PluriCards: Engaging with the Pluriverse to Explore New Sustainability Research Directions

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***Abstract*—This paper describes the design and testing process of PluriCards – a card deck used to promote conversations about sustainable and digital futures. We address an existing need in the Global North for alternative ways of thinking about sustainability, building on concepts from the Global South, like the Pluriverse. Presenting the rationale and usages of the deck with students and researchers, we offer examples of how disparate participants are brought together and engaged in foreseen shared research directions that relate to alternative futures. We propose that ICT researchers and students can use PluriCards to challenge the prevailing digital exceptionalism that certain aspects of ICT development are presently benefiting from.**

***Index Terms*—pluriverse, sustainability, ICT development, alternative futures, card deck**

I. Introduction

There can be little doubt that human living has profound sustainable consequences for all beings and non-being things on Earth. To combat human-induced climate change, we see societal, political, and financial initiatives supporting the development of information and communications technologies (ICT) to help societies transition towards more sustainable futures. Such initiatives are, for instance, materialized in UN's 17 Sustainable Development Goals, portraying global imaginaries of how development may bring *"peace and prosperity for people and the planet, now and into the future"* [1].

In a Global North (European) context, sustainable digital technologies are typically being imagined, designed, and developed with expectations that such technologies alone will 'solve' our sustainability problems – by giving "digital exceptionalism treatment" to ICT development [2]. For instance, the development of emergent technologies such as smart grids [3], smart cities [4], and smart homes [5] come with embedded visions of desirable sustainable energy futures [6]. Yet, such ICT visions are typically shaped by stakeholders from industry [7], software engineers and computer science researchers [8], and collective national policies [9], often distancing visions and development from the diverse cultural and social world making where these technologies are envisioned to become embedded. Further, despite efforts in innovative sustainable developments, we still see an increase in energy consumption for ICT infrastructures [10], [11] and e-waste production [12], raising open questions of how and if these promised solutions may mitigate the sustainability problems of our time.

To help raise critical questions about such prevailing solutionist visions of sustainable ICT development, we are starting to see HCI and design scholars arguing for a need for alternative ways of thinking about sustainable ICT development to challenge the status quo [13]. In this line of work, we see emergent alternative framings such as post-growth [14] and post-development [15] arguing for *pluriversal design visions* of addressing sustainability problems. A pluriversal design vision of our worlds shifts the focus from seeing developmental ICT as a 'silver bullet' to our sustainability problems towards alternative imaginings of how sustainable futures might be shaped with (and without) technology. Shaped by situated caring narratives of local communities – for instance, from the Global South [15], in political and contested contexts [16] – a pluriversal design perspective embraces diverse lifeworlds by recognizing the relational meanings of people, other 'non-human beings', their communities, and situated cultural and social practices, as the 'things' we study and design for, with, through, by, etc. [17].

In this paper, we attempt to address these current critiques of needed pluriversal alternatives when designing ICT for sustainability. Hence, our aim is to explore and materialise such alternatives as conversation starters that open for reflective and critical discussions on future sustainable digital world-making. This leads to the following research question: How can we materialise *pluriversal* conversations and narratives to spark

Strategic funding provided by the TECH Faculty of IT and Design at Aalborg University, Denmark

imaginations and reflections on future research and learning paths around sustainable ICT development in places where such ideas are not traditionally considered?

The exploratory study presented in this paper is situated in the Global North, at Aalborg University's TECH faculty, where both teaching and research are primarily shaped by problem-based and experimental learning perspectives [18]. In this context, working actively with developing and designing (ICT) solutions to address sustainability problems, is an integral part of the learning environment. To move beyond a conventional developmental 'one-size-fits-all' solutionist perspective of working with sustainable problems in this context, we explore the notion of pluriversal design to facilitate alternative discussions on possibly sustainable futures.

