CYBN 6002

INDUSTRY PARTNER PROJECT

CYBERNETIC PRACTICE FOR ANU TRAVEL LAB **CONFERENCE TRAVEL CARBON REDUCTION**

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By:
Dominika Janus,
Muhammad Asfour,
Sahar Farzanfar

This report covers the content of the team's final presentation on the Cybernetic Practice for ANU Travel Lab's Conference Travel Carbon Reduction Project.

The interactive presentation can be accessed from this link: CLICK HERE

The presentation covered five main areas as follows:

Introduction summary and setting project boundaries,
An overview of the cybernetic tools used,
Explore the system in its context,
A cybernetic analysis
Guidelines and recommendations.

Introduction:

The Australian National University's commitment to sustainability aligns with global and national carbon reduction policies, as reflected in the ANU2025 Strategic Plan. This commitment is implemented through ANU Green, which includes the Environmental Management Plan and the Below Zero Programme.

The Below Zero Programme leads university's efforts to reduce its carbon footprint, with ambitious targets:
Carbon neutrality for on-campus and energy-related emissions by 2026, and
Below zero emissions from operations and value chain by 2040.

These programs integrate research and teaching efforts to drive innovation in sustainability practices, addressing institutional, operational, and behavioural mechanisms for change.

Project Boundary

As we look into this project, it's important to acknowledge our systems thinking perspective. While our focus is on developing alternatives to conference travel for carbon reduction, we recognise that there may be other areas where ANU could potentially have a more significant impact on achieving its sustainability goals. However, respecting the boundaries of our given project, we've confined our systemic review to this specific initiative, and therefore Our project focuses on academic conference-related travel, as a source of emissions. The ANU Travel Lab, an interdisciplinary research group, supports ANU in developing evidence-based recommendations and evaluating their effectiveness.

Our collaboration between the School of Cybernetics and ANU Travel Lab aims to develop sustainable alternatives to traditional academic conferences. Using a cybernetic approach, we're analysing the system, identifying challenges and gaps, and proposing improvements.

We expect this project to support ANU in achieving its Below Zero targets while maintaining its global academic standing, and to create transferable knowledge for other institutions.

Cybernetic Tool Overview

In our analysis, we're using the Viable System Model as our primary tool to map system components and review subsystem relationships. Throughout this process, we ensure that requisite variety is maintained. The arrows demonstrate the amplification and filtration of information between systems with varying variety. We've simplified this concept for clarity in our presentation to graphics shown below.

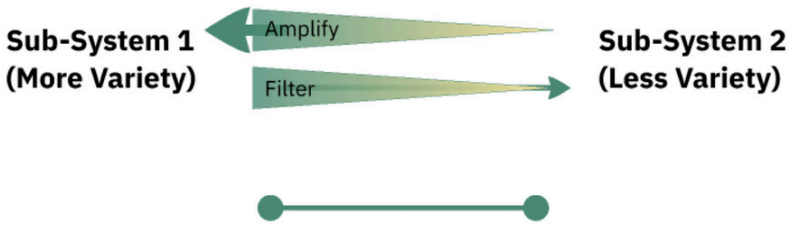

fig 1. Simplified model of amplification and filtration of information based on Ashby (1956) used in this presentation

In addition to our VSM analysis, we're also examining the upstream pipeline, analysing input, process, and output factors based on existing research to inform our recommendations.

Graphics below indicate how we have visualised our Viable System Model for our systems analysis.

Within the model, we've identified six key subsystems. These are: Operation, Coordination, Control, Audit, Development, and Purpose, with the Environment as an external factor. Management is represented by the combination of Control and Development subsystems.

