

Reflections of Decolonizing exercises in a Systems Engineering Capstone

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Reflections of Decolonizing Exercises in a Systems Engineering Capstone

Systems Engineering (SE) lifecycle artifacts are built to support an engineering concept development from cradle to grave. For SE students, that full life cycle planning and design happens in their capstone course. The Systems Engineering Capstone class is usually taught as the last course for any Master of Systems Engineering program. Within the class, students pursue a team project where they apply systems engineering methods to a specific problem. They then create the final deliverable with a systems engineering management plan. While students receive strong technical training within this experience, ethical and justice-oriented skillsets and mindsets are lacking if not non-existent. For example, decolonization strategies – the ability to critically examine systems and power differentials through systems design – are not taught. In systems engineering programs, students are usually not exposed to that kind of literature nor do faculty often recognize its importance. More study needs to be done to understand this gap.

For this paper, we present a case study on the relevance and impact of decolonization concepts on multiple systems engineering artifacts. We chose to study a systems engineering capstone class to build on our past work in the decolonizing stakeholder analysis paper presented in ASEE 2024. We expand the research to include all deliverables expected of any systems engineering capstones. The goal was to give systems engineering students new tools to self-examine their SE artifact from the decolonialization perspective. All of the students were full-time professionals working in the defense industrial complex and had more than 5 years of experience. In this paper we build on the insights of our stakeholder analysis paper by having all teams include a stakeholder analysis with emphasis on decolonial aspects. We will also build reflection on the generated systems engineering artifacts such as requirements, trade space and architecture, test and evaluation, and lifecycle management plans. At the end of the course the students were asked to reflect on the exercise and express its relevance to Systems Engineering and Systems Engineering education. In this paper we present the results of the study and key takeaways for systems engineering educators on easy to implement exercises helping Systems Engineering students articulate human diversity more centrally in their artifacts.

Literature Review

Stakeholder analysis is a critical tool for engineering education which could be made more inclusive and critical. The use of traditional models of stakeholder analysis, while centering the “user” in the creation of systems and products, can miss out on critical questions of equity, fairness, and inclusion. In order to affect change in the stakeholder analysis process, systems engineering educators have an opportunity to create more meaningful experiences and activities to help students think about decolonizing engineering processes [1].

Issues of equity are not just with marginalized populations but also with new tech, new methods, and a loss of objective critical thinking with the introduction of bias into systems. If students are not attuned to these potential biases, there is a high probability that they will be replicating unequal systems in their own systems design [2]. This can have particularly dire consequences in situations where health of a population is affected by that bias, such as design of medical devices that disenfranchise those who are not fully able-bodied or tests that are ineffective on

populations due to skin pigmentation such as in skin cancer screening [3]. Bias in systems design, if not properly addressed, can cause harm that is irreparable.

What prevents engineers from addressing biases in their process and products? For many, that lack of awareness or skillset stems from the curriculum they received in their engineering education [4]. For others, they are not skilled or supported in addressing the power dynamics that can influence issues of bias and inequality in their professional work, systems design, and project team interactions [5].

This is changing, however, and some curricula are being developed and used in the classroom to support students' ability to recognize and address bias [6]. While this is a promising development, this training can be inconsistent and circumstantial—rather than a part of International Council on Systems Engineering (INCOSE) or Accreditation Board for Engineering and Technology (ABET) and therefore has not been regularized to the extent of systems-wide engineering education change [7]. Thus, we have an important opportunity to study this training and reflection in settings to understand its impact on developing engineers.

Engineering capstones are one space where educators can support the process and practice of bias checking and critical reflection, where there are clear gaps between engineers and policy-makers [8]. In the following study, we will delve further into our context—an engineering capstone course—and the learnings we gleaned from a review of student reflections and artifacts.

Methods

We conducted this study as a qualitative evaluation of systems engineering artifacts such as stakeholder analysis from a graduate-level systems engineering capstone course (SYS 585). The research questions that guided our work were:

- What pedagogical tools might we design that help students to consider community voice and human impacts of their system design?
- What potential value does decolonization tools bring to systems engineering education?
- What is the impact of decolonization exercises on systems engineering methods?
- How does *explicit* reflection of decolonization impact the educational insights and final project creation for graduate-level systems engineering students?

In order to answer these questions, we conducted a qualitative analysis of student artifacts from the systems engineering capstone course. After reviewing initial materials WPI's IRB determined that the study was exempt from further review (see Appendix 1) and the course and students in it could be used as a case study. While completing Concept of Operations (CONOPS) and the requirements deliverable, the student teams were asked to answer some additional questions as shown in the following example. We took a grounded theory approach to qualitative data analysis to create a thematic codebook that would then be cross-referenced with our use of Microsoft Copilot to analyze these student artifacts from the SYS 585 course[9].

Course Description

SYS 585 Systems Engineering Capstone Experience is a culminating course that draws both students and working professionals who have returned for further formal education to meet career goals. The purpose of the course is to provide a space for students to apply the concepts, skills, and knowledge gained through the curriculum in a practical project with real-world implications. Students were “encouraged to select projects with practical significance for the advancement of their company’s competitive position as well as their own personal development.”

To begin the term, students were provided with a lecture – drawing from the authors 2024 ASEE presentation on decolonizing stakeholder analysis – to orient to the concepts of decolonization, equity, and stakeholder analysis. The students were asked to incorporate the decolonization rubric defined in Figure 1 and decolonial thinking in their stakeholder analysis process and in their deliverables. They were given the choice to opt in or out of this decolonization approach. 2 out of 4 teams (teams 2 and 3) completed the optional reflection for each assignment that connected the concepts of decolonization and systems design. The assignments given to all students are elaborated in Table I.

TABLE I
STUDENT ASSIGNMENTS IN SYS 585

Unit	Activity 1	Activity 2
1	Project Description	Form Teams
2	Concept of Operations (CONOPS)	Student Work Plan
3	Decolonization deliverable: requirements	Capstone Project Organization and Staffing Plan
4	Trade Study (Analysis of Alternatives)	System Architecture of Selected Alternative
5	Test and Evaluation Plan	Risk Management Plan
6	Life Cycle Management Plan	Dry Runs of Final Presentations
7	Final Project Presentations (with sponsors, WPI faculty/staff, etc.)	N/A
8	Final Project Report Due	Decolonization Reflections

Part 1. Collected reflection of students’ assignment using decolonization questions

While completing the CONOPS and requirements deliverable the student teams were requested to answer some additional questions as shown in the following example. This is especially valuable when you link the stakeholder to the requirements generated by each stakeholder. An instructor can also highlight each of the decolonized requirements as a result of these questions. The example from this case study is outlined in Figure 1.

Stakeholders	Requirements
Users (Traffic Police, Security, Investigators, Traffic Control Center,	The system should: • Be easy to use

Department of Transportation, Law Enforcement)	• Be easy to install • Consume less space in the device • Should be compatible with hardware devices like mobile, laptops, other screens, etc. • Run fast (Give fast output) • Give correct output (accuracy)
<i>Decolonizing Questions for Users: Does the system add any inequitable burdens or benefits to a population? How might you design to avoid that inequity?</i>	
Dataset Owners and Maintainers	The dataset owners and maintainers ensure that the system is not misusing the dataset provided by them. The system should only use the dataset for the defined and agreed purpose. (In deep learning world, to use the dataset of any kind an agreement is required to be signed with the dataset owner, only then access is given to the deep learning engineer)
<i>Decolonizing Question for Dataset Owners and Maintainers: How is the data protected? Is there a history of misuse of data against the community/population? Are there concerns or considerations to build into your process to ensure the data you have collected will be used appropriately and to the benefit of those who are directly impacted by the system design?</i>	
Software Developer and Updater	The software developers will handle the updates and changes in the existing system. Therefore, it is necessary for the system to be updatable and not fixed.
<i>Decolonizing Question for Software Developer and Updater: Who is designing the software and what biases, lenses, or assumptions might they bring to the project? How might the developer reflect upon and address those biases? How can we check our assumptions?</i>	
Competitors	The competitors would always come up with a better deep learning model for the system.
<i>Decolonizing Question for Competitors: How does the ethical conduct of your entity or project influence the accepted norms of how others in the field conduct their own systems design and implementation? Can your work set a standard for ethics and justice in the design process that influences the field?</i>	

Figure 1. Stakeholder requirements worksheet with associated decolonization questions [7].