Our study reports on a larger project exploring emergent alternative and diverse perspectives on sustainable and digital transformation within this learning and research context. In this paper, we present PluriCards, a card deck developed along with game mechanics, designed to facilitate reflexive conversations on the topics of sustainability and digitalization. We report on the usage of the PluriCards both 1) as ideation cards to spark imaginations and reflections on future research and learning paths and 2) as a game that facilitates conversations and building narratives of sustainable futures reflected by the pluriverse contained within the cards themselves.

II. Related Work

A. Pluriversal Design

The 'pluriverse' - "*a world where many worlds fit*" [17, p. xvi] - is an alternative to the dominant paradigm of universalism, which assumes that there is one single reality, truth, and rationality that can be known and measured. This assumption is challenged by recognizing the diversity and complexity of life forms, cultures, and knowledge systems that exist on Earth. Arturo Escobar describes the pluriverse as a potential for a loose network of communities with different cultures, economic realities and political views, which can operate to the mutual benefit of all [17]. The idea of the pluriverse also implies a political and ethical commitment to respect and protect diversity, as well as to foster dialogue and collaboration among different ways of being and knowing [19], [15].

Research on pluriversal design highlights a fundamental difference in its structure: instead of a needs-centered approach, pluriversal design is argued to be desire-centered [20]. While social designers tend to approach communities on the periphery of colonial modernity focusing on their baseline or material needs, the communities' desires for flourishing can be neglected. As such, pluriversal design approaches (which are sensitive to cultural, historical, and political specifics) can by definition be desire-centered, thus supporting active participation and engagement, while avoiding what Escobar calls the "systematic creation of unsustainability" [17, p. 52].

B. Critical Computing

Critical computing is an interdisciplinary academic approach that scrutinizes the socio-political implications of technology and it challenges dominant paradigms by proposing alternative technological designs that embody different values and priorities. For instance, recognizing the harmful effects of powerful algorithmic systems due to their erroneous decisions and structural tendencies and addressing it by limiting their power in decision-making [21]. Similarly, the development of open-source software promotes transparency and collaboration, thereby challenging the proprietary nature of traditional software development [22]. Through these examples, critical computing illuminates the potential for technology to drive sustainable change, while simultaneously critiquing the status quo of ICT development. Ultimately, critical computing is shown to be an effective approach towards opening up spaces for critical discussion, especially when physical or digital artefacts are involved.

C. Card-Based Design- and Ideation Tools

Physical cards have gained popularity as design tools, likely due to their simplicity, tangibility, and ease of manipulation. As an evaluation method, Card Sorting has been commonly used in the past [23] and designers have extensively employed cards to render the design process more tangible, less abstract and even fun [24], [25]. These cards also function as effective communication tools, facilitating interaction between design team members and users. They have a rich history in both the design community [26], co-design practices [27] as well as in the interaction design community [28], [29]. In their review, Roy and Warren document design cards reaching back to 1952 with the "The House of Cards" by Charles and Ray Eames [26]. Since then a variety of such design cards have been developed and now span a wide variety of topics, ranging from designing playful experiences with the PLEX cards [24], over child-computer interaction with the DSD cards [30], to even ethical reflection on IT with Moral-IT deck [31] as well as designing with AI[1]. For reasons of brevity, we will not give an overview of all these tools and rather point towards the several review papers that documented the different styles and areas [26]–[29].

There are also several card-based design tools that focus on sustainability. The Eco-design cards were one of the first developed, presented by Lindley [32]. The aim of the Eco-design cards is to help integrate sustainable objectives that can be incorporated into a design brief. Furthermore, the Design Play Cards from Eco Innovators offer practical ideas around design for sustainability in learning through play manner [33]. However, no systematic evaluation for these exists. One of the more investigated and used cards is the Sustainability Cards [34]. These focus on industrial design strategies to extend the lifetime of products, which have shown some promising results in application [35], [36].

