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DESIGNING OUT UNWANTED HEALTHCARE FUTURES: A NEW FRAMEWORK FOR HEALTHCARE DESIGN INNOVATION WITH INTENT

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ABSTRACT
At the time of a global pandemic, it is becoming acutely evident that design has to intensify efforts to move beyond reactive tackling of healthcare challenges as they occur, towards a proactive approach of designing-out unwanted healthcare futures before they become a reality. As healthcare design navigates towards more distant horizons, the scale and magnitude of design challenges increase. New approaches to envisioning and negotiating preferable healthcare futures across disciplines are required in order to make that shift successful. In this paper, we discuss the application of a new trans-disciplinary approach applied within burst-mode healthcare design education of professionals from multidisciplinary backgrounds. This strategic design-led innovation approach distinguishes between desirable and undesirable futures. It employs futures scoping methods, alongside the identification of technology drivers and enablers, to understand the target landscape and to design strategic pathways toward paving design interventions. Tools, such as the four futures of Jim Dator and NASA TRLs, are used alongside collaborative mood boarding to visualise possible futures and facilitate concept generation utilising moon-shot thinking and back casting.

Keywords: Healthcare futures, designing-out unwanted futures, transdisciplinary education

1 INTRODUCTION
Design disciplines have a moral responsibility to intensify efforts to tackle future health challenges, consider potential risks and address emerging crises before they arise. Healthcare design has an ethical obligation to maximise positive impact, preferably facilitating prevention over cure. We can consider maximising design impact operating within three-dimensional space, which includes an axis of time, scale and variety of design expertise involved, which we illustrate diagrammatically below (Figure 1). The scale axis captures the changing role of design is anchored in facilitating trans disciplinarity in problem-solving, referring to Meadow's Leverage Points and the movement from designing objects to systems and models [1]. The temporal axis can refer to reactive vs. proactive design. The third 'disciplinarity' axis captures the range of expertise involved. Design for behaviour change maximises impact by utilising behavioural science expertise and frameworks to detect and pre-empt unwanted behaviour and intervene with a solution (preferable outcome) ahead of time [2]. The temporal scale is considered within a short, 'micro' fragment of the user journey and identifies particular behaviour, analyses different components, including actors, motivation, capabilities, barriers and facilitators, to propose an optimal design intervention. Design innovation in the context of health futures has the potential to maximise impact by operating analogously, but including a wider temporal component, within a macro-scale. In this way, it either observes a variety of futures and proposes solutions to design-out unwanted futures or facilitates solutions for an envisioned, 'negotiated' preferable future.