Part 2. Review of systems engineering design tools from a decolonization lens

The student teams were requested to answer the following questions for each of their deliverables in a separate word document. This part was not be graded.

1. Who is driving this process?
2. Who has power in this process?
3. What societal/ historical / identity considerations were taken?
4. Who is missing in the process?
5. What are the ethical challenges that might be posed?
6. How might we get to full participation in the process?

The last part of the study was for the students to submit one paragraph each reflecting on their decolonization exercise. Along with the final report the student must “Submit one document containing one or more paragraph per student reflecting on the decolonization questions and its impact on systems engineering methods.”

The “decolonization of stakeholders” artifact gave them a concrete example of the decolonization question. The six questions helped students organize their thoughts around theoretical aspects of decolonization. The reflection exercise was intended for students to synthesize and internalize how these exercise methods can manifest in their day-to-day work environments.

The study data comprised of 21 students of which 11 were women and 10 were men. They self-selected to form 5 teams. The demographic information for each team is as follows: Team 1 was a four-member team with all women; Team 2 was a four-member team with two women and two men; Team 3 was a five-member team with three women and two men; Team 4 was a three-member team with two men and one woman; and Team 5 was a five-member team with all men.

Team 4 had signed a Non Disclosure Agreement with Worcester Polytechnic Institute (WPI) and therefore, while they completed all their assignments their results are not included in this study. Additionally, Team 5 did not submit any reflections of the exercise. Team 1 completed the reflection exercise but did not address the six questions for each assignment. Teams 2 and 3, however, completed all the decolonization exercises for each assignment and submitted their final reflections.

Qualitative research methodology was used to understand the emerging themes within the teams and solutions of systems engineering in their reflections. The results are therefore divided into two parts: one of team perspectives and one of individual perspectives. Since teams 2 and 3 had a complete set of data, their work was used to analyze team evolution across the project lifecycle. The data from teams 1 and 5 was reviewed but not added for evolving themes analysis. For individual perspective analysis all students from teams 1, 2 and 3 had completed their review and therefore were considered.

The research team read all the assignments and coded all identifiable data to anonymize data. They then used generative AI to read and analyze the evolution of themes within the team perspective and analyze the individual reflections for solutions. The prompt used and the MS Copilot session can be found in the Appendix 2. The team chose Copilot as the qualitative analysis tool because it has enterprise data protection and was available through their institution. There were two levels of review for the analysis generated by the Copilot. First, the engineering faculty cross-checked for hallucination and misinformation and interpreted the theme connection to engineering education and learning. Second, the social science faculty cross referenced and interpreted the data to ensure that the results accurately captured the nuance and context of the answers.

In the first round of Copilot data analysis, the prompts used for team perspectives analysis in sequential order were:

1. Analyze the emerging themes for the 6 decolonization questions and present your analysis with clear summary of how themes emerged for each question I upload 3 set of these question and their answers
2. Compare your answers and show how themes evolved from first to second and third
3. Analyze the themes in the reflections on decolonization exercise by this team

The prompts used for individual final reflections were:

1. Analyse and summarize the following reflection and quote important sentences also let me know if gender dynamics are at play
2. What is common to all
3. Did any student find that they did not have agency
4. Any solutions presented to incorporate these in systems engineering

The next section shows the findings of the research study, please see the Appendix 2 for all the results generated by the Copilot and its associated prompts. The team numbers and their projects are:

- Team 1: Assisted Car Technology
- Team 2: Online Voting system
- Team 3: Energy Producing Rental Bike platform
- Team 5: Rapid Air Evacuation Systems

Results and Findings

The goal of this research was to identify themes within the systems engineering capstone teams and individuals to help define the role of decolonization within systems engineering methods. Our grounded theory analysis of the student artifacts raised a few thematic areas that indicate learning and growth related to their ability to understand and address bias and power dynamics. What we found was that all students who completed their exercise found the concept of decolonization not only relevant within a team project but also aligned with their systems engineering work such as stakeholder analysis and other artifacts development.

Table II shows the summary of the team perspectives and emergent themes within the four teams' artifacts examined in this study. The emergent themes were cross referenced by both authors to ensure accuracy across the generated AI and actual study data.

TABLE II
Thematic analysis of responses to decolonization questions

Decolonization Questions		Themes					
Q1	Who is Driving the Process?	Responsibility / Leadership (1, 2, 3)	Collaboration (2, 3, 5)	Stakeholder Involvement (5)			
Q2	Who has Power in this process?	Stakeholder Influence (2, 3, 5)	Regulatory Compliance (2, 3)	Systems Engineers (1, 5)			
Q3	What Societal/historical/identity considerations?	Societal Impact (3, 5)	Identity Alignment (2, 3)	Societal Trust (2)	Inclusive of both able and disabled people (1)	Regulatory standards (5)	
Q4	Who is Missing in this process?	User Involvement (3)	Inclusion of Officials (2)	Comprehensive Involvement (1, 2)	Human Factors (5)	Ethical and Legal oversight (5)	
Q5	What are Ethical Challenges that might be posed?	Fairness and Equity (3)	Transparency (3)	Voter Fraud Prevention (2)	System Integrity (2)	Data Privacy and Cybersecurity (1)	Evacuation Prioritization (5)
Q6	How might we get to Full Participation in the process?	Stakeholder Engagement (3, 5)	Better Communication (3)	Building Confidence (2)	Overcoming Trust (2)	Active Engagement and Outreach (1)	Feedback loops (5)

Blue sections indicate that more than 3 teams found the topic as a common theme and green sections indicate that 2 teams discussed the same theme. It was interesting to see that there was no overlap of ethical challenges in each domain. While it can be argued that the system integrity in Team 2 can have an overlap with cybersecurity, this is at a larger sense of technical challenges instead of ethical ones. Table III shows that there is some agreement of the first three questions across all teams, because those questions are aligned questions about stakeholders and goals in the concept development stage of systems engineering life cycle. However, ethics and justice-centered themes are not stated in the systems engineering life cycle but were included within our process life cycle models and prompts. Therefore, this shows the divergence in the evolving themes. It also indicates that students, even at this advanced stage of their education, are still not attuned to or fully aware of what constitutes an ethical challenge and ways to address it.

Next, we examine the individual reflection which was collected as part of the final assignment. All but the students in Team 5 submitted their reflections. In Table III, we summarize thematic insights from analyzing their individual reflections. The themes that arose were: Gaining New Perspectives, Power Dynamics, Stakeholder Impact, Inclusivity and Accessibility, Historical Implications, Security and Safety, Lack of Agency, and Value.

TABLE III
Emergent themes from student final reflections

Student	New Perspective	Power	Stakeholder Impact	Ethics	Inclusivity/ Accessibility	Historical Implications	Security/ Safety	No Agency	Value
T3P1	X	X	X						
T3P2	X		X						
T3P3	X			X	X				
T3P4	X	X				X			
T3P5	X	X	X						
T2P1	X			X			X		
T2P2	X			X	X				
T2P3		X			X				
T2P4	X				X				
T1P1	X				X			X	X
T1P2	X				X				
T1P3								X	X
T1P4					X				

While New Perspectives was the most prominent theme followed by Inclusivity, students also mentioned that it helped expand aspects of systems thinking used in the systems engineering courses. One student reflected that *"The decolonization questions add a new dimension to systems thinking."* This indicates these questions help students build on the systems concepts and critically think about not only current systems but future systems. Another student articulated the need for critical reflection on second and third hand effects, as well as the impact on unanticipated stakeholders by saying, *"Current and future system engineers will need to adapt and design systems that not only address the immediate technical specifications but also account for secondary and tertiary dependencies and their effects."*

Author Bhada in her courses has tried to help students think through these dependencies from technical perspectives, but decolonization helps them think through human and planet impact to truly visualize and validate systems holistically. There are multiple ways in which the students believe these questions and studies will help systems engineering. One student summarized by sharing, *"It contributes to a holistic approach to systems engineering that can better meet the needs of all communities, especially those that are marginalized."*

One interesting data point was that two students mentioned the value of this exercise while also noting that they do not have an agency to change it within their organization since the process is developed and implemented through company policy. Author Bhada would argue that every systems engineer has an agency and while sometimes the change is slow to happen if there is value it can be incorporated.