[1]https://aixdesign.co/shop/p/cards-print

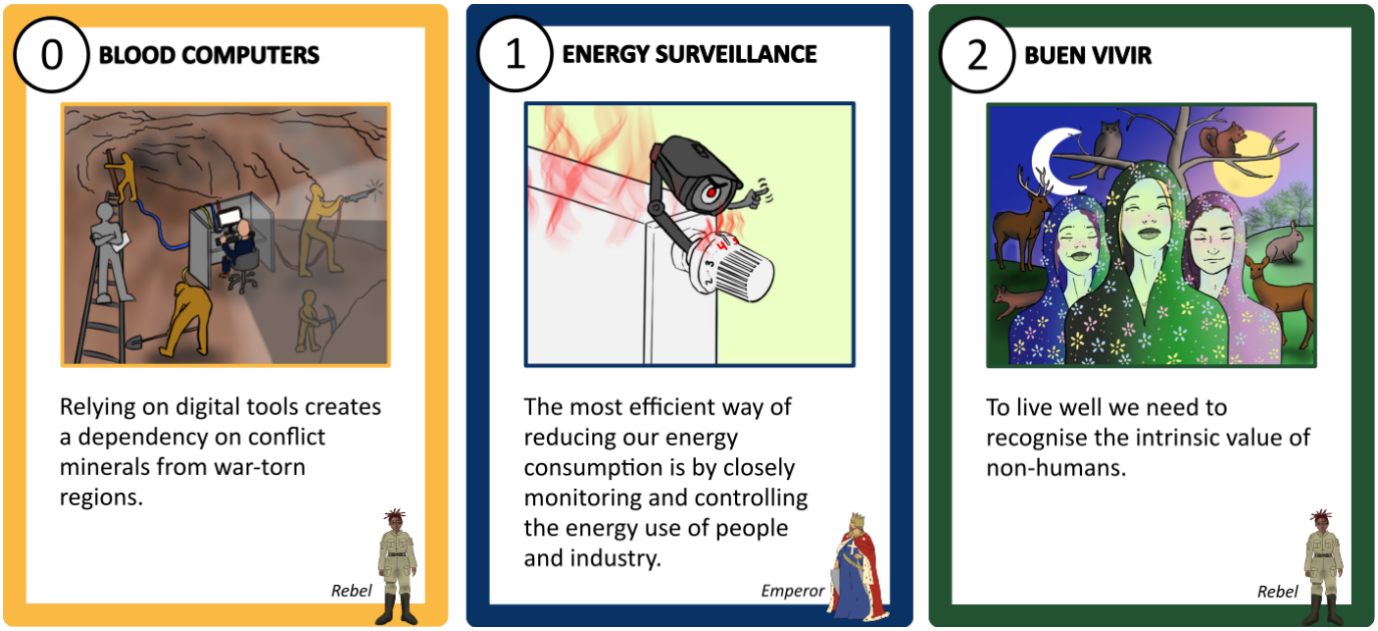

Fig. 1. From left to right: Yellow PluriCard (*Blood Computers*), Blue PluriCard (*Energy Surveillance*), Green PluriCard (*Buen Vivir*).

While some design tools exist that take a pluriversal perspective [37], to the best of our knowledge, none of them focuses on digitalisation (or digital transformation) and ICT development. Also, to the best of our knowledge, there is no pluriversal design or ideation tool that comes in a card-based format. Given the success we have seen from card-based design and ideation tools in the past [27], [38], the aim of this project is to develop a card tool that focuses on bringing pluriversal perspectives into the design of sustainability ICT technology.

III. The PluriCards Design

PluriCards originated from a deliberate exploration of ideation in research initiatives, leveraging the power of cards to spark innovative ideas. Drawing inspiration from "Pluriverse: A Post-Development Dictionary" [15], we identified tensions between Global North perspectives and more pluriversal viewpoints, prompting the need to bridge these realms. As a tangible artefact, the PluriCards are meant to serve as a catalyst for transformative ideation, embodying the pluriverse and challenging paradigms in sustainable and digital transformation. PluriCards, thus, integrate non-Western-centric perspectives into the academic discourse, offering a novel approach to research that contributes to a more inclusive and expansive academic landscape.

