School of Science, Computing and Engineering Technologies

SWINBURNE UNIVERSITY OF TECHNOLOGY

COS10025

Technology in an Indigenous Context Project

Final project reflection report

Project Title: Yuendumu – Resolving water scarcity with environmental friendly water purification and filtration system

Student Name: Xuan Tuan Minh Nguyen

Student ID: 103819212

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I acknowledge the Wurundjeri people of the Kulin Nation, who owned the land of Melbourne's east, which Hawthorn campus of Swinburne resides, where this report is based. I respect the honour of Wurundjeri Country and its history, culture and spirituality. Moreover, I also acknowledge and respect all Aboriginal and Torres Strait Islander, as well as the Elders, Ancestors, customs and legacy of the traditional owners of Australia lands.

Declaration

I declare that this report is my individual work. I have not copied from any other student's work or from any other source except where due acknowledgment is made explicitly in the text, nor has any part of this submission been written for me by another person.

Signature: Xuan Tuan Minh Nguyen

Part A:

Introduction (Project Description)

Residing in the Northern Territory, 293 km away from the northwest of Alice Springs, Yuendumu is home to the Walpiri communities, which is one of the most enduring Indigenous Communities in Australia. In terms of cultural and historical values, Yuendumu is currently facing lots of environmental challenges, one of them is the lack of clean and reliable water sources. The current existing water sources are getting contaminated this could be a hazard for them to use and drink it daily. For this reason, Yuendumu residents have to depend on the poor and limited water supplies, which negatively affects their health and their daily life quality.

Moreover, according to the ABC article "Yuendumu in Central Australia at 'severe risk' of running out of water" written by Beavan Katrina (2019, publish by ABC), due to the impure and unreliable sources of water, some water-related diseases, such as parasite ailments and gastrointestinal infections, are creeping into the residents life, making it a stubborn problem to get through. Thus, an environmental-friendly, sustainable and easy-to-use water purification and filtration system is essential to help the Yuendumu residents overcome this problem.

Our group project - "Yuendumu – Resolving water scarcity with an environmentally friendly water purification and filtration system" focusing on creating a sustainable, reliable and easy-to-use water purification system that could immediately address the water supply crisis problem in Yuendumu. We aim to create a self-sustainable device that could reduce the community's dependence on fossil fuels by replacing it with a solution that is more friendly to the environment, which incorporates and integrates natural and renewable energy sources, such as biological components or solar energy. Additionally, our solution also contributes to supporting worldwide strategies in order to curb climate change and encourage in developing more sustainable solutions in remote towns.

Recommended option to proceed

In the initial plans, there are a total of six distinct designs, each of them containing the use of different environmental friendly components, such as biological and solar energy to purify and create a safe and drinkable water source. However, after a number of debates and considerations, we have decided to come up with the two most ideal designs that are suitable based on the conditions of Yuendumu, which is the implementation of using solar panels to clean the river, wells, lakes and channels water and the bio-sand filter system. In my opinion, the one that I will choose to stick with in this report is the solar panels as this implementation idea offers a vast amount of advantages and positive impacts for present and further use compared to the bio-sand filter system, thus making it perfectly suitable for the Yuendumu community based on their current conditions.

Specifically, this design idea offers several key components and procedures in order to ensure the provision of a clean and reliable water source. It practices the use of solar energy to get rid of the infections and purity the water from various local sources. The most essential component that makes up this design idea is the solar panels and some parabolic troughs, which are used to harvest the sunlight and boil the water. Other than those components, this solution also includes a closed lid for storing the steams, a tank that could be able to store filtered and unfiltered water on each chambers, ceramic and carbon filters for removing

impurities and microbials, and a pipe that has the mission of channeling steam water from the troughs to the filtered tank. The filtration process starts with boiling up the water into the intense heat using the solar troughs, which disinfects all of the microbes and bacteria, while settling the sediments at the bottom of the barrel and raising the streams to the lid. Finally, before the water is going to the filtered tank, it will go through the ceramic and carbon filters that will eliminate microorganisms and impurities.