Discussion and Implications

Through this case study, we learned two critical insights in the context of engineering education and decolonization. First, we need to equip students with the tools they need to better address the bias and power dynamics in their work. The critical reflection and associated decision-making rubric were one way that students were prompted to articulate potential bias and erasure in systems design. Another potential tool for engineers to use is checklists. Checklists are a simple but powerful tool for designers and engineers to use in order to make systematic changes within larger systems. By adding in checks to the many stages of the design process, we help engineers build habits of mind to be looking for imbalances, biases, or inequities.

In addition, tools that prompt learners to go deeper—beyond the obvious stakeholders—are also critical. While engineers might identify stakeholders as those who will experience first level effects of the engagement or design, the second and third order impacts, unintended consequences, or overlooking and erasure of certain populations are also important to evaluate. This approach of centering the margins addresses the 2% that is missing from the discussion when so much of design is focused on the needs of the majority.

The second critical insight is that students are also unaware of their role in addressing power dynamics and bias in systems engineering or feel powerless to do so. This is an important topic for engineering educators as they endeavor to develop the additional skillsets of students in terms of their ethics and engagement with society.

Implications of this work are limited, due to the small sample size for this first pilot. However, the potential for future exploration for researchers is clear. We have indications that there is more to study in the space of engineering education to address biases, power dynamics, and decolonization. Students indicated the value of learning about this understudied area and a larger effort in the future could help to gain more evidence of ways in which decolonial systems engineering curriculum might be scaled.

Beyond the research findings, we intend to design tools and approaches to better help systems engineering students explore the concept within the context of the final capstone in their graduate studies. Through a scaffolded approach to student engagement and education, students in a system engineering capstone can use rubrics and reflection to deepen their understanding of power dynamics and bias. We have evidence from this study that the rubric and tool we designed was, in fact, supportive of student learning and analysis in their systems design. The reflections and prompted discussions of decolonization did support student awareness and incorporation of decoloniality in their process and products.

Additionally, the use of Microsoft Copilot for guided qualitative analysis gives researchers a potential tool to support their data analysis in future if done in a way that is consistent, validity-checked, and robust. The use of Copilot for educators, too, is an interesting takeaway, as it can help instructors better evaluate student trends over time in their thinking through analysis of their artifacts. This helps to identify gaps and opportunities for student learning and for research.

Conclusion

The systems engineering capstone experience is but one space in systems engineering education that can help students develop their skills of critical reflection and bias detection. While this study establishes the value of using decolonization questions more work is required in formalizing these approaches. We believe formal inclusion of these questions, tools, and methods within Systems Engineering Book of Knowledge or INCOSE Handbook technical processes will help contribute to the practice of systems engineering. The inclusion of these topics in the seminal texts of systems engineering is one important step towards regularization of these topics in education. At the same time, we recognize that a cultural shift needs to occur for engineering educators to both feel comfortable and equipped to teach decolonial systems design, as well as having the tools to effectively do so.

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Appendix 1

WPI IRB Approval and Exemption

WORCESTER POLYTECHNIC INSTITUTE

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Institutional Review Board

FWA #00030698 - HHS #00007374

Notification of IRB Approval

Date: 05-Nov-2024

PI: Shamsnaz V Bhada
Protocol Number: IRB-25-0072
Protocol Title: Decolonization of Systems Engineering Tools

Approved Study Personnel: Bhada, Shamsnaz V~Stanlick, Sarah~

Effective Date: 05-Nov-2024

Exemption Category: 2

Sponsor*:

The WPI Institutional Review Board (IRB) has reviewed the materials submitted with regard to the above-mentioned protocol. We have determined that this research is exempt from further IRB review under 45 CFR § 46.104 (d). For a detailed description of the categories of exempt research, please refer to the [IRB website](#).

The study is approved indefinitely unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific approval must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue. You are also required to report any adverse events with regard to your study subjects or their data.

Changes to the research which might affect its exempt status must be submitted to the WPI IRB for review and approval before such changes are put into practice. A full IRB application may be required in order for the research to continue.

Please contact the IRB at irb@wpi.edu if you have any questions.

*if blank, the IRB has not reviewed any funding proposal for this protocol

Appendix 2

Copilot Prompts and Responses

Team 3 Team Perspectives

Prompt 1: Analyze the emerging themes for the 6 decolonization questions and present your analysis with clear summary of how themes emerged for each question I upload 3 set of these question and their answers.

Thank you for sharing the questions and answers. I'll analyze the emerging themes for each question and provide a clear summary.

1. Who is driving this process?

Emerging Themes:

- **Responsibility and Leadership:** The company and Energy Producing Rental Bike Platform are both seen as key drivers. The company is responsible for the system's lifecycle, while the Energy Producing Rental Bike Platform's cooperation is crucial for integration and success.
- **Collaboration:** Emphasis on the need for both entities to work together, highlighting the importance of partnership and shared goals.

2. Who has power in this process?

Emerging Themes:

- **Stakeholder Influence:** The Energy Producing Rental Bike Platform is identified as the top stakeholder with significant power due to their investment in time, money, and image.
- **Regulatory Compliance:** Government regulations at various levels also hold power, influencing the system's compliance and implementation.

3. What societal/historical/identity considerations?

Emerging Themes:

- **Societal Impact:** Focus on increasing accessibility to eco-friendly transportation.
- **Identity Alignment:** Importance of aligning the company's identity and branding with eco-friendly values and cost savings.

4. Who is missing in the process?

Emerging Themes:

- **User Involvement:** Initial lack of user input is identified. Emphasis on the need for beta testing and user feedback to ensure the system meets user needs and expectations.

5. What are the ethical challenges that might be posed?

Emerging Themes:

- **Fairness and Equity:** Ethical considerations around how users earn deals based on power generation. The challenge of balancing incentives and fairness among users with different power generation capacities.
- **Transparency:** Importance of clear communication to users about how the system works and how savings are distributed.

6. How might we get to full participation in the process?

Emerging Themes:

- **Stakeholder Engagement:** Strategies to ensure all stakeholders are aware of and excited about the system's benefits.
- **Benefit Communication:** Tailoring messages to different stakeholders (the Energy Producing Rental Bike Platform, users, government) to highlight specific advantages for each group.

These themes emerged from the detailed responses provided for each question, reflecting the key considerations and challenges in the decolonization process. If you need further analysis or have any specific questions, feel free to ask!

Prompt 2: Compare your answers and show how themes evolved from first to second and third

Certainly! Let's compare the themes from the first, second, and third sets of answers to see how they evolved.

1. Who is driving this process?

First Set:

- **Responsibility and Leadership:** The company and the Energy Producing Rental Bike Platform are both key drivers.
- **Collaboration:** Emphasis on partnership and shared goals.

Second Set:

- **Responsibility and Leadership:** The company and the Energy Producing Rental Bike Platform are both key drivers.
- **Collaboration:** Emphasis on partnership and shared goals.

Third Set:

- **Responsibility and Leadership:** The company and the Energy Producing Rental Bike Platform are both key drivers.
- **Collaboration:** Emphasis on partnership and shared goals.

Evolution: The themes remained consistent across all three sets, highlighting the importance of both the company and Bay Wheels in driving the process and the need for collaboration.

2. Who has power in this process?

First Set:

- Stakeholder Influence: The Energy Producing Rental Bike Platform as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Second Set:

- Stakeholder Influence: The Energy Producing Rental Bike Platform as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Third Set:

- Stakeholder Influence: The Energy Producing Rental Bike Platform as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Evolution: The themes remained consistent, emphasizing the significant power held by the Energy Producing Rental Bike Platform and the influence of government regulations.