We used an iterative design process in an effort to 1) materialize pluriversal ideas into a tangible artefact which invites challenges to the status quo, 2) foster alternative ideation for the future, and 3) critique taken-for-granted understandings of sustainable and digital transformation in the Global North. We support this process by following an information-based design research methodology [39]. Initially, we chose to thematically align the PluriCards with the three pillars of sustainability (social, economic, and environmental [40]), where the yellow cards would correspond to the social pillar, the blue cards to the economic pillar, and the green cards to the environmental pillar. However, through later empirical and theoretical work, we decided against drawing an explicit connection between the pillars and colors, as we realized that the categories of the three pillars are not necessarily mutually exclusive. Instead of completely abandoning the pillars, we chose to simply not name them in the PluriCards. We found that players would assign their own meaning to different card colors, creating thematic associations, thus making the colors serve a gameplay mechanic, rather than a conceptual one. All card elements - colors, figures, illustrations, etc. - ultimately play into the players' interests and need to combine the cards in different ways, and to prioritize different aspects differently (e.g., more progressive futures over more status quo approaches). The game mechanics nudges players into reshuffling entrenched opinions that may not be contested often enough.

Ultimately, the journey of designing the PluriCards was not just about creating a card deck, but rather about cultivating a tool that could integrate pluriversal thinking and Global South perspectives into existing normative discourses of the Global North.

Our testing phase involved a series of assessments, evaluating both the conceptual framework and the design of the cards, along with the game mechanics.

A. The Card Elements

A single PluriCards deck holds 78 cards (48 theme cards, divided in equal number of yellow, blue and green, and 30 resource cards). The theme cards come in three colors, with illustrations, text, figures, and points, and the resource cards come in the same three colors with illustrations on both sides.

The theme cards are what players use to create scenarios for sustainable futures. The resource cards are the cost the players expend to play the theme cards. Depending on the point on the theme card, the player will expend corresponding number of resource cards (e.g., if a player plays a card that has a cost of one, they will expand two resource cards - one for playing the card, and one for the cost of that card). The PluriCards integrate various elements to facilitate a nuanced exploration of sustainability and digital transformation. Each card features a title associated with specific concepts or theories linked to sustainability and digital transformation. This nomenclature serves as a thematic guide, providing a quick reference to the overarching idea encapsulated in the card. The inclusion of illustrations further enhances the visual appeal and conceptual engagement, offering users a tangible backdrop to further understand pluriversal ideas.

Adding an innovative layer, each card introduces a Rebel or Emperor figure, acting as a persona that subtly hints at the type of perspective presented, adding a narrative dimension. The Rebel figure embodies dissent or alternative viewpoints, challenging established norms, while the Emperor figure represents authoritative perspectives, contributing to a nuanced exploration of the weight of different perspectives and interconnected conflicts.

A few examples of the PluriCards can be seen in Figure 1. The "Blood Computers" card addresses well-known and uncomfortable issues around mineral extraction. The card uses the Rebel persona to highlight critical human, moral, material and economic questions which are fundamental to the premise of a digital transformation. The "Energy Surveillance" card exemplifies a northern techno-optimist perspective that typically aligns with technologically driven solutions, emphasizing centralized control and efficiency measures. This perspective borders on technocratic hubris, illustrated through the use of the Emperor persona. The "Buen Vivir" card represents a central pluriversal concept - one that rejects a universal goal for all societies [41], - which embodies a profound shift in human-nature/non-human relations [15]. Blending indigenous wisdom with modern critiques, this concept emphasizes context-specific understandings of "living well" and advocates for a politics founded on plurinationality, rejecting colonialism in favour of an inclusive interculturality, illustrated by the Rebel persona.

These examples demonstrate how PluriCards can enrich a critical discussion by juxtaposing contrasting approaches to sustainability and highlighting the potential for diversity within a pluriversal framework. To further materialise these conflicts between perspectives, game mechanics were introduced weighing perspectives differently according to the ease with which it could be implemented in our current sustainability efforts, which will be further elucidated in the following section.

