. This resulted me to go back and do multiple revisions in my code to ensure that transmission of information between microcontrollers are functioning appropriately. Additionally because of this independent distribution of tasks, I faced a lot inconsistencies between the overall software/programming subsystem. One such example includes the fact that I programmed the LCD to calibrate the sensor and output the result in percentage, whilst my other team member designed the LED matrix to take readings as raw values and categorize the acceptability range accordingly. This resulted in a lot of inconsistencies, caused me to go

Subsystem	Item	Interim Deadline	Anusha	Harry	Marcus	Jason	Kate	Meredith	Completed	Finished on...	Extra Notes
Electrical	LCD Display Circuit	4th April									
	LED Matrix Circuit	4th April									Only able to light up one LED on the LED Matrix
	GPS Circuit	8th April									
	Soil Moisture Sensor Circuit	1st April								5th April	
Mechanical	Handle and display housing unit (CAD)	27th March								24th March	Printed on 27th March
	Main circuit housing unit (CAD)	27th March								24th March	Printed on 27th March
Software	GPS and location matrix code	6th April									
	Soil Moisture Sensor code	6th April								6th April	
	LED Matrix code	6th April									Only able to configure 1 LED to turn on
	LCD Display code	6th April									
	Datalogging	6th April								6th April	

Figure 2: Prototyping Schedule from Phase III

back and forth and do numerous iterations which was unnecessarily time consuming and lead to redundancy of tasks.

1.5 How this impacted the team process?

We were mostly behind our interim deadlines and most of our prototyping work was delayed to accommodate iterations and correction of failed attempts and differences in our completion of tasks. Using this agile approach also further delayed the completion of independent tasks. For example, team members who were working on the electrical subsystem of the moisture sensor took too long and procrastinated a bit too much in ensuring the moisture sensor operates correctly and is calibrated appropriately. As such this resulted in the team members working on the GPS module and LED matrix unable to verify and test in time whether the GPS module and LED matrix operate correctly based on the moisture sensor outputs. This added additional delay in our design This is because these two subsystems were interdependent, and the agile PM approach hindered our ability to test the functionality and operation due to lack of sequential progression. This resulted us in being unable to operate the LED matrix by the showcase deadline. As such the agile approach is not efficient for interdependent core-functionalities and subsystems.

1.6 How this strategy impacted our overall Design work?

This design approach increased the difficulty of system integration of the overall design concept. Because we were independently working on the CAD Modelling, electrical and software subsystem, our overall system did not integrate properly. For instance, our LCD screen was too large for the hollow space in the 3D printed CAD model, and although the GPS module was working, it was not compatible with lighting up the LED matrix based on coordinate system. As such our individual components functioned appropriately, but we could not combine all the subsystems inside the 3D printed CAD. We also realized that we utilized a total of 4 breadboards in total which meant the 3D CAD model could not fit all of the them inside. Additionally because of the haphazardness and lack of organization, we struggled with establishing communication between the different microcontrollers used for different components, which meant that many of instruments could not connect to each

other and did not display any results. As such the Agile PM approach was highly inefficient to navigate system integration.

1.7 What could be done differently in future?

Acknowledging the facts above, I feel that (besides its benefits and versatility) using the Agile approach did not work in our favour. We were far off our expected deadline, and could not complete all the design specifications as seen in figure 2 with 2 left incomplete (sad face). As such, in future we should definitely opt for a Waterfall PM approach with more sequential deadlines in tact that are imposed more strictly. Another thing I noticed, was that we only worked together in studio hours which I believe was not sufficient for the project time-frame and allocating work hours outside of studio together could have certainly improved our lack of team communication.

1.8 How will I incorporate this in the future?

From this praxis III, phase 3 experience, I have learnt that the Agile method is not the best approach and results in prolonged duration of iteration and increased dependency on each other's completion of work. Next time, I will keep this in mind especially for APS360 summer project where I will again be working with a large group to use deep learning in image colorization. For my future APS360 project, I will try incorporating the Waterfall PM approach and divide tasks sequentially rather than the Agile method with more well-defined deadlines. Some of these sequential deadlines, include writing a project proposal and doing literature review in advance, then pursuing the building of the AI model, followed by testing and validation systematically.

1.9 Conclusion

Ultimately, the agile method (despite being more flexible), hindered our ability to prototype in a timely manner. In the future, I intend to employ the waterfall project management approach along with its related documents to guarantee that our team projects are completed on schedule. This means I'll use a structured method where tasks flow sequentially, and I'll make sure to use all the necessary documents and tools associated with this approach to keep our teamwork efficient and on track.