3. What societal/historical/identity considerations?**First Set:**

- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Second Set:

- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Third Set:

- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Evolution: The themes remained consistent, focusing on societal impact and the importance of aligning the company's identity with eco-friendly values.

4. Who is missing in the process?**First Set:**

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Second Set:

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Third Set:

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Evolution: The themes remained consistent, highlighting the need for user involvement and feedback.

5. What are the ethical challenges that might be posed?

First Set:

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Second Set:

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Third Set:

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Evolution: The themes remained consistent, focusing on fairness, equity, and transparency.

6. How might we get to full participation in the process?

First Set:

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.
- Benefit Communication: Tailoring messages to different stakeholders.

Second Set:

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.
- Benefit Communication: Tailoring messages to different stakeholders.

Third Set:

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.
- Benefit Communication: Tailoring messages to different stakeholders.

Evolution: The themes remained consistent, emphasizing stakeholder engagement and effective communication of benefits.

Overall, the themes across all three sets of answers remained consistent, reflecting the key considerations and challenges in the decolonization process. If you have any further questions or need additional analysis, feel free to ask!

Prompt 3: Analyze the themes in the reflections on decolonization exercise by this team

To analyze the themes in the reflections on the decolonization exercise by this team, I'll focus on the key points and insights provided in their responses. Here are the main themes that emerged:

1. Responsibility and Leadership

- **Company's Role:** The team consistently emphasized that their company is ultimately responsible for the system's lifecycle, from design to retirement.
- **Energy Producing Rental Bike Platform's Role:** The Energy Producing Rental Bike Platform is seen as a crucial partner, driving the process alongside the company due to their investment and integration needs.

2. Stakeholder Influence and Power Dynamics

- **Energy Producing Rental Bike Platform's Influence:** The Energy Producing Rental Bike Platform is identified as the top stakeholder with significant power due to their investment in time, money, and company image.
- **Government Regulations:** The team highlighted the importance of complying with government regulations at various levels, which also hold power over the process.

3. Societal and Identity Considerations

- **Societal Impact:** The team focused on the societal benefits of increased accessibility to eco-friendly transportation.
- **Identity Alignment:** There is a strong emphasis on aligning the company's identity and branding with eco-friendly values and cost savings.

4. User Involvement

- **Initial Exclusion:** The team recognized that users were initially missing from the process and stressed the importance of conducting beta testing and gathering user feedback before full rollout.

5. Ethical Challenges

- **Fairness and Equity:** Ethical considerations around how users earn deals based on power generation were discussed. The team explored the challenge of balancing incentives and fairness among users with different power generation capacities.
- **Transparency:** The importance of clear communication to users about how the system works and how savings are distributed was emphasized.

6. Stakeholder Engagement and Participation

- **Engagement Strategies:** The team proposed strategies to ensure all stakeholders are aware of and excited about the system's benefits.
- **Benefit Communication:** Tailoring messages to different stakeholders (the Energy Producing Rental Bike Platform, users, government) to highlight specific advantages for each group was seen as crucial for full participation.

Summary of Theme Evolution

The themes remained consistent across the three sets of answers, reflecting the team's thorough consideration of the key aspects of the decolonization process. The emphasis on collaboration, stakeholder influence, societal impact, user involvement, ethical challenges, and stakeholder engagement highlights the team's comprehensive approach to addressing the complexities of decolonization.

If you need further analysis or have any specific questions, feel free to ask!

Team 3 Individual final reflection

Prompt 1: Analyze and summarize the following reflection and quote important sentences also let me know if gender dynamics are at play

Analysis and Summary of Reflections

T3P1:

Key Themes:

- **New Perspective:** T3P1 found that the decolonization questions revealed a new side of systems engineering, extending beyond technical aspects to societal, ethical, and power dynamics.
- **Stakeholder Impact:** She highlighted the importance of considering how engineering decisions affect all stakeholders, especially those with little influence, such as end-users.
- **Power Dynamics:** TSP1 noted the inherent power imbalances among stakeholders and the importance of being aware of these dynamics to balance stakeholder needs more fairly.

Important Quotes:

- "The questions demonstrate how systems engineering can extend beyond technical aspects to address societal, ethical, and power dynamics."
- "It almost always feels like there's an inherent power imbalance among stakeholders (like between the government and end-users) that is impossible to overcome."

T3P2

Key Themes:

- **New Practice:** T3P2 had never practiced decolonization before and appreciated the new perspective it provided.
- **Stakeholder Definition:** The questions encouraged the team to define stakeholders and consider who has power and decision authority.
- **Design Validation:** She emphasized the importance of taking a step back to validate the project and ensure it meets all considerations.

Important Quotes:

- "The questions encouraged us to define the stakeholders of the project that we may have overlooked, really diving into who has power and decision authority."
- "I think taking this step back truly allows for the designers to validate the project."

T3P3

Key Themes:

- **Different Perspective:** T3P3 found that the decolonization questions provided a different perspective on the systems engineering process.
- **Ethical Concerns:** He highlighted the importance of considering ethical concerns related to production and rollout, and the impact on communities.
- **Inclusivity:** T3P3 stressed the need to include representatives from various groups to ensure full participation in the SE process.

Important Quotes:

- "The decolonization questions...put a spotlight on individuals who may or may not be able to use the final product, as well as the different ethical concerns that may arise."
- "Considering them and including representatives from these groups to hear their thoughts and ideas is key to having full participation within the SE process."

T3P4

Key Themes:

- **Broader View:** T3P4 found that the decolonization questions helped her think about systems engineering in a broader way, beyond just technical aspects.
- **Power and Conflict:** She noted the importance of considering the power that various stakeholders have and the potential for conflicting opinions and needs.
- **Historical Implications:** T3P4 appreciated the consideration of historical implications in systems engineering.

Important Quotes:

- "The questions really focus on the who/why/how behind some of the major systems engineering methods and concepts."
- "There is seldom thought to the historical implications, so I found that to be a really interesting thing to consider as well."

T3P5

Key Themes:

- **True Stakeholders:** T3P5 appreciated the focus on identifying true stakeholders and understanding their influence on the system.
- **Prioritization:** He emphasized the importance of prioritizing stakeholders and avoiding wasted efforts on less critical stakeholders.
- **Reflection:** T3P5 valued the opportunity to reflect on the scope of work and ensure no stakeholders are missed.

Important Quotes:

- "Getting to the bottom of the first two questions in the list 'Who is driving the process?' and 'Who has power in the process?' is extremely helpful for a leader to understand which stakeholders to prioritize."
- "It is important to have dedicated moments to stop and think to ensure nothing is being washed over."

Gender Dynamics

The reflections do not explicitly mention gender dynamics. However, the diverse perspectives provided by both male and female team members suggest an inclusive approach to the decolonization exercise. Each reflection highlights the importance of considering various stakeholders and power dynamics, which can inherently include gender considerations, even if not explicitly stated.

If you need further analysis or have any specific questions, feel free to ask!

Prompt 2 What is common to all

Across all the reflections, several common themes emerged:

1. **New Perspectives:** All team members found that the decolonization questions provided a new and broader perspective on systems engineering, extending beyond technical aspects to include societal, ethical, and power dynamics.
2. **Stakeholder Consideration:** Each reflection emphasized the importance of identifying and considering all stakeholders, particularly those who might be overlooked or have less influence, such as end-users.
3. **Power Dynamics:** The reflections highlighted the significance of understanding and addressing power imbalances among stakeholders, and the need to balance their wants and needs more fairly.
4. **Ethical Concerns:** Ethical considerations were a common theme, with a focus on how engineering decisions impact communities and individuals, and the importance of transparency and fairness.
5. **Inclusivity and Participation:** The team members stressed the importance of including diverse perspectives and ensuring full participation from all relevant groups in the systems engineering process.
6. **Reflection and Validation:** The reflections underscored the value of taking a step back to validate the project, ensuring that all considerations are addressed and that the project is on the right track.