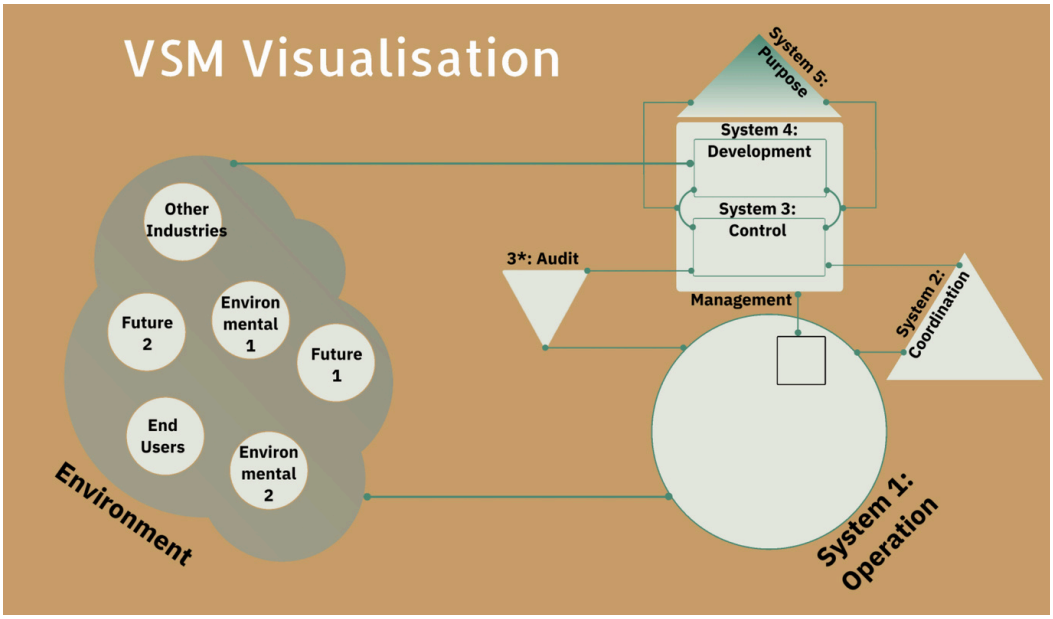

Fig. 2 Viable Systems Model visualisation.

System Recursions

Now, let's zoom into the system of focus, from the broader system's context, to understand its recursions. We're outlining three primary recursions in our analysis:

First, we have the ANU system as a whole. Within this, we find our second recursion: ANU Sustainability, which exists within the control subsystem of ANU. Finally, our project - the Travel Lab's conference travel initiative - forms the third recursion, nested within the control subsystem of ANU Sustainability.

This nested structure allows us to analyse how our project fits into, and impacts the larger systems it's a part of.

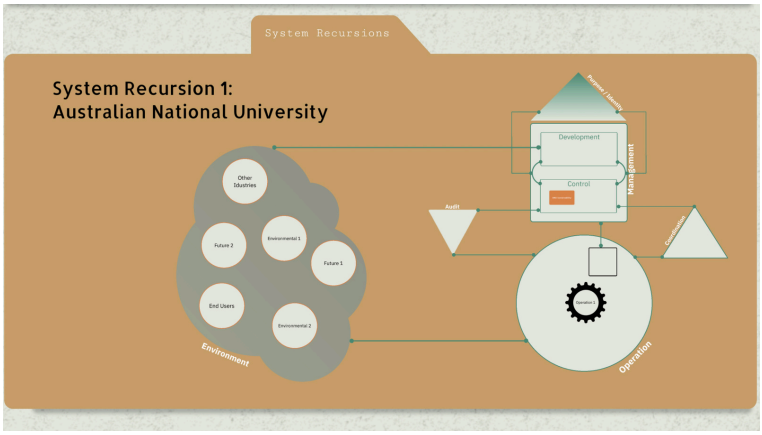

fig 3. System Recursion 1. Source "ANU Travel Lab x Cybernetic Presentation"

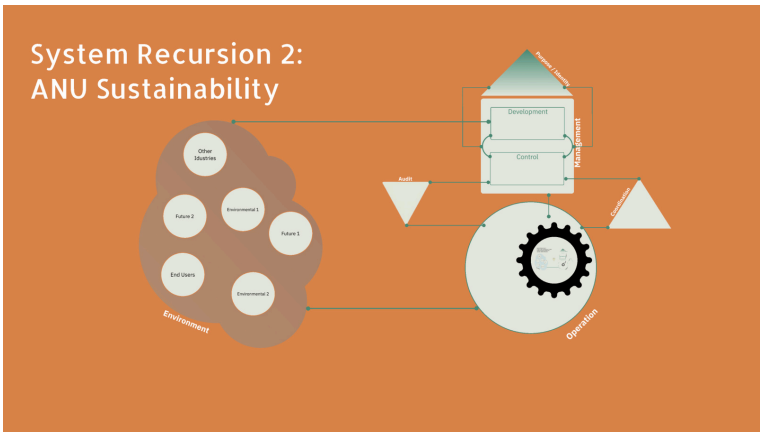

fig 4. System Recursion 2. Source "ANU Travel Lab X Cybernetic Presentation"