The use of solar in water treatment offers a range of benefits. Firstly, according to a research on Yuendumu weather conditions that is written by Energy Makeover A Breakdown: The Australian State That Gets The Most Sunshine (Dec, 2022), the state of Northern Territory is the second highest state in Australia in terms of the amount of received sunlight yearly, which is 14.1 percents, behind Western Australia with 14.6 percents. Thus proves that this solution is a highly sustainable and sustainable approach for Yuendumu, which has abundant sunlight and less rainfall. By using solar energy, this design idea ensures a consistent and natural power for purifying water, eliminating the dependency of chemical fuels and lowering greenhouse gas emissions. These advantages contribute to environmental responsibility, which helps catch up with the global trend of using cleaner and greener energy sources. Moreover, this design terminology also focuses on improving access to reliable and drinkable water sources by eliminating a range of harmful bacterias and viruses, thereby increasing the health and safety for the local communities. In the communities where waterborne disease is a persistent problem and weather is not really suitable, such as Yuendumu township, the solar water treatment plays a major role in offering a reliable and clean solution that could reduce the illness and increase the overall life expectancy of the community.

Beside the benefits, the solar water treatment system also promises bright and many-sided impacts on the Yuendumu communities. First of all, it enhances the community's health by providing a persistent, clean and drinkable water source, dropping the risk of waterborne diseases and improving the well-being of the residents. In addition, this design also helps to empower the community by pushing up the awareness and the education of sustainable practices and renewable energy methods, thus promoting self-sufficiency and environmental management. The solar water treatment system also contributes to the conservation of fossil resources and reduces greenhouse gas emissions, thus reserving a seat in with global efforts to fight against climate change. Moreover, the design also aims to lower the cost of providing clean water by the ability to filter diverse water sources, decreasing material expenses through using sustainable energy sources and eliminating the requirements of using electricity and chemical components such as chlorine. Overall, the solar water treatment enhances the public health, community empowerment, sustainability and environment responsibility inside the community of Yuendumu.

However, this design idea also has potential constraints that needs to be recognised and understood in order to successfully implement and operate in a sustainable way. One constraint that is most concern for this design is the high initial setup cost, which could be the largest barrier to remote communities, in this case Yuendumu, as most of the remote communities are facing lack of financial support. In another case, this design is a weather-dependent design, meaning that it could not be effective during rainy days and night time. Finally, maintenance and technical expertise for the system is also another issue to concern, as a comprehensive training personnel development programs is essential but is a big challenge to deploy in such a remote community like Yuendumu.

In general, although there are still several disadvantages that need to be considered, applying solar water treatment design into the Yuendumu community offers a range of benefits, including sustainability, stable health, community empowerment and environmental responsibility. This design promises to align with the sustainable environmental goals, providing opportunities for education, community engagement and a bright future for using clean and green energy to deploy more innovations.

Part B: Project reflection

Group Work Reflection

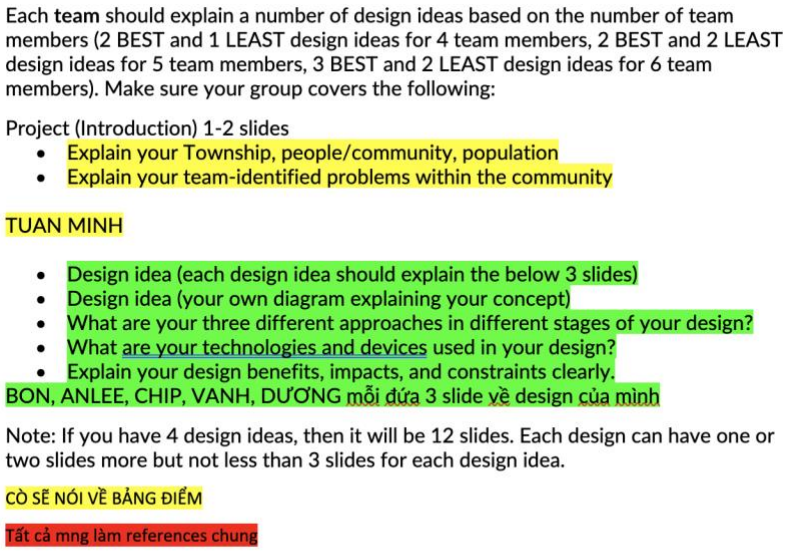
1. Describe the group work strategies/processes that worked for your team.
   The strategies that I think work the most for my group is maintaining period meetings via multiple online social-media platforms, such as Facebook, Discord and Microsoft Teams in order to have a clear discussion and getting every team member to understand the core objective of the issues and the solutions in the Yuendumu community. Moreover, these meeting sessions are also where we divide the work to each team member, ensuring everyone is equally doing the job. For instance, while myself focusing on doing the information and justification, every team member will be responsible for doing the introduction and finding references (one for each team member). In addition, our group is wide-open and acknowledges any new ideas and perspectives, for instance, Nhat Minh has hosted a meeting just to discuss any advantages and disadvantages on the proposal projects and finding out if there are any solutions that are better than those.