B. The Game Mechanics

The PluriCards are designed to enable interaction with imagined pluriversal futures, which are synthesized in the cards themselves. Additionally, the card deck itself is meant to be used by a broad and diverse audience, e.g. researchers, teachers and students in any field that deals with issues of sustainability and digitalization. The game mechanics support forms of playful engagement that can nourish imagination and ideation.

PluriCards can be played by two or three players in a competitive way built to promote the emergence of novel narratives on sustainable and digital transformation. Two players compete by creating compelling narratives of sustainability to gain points while - when three people are playing - the third player functions as a facilitator who engages in critical reflection and distribution of points.

A game of PluriCards consists of three rounds, and every round requires the two competing players to play PluriCards once. At the game's beginning, players draw two PluriCards and two resource cards from each each of the three colors, which gives them a total of twelve cards per player (six PluriCards, six resource cards) (see Figure 2).

The cost of a PluriCard is visualized in its top left corner, ranging from 0–2 (see Figure 1). This cost distinction serves to highlight a card's degree of transformation, letting users explore sustainability on a spectrum from *status quo* (0) to *transformation* (2) [40]. In each round, a player may play a number of PluriCards, paying the appropriate resource cards in return, and may also combine these PluriCards across categories. The combination mechanic encourages exploring how different approaches to sustainability in the theme cards, represented by the aforementioned pillars of sustainability [40], complement each other conceptually, as playing combinations of cards is more accessible due to a player's initial drawing of two resource cards from each color.

When participants play the PluriCards, they must provide an explanation for how the cards fit together as a vision of sustainability. With the breadth of contents in PluriCards, players are encouraged to engage with both well-known card combinations, as well as forced to reckon with foreign understandings of sustainability due to the random nature of drawn cards. Playing cards rewards a player with one point plus the cost of the card (e.g., a 0-cost card provides one point) to award players who explore radical, transformative ideas contained in the PluriCards. When players have played PluriCards associated with a vision of sustainability, the facilitator is to probe these visions and ask questions that prompt reflection. By doing so, the facilitator helps players to argue why a combination of PluriCards is seen as a compelling vision of sustainability, as well as reflect on possible drawbacks and tensions of this vision. In the specific university context, facilitators might, for example, ask students how their educational background(s) could contribute to this vision. This allows for a nuanced engagement with different people's perceptions of sustainable transformation, leading players to discuss these with each other and integrate these discussions in future rounds.

After three rounds, the game proceeds to an "epilogue", where the facilitator engages players in reflections on the entirety of combinations played by a given player. This entirety

Fig. 2. A visual representation of PluriCards' gameplay structure. See detailed description in Section III B. Game Mechanics.

of combinations is framed as a "future", where all combinations are woven together to materialize visions of what a sustainable future might look like and the many possible ways this can be understood. The facilitator engages the players in a discussion and can distribute three points to the player they deem to have provided the most compelling sustainable future overall. The facilitator's additional points mechanics encourage players to consider the totality of sustainability initiatives and how these may pose tensions and opportunities across visions played.

Event	Participants	Roles
Workshops	15	Researchers
Networking on funding	8	Researchers
Teaching	45-50	Master's students
Game testing	15	Master's students
Research exchange	7	Researchers

TABLE I
THE TESTING EVENTS OF PLURICARDS

IV. PLURICARDS USAGE

We tested and used PluriCards in multiple settings, leveraging both their intended capacity to promote ideation and the game mechanics. The intention was to see how people would relate to the concepts depicted in the cards and how that would feed their conversation on research.

In this section, we will comment on their use, and report on the multiplicity of events in which PluriCards have been used (see table I). More specifically, the cards have been tested in two physical workshops with research colleagues (with a total of 15 participants), in an online event promoting networks for research funding applications (8 participants), with students of three different educations in a university (approx. 45-50 students), with students of different departments at the TECH faculty in a "game night" event (15 participants), and in a meeting with another cross-departmental centre working on circular economy (7 participants). In those situations, PluriCards have been used as a game (in the case of the game cafè) or as conversation starters. In this section, we will summarize what happened on the basis of those two uses, as *ideation cards* or as *a game*.