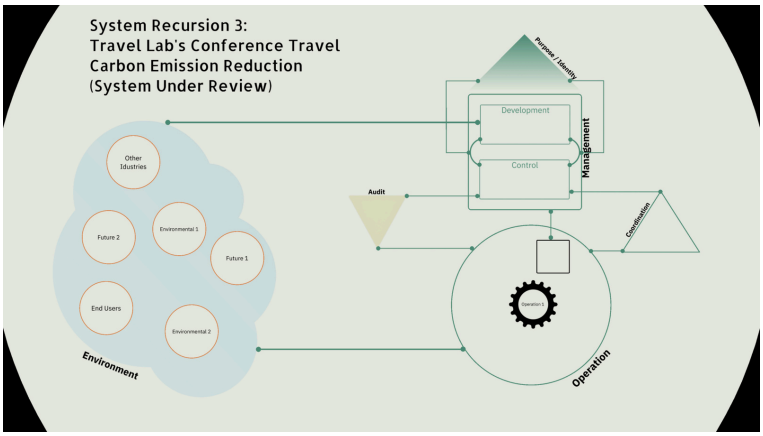

fig 5. System Recursion 3. Source "ANU Travel Lab X Cybernetic Presentation"

System Analysis

We'll delve deeper into our system of focus, within its boundaries, and investigate existing components, shown in black text, the key challenges that we have identified, and our suggested guidelines to address these challenges shown in colour.

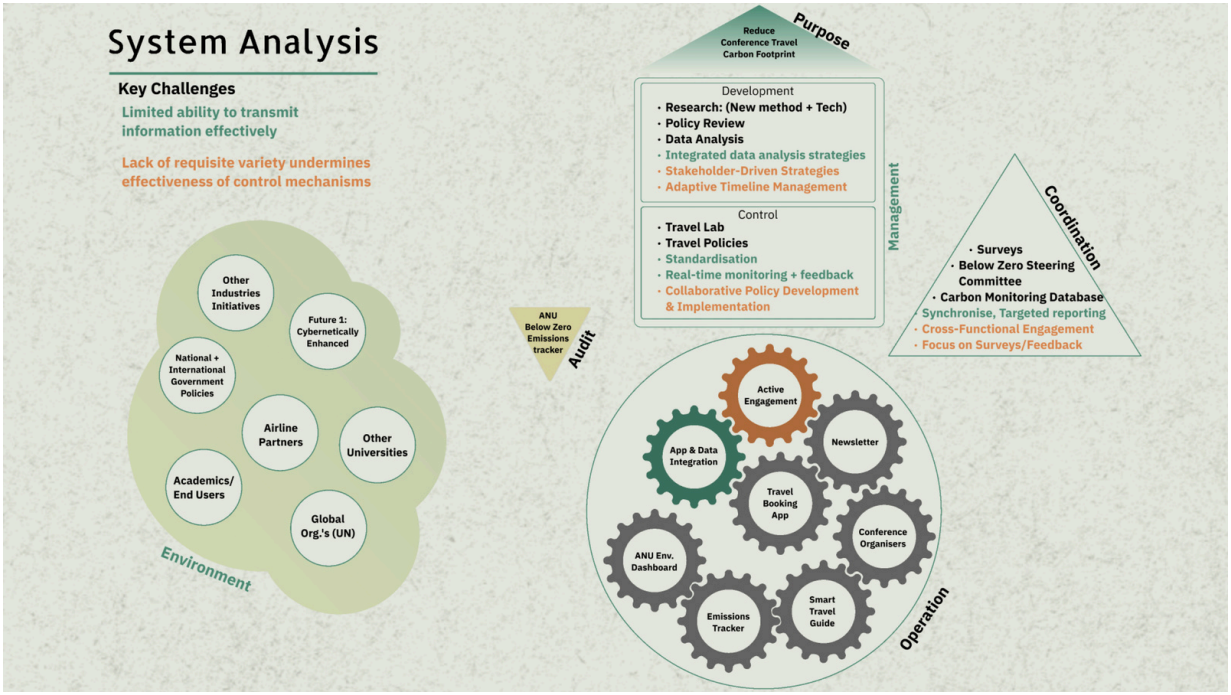

fig. 6 System Analysis of ANU Below Zero based on our VSM model visualisation

Through our VSM analysis of the Travel Lab project, we surfaced key opportunities for improvement. This systematic approach brought to our attention two major challenges spanning across multiple systems. We've developed targeted guidelines for each challenge mapped to specific VSM components.