2. Describe the group work strategies/processes that did not work for your team.
   Throughout the course, our group has faced several problems, mostly caused by applying wrong strategies and not having good time management. For instance, our group has a late submission in Week 4, due to the long review time on some essential details. Moreover, although the work is divided equally, a disproportion of individual workloads had a big impact on our overall result. We only concentrated on doing with the word content, and forgot the visual content such as figures and diagrams in the report. Thus negatively affecting the final evaluation result of the report.

3. Describe what could be improved on next time you work in a group. This should be from your individual perspective, e.g., "not working with person X" is not something **you** can change.
   In order to prevent mistakes in the future group projects, I would improve my time management skill by setting the deadline time earlier for my task or the group task, this would allow me to have more time to review and fix any mistakes, thus reducing the late submissions. Moreover, thinking is also an essential skill that I must improve. In order to deliver the work more efficiently and equally, I must calculate if there are any categories that need to be implemented first and deliver it to the member once I have finished calculating. Fixing these mistakes could promote more efficient group work thus increasing the quality output.

4. Describe an event/action (add evidences) in your team (i.e., not just from you) that you think was outstanding with respect to each of:
   a. Team organisation
      In our team, the workload is assigned equally to each team member, even if the co-leader or leader must have the same workload as the team member. Each team member was responsible for each task to ensure that the tasks

were distributed fairly. For instance, while Thu is responsible for facilitating the conversation and asking questions to the tutor, Tung Duong, Phuong Doanh and Nhat Minh are taking part in finding sources and information for the project. My mission is to host the meeting, editing and confirming the content before submitting and Viet Anh is responsible for providing the time for everyone to join the meeting.



Each **team** should explain a number of design ideas based on the number of team members (2 BEST and 1 LEAST design ideas for 4 team members, 2 BEST and 2 LEAST design ideas for 5 team members, 3 BEST and 2 LEAST design ideas for 6 team members). Make sure your group covers the following:

Project (Introduction) 1-2 slides

- Explain your Township, people/community, population
- Explain your team-identified problems within the community

TUAN MINH

- Design idea (each design idea should explain the below 3 slides)
- Design idea (your own diagram explaining your concept)
- What are your three different approaches in different stages of your design?
- What are your technologies and devices used in your design?
- Explain your design benefits, impacts, and constraints clearly.

BON, ANLEE, CHIP, VANH, DƯƠNG mỗi đứa 3 slide về design của mình

Note: If you have 4 design ideas, then it will be 12 slides. Each design can have one or two slides more but not less than 3 slides for each design idea.