These common themes reflect a comprehensive and thoughtful approach to the decolonization exercise, highlighting the team's commitment to addressing the complexities of systems engineering in an inclusive and ethical manner.

Prompt 3 Did any student find that they did not have agency

None of the students explicitly mentioned feeling that they did not have agency in the decolonization exercise. However, some reflections did touch on the challenges of power dynamics and the inherent power imbalances among stakeholders. For example:

- **T3P1** noted, "It almost always feels like there's an inherent power imbalance among stakeholders (like between the government and end-users) that is impossible to overcome." This suggests an awareness of limited influence for certain stakeholders, but not necessarily a lack of agency for the students themselves.
- **T3P3** mentioned the importance of considering individuals who may not have access to bikes or may not be able to use normal bikes, highlighting the need to include representatives from these groups. This reflects a recognition of the need to amplify the voices of those who might otherwise be overlooked.

Overall, while the reflections acknowledge power imbalances and the need to consider all stakeholders, they do not indicate that the students themselves felt a lack of agency in the process. Instead, they focused on the importance of being aware of these dynamics and striving for a more inclusive and balanced approach.

Prompt 4 Any solutions presented to incorporate these in systems engineering

Yes, several solutions were presented by the students to incorporate the insights from the decolonization exercise into systems engineering:

1. **Stakeholder Engagement:**

- **T3P2** emphasized the importance of defining stakeholders and considering who has power and decision authority. This involves actively identifying and engaging all relevant stakeholders throughout the project lifecycle.
- **T3P5** highlighted the need to prioritize stakeholders based on their influence and ensure that critical stakeholders are not overlooked.

2. **Ethical Considerations:**

- **T3P3** suggested including representatives from various groups to hear their thoughts and ideas, ensuring that ethical concerns and the impact on communities are considered.
- **T3P1** mentioned the importance of being aware of power dynamics and striving to balance the needs of different stakeholders more fairly.

3. **User Involvement:**

- **T3P4** and **T3P3** both stressed the need to consider end-users and those who might be excluded from the process. This includes conducting beta testing and gathering user feedback to ensure the system meets user needs and expectations.

4. **Reflection and Validation:**

- **T3P2** and **T3P5** emphasized the value of taking a step back to validate the project and ensure that all considerations are addressed. This involves continually referring to the decolonization questions throughout the systems engineering process to check for external considerations and avoid scope creep.

5. **Inclusivity and Participation:**

- **T3P3** and **T3P4** highlighted the importance of including diverse perspectives and ensuring full participation from all relevant groups. This can be achieved by actively

seeking input from underrepresented stakeholders and considering their needs in the design and implementation of the system.

These solutions reflect a comprehensive approach to incorporating the insights from the decolonization exercise into systems engineering, ensuring that the process is inclusive, ethical, and responsive to the needs of all stakeholders.

Team 2 Analysis

Prompt 1: Analyze the emerging themes for the 6 decolonization questions and present your analysis with clear summary of how themes emerged for each question I upload 3 set of these question and their answers

Thank you for providing the detailed information. I'll analyze the emerging themes for the six decolonization questions based on the provided answers and present a clear summary of how these themes emerged for each question.

1. Who is driving this process?

Emerging Themes:

- **Responsibility and Leadership:** The government and voters are identified as the primary drivers of the process. The goal is to create a system that increases efficiencies and voter confidence.
- **Collaboration:** Emphasis on the need for collaboration between the government and voters to achieve the desired outcomes.

2. Who has power in this process?

Emerging Themes:

- **Stakeholder Influence:** Both voters and the government hold significant power. Voter confidence is crucial for the system's success, while the government can influence voter behavior by limiting physical voting locations.
- **Regulatory Influence:** The government's role in regulating and facilitating the process is highlighted.

3. What societal/historical/identity considerations?

Emerging Themes:

- **Societal Trust:** Ensuring voter trust and comfort with the system is a top priority, especially given the uneasiness from previous elections.
- **Identity and Comfort:** The system must address identity considerations by making voters feel their vote counts and that the system is trustworthy.

4. Who is missing in the process?

Emerging Themes:

- **Inclusion of Officials:** The potential exclusion of officials running physical voting locations is noted. The process is largely driven by voters, but the role of these officials should not be overlooked.
- **Comprehensive Involvement:** Ensuring all relevant parties, including those managing physical locations, are included in the process.

5. What are the ethical challenges that might be posed?

Emerging Themes:

- **Voter Fraud Prevention:** Ensuring there is no voter fraud and that each eligible vote is counted accurately is a paramount ethical challenge.
- **System Integrity:** The system must be designed to prevent manipulation and maintain the integrity of the voting process.

6. How might we get to full participation in the process?

Emerging Themes:

- **Building Confidence:** Achieving full participation requires building voter confidence in the system. This involves ensuring voters feel their vote counts and that the system is secure.
- **Overcoming Distrust:** Addressing the distrust some people have towards technology is crucial for full participation.

Summary of Theme Emergence

1. **Responsibility and Leadership:** The themes of responsibility and leadership emerged from the emphasis on the roles of the government and voters in driving the process. Collaboration between these entities is crucial for success.
2. **Stakeholder Influence:** The power dynamics between voters and the government were highlighted, showing the importance of both groups in the process. The government's regulatory role also emerged as a key theme.
3. **Societal Trust and Identity:** The need to build societal trust and address identity considerations emerged from the focus on making voters feel comfortable and confident in the system.
4. **Inclusion of Officials:** The potential exclusion of officials running physical voting locations highlighted the need for comprehensive involvement of all relevant parties.
5. **Ethical Challenges:** Preventing voter fraud and ensuring system integrity were identified as major ethical challenges, emphasizing the importance of designing a secure and trustworthy system.
6. **Building Confidence and Overcoming Distrust:** The themes of building voter confidence and overcoming distrust in technology emerged as crucial for achieving full participation in the process.

These themes reflect the key considerations and challenges in the decolonization process, highlighting the importance of inclusivity, ethical integrity, and stakeholder engagement. If you need further analysis or have any specific questions, feel free to ask!

Prompt 2: Compare your answers and show how themes evolved from first to second and third

Certainly! Let's compare the themes from the first, second, and third sets of answers to see how they evolved.

1. Who is driving this process?

First Set:

- Responsibility and Leadership: The company and Bay Wheels are both key drivers.
- Collaboration: Emphasis on partnership and shared goals.

Second Set:

- Responsibility and Leadership: The company and Bay Wheels are both key drivers.
- Collaboration: Emphasis on partnership and shared goals.

Third Set:

- Responsibility and Leadership: The company and Bay Wheels are both key drivers.
- Collaboration: Emphasis on partnership and shared goals.

Evolution:

The themes remained consistent across all three sets, highlighting the importance of both the company and Bay Wheels in driving the process and the need for collaboration.

2. Who has power in this process?

First Set:

- Stakeholder Influence: Bay Wheels as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Second Set:

- Stakeholder Influence: Bay Wheels as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Third Set:

- Stakeholder Influence: Bay Wheels as the top stakeholder.
- Regulatory Compliance: Government regulations hold power.

Evolution:

The themes remained consistent, emphasizing the significant power held by Bay Wheels and the influence of government regulations.

3. What societal/historical/identity considerations?

First Set:

- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Second Set:



- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Third Set:

- Societal Impact: Increased accessibility to eco-friendly transportation.
- Identity Alignment: Aligning the company's identity with eco-friendly values and cost savings.

Evolution:

The themes remained consistent, focusing on societal impact and the importance of aligning the company's identity with eco-friendly values.

4. Who is missing in the process?**First Set:**

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Second Set:

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Third Set:

- User Involvement: Initial lack of user input. Need for beta testing and user feedback.

Evolution:

The themes remained consistent, highlighting the need for user involvement and feedback.

5. What are the ethical challenges that might be posed?**First Set:**

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Second Set:

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Third Set:

- Fairness and Equity: Ethical considerations around power generation deals.
- Transparency: Importance of clear communication to users.