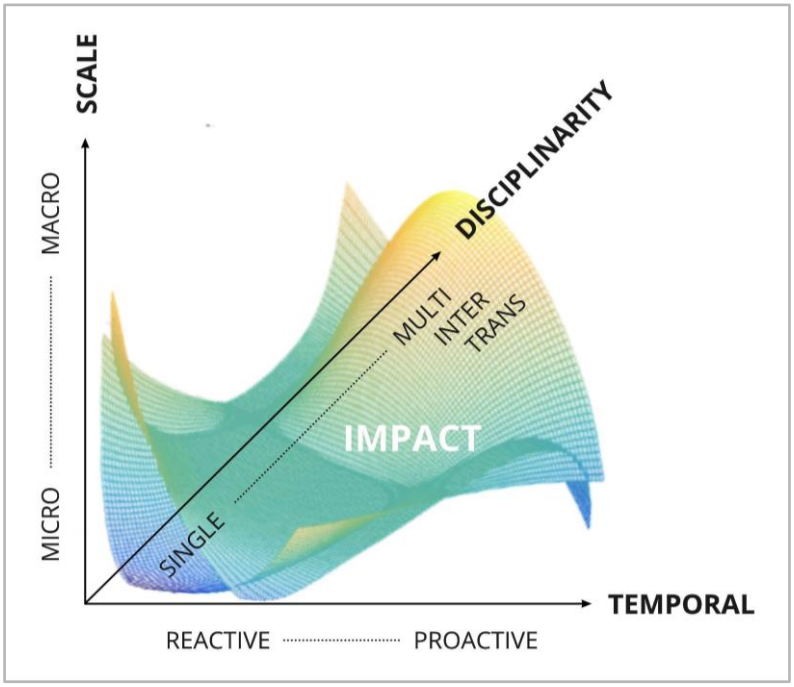

Figure 1. Three-dimensionality of maximising the design impact

The expanding body of research within the domain of future studies provides a variety of methods and tools within futures research practice and education for impacting social change [3]. Some futurists point out the need for preventing situations when *'back casting often ends only in a report'* or *'methodologies for integrating thought and action (...), such as anticipatory action-learning (...) are seldom applied and tested'* [4]. Space industry organisations, such as NASA, which undertake projects with long time horizons (measured in years and even decades), have developed tools and methods, including Technology Readiness Levels (TRLs) [5] and Technology Taxonomy, to assess technology maturation during the project development cycle [6]. Design futures research practice offers 'futuring' methods from Speculative Design to Foresight and Scenario Planning [7]. Despite the advancements in futures research, the implementation of 'proactive' design approaches to health(care) innovation still remains largely unexplored. New educational approaches to teaching future healthcare design innovation in an interdisciplinary context are required to maximise the impact on the future of health.

Health Design Innovation is a core one-week module delivered as part of the second year curriculum of the Healthcare and Design MRes and MSc courses jointly at the Royal College of Art (RCA) and Imperial College London (ICL) [8]. The module introduces different mechanisms of disruptive innovation, types of innovation, design futures, including anticipatory, speculative, prospective futures, and Design for the Unthinkable World. By the end of the module, participants are expected to be equipped with a variety of future scanning and forecasting approaches, as well as methods to negotiate and deliver Preferable Futures, outline innovation strategies and the innovation blueprint of the proposed solution. The module has been delivered both as face-to-face hands-on teaching in the academic year 2021/22 and through an online, highly interactive, multi-time zone mode in the academic year 2020/21 due to pandemic social distancing restrictions. The teaching staff included experts from healthcare design innovation, health policy and invited staff from NASA's Jet Propulsion Laboratory with long-term future project planning expertise. The student teams included a wide range of expertise, with backgrounds ranging from design, art, medical, policy, business and social sciences.

2 THE JOURNEY FROM PAST(S) TO FUTURE DESIGN INNOVATION

The first two days of the module introduce the theory of innovation and retrospective analysis of innovation types in lecture-discussion format. The themes include technology, business models, systems and processes analysed on case-study examples. This lays the groundwork for the hands-on group work over the rest of the week. Students are divided into teams of four to five participants with diverse backgrounds and engage with directed hands-on workshop activities, which are introduced by short strategic lectures. The faculty provides group mentoring, facilitating, and feedback in the form of studio walk-around tutorials and open-office sessions. The diagram below illustrates the framework of the

design research process application, from health challenge identification and incorporating past insights, to proposed design solution innovation impact blueprinting (Figure 2).

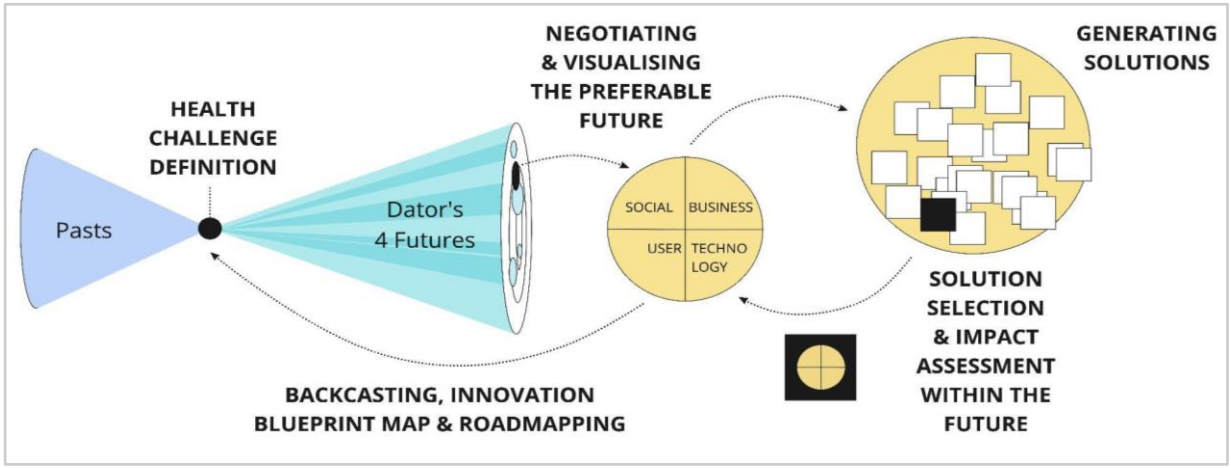

Figure 2. Modular workshop cycle from understanding the challenge and design opportunity to the design solution and impact map

3 THE PAST CONE, THE FUTURE CONE, AND THE HYPERSPACE OF NOW

During the third day, student groups defined a selected health challenge by discussing multiple pasts and futures in the context of Minkowski Spacetime Cone.