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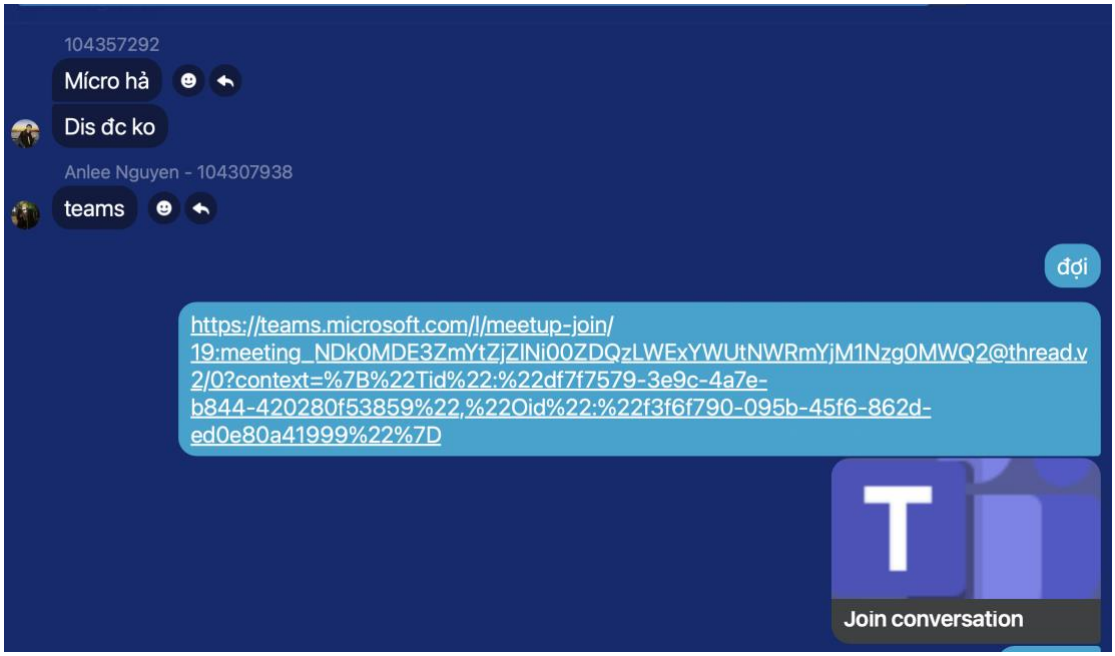
Tất cả mng làm references chung

b. Meetings

During the workshops, we had discussed what we will do and divided the workflow in order to provide an effective workflow for finalizing the weekly activities. However, there is still a late submission at Week 4, mostly from our long review time and misunderstood content. Our Discord and Microsoft Teams meeting sessions were very exalted and productive with lots of new ideas and perspectives in terms of design ideas and work fulfillment. My mission in the meeting is to provide perspectives about the new ideas, evaluating the appropriateness of the idea and dividing workload to the team member.



c. Delivery of the project design ideas
In the first few weeks, we have gone through multiple debates and brainstorms to figure out which solution would be suitable for our project, with each member providing five distinct design concepts for consideration. Despite difficulties in finding and identifying specific concerns, we have concentrated on addressing the lack of water sources in Yuendumu and providing solutions for the problem by one design idea per each team member. This results in variable design solutions that address the Yuendumu water sources issue.

d. Delivery of the Innovation concept
Our team carefully stuck with the requirements throughout the Innovation concept project, we have focused on pointing out five categories of concept, process, advantage, impact and constraints on all five design ideas. However, because the lack of references and content focused, we eventually got a point loss throughout the review although we have done really well on design ideas and the quality of writing. 15.5 out of 20 is an appropriate score for this project, with some improvements that need to be made on technological aspects, justifications for cultural appropriateness and format-related issues.

e. Delivery of the final presentation
For the final presentation, we divided roles equally to the group members in order to achieve the greatest outcome for the final presentation. However, we have encountered some major challenges in the presentation stage, such as the lack of three different approaches and the justifications that led to unwanted results. Despite the result not as we expected, we are happy with the presentation as it is well-prepared and neatly followed the requirements. However, the team's satisfaction for this project is still disappointing because we have not achieved what we have expected.

Individual Work Reflection

- Project tasks
    - Describe your tasks in the group project in each phase of the project (add evidences)
        - Phase 1 – Identifying township and the team problem
        - At first, I was keen on sticking with the internet-related problem in the Parngurr, which is a remote town in the middle of Western Australia. Although there are a range of informations for the technology that has been applied in Parngurr, however the technological aspects of this field is too complex and would take a lot of time to do research. After carefully discussed with my group, it is clear that this problem is outside of our knowledge and would be a time-wasting if we chose to stick with that. After all, we chose to develop our efforts into Yuendumu and its water scarcity problems. Since the context is easier to understand, it allows our group to provide detailed and better solutions without spending too much time on it.
        - Phase 2 – Develop design ideas, Use design criteria to make standard design ideas, Analysing the benefits, impacts of each design idea
          I have participated in the development and fine-tuning process of the project, which also includes analyzing good and bad perspectives of the design ideas. I have been fascinated with using renewable energy, especially for solar energy and rainwater harvesting for filtering the water. Thus I have spent my efforts researching multiple case studies, papers and insights from experts. I have expressed my research on the team meetings to get feedback and debates from my teammates in order to fine-tune the design ideas.