A. PluriCard As Ideation Cards

As anticipated, PluriCards have been used - and tested - as ideation cards to be easily picked up and put to use in favouring conversations among people with different backgrounds and research goals. In all the different events, PluriCards' capacity to support ideation and conversations was tested, and their use positioned at different moments during the conversations (see Figure 3). In particular, when research colleagues were involved, PluriCards were introduced after a moment of presentation of research directions. Here, the PluriCards sparked a discussion on the meaning of concepts like *sustainability* or *digitalization*, positioned from the discipline of the individual participants. When students were involved, the cards were mostly used as a way of letting

students articulate sustainability concerns to each other and their respective interests on the topic of the courses they were attending. In all those occurrences, we placed a full deck among a group of people and asked them to pick one to start a conversation and draw further cards when needing new prompts.

In general, we could see three main forms that the conversation would take after cards were drawn from the main deck. Those forms depended on the disciplinary composition of the group, the familiarity with the drawn card content, and the general flow of the interactions. The three patterns we could see are: 1) *a focused flow* in the conversation with the drawing of only one card, in which the conversation included the card but as a way of reconnecting to the topics discussed before the cards had been introduced; 2) *an exploratory pattern* in which cards would be picked up regularly, adding to the ongoing conversation but in absence of a strict focus; 3) *a slowed down pattern* of interaction, in which the content of the card drawn becomes the focus of the conversation, in terms of questioning its validity, meaning, or assumptions.

In the latter case, we noticed that usually a single participant is questioning the content of the card. One notable case is the picking of the "Beyond Growth" card (describing how less energy and material consumption leads to thriving and that thriving is the most important growth at all) –, and the conversation turning into assessing the card's content more than relating it to research fields and domains. This is an example of some of the card content slowing down conversation. In the exploratory pattern, we have sometimes seen an expansion from research-related topics to general life in [Scandinavian country] or general trends in the world, and then conversations move back to the research environment. For example, in one of the workshops with research colleagues, the card "Valuing Diversity" triggered a conversation on diversity in [Scandinavian] society, from homogeneity to how some parts of society value differences. Here, the conversation ended with examples coming from one colleague's research field in which questions about who and how to include people from diverse cultures in research activities are common.

A different pattern could be observed when the PluriCards were used as a starter of a group conversation and not following previous activities, for example, with students. In those cases, the content of the cards acted as a way for students to articulate their interests. For instance, in a Master's program in [removed for blind review], the PluriCards were also used at the beginning of the semester, when students are assigned by one of the instructors to groups of 3-4 people. The students are supposed to work together in these groups for the entire semester on a shared project worth half the total study time. In this case, students used the cards as a way of getting to know each other (groups include students coming from the bachelor and newcomers, among international students) and to present their interests on technology. Students shared with the instructor that the use of the cards made it easier for them to engage, in a second phase, to discuss the potential topic for their shared semester project.

Fig. 3. PluriCards tested as ideation cards to spark conversation and reflections on sustainability and digitalization among research colleagues

B. PluriCards As a Game

The goal of adding the game mechanics to the PluriCards deck was to add a way that triggers participants to quickly engage with a wide variety of pluriversal ideas. Given the previous success of card games for ideation [26]–[29], we hoped that this could work for the pluriverse. To evaluate the potential of the PluriCard, we hosted a game night with 15 students. We invited students across campuses as it was deemed important to engage differing educational backgrounds and views on both game mechanics but also on sustainability and digitalization.

The game night was split into two rounds of card evaluation. The initial round aimed to enhance participants' comprehension of the concepts and content aspects of the cards. This was informed by the previous experiences described above, recognizing the significance of players grasping the intricacies of their card and the potential they can hold for effective gameplay.