Evolution:

The themes remained consistent, focusing on fairness, equity, and transparency.

6. How might we get to full participation in the process?**First Set:**

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.

- Benefit Communication: Tailoring messages to different stakeholders.

Second Set:

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.
- Benefit Communication: Tailoring messages to different stakeholders.

Third Set:

- Stakeholder Engagement: Ensuring stakeholders are aware of and excited about the benefits.
- Benefit Communication: Tailoring messages to different stakeholders.

Evolution:

The themes remained consistent, emphasizing stakeholder engagement and effective communication of benefits.

Overall, the themes across all three sets of answers remained consistent, reflecting the key considerations and challenges in the decolonization process. If you have any further questions or need additional analysis, feel free to ask!

Prompt 3: Analyze the themes in the reflections on decolonization exercise by this team

Summary of Theme Emergence

1. **Responsibility and Leadership:** The themes of responsibility and leadership emerged from the emphasis on the roles of the government and voters in driving the process. Collaboration between these entities is crucial for success.
2. **Stakeholder Influence:** The power dynamics between voters and the government were highlighted, showing the importance of both groups in the process. The government's regulatory role also emerged as a key theme.
3. **Societal Trust and Identity:** The need to build societal trust and address identity considerations emerged from the focus on making voters feel comfortable and confident in the system.
4. **Inclusion of Officials:** The potential exclusion of officials running physical voting locations highlighted the need for comprehensive involvement of all relevant parties.
5. **Ethical Challenges:** Preventing voter fraud and ensuring system integrity were identified as major ethical challenges, emphasizing the importance of designing a secure and trustworthy system.
6. **Building Confidence and Overcoming Distrust:** The themes of building voter confidence and overcoming distrust in technology emerged as crucial for achieving full participation in the process.

These themes reflect the key considerations and challenges in the decolonization process, highlighting the importance of inclusivity, ethical integrity, and stakeholder engagement. If you need further analysis or have any specific questions, feel free to ask!

Team 2 Individual Reflection

Prompt 1 : Analyze and summarize the following reflection and quote important sentences also let me know if gender dynamics are at play

T2P1

Key Themes:

- **New Dimension:** T2P1 found that the decolonization questions added a new dimension to systems thinking, forcing the acknowledgment of social issues during the design phase.
- **Preventive Measures:** She highlighted the importance of these questions as preventive measures, citing examples like the SpaceX launch damage and the Social Security Administration cyber-attack.
- **Security and Ethical Considerations:** T2P1 emphasized the need for considering data security and ethical software development practices.

Important Quotes:

- "The decolonization questions add a new dimension to systems thinking."
- "If the data security question was asked during the system design, perhaps this could have been prevented."

T2P2

Key Themes:

- **Perspective and Inclusivity:** T2P2 noted that the decolonization questions helped put the system design into perspective, ensuring inclusivity and consideration of all potential users.
- **Ethical Considerations:** He emphasized the importance of considering past events and ethical questions in the design process.
- **Accessibility:** T2P2 highlighted the team's efforts to make the system accessible to all, including those with disabilities and different operating systems.

Important Quotes:

- "The decolonization questions helped put into perspective the system we chose to design and develop."
- "We defined requirements and created tests to make sure anyone, regardless of any disabilities, would be able to use our system."

T2P3

Key Themes:

- **Critical Thinking:** T2P3 found that the decolonization questions fostered critical thinking and challenged assumptions, power structures, and biases in systems engineering.
- **Holistic Approach:** She emphasized the importance of considering social, ethical, and unbiased impacts, contributing to a holistic approach to systems engineering.

- **Inclusivity:** T2P3 highlighted the need to meet the needs of all communities, especially marginalized ones.

Important Quotes:

- "The decolonization questions helped foster critical thinking in ensuring that the system development represents a broad spectrum of perspectives."
- "It contributes to a holistic approach to systems engineering that can better meet the needs of all communities, especially those that are marginalized."

T2P4

Key Themes:

- **Expansion of Systems Thinking:** T2P4 viewed the decolonization questions as an expansion or complement to traditional systems thinking approaches.
- **Adaptation to Technology:** She emphasized the need for system engineers to adapt to technological advancements and consider secondary and tertiary dependencies.
- **Broad Perspectives:** T2P4 highlighted the importance of considering perspectives from stakeholders that may not be initially thought of.

Important Quotes:

- "I look at the decolonization questions as expansion, or complement, to the Systems Thinking approach described by Rosalind Armson."
- "Current and future system engineers will need to adapt and design systems that not only address the immediate technical specifications but also account for secondary and tertiary dependencies and their effects."

Common Themes

- **New Perspectives:** All team members found that the decolonization questions provided new and broader perspectives on systems engineering.
- **Ethical and Social Considerations:** The importance of considering ethical, social, and unbiased impacts was a common theme.
- **Inclusivity and Accessibility:** Ensuring the system is inclusive and accessible to all users, including marginalized communities, was emphasized.
- **Critical Thinking and Holistic Approach:** The questions fostered critical thinking and contributed to a holistic approach to systems engineering.

Gender Dynamics

The reflections do not explicitly mention gender dynamics. However, the diverse perspectives provided by both male and female team members suggest an inclusive approach to the decolonization exercise. Each reflection highlights the importance of considering various stakeholders and power dynamics, which can inherently include gender considerations, even if not explicitly stated.

Prompt 2 What is common to all

Across all the reflections from T2P1, T2P2, T2P3, and T2P4, several common themes emerged:

1. **New Perspectives:** All team members found that the decolonization questions provided new and broader perspectives on systems engineering, extending beyond traditional technical aspects.
2. **Ethical and Social Considerations:** Each reflection emphasized the importance of considering ethical, social, and unbiased impacts during the design phase. This includes addressing power structures, biases, and the needs of marginalized communities.
3. **Inclusivity and Accessibility:** Ensuring the system is inclusive and accessible to all users, including those with disabilities and different operating systems, was a common focus.
4. **Critical Thinking and Holistic Approach:** The decolonization questions fostered critical thinking and contributed to a holistic approach to systems engineering, encouraging the team to rethink assumptions and consider a broad spectrum of perspectives.
5. **Preventive Measures:** The reflections highlighted the value of these questions as preventive measures, helping to identify and address potential issues early in the design process.

These common themes reflect a comprehensive and thoughtful approach to the decolonization exercise, highlighting the team's commitment to addressing the complexities of systems engineering in an inclusive and ethical manner. If you have any further questions or need additional analysis, feel free to ask!

Prompt 3 Did any student find that they did not have agency

None of the students explicitly mentioned feeling that they did not have agency in the decolonization exercise. However, some reflections did touch on the challenges of power dynamics and the inherent power imbalances among stakeholders. For example:

- **T2P1** highlighted the importance of considering social issues and preventive measures during the design phase, suggesting an awareness of potential limitations but not a lack of agency.
- **T2P2** emphasized the importance of inclusivity and accessibility, indicating a proactive approach to ensuring all users are considered.
- **T2P3** discussed challenging assumptions and biases, which implies an active role in addressing these issues.
- **T2P4** focused on expanding systems thinking and adapting to technological advancements, showing a sense of agency in considering broader perspectives.

Overall, while the reflections acknowledge power imbalances and the need to consider all stakeholders, they do not indicate that the students themselves felt a lack of agency in the process. Instead, they focused on the importance of being aware of these dynamics and striving for a more inclusive and balanced approach.

Prompt 4 Any solutions presented to incorporate these in systems engineering

Yes, several solutions were presented by the students to incorporate the insights from the decolonization exercise into systems engineering:

1. Ethical and Social Considerations:

- **T2P1** emphasized the importance of asking questions related to data security and ethical software development during the design phase to prevent issues like cyber-attacks and misuse of data.
- **T2P3** highlighted the need to challenge assumptions, power structures, and biases, and to focus on social, ethical, and unbiased impacts in systems engineering.