In order to outline the challenge, its dimensions and scale, the teams used multiple pasts to understand the potential relationships [9]. Four quadrants of realisation, adopted by Johnes from the Johari Window have been used by team members to gather insights, evidence, and spot potential gaps within: 'known knowns'—consequences relatively easy to predict, 'known unknowns'—such as side effects of a new treatment, 'unknown unknowns'—related to the awareness of not knowing, and 'unknown knowns'—which the team might know, but is not aware of at the time [10]. Students used medical technology horizon scanning [11] and NASA Technology Taxonomy [6] discussing potential technology roadmaps and identifying them within the future cone of possible, plausible and probable futures [12].

As a next step, the teams envisioned in detail Dator's 4 Futures—Continuation, Limits and Discipline, Decline and Collapse, Transformation—within the selected challenge area [13]. Teams used the Miro.com online collaborative whiteboard platform to detail each of the futures with visuals and diagrams, and describe within: User, Social, Economic, and Technology contexts (Figure 3).

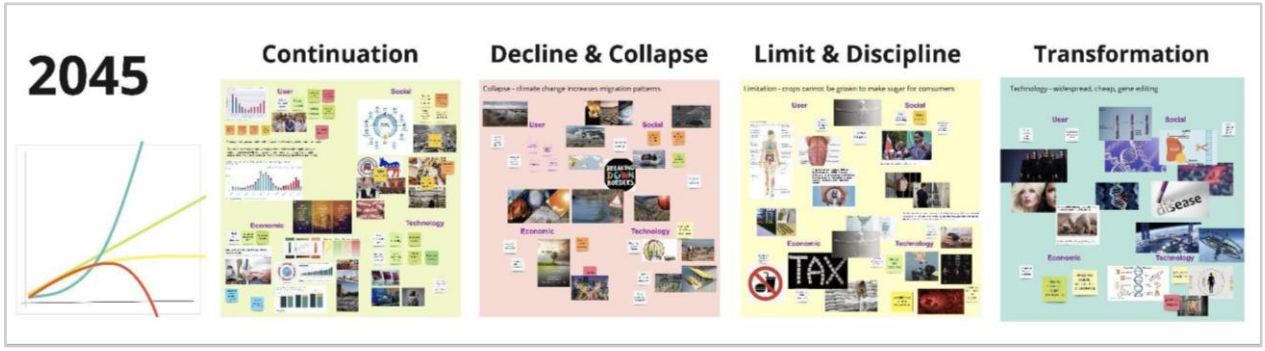

Figure 3. Example: Visual scoping of Dator's 4 Futures. Students: Rozansky, E. Krenkler, J. McEntee, K. Kandya, S. Minkovska, S. Richter

4 NEGOTIATING THE PREFERABLE FUTURE

Day four was focused on the selection of a preferable future within the envisioned foresight landscape. With the diversity of background and expertise, negotiating common visions of what would constitute the preferable future for the team was one of the key challenges. Lohman's 'fields of vision' diagram illustrates 'individual' future cone perspectives and potential disparity of preference (Figure 4) [14].