Challenge 1. Limited ability to transmit information effectively

This challenge became apparent when we noticed that the system's ability to transmit information effectively was limited. This is because the Travel Emissions Tracker and the ANU Environment dashboard are important system parts where data is collected, analysed, and managed. However, the effectiveness of these nodes is limited due to data silos found in the system and manual reporting methods, including inconsistent reporting and use of E-forms to report.

This is seen when the ANU Booking app isn't integrated with the emissions tracker, relying on submitted Travel E-forms or accurate updates. This limits the system's ability to respond holistically to travel-related decisions and diverse situations, which could cause actions contradicting the goal of reducing conference-related travel.

We have proposed five guidelines that present opportunities to mitigate:

- **Data & App Integration:**

Starting with System Operations, we could include Integrating apps and data across all travel-related systems, making operational tools unified to share data seamlessly. For example, the tools I mentioned could have a central interface, allowing all system parts to stay updated to reduce inconsistencies.

- **Synchronised, Targeted Reporting:**

Moving to the Coordination part of the system, we can include a mechanism to Synchronise policy in apps and include Targeted reporting.

From the first guideline, the centralised system should instantly update all travel-related tools when new policies are set but also provide users with only the most relevant data for their roles and current tasks rather than overwhelming them with all available information. It should allow staff to assess their performance against travel reduction targets, regularly communicate the purpose of policies and their tangible impacts, and use targeted messaging to build motivation across departments.

- **Standardisation:**

The Control part of the system could benefit from including a policy for the Standardisation of reporting and metric interpretation. This is crucial because standardisation would allow everyone to compare data, identify trends and make informed decisions easily.

This could involve:
-Defining Key Performance Indicators
-Creating standardised templates and
-Standardising language, such as definitions and measuring methods

- **Real-time monitoring & Feedback:**

In the Control system, we could also include a focus on systems that provide Real-time monitoring and feedback mechanisms: on-the-fly updates on travel activities and their impact to allow proactive management.
This could involve:
-Developing dashboards that update in real-time
-Setting up automated alerts for specific triggers like approaching travel budget limits
-Creating channels for quick user feedback.

- **Integrated Data Analysis Strategies**

In the Development part of the system, we should also focus on Creating strategies based on integrated data analysis
By analysing the trends from all integrated systems within this organisation, identifying patterns and applying predictive analytics. ANU could inform planning to anticipate future needs or challenges, making the Travel Lab more agile in adjusting its strategies to reduce conference-related travel.

Challenge 2. Lack of requisite variety undermines effectiveness of control mechanisms

The Travel Lab policies and below-zero steering committee represent the control mechanisms in this system. However, their effectiveness is potentially undermined by a lack of requisite variety

In the context of this system, this means management strategies need to be as nuanced and flexible as the complex scenarios that they're trying to address in reducing conference-related travel:
This is an issue of control signals, which are policies and targets that operational components can misinterpret or resist. If we consider the Development system's push for virtual conferences, this is an attempt to introduce a new regulatory mechanism to achieve the system's goals. However, if this mechanism doesn't account for the value academics place on in-person networking and participation, it's likely to face significant resistance. This resistance represents negative feedback that the system must adapt to, rather than ignore, to maintain viability.

We have proposed six guidelines that present opportunities to mitigate this challenge:

- **Active Engagement:**

In System Operations: to include Active Stakeholder Engagement for Increased Ownership
We can establish working groups and committees that include representatives from all levels, including but not limited to leadership, faculty, researchers and administrative staff, to be involved in making travel reduction policies.

- **Cross-Functional Engagement**

In the Coordination, we need to Align Actions through Cross-Functional Engagement. This is where the organisation could regularly task departments with setting their own travel reduction targets within the broader organisational goals.

- **Collaborative Policy Development & Implementation**

In the Control system, we need to allow Collaborative Policy Development and Implementation, giving working groups the authority to propose, develop, or refine travel reduction policies.

- **Stakeholder Driven Strategies**

In Development, we need to support Stakeholder-Driven Strategy Development
The organisation supporting these guidelines creates a sense of ownership, responsibility and empowerment in individuals supporting the success of travel reduction initiatives, leading to more effective implementation and reduced resistance to change.