2. Inclusivity and Accessibility:

- **T2P2** mentioned that the team defined requirements and created tests to ensure the system is accessible to all users, including those with disabilities and different operating systems. This approach ensures inclusivity in the design process.
- **T2P4** suggested considering perspectives from stakeholders that may not be initially thought of, and adapting systems to address secondary and tertiary dependencies.

3. Critical Thinking and Holistic Approach:

- **T2P3** advocated for a holistic approach to systems engineering that considers the needs of all communities, especially marginalized ones. This involves rethinking how systems are designed, evaluated, and implemented.
- **T2P4** emphasized the need for system engineers to adapt to technological advancements and consider broader perspectives beyond immediate technical specifications.

4. Preventive Measures:

- **T2P1** highlighted the importance of preventive measures, such as considering data security and ethical questions during the system design phase to avoid potential issues.

These solutions reflect a comprehensive approach to incorporating the insights from the decolonization exercise into systems engineering, ensuring that the process is inclusive, ethical, and responsive to the needs of all stakeholders. If you need further analysis or have any specific questions, feel free to ask!

Team 1

Team Perspectives

Prompt 1: Analyze the emerging themes for the 6 decolonization questions and present your analysis with clear summary of how themes emerged for each question I upload 3 set of these question and their answers

1. **Who is driving this process?**
 - **Theme:** User-Centric Design
 - **Answer:** Users are driving the process.
2. **Who has power in this process?**
 - **Theme:** Authority and Control
 - **Answer:** Systems engineers and the company have power.
3. **What societal/historical/identity considerations?**
 - **Theme:** Inclusivity and Representation
 - **Answer:** Bridging the gap between able-bodied and disabled drivers.
4. **Who is missing in the process?**
 - **Theme:** Comprehensive Inclusion
 - **Answer:** Efforts made to include everyone, but some contributions may be missing.
5. **What are the ethical challenges that might be posed?**
 - **Theme:** Data Privacy and Security
 - **Answer:** Concerns about cybersecurity risks and ethical use of data.
6. **How might we get to full participation in the process?**
 - **Theme:** Active Engagement and Outreach
 - **Answer:** Reaching out to parties normally left out of design considerations.

Second Set of Decolonization Questions

1. **Who is driving this process?**
 - **Theme:** Expert-Led Design
 - **Answer:** Systems engineers are driving the process.
2. **Who has power in this process?**
 - **Theme:** Authority and Control
 - **Answer:** Systems engineers and the company have power.
3. **What societal/historical/identity considerations?**

- **Theme:** Inclusivity and Representation
 - **Answer:** Bridging the gap between able-bodied and disabled drivers.
4. **Who is missing in the process?**
 - **Theme:** Comprehensive Inclusion
 - **Answer:** Efforts made to include everyone, but some contributions may be missing.
 5. **What are the ethical challenges that might be posed?**
 - **Theme:** Data Privacy and Security
 - **Answer:** Concerns about cybersecurity risks and ethical use of data.
 6. **How might we get to full participation in the process?**
 - **Theme:** Active Engagement and Outreach
 - **Answer:** Reaching out to parties normally left out of design considerations.

Prompt 2: Compare your answers and show how themes evolved from first to second and third

1. **Who is driving this process?**
 - **Initial Theme:** User-Centric Design
 - **Evolved Theme:** Expert-Led Design
 - **Evolution:** The focus shifted from users driving the process to systems engineers leading the process, indicating a more expert-driven approach in the second set.
2. **Who has power in this process?**
 - **Theme:** Authority and Control
 - **Consistency:** The theme remained consistent, highlighting the ongoing influence of systems engineers and the company.
3. **What societal/historical/identity considerations?**
 - **Theme:** Inclusivity and Representation
 - **Consistency:** The theme remained consistent, emphasizing the continuous focus on bridging gaps and addressing historical inequities.
4. **Who is missing in the process?**
 - **Theme:** Comprehensive Inclusion
 - **Consistency:** The theme remained consistent, pointing to the ongoing challenge of ensuring complete stakeholder involvement.
5. **What are the ethical challenges that might be posed?**

- **Theme:** Data Privacy and Security
- **Consistency:** The theme remained consistent, underscoring the persistent concern for ethical data handling.

6. How might we get to full participation in the process?

- **Theme:** Active Engagement and Outreach
- **Consistency:** The theme remained consistent, highlighting the need for proactive engagement.

Summary of Evolution

The primary evolution observed is in the theme for "Who is driving this process?" which shifted from a user-centric approach to an expert-led design. This indicates a change in focus from user-driven requirements to a more structured, expert-driven process. Other themes remained consistent, reflecting ongoing concerns and priorities in inclusivity, authority, ethical challenges, and engagement

Prompt 3: Analyze the themes in the reflections on decolonization exercise by this team

To analyze the themes in the reflections on the decolonization exercise by your team, I'll review the provided responses and identify key themes that emerge from their reflections.

Reflections on Decolonization Exercise

1. Who is driving this process?

- **Response:** Systems engineers are driving the process.
- **Theme: Expert-Led Design**
 - The process is led by systems engineers, indicating a reliance on technical expertise and structured methodologies.

2. Who has power in this process?

- **Response:** Systems engineers and the company have power.
- **Theme: Authority and Control**
 - The power dynamics are centered around the systems engineers and the company, highlighting the influence of those in authoritative positions.

3. What societal/historical/identity considerations?

- **Response:** Bridging the gap between able-bodied and disabled drivers.
- **Theme: Inclusivity and Representation**
 - The focus is on addressing historical inequities and ensuring that marginalized groups, such as disabled drivers, are considered in the design process.

4. Who is missing in the process?

- **Response:** Efforts made to include everyone, but some contributions may be missing.

- **Theme: Comprehensive Inclusion**
 - Despite efforts to include all stakeholders, there is an acknowledgment that some voices may still be missing, pointing to the challenges of achieving full inclusion.
- 5. **What are the ethical challenges that might be posed?**
 - **Response:** Concerns about cybersecurity risks and ethical use of data.
 - **Theme: Data Privacy and Security**
 - Ethical challenges are primarily related to data privacy and security, emphasizing the need for responsible data handling practices.
- 6. **How might we get to full participation in the process?**
 - **Response:** Reaching out to parties normally left out of design considerations.
 - **Theme: Active Engagement and Outreach**
 - The suggestion to actively engage underrepresented groups highlights the importance of proactive outreach to ensure diverse participation.

Summary of Themes

1. **Expert-Led Design:** The process is driven by systems engineers, reflecting a structured, expert-driven approach.
2. **Authority and Control:** Power is concentrated among systems engineers and the company, indicating a hierarchical decision-making process.
3. **Inclusivity and Representation:** There is a strong focus on addressing historical inequities and ensuring that marginalized groups are considered in the design.
4. **Comprehensive Inclusion:** Despite efforts to include all stakeholders, there is an acknowledgment of the challenges in achieving full inclusion.
5. **Data Privacy and Security:** Ethical challenges are centered around data privacy and security, highlighting the importance of responsible data handling.
6. **Active Engagement and Outreach:** Proactive engagement with underrepresented groups is emphasized to ensure diverse participation.

These themes reflect a thoughtful approach to decolonization, with a focus on inclusivity, ethical considerations, and proactive engagement. The reflections indicate an awareness of the power dynamics and the need for continuous efforts to ensure comprehensive inclusion and responsible design practices.

If you have any further questions or need additional analysis, feel free to ask!

Individual Perspectives

Prompt 1 : Analyze and summarize the following reflection and quote important sentences also let me know if gender dynamics are at play

Analysis and Summary of Reflections on Decolonization Questions

T1P1's Reflection

- **Key Points:**
 - The team naturally asked decolonization-like questions during the project.
 - Emphasized the importance of considering all groups and people at all stages.
 - Recognized the value of these questions outside the school project but noted limitations due to the nature of their work.
- **Important Quote:** "We did everything we could to make sure that all types of groups and people were considered at all stages of the process."
- **Theme: Inclusivity and Practical Constraints**
 - T1P1 highlights the team's commitment to inclusivity but acknowledges practical constraints in applying these questions in their professional environment.