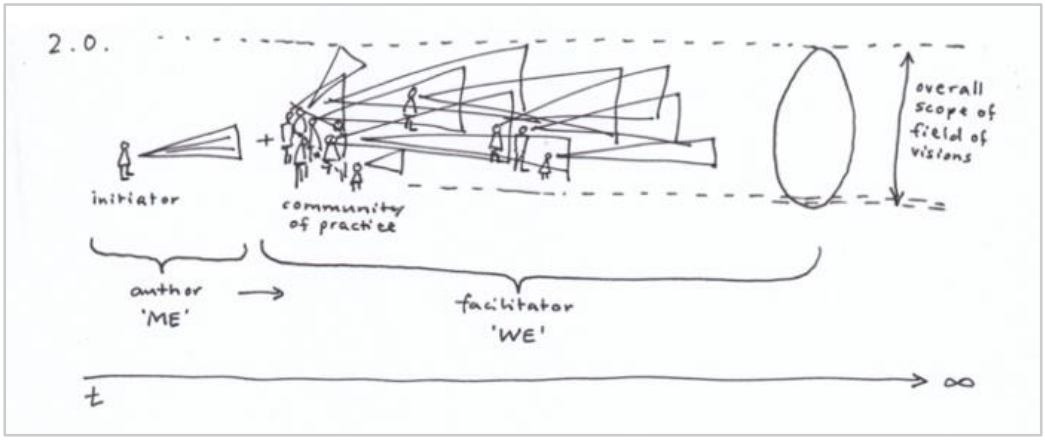

Figure 4. Fields of vision, after Julia Lohman

To facilitate the process of negotiation, teams used a number of design methods to advance the conversations and develop their concepts, including boundary objects in the form of visualisation tools and mock-ups [15]. The term 'boundary objects' originates from the field of social sciences and refers to objects that can be simultaneously (a) concrete and abstract; (b) specific and general, and (c) conventionalised and customised. Through connecting conversations, they facilitate developing novel distinctions and shared meanings between the design team members. Boundary objects overlap between worlds (or disciplines), becoming the problem space for negotiations and (design) conflict resolutions. During the design process, both the conversations and the boundary objects may evolve and could be referred to as second-order boundary objects [16][17]. Conflict resolution could be achieved through cybernetic circularity, with conversations between the participants, reaching across discipline boundaries. This approach helps to evolve an idea towards a preferred outcome. The teams worked with visuals, sticky notes, simple sketches, higher fidelity drawings to create keystone graphics, and low fidelity mock-ups to establish a shared vision of the preferred future, defining it within multiple layers: User, Social, Economic, Technology and Environment (Figure 5).

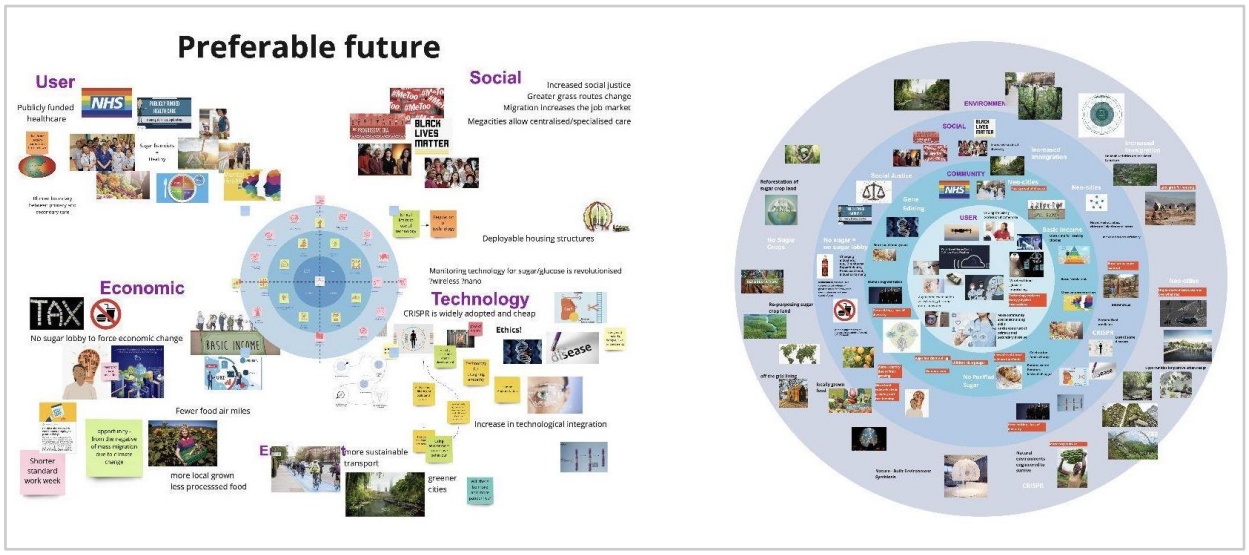

Figure 5. Preferable future layers detailing. Students: D. Rozansky, E. Krenkler, J. McEntee, K. Kandya, S. Minkovska, S. Richter

5 DESIGN INNOVATION AND IMPACT

The envisioned landscape of different futures, potential black swan events, and the defined context of the preferable future allowed teams to consider strategies to design-out unwanted futures. Each team selected an innovation strategy of either Moon-shot Thinking or Blue Sky Thinking, and/or Back casting approach.

Healthcare Design Workshop Cards were used to facilitate generating a large volume of solutions within

a selected preferable future context [20]. The ideas were thematically grouped, narrowed down and examined using the disruptive innovation impact map (Figure 6) developed by the authors.