- **Adaptive Timeline Management**

Also, in Development, we must include a strategy focusing on Adaptive Timeline Management for Cultural Transformation. This would focus on things like:
-Setting longer and adjustable implementation timeframes and regularly updating them based on feedback and changing circumstances.

-Integrating staff perspectives through working groups, with a stronger focus on early career staff, as they may adapt more easily.
-Fostering an environment that allows for gradual cultural change and reduces resistance to new travel policies and technologies like VC.

- **Focus on Surveys & Feedback**

The final guideline would be implemented in System Coordination, introducing a mechanism that supports a greater focus on surveys and feedback collection. This guideline aims to make feedback collection through surveys a natural part of the process without overburdening staff.

To achieve this, the coordination part of the system should consider the following:
-Integrate mandatory feedback sessions into existing workflows to complete post-travel reports or conference registrations.
-Keep surveys short and relevant to minimise additional workload.
-Offer small incentives for thoughtful responses, such as priority booking for future travel.
-Publicly recognise departments with high participation rates.
-Allocate specific time during regular meetings for feedback discussions.
-Use automated reminders and user-friendly interfaces to increase response rates.

End User Perspective

Using the VSM, we've identified improvements in system viability, coordination, and feedback loops. Now, we focus on the last area for improvement: complexity in behaviour and cultural shifts.

When looking at the system from the perspective of a single researcher, it may seem like a complex environment filled with policies, guidelines, and initiatives. Within this environment, ANU provides clear recommendations to help individuals make more informed decisions about their travel and emissions.

Below Zero encourages researchers to avoid unnecessary travel by considering whether the objectives of a trip can be met through virtual communication instead. This advice is key in reducing travel-related emissions, a major contributor to ANU's carbon footprint.
Another recommendation from ANU is to leverage digital tools. Various platforms and apps are available to facilitate online meetings and events, enabling researchers to engage without the need for travel. Apps and trackers, created by ANU, can also help track and calculate the carbon footprint of trips when travel is unavoidable. These tools are spread across multiple resources and SharePoint entries, which is confusing, but they remain an essential part of the strategy.

Researchers are also encouraged to combine multiple activities into a single itinerary, which reduces the frequency of trips. For example, planning research, collaborations, and conference presentations into one journey can significantly cut down on emissions.
Additionally, collaborating locally is a key recommendation, where researchers are urged to work with regional partners or establish local hubs for events. This reduces the need for long-distance travel, allowing for more sustainable collaboration without sacrificing face-to-face interaction.

Lastly, offsetting emissions through high-calibre carbon credits is recommended for those occasions where travel cannot be avoided. This approach ensures that even when travel happens, its impact can be mitigated by funding renewable energy projects or similar initiatives.

With this in mind, we will now address the central part of Below Zero advice:

The Push for Online and Hybrid Events over in-person ones, when possible.

This approach has been particularly effective during the COVID-19 pandemic and continues to offer significant advantages.

Virtual conferences offer many benefits: saving time, costs, and reducing fatigue. Often recorded, enabling asynchronous viewing and allowing individuals to access materials at their convenience, even if they cannot attend live sessions.
Moreover, virtual platforms often have chat functionalities, which enable real-time interactions between participants, encouraging continuous engagement during sessions. Overall, costs are lower for both attendees and event organisers, as there are no expenses for venues, catering, or printed materials. Virtual formats also increase the diversity of participants, fostering a richer exchange of ideas across a broader geographic area.

However, there are also challenges with online formats. It's difficult to measure audience engagement in a virtual setting, as attendees may not be fully present or participating actively. Asking questions in an online environment can feel impersonal, and technical issues often present barriers, particularly when sessions span across different time zones.

The Importance of Technology in Networking and Collaboration

This brings us to a deeper cybernetic analysis of the user's perspective, where system viability and coordination, gaps in feedback loops, and cultural shifts emerge as key areas for improvement. Our analysis references Wenger's (2023) work on networking efficacy and ANU's ongoing reviews, demonstrating that available technologies and best practices change rapidly.

Similarly, ANU has undertaken reviews of other universities' practices, identifying similar concerns and solutions. However, these practices and available technologies evolve rapidly, which is why ANU and similar institutions must regularly review and update their approaches.