For the first round, participants were randomly split into three mixed groups of five (see Figure 4). For the second round, they were split into pairs and one group of three participants. The second round focused on the examination of the game mechanics, with the primary objective of soliciting constructive feedback on this part. During both rounds, three facilitators were present to assist and explain cards and concepts if needed. These facilitators also collected observational data during the sessions, focusing on participant engagement and issues that arose. After the second round, participants also filled out a questionnaire focusing on their subjective reflections on the game, the topics covered and the relation to their education.

In the first round, it became evident from our observations that the participants were immersed in active gameplay and had a comprehensive understanding of the card's contents. Participants actively engaged in discussions, attempting to

Fig. 4. PluriCards tested as a game to trigger reflections on sustainability and digitalization among students.

discern the meaning and significance of the different cards and their broader relevance to the overarching themes of sustainability and digitalization. Here also the varying educational backgrounds impacted the discussions significantly, in a helpful way. As most participants had an interest in sustainability, they all possessed a certain level of knowledge in their own specific area before and thereby could help each other grasp the concepts. Overall, using the first round in larger groups with varying knowledge helped participants establish familiarity with the card concepts and get an initial grasp of the game mechanics.

For the second round, we paid particular attention to play strategies and the discussions around the game sessions. Overall, we saw that the participants had very few issues creating a variety of scenarios, which was also reflected in several of the comments we received in the questionnaires *"The points on the cards were my main driver in what cards to play. I felt like I could argue for most - not all – combinations"*. Driven by trying to win, participants were forced to take different perspectives: *"They helped me get in the mind or take the stance of a capitalist or the capitalist perspective which generated good questions and arguments for and against different scenarios. This perspective also brought forth some very real or realistic challenges that we are facing."*.

The diverse ways in which participants advocated for their cases underscored the varying mindsets between the different studies: *"It was fun to play with others from another study to see different arguments and point of views."*. One interesting case that was observed was that one participant, instead of trying to create a sustainable future vision, actively created a dystopian future. Interestingly, though, this was still considered as a valuable engagement by other group members. We did not collect any user types (e.g., using the Hexad method [42]), which could have given a better understanding of the situation, e.g. if the player was a disruptor or if they actually found the dystopian outcome more likely. Overall, the written feedback and the voiced feedback during the playthrough were overwhelmingly positive: *"The cards are a great jump off point for discovery! As such, they function as a great platform to discuss, or education experience"*.

V. Discussion.

A. Reflecting on Pluriversal Design

There are two major reflection points concerning the usage of the PluriCards as ideation tools. The first reflection point concerns the format, i.e. the fact that the card deck has proven to be successful in engaging people with different cultural, historical, and professional backgrounds in critical discussions on futures for possible sustainable ICT development. As demonstrated by the different usages of the cards - as ideation tools and a game - the PluriCards have proven to be stimulating in a variety of contexts for different participants: ICT practitioners at a university, researchers learning about funding applications as well as [country] and international students from three different educational programs. While more experiments will surely add new dimensions to how the PluriCards can support digitalization and ICT discussions with a pluriversal perspective, our initial sample demonstrates that such critical conversations are already taking place. The second reflection point concerns the content, i.e., the capacity of the PluriCards to hold, convey, and support pluriversal perspectives as central discussion points amongst different participants. The visual and textual design of the cards has proven to be effective enough in framing discussions, which take place in a "world where many worlds fit" [17] - e.g., different cultural, academic and national backgrounds creating imagined sustainable futures equitably, in a predominantly student, researcher, or teacher-heavy environment.

What should ICT practitioners and researchers working with digitalization and considering issues of sustainability take away from these reflection points, and the paper as a whole?

- The presented design approach offers a structured way to produce tangible artifacts for critical pluriversal discussions with a diverse pool of participants.

- Status quo, entrenched conceptions of ”sustainability” regarding ICT topics can be challenged in an inviting, gamified format.
- Research, administrative, and teaching activities are environments where PluriCards-supported critical discussions thrive.