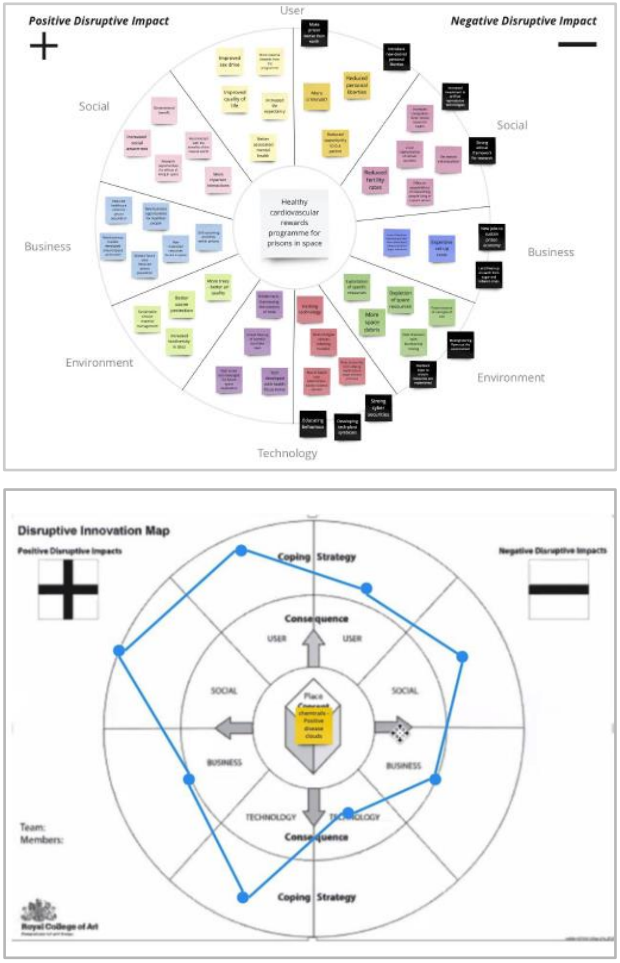

Figure 6. Innovation-impact blueprinting maps. Students: C. Luxford, K. Kandya, S. Ahuja (left), A. Mirani, B. Wall, C. Tighe, J. Chui (right).

Modular outputs were presented on the last day of the module. Teams presented the challenge analysis, the proposed solution within the context of the selected preferable future and the projected innovation impact map. The teams provided reflective analysis of the research process and methods used to negotiate preferable futures, as well as ideated solution groups and the innovation blueprinting.

6 REFLECTIONS AND INSIGHTS

The collaborative visualisation and diagramming played a key role in facilitating the module learning, both in the remote and face-to-face delivery of the module. Digital whiteboarding tools, such as the Miro.com platform, have been introduced to enable collaborative work during remote delivery of the module. This not only facilitated the successful teamwork across different locations and time zones, but also strengthened the richness of captured design research process, and has been incorporated into the face-to-face teaching model, where each team keeps a trace of the process throughout the week.

One of the key observations highlighted by the student teams was the complexity of negotiating the shared vision of a preferable health future. The role of using boundary objects in facilitating communication enabled a common understanding of matters discussed and played a key role in facilitating the discussions and productive conflict resolution. Other teams defined 'actors' representing stakeholders within the selected future.

The crucial element of the idea selection process was the solution evaluation using the Disruptive Innovation Map, which enabled assessing the impact of the solution as of 'now' and also for a projected future.

7 CONCLUSIONS

The introduced process has been enthusiastically received, and resulted in rich module outputs, especially when it comes to the process. Elements of the framework we have tested here have been the subject of discussion by the authors over several years and have a dual purpose of introducing students to a number of futures-related concepts while also indicating how these can be used together as a whole. This approach recognises a general trend we have observed in healthcare design projects away from classic design solutions towards realising that larger issues lie in the positioning of design and meta skillset orientation towards design futures. It also helps build methods and methodological fluency and confidence which we have observed later in the student's major projects. While the main aim of this approach is strategic for enhancing healthcare design capability and for navigating towards preferable futures, we also suggest there is novel value in future explorations towards products and services at a more applied level.

The disruption mapping has increased impact assessment and afforded us to appreciate follow-on innovation opportunities while the framework approach has allowed both designers, healthcare professionals and students from diverse backgrounds to rapidly gain confidence in design futures delivered through a burst-mode postgraduate education model.

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