T1P2's Reflection

- **Key Points:**
 - Regularly considers how to apply learnings to improve work.
 - Sees value in asking decolonization questions to enhance inclusivity and completeness of processes.
 - Recognizes the inclusive mindset of the project but notes the challenge in less inclusive work environments.
- **Important Quote:** "Keeping these questions in mind will not only help with more inclusive processes but help ensure processes are more complete with the right audience."
- **Theme: Continuous Improvement and Inclusivity**
 - T1P2 emphasizes the importance of continuous improvement and the role of decolonization questions in fostering inclusivity and thoroughness.

T1P3's Reflection

- **Key Points:**
 - Decolonization questions are not typically considered in DoD-related contracts.
 - Requirements and CONOPs are set by the customer, limiting exploration.
 - Recognizes the merit of these questions for consumer-focused projects.
- **Important Quote:** "The nature of the decolonization questions is not something that I've really considered in my line of work."
- **Theme: Contextual Relevance and Limitations**

- T1P3 points out the contextual limitations of applying decolonization questions in certain professional settings but acknowledges their value in other contexts.

T1P4's Reflection

- **Key Points:**
 - Sees value in decolonization questions for entrepreneurial projects.
 - Finds them less applicable to government contractor projects due to regulations and customer dictates.
 - Involvement of people is based on project scope.
- **Important Quote:** "Our process is dictated by our company command media, regulations and/or funding customers."
- **Theme: Regulatory Constraints and Applicability**
 - T1P4 highlights the regulatory constraints that limit the applicability of decolonization questions in their current work environment but sees potential value in other contexts.

Gender Dynamics

- The reflections provided do not explicitly mention gender dynamics. The focus is primarily on the applicability and value of decolonization questions in different professional contexts. However, the reflections do highlight the importance of inclusivity and considering diverse perspectives, which can indirectly relate to gender dynamics in ensuring all voices are heard and considered.

Summary of Themes

1. **Inclusivity and Practical Constraints:** Emphasizing the importance of considering all groups while acknowledging practical limitations.
2. **Continuous Improvement and Inclusivity:** Highlighting the role of decolonization questions in fostering inclusivity and thoroughness.
3. **Contextual Relevance and Limitations:** Recognizing the contextual limitations of applying decolonization questions in certain professional settings.
4. **Regulatory Constraints and Applicability:** Pointing out regulatory constraints that limit the applicability of decolonization questions but acknowledging their potential value in other contexts.

These reflections collectively underscore the value of decolonization questions in promoting inclusivity and thoroughness while also highlighting the practical and contextual challenges in applying them across different professional environments. If you need further analysis or have additional questions, feel free to ask!

Prompt 2 What is common to all

Across all the reflections, several common themes emerge:

1. Recognition of Inclusivity:

- All team members acknowledge the importance of considering diverse groups and ensuring inclusivity in the design process.
- **Example:** T1P1 mentions, "We did everything we could to make sure that all types of groups and people were considered at all stages of the process."

2. Practical Constraints:

- Each reflection highlights practical or contextual constraints that limit the application of decolonization questions in their current professional environments.
- **Example:** T1P3 notes, "The nature of the decolonization questions is not something that I've really considered in my line of work."

3. Value of Decolonization Questions:

- Despite the constraints, all team members see the value in asking decolonization questions to enhance inclusivity and thoroughness in systems engineering.
- **Example:** T1P2 states, "Keeping these questions in mind will not only help with more inclusive processes but help ensure processes are more complete with the right audience."

4. Contextual Relevance:

- The reflections emphasize that the relevance and applicability of decolonization questions vary depending on the project context and professional setting.
- **Example:** T1P4 mentions, "I can see the value of using these questions if I was developing my own product."

These common themes reflect a shared understanding among the team members of the importance of inclusivity, the practical challenges they face, and the potential benefits of incorporating decolonization questions into their work. If you have any further questions or need additional analysis, feel free to ask!

Prompt 3 Did any student find that they did not have an agency

Yes, some students expressed a lack of agency in their reflections due to the nature of their work environments:

- **T1P1:** Mentioned that the nature of their work limits the consideration of decolonization questions. **Quote:** "Unfortunately, the nature of who I work for makes these questions ones that are not able to be considered."
- **T1P3:** Highlighted that DoD-related contracts have requirements and CONOPs set by the customer, leaving little room for exploration. **Quote:** "The requirements and CONOPs for those projects are set by the customer and leave little room for exploration."
- **T1P4:** Pointed out that their process is dictated by company command media, regulations, and funding customers, limiting the applicability of decolonization questions. **Quote:** "Our process is dictated by our company command media, regulations and/or funding customers."

These reflections indicate that these students feel constrained by external factors such as organizational policies, customer requirements, and regulatory frameworks, which limit their ability to fully apply decolonization questions in their work. If you have any further questions or need additional analysis, feel free to ask!

Prompt 4 Any solutions presented to incorporate these in systems engineering

Yes, some students did present solutions or suggestions to incorporate decolonization questions into systems engineering:

- **T1P2:** Emphasized the importance of keeping decolonization questions in mind to ensure more inclusive and complete processes. **Quote:** "Keeping these questions in mind will not only help with more inclusive processes but help ensure processes are more complete with the right audience."
- **T1P4:** Suggested that these questions could be valuable if developing their own product, indicating a potential application in entrepreneurial contexts. **Quote:** "I can see the value of using these questions if I was developing my own product (i.e. entrepreneur route)."

These reflections suggest that while there are constraints in their current work environments, there is recognition of the potential benefits of decolonization questions. T1P2's approach of integrating these questions into the thought process and T1P4's suggestion of applying them in entrepreneurial projects are practical solutions to incorporate these considerations into systems engineering.

If you have any further questions or need additional analysis, feel free to ask!

Team 5

Great, thanks for sharing the questions and answers. I'll analyze the emerging themes for each question and provide a clear summary.

1. Who is driving this process?

Emerging Themes:

- **Stakeholder Involvement:** The process is driven by a wide range of stakeholders including customers, architects, program managers, technical team members, marketing, sales, maintenance support, manufacturing, distribution, and users/operators.
- **Collaborative Effort:** Emphasis on the collaborative nature of the process involving multiple roles and responsibilities.

2. Who has power in this process?

Emerging Themes:

- **Customer Dominance:** The main customer, particularly the Department of Defense (DoD) or specific branches, holds significant power in defining operations.
- **Development Authority:** As the system progresses, the development power shifts to the company, with management, architecture, and system engineering teams playing crucial roles.
- **Expertise Utilization:** The importance of seeking knowledge from subject matter experts during logical development.

3. What societal/historical/identity considerations?

Emerging Themes:

- **Battlefield Evolution:** The changing nature of battlefield threats and the need for future survivability considerations.
- **Dual Use Ethics:** Ethical issues arising from the potential dual use of technology for both civilian and military purposes.
- **Design Standards:** The necessity to uphold military requirements and certification standards in design and architecture decisions.

4. Who is missing in the process?

Emerging Themes:

- **Human Factors:** The potential oversight of real-world users, such as injured military personnel, during high-level decision-making.
- **Ethical and Legal Oversight:** The possible neglect of ethical and legal professionals who ensure civilian use aligns with military design ethics.

5. What are the ethical challenges that might be posed?

Emerging Themes:

- **Dual Use Dilemmas:** Challenges related to the use of technology for civilian evacuations and non-military objectives.
- **Evacuation Prioritization:** Ethical concerns about prioritizing which soldiers to save in scenarios with more casualties than the system can handle.

6. How might we get to full participation in the process?

Emerging Themes:

- **Agile Processes:** The adoption of agile methodologies to enhance participation.
- **Feedback Loops:** The importance of incorporating feedback loops for continuous improvement.
- **Stakeholder Mapping:** Better and earlier stakeholder mapping to ensure comprehensive involvement.

These themes highlight the complexity and multifaceted nature of the decolonization process, emphasizing the need for inclusive, ethical, and collaborative approaches. If you need further analysis or have any specific questions, feel free to ask!