        - Phase 3 – Desing justification (using score sheets) by scoring the six guidelines
          Once I received the feedback from the tutor, I have taken a revision on my design idea, I have reviewed and taken a look at the appropriateness of my design on the cultural values of the community that we have chosen. The design idea must be appropriate, meet with the Australia health standards in order to create a clean and reliable water source with the lowest cost, ensuring that everyone in the community receives the same high-quality water with the lowest risk potential. Moreover, I have spent plenty of time doing research about the specific requirements and concerns of Yuendumu, which consists of characteristics of the area, resources, weather conditions, etc. to consider that the technology would be suitable with the conditions and lifestyle.

Team 1	Design 1	Design 2	Design 3	Design 4	Desing 5	Desing 6
AE 1	1.333333	2.166667	2.333333	2	2.166667	1.833333
AE 2	1.333333	2.333333	1.833333	2.2	2	1.833333
AE 3	1	2.333333	1.5	1.833333	1.333333	1.5
AE	**1.222222**	**2.277778**	**1.888889**	**2.011111**	**1.833333**	**1.722222**
HS 1	3	2	2	2.166667	2.166667	2
HS 2	2.166667	1.166667	2.333333	1.666667	1.5	1.5
HS 3	1	1.166667	1.666667	1	1	1
	2.055556	**1.444444**	**2**	**1.611111**	**1.555556**	**1.5**
EH 1	3	2.333333	2.833333	2.166667	2	2.333333
EH 2	2.833333	2.333333	2.5	1.666667	2	1.833333
	2.916667	**2.333333**	**2.666667**	**1.916667**	**2**	**2.083333**
AP 1	1.5	2.166667	1.833333	1.833333	1.666667	1.5
AP 2	2.166667	2.166667	2.5	2.5	2	1.333333
	1.833333	**2.166667**	**2.166667**	**2.166667**	**1.833333**	**1.416667**
AF 1	1.666667	2.666667	2.333333	2.333333	2	1.166667
AF 2	1.833333	1.833333	1.666667	2.333333	2	1.666667
AF 3	2	1.833333	2.166667	2.166667	1.666667	1.833333
	1.833333	**2.111111**	**2.055556**	**2.277778**	**1.888889**	**1.555556**
SL 1	2.5	1.166667	2.5	2.333333	1.833333	1.666667
SL 2	2.333333	2.5	2.166667	1.666667	1.666667	1.333333
SL 3	3	2.5	2.833333	1.833333	2.166667	1.5
	2.611111	**2.055556**	**2.5**	**1.944444**	**1.888889**	**1.5**

- Phase 4 – Analysing design average score sheets and improvising design ideas
  At this point, me and my teammates have analyzed and discussed the average scores for each category of the design concept and identified some improvements that could be made. We have chosen three best designs and two least designs based on the analysis.

- Contributions to the group
  - Describe how your efforts contributed to the whole group
    I constantly participated in most aspects of the group's activities, both online and offline sessions. I have contributed to dividing a fair workload to the group member, creating multiple topics with various perspectives on the project to help the group decide which is the best solution to stick on, maintaining the output quality of the project and setting up rules and standards for the group to follow on.

  - Describe how you were involved in the teamwork environment
    As the leader of the group, my responsibility is to create an open environment, in which all perspectives and ideas from any member are fully respected by the other in order to ensure that members in the team are going in the right direction. Moreover, by seeking explanation from the tutor for the hard questions and influencing my team members with a strict set of standards and rules, I intended to improve my team's general knowledge and problem-solving abilities thus contributing to the success of the team.Conclusion and recommendation

  - Conclude your achievement in accordance with the culturally suitable solution (you can pick either 1 or 2 design ideas that suit well)

    In general, the project that is the most suitable for Yuendumu township is design 2 and 3, which is bio-sand filter and solar water treatment. While the solar power treatment brings a new concept of using solar power to purify and filter the water, the design 2 provides a cost-effective and more user-friendly

interface as the components are not expensive and could be found anywhere in nature. However, the general aim of these two design concepts is to create a reliable and safe water source for remote communities with the lowest cost possible.