Based on the findings presented in the paper, we propose that ICT practitioners can benefit from incorporating and/or adjusting the PluriCards deck into their professional practices. In this way, they can create space for the pluriversal concepts visible in each card to further challenge the status quo of existing ICT development ideas on sustainability. Additionally, we advocate for ICT practitioners as well as students in related fields to go beyond an academic setting by including many more diverse participants from the private and public sectors alike in their work. A more open approach like this would be in support of the pluriverse's description of ”*a world where many worlds fit*” [17, p. xvi].

B. Materializing Alternative Perspectives on Sustainability

As mentioned, the impact of human living on the planet has led to environmental consequences that not only trouble socio-economic perspectives of being human but also the surrounding nature, non-human beings, and their communities. To address such human-induced “wicked problems,” we typically see various Global North initiatives narrating sustainable imaginaries of universal ICT solutions shaped by visions from the industry [7] and national policies [9] (e.g., the smart home, the smart grid). Such technology-driven solutions are often developed on the assumption alone that *“the idea that all excesses of computing are justified because of the technology's unique capacity to increase productivity and generate profit”* [2]. In this paper, we presented PluriCards as an alternative way forward [13] to challenge this status quo of addressing sustainable futures in a research and learning environment. The PluriCards materialize pluriversal meanings with diverse and divergent worldviews of what, why, and how sustainable living can be performed. Together with the usage and testing of the PluriCards, our study illustrates that – although many of the cards' pluriversal worldviews are shaped by social and cultural practices performed in local communities in the Global South [15] – the cards still manage to spark alternative conversations of possible digitalized sustainable futures among researchers and students located at a university in the Global North.

Based on the participants' experiences of touching, seeing, reflecting, and discussing the meanings materialized in the cards, we argue that by materializing abstracted pluriversal ideas and concepts [15] with words, images, colors, and game mechanics, the cards perform as a collaborative reflexive learning tool. In the ideation sessions, this played out as conversations and reflections on, e.g., past research assumptions, future research positioning, and the value of fostering diversity in collaborations in a somewhat homogeneous university context. In the playing sessions, we saw students displaying divergent imaginations by having to discover, argue, and reflect on alternative ways of thinking about the development of ICT and sustainable futures as they put together narratives from the cards by playing PluriCards as a game. Thus, we argue that the value of PluriCards can also be found in the conversations, ideations, imaginations, reflections, and alternative narratives found in collaborative settings akin to research collaborations and students' learning environments.

Lastly, we want to highlight that on acceptance of this paper, we will make the card deck available via GitHub, allowing fellow researchers and teachers to make change requests, suggest additions or even create their own fork and change the whole set completely. This will ensure that the PluriCards will be adaptable and available in the future.

VI. Conclusion

In this paper, we present an exploratory study of PluriCards conducted in a Scandinavian TECH university faculty to move beyond the conventional solutionist perspective of working on sustainable problems. PluriCards, a card deck with game mechanics, was designed to facilitate reflexive and alternative conversations on sustainability and digitalization. Our study illustrates how PluriCards were used as ideation cards to spark imaginations and reflections on future research and learning paths and as a game that facilitates conversations and narratives of sustainable futures reflected by the pluriverse contained within the cards. These uses of the PluriCards underscore their potential as an innovative tool for fostering a more holistic and inclusive approach to sustainability, further supporting the ideas of the pluriverse. We acknowledge the limitations of our work, first of all the fact that we operated in a specific, situated context. Therefore, we are looking forward to future uses of PluriCards in different contexts. The design of PluriCards allows for the expansion of the deck, based on future research projects, new conceptualizations, and multiple collaborations. PluriCards have been released following a Creative Commons license (CC BY-NC-SA 4.0), and that allows for the appropriation and proliferation of the deck by multiple researchers. Moreover, starting with this paper, the promoters of PluriCards are engaged in disseminating them through further occasions, like doctoral schools, conference workshops, etc., and that has the potential of increasing PluriCards capacity to promote sustainability within ICT.

Acknowledgment

The work on PluriCards has been possible thanks to strategic funding by the TECH Faculty of IT and Design, Aalborg University, Denmark.

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