Input Factors
For a system like a virtual or hybrid conference to function effectively, certain input factors must be considered. These include the personal characteristics of conference attendees, such as their motivation, attitudes, and technological readiness. If attendees are not comfortable with the technology or are disengaged, the system will not perform at its best.
Additionally, factors like group composition—the size of groups and how familiar participants are with each other—play a critical role. The role of conference organisers' leadership cannot be overstated. Their efforts, creative thinking, and understanding of the technology and purpose of the conference influence how well the system performs.
Technology also forms a significant part of the input factors, including the type of technical equipment used and how well it supports data privacy and security—a recurring concern for virtual conferencing.

Process Factors

As the conference unfolds, several process factors come into play:
·Participation can be hindered by low social buy-in or distractions when participants are in remote settings.
Communication modes like non-verbal communication, moderated discussions, and brainstorming are crucial for creating an engaging experience.
·Planning and coordination ensure interaction occurs smoothly, and the timing of these discussions and sessions is vital to keeping attendees engaged.
A strong emphasis must also be placed on group dynamics. How attendees are encouraged to share meals, socialise, and engage in networking are all critical in motivating attendees, even in a virtual environment.

Output

At the end of these processes, the output centres on the concept of networking efficacy. In virtual and hybrid settings, the goal remains the same: building relationships, making meaningful connections, and engaging in collaborative dialogue. However, offering a financial incentive can significantly boost participation and engagement. For example, reimbursements for time spent out of the office or other forms of return could encourage better participation, particularly from junior academics or those who may not otherwise engage.