- Recommend how you could further improve your design ideas within a team environment
  Acknowledge comments and ratings from the community is essential to ensuring long-term, culturally appropriate design solutions. This could be done by obtaining ratings through local people who have authorization to collect and send those comments. In addition, period reports and open communication between members is also essential to refine the project and successfully deploy / maintain the design ideas.

Part C: Unit Learning Outcomes (ULOs)

1. Locate Indigenous knowledge systems and consider how they story the long history of technology, science, and engineering. (add evidences from weekly workshop team activities, weekly seminar reflections, assessments)
   a. Understanding and exploring Indigenous knowledge systems
   b. Ensure the project was undertaken in accordance with locating Indigenous knowledge systems (Technologies)

- **Situation:** Recognizing how Indigenous knowledge is important to the fields of science, engineering and technology
- **Task:** Investigating various Indigenous knowledge to comprehend their historical contributions to science and technology
- **Action:** Examining the ways which various knowledge systems have influenced scientific practices and technological advancements throughout the years. In the project, we were extremely cautious about including indigenous problem-solving methods and communication skills into our ideas.
- **Respond**: Exhibiting a through comprehension of the ways in which Indigenous knowledge informs science and technology while making sure the honors of the project and acknowledges the significance of the systems.

2. Apply relevant knowledge of emerging technologies to a project within an Indigenous context taking into consideration and acknowledging Indigenous histories, worldviews, standpoints, and cultures. (add evidences from weekly workshop team activities, weekly seminar reflections, assessments)
   a. Analysing the challenges, needs and services for the remote Indigenous community
   b. Explore user access, affordability, appropriateness in relation to the design ideas

- **Situation:** Recognising the contextual and historical differences among Indigenous communities on the application of developing technologies
- **Task:** Examining and comprehending remote Indigenous communities' particular communication technology and service requirements, with a focus on their unique issues
- **Action:** Conducting a methodical analysis and assessment of the affordability, appropriateness and accessibility of communication infrastructures in Indigenous environments
- **Respond:** Using cutting-edge knowledge about technology in a project that demonstrates cultural respect and incorporate in Indigenous histories, perspective while linking the identified challenges for the communities.

3. Function as an effective team member using project management tools and demonstrating professionalism and ethical behaviour. (add evidences from weekly workshop team activities, weekly seminar reflections, assessments)
    a. Attended team meetings, facilitator meetings and workshops
    b. Assisted in planning for the team
    c. Delivered work on time for the team

- **Situation:** Effectively contribute to the project, including all team-related events such as meetings, workshops and facilitator interactions
- **Task:** Work with team to schedule and coordinate events, ensuring that team member understood their responsibilities and efficiently reached the deadlines
- **Action:** Actively participating in a range of team discussions, including inside and outside of the workshops. I also ensure that my task was completed before deadline and make sure that the team's activities were well-organized
- **Respond: Displayed** the expertise by consistently taking part in group activities, finishing tasks before deadline and actively collaborating with the group. Therefore guarantee the successful of the team's achievement

4. Communicate within teams, stakeholders using appropriate verbal, written, and technological approaches. (add evidences from weekly workshop team activities, weekly seminar reflections, assessments)
    a. Contributed to team meetings
    b. Engaged with facilitator meetings
    c. Proficient in verbal communication, both presentations and conversation
    d. Proficient in written communication, both reports and online interaction
    e. Made use of other tools (e.g., online brainstorming tools) to interact with others

- **Situation:** Fully participating in workshop and discussions that focused on the role of emerging in both local, global and sustainable contexts. Understanding the importance of technology design that is culturally appropriatre for a given culture
- **Task:** Finding out the many contexts of developing technologies, with an emphasis on cultural sensitivity in both local and global contexts. Analysed the design concept's relationship to the integration of sustainable lives in both local and global implications.
- **Action:** Work with a team to investigate the contexts of developing technologies, emphasizing on design's cultural relevance. This entailed in-depth discussions on sustainable livelihoods and how it related with the given design idea.
- **Respond:** Demonstrated a deep understanding on the diverse effects of evolving technology, especially in regional, worldwide and ecological consequences. Considering these observations into the proposed design idea, considering cultural appropriateness and the promotion of sustainable livelihoods within the community.

Part D: Reference

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