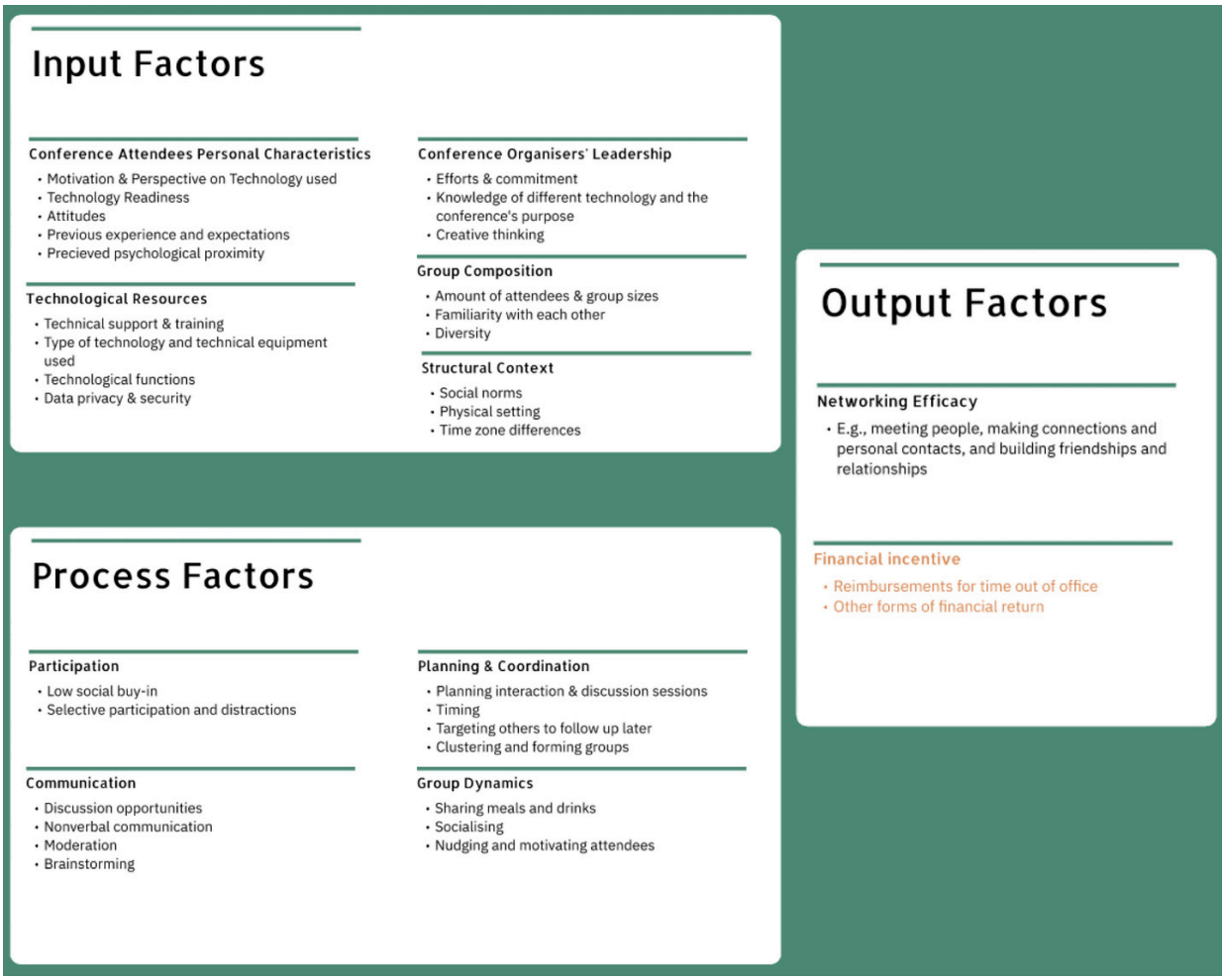

fig 7. Upstream pipeline analysis based on Wenger (2023)

Future Alternatives

Looking ahead, we have several technological alternatives to improve virtual and hybrid conferences. These models facilitate better engagement and networking: attendees' connection through social media, distributed contact, matchmaking software, and tools like virtual whiteboards or online games can enrich the conference experience.

For hybrid events, alternative hybrid models like TEDxVirtual offer insights into how virtual and physical components can coexist successfully.

Decentralised conferences—where small, local gatherings are connected virtually—have proven to be effective. Similarly, distributed conferences, which use a hub-and-spoke model, allow for a more inclusive approach, connecting multiple events from different cities globally.

Virtual and augmented reality conferences represent another frontier, with platforms like Laval Virtual World offering attendees the ability to interact as avatars in a 3D space. Asynchronous conferences, where participation is spread over time, can allow for more flexible attendance and fewer simultaneous travels.

Creating local hubs where small, geographically dispersed events are connected virtually can also foster collaboration and reduce emissions. AI-enhanced networking, as seen in events like Web Summit, can help attendees connect more meaningfully with relevant peers.

Finally, additional suggestions include encouraging shared transport for attendees within a city, ensuring environmentally friendly conference merchandise, and improving the accessibility and readability of external communications and resources.

Conclusion

To conclude, we've identified key opportunities for ANU to improve its travel policies and align them with Below Zero goals. By integrating cybernetic principles and leveraging technological advancements, ANU can maintain its leadership in sustainable practices while reducing travel emissions. We believe however, after considering the objectives of this project more systemically, that there are more impactful areas that can be focused on by ANU to achieve their target
By applying the models and recommendations we've discussed, we've successfully addressed key challenges identified in our first presentation.

ANU has done well in reviewing the practices of other universities, but given the fast-changing nature of technology, these reviews must be conducted frequently. Available tools and platforms, as well as user attitudes, are in constant flux. What worked well a year ago may no longer be the best solution today. Regularly updating these practices ensures that ANU remains at the forefront of sustainable conferencing and collaboration.

As a final point, it is crucial to integrate technology in a way that suits both the institution's environmental goals and the user experience. The tools must be easy to use, accessible, and aligned with the day-to-day needs of researchers. For this reason, providing centralised access to the tools and guidelines would help reduce confusion and streamline adoption, enabling researchers to fully utilise the resources available for sustainable travel and conferencing.

The nexus of human, environment and technology plays a central role in helping ANU achieve its Below Zero targets, but it needs to be constantly reviewed and updated. By embracing the latest tools and practices, ANU can empower its researchers to contribute to global sustainability goals while maintaining strong academic collaboration.

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References:

Ashby, W.R. (1956) An Introduction to Cybernetics. 2nd ed. London: Chapman & Hall. Chapter 11: Requisite Variety, pp. 203-218. Available at: http://dspace.utalca.cl/bitstream/1950/6344/2/IntroCyb.pdf (Accessed: 22 October 2024).

ANU Below Zero, University-Related Travel Policy Review, 2022. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/files/2023-12/Opportunities%20for%20change%20in%20Human%20Resources%20and%20Travel%20policies%20at%20ANU.pdf [Accessed 12 September 2024].

ANU Events Toolkit, 2024. ANU Communicators Network. [online] Available at: https://anu365.sharepoint.com/sites/ANUCommunicatorsNetwork/SitePages/Events-toolkit(1).aspx [Accessed 12 September 2024].

ANU University Travel Survey 2024 Snapshot Report, 2024. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/files/2024-09/ANU_University_Travel_Survey_2024_snapshot-report.pdf [Accessed 12 September 2024].

Announcement on our Second Temporal Belongings Conference, 2019. Temporal Belongings. [online] Available at: https://www.temporalbelongings.org/home/announcement-on-our-second-temporal-belongings-conference [Accessed 12 September 2024].
Bastian, M., Flatø, E.H., Baraitser, L., Jordheim, H., Salisbury, L. & van Dooren, T., 2022. 'What about the coffee break?' Designing virtual conference spaces for conviviality. Geo: Geography and Environment, [online]. DOI: 10.1002/geo2.114.

Bastian, M., Flatø, E.H., Baraitser, L., Jordheim, H., Salisbury, L. & van Dooren, T., 2023. Ethical conference economies? Reimagining the costs of convening academic communities when moving online. The Geographical Journal, [online]. DOI: 10.1111/geoj.12557.

Carbon Smart Event Guide, 2024. ANU Communicators Network. [online] Available at: https://anu365.sharepoint.com/sites/ANUCommunicatorsNetwork/SitePages/Low-carbon-emissions-events-sub-guide.aspx [Accessed 12 September 2024].

Carbon Smart Event Guide, 2024. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/files/2024-07/Carbon%20smart%20event%20guide.pdf [Accessed 12 September 2024].

Carbon Smart Events at ANU, n.d. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/solutions/emissions-reduction-energy/carbon-smart-events-at-ANU [Accessed 12 September 2024].

Carbon Smart Travel Guide, n.d. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/carbon-smart-travel-guide#:~:text=ANU%20has%20a%20target%20to,some%20aspects%20of%20our%20work [Accessed 12 September 2024].

Emissions Reduction & Energy, n.d. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/solutions/emissions-reduction-energy [Accessed 12 September 2024].

Flying Less, n.d. Tufts University. [online] Available at: https://sites.tufts.edu/flyingless/ [Accessed 12 September 2024].

Gorla, N., Cañete, M. and Hu, L. (2005) 'Towards a systemic approach to autonomic systems engineering', in Proceedings of the 12th IEEE International Conference and Workshops on the Engineering of Computer-Based Systems (ECBS '05). Available at: https://www.researchgate.net/publication/4133293_Towards_a_systemic_approach_to_autonomic_systems_engineering(Accessed: 22 October 2024).

Guetter, C.R., Altieri, M.S., Henry, M.C.W., Shaughnessy, E.A., Tasnim, S., Yu, Y.R. & Tan, S.A., 2022. In-person vs. virtual conferences: Lessons learned and how to take advantage of the best of both worlds. American Journal of Surgery, 224(5), pp.1334-1336. DOI: 10.1016/j.amjsurg.2022.07.016.

Guidelines for Low Carbon Travel, 2021. ANU Below Zero. [online] Availabl
Policy: ANU Travel, 2023. ANU Policies. [online] Available at: https://policies.anu.edu.au/ppl/document/ANUP_000476 [Accessed 12 September 2024].

Hoverstadt, P., Loh, L. and Marguet, N. (n.d.) 'Organisation Design Using The Viable System Model – Experience From Practice'. Available at: https://www.researchgate.net/publication/328019548_Organisation_Design_Using_The_Viable_System_Model-Experience_From_Practice_ORGANISATION_DESIGN_USING_THE_VIABLE_SYSTEM_MODEL-EXPERIENCE_FROM_PRACTICE (Accessed: 22 October 2024).

The Material Life of Time, 2021. Temporal Belongings. [online] Available at: https://www.temporalbelongings.org/the-material-life-of-time.html [Accessed 12 September 2024].

University Approaches to Reduce Business Sector Travel Emissions, 2024. Research Report. [online] Available at: https://sustainability.anu.edu.au/files/2024-05/University%20approaches%20to%20reduce%20business%20sector%20travel%20emissions.pdf [Accessed 12 September 2024].

University Travel Emissions, n.d. ANU Sustainability. [online] Available at: https://sustainability.anu.edu.au/solutions/climate-change-energy/university-related-travel [Accessed 12 September 2024].

Wenger, A., 2023. Shifting from academic air travel to sustainable research exchange: Examining networking efficacy during virtual conferences. Journal of Cleaner Production, 414, 137577. DOI: 10.1016/j.jclepro.2023.137577.