Translation as an explicit practice in design research

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Abstract: Translation as a practice, has many applications and histories. In a research context, the translation of knowledge from one domain to another brings scientific knowledge and critical ideas to people and industries. Translation between different forms of knowledge can enable collaboration between research, industry, policy and society to enable systemic knowledge co-production and impact. This paper explores the ways that design is intrinsically translational, and why translation is now becoming an expanded and explicit practice in design research. As the complexity of multidisciplinary and multistakeholder collaborative research increases, the translational nature of design could play a vital role in convening knowledge and creating impact through synthesis and interpretation into tangible artefacts and interventions. This raises the question: how might design explicitly define its role as a translator in new contexts of research and practice?

Keywords: translational design; collaborative design; multidisciplinary research; systemic design

1. Introduction

Design, at its core, is an attempt to synthesise diverse inputs into a seamless whole. Designers pride themselves on organizing complexity, finding ‘clarity in the chaos' and reconciling complex tradeoffs to create an artefact that is understandable to an end-user (Kolko 2010). Universities are increasingly reimagining themselves as impact-oriented institutions (Campillo et al 2023) that seek to not just generate new knowledge but also to use that knowledge to create impact and change in the community. Impact can come from a variety of sources, from the application of technical knowledge generated by scientific methods to scholarship in the humanities influencing policy. The concept of Translational Research is explicitly discussed in the field of healthcare research. Translational Science describes the process through which fundamental scientific knowledge is ‘translated’ into practical impact (Drolet and Lorenzi 2011); from the lab bench to the patient bedside. Other

terms like Knowledge Transfer, Research Commercialisation, Research Uptake, Implementation Science, Knowledge Mobilisation, Research Utilisation and many more variants are used across research communities to describe the increasingly defined process of knowledge translation through to impact.

Meanwhile, research topics and project teams are becoming more complex in response to increasingly intractable challenges across all sectors, with a greater diversity of disciplines and forms of knowledge needing to come together to realise this practical impact from their collective knowledges. Practice-based design researchers[1] (Kaszynska et al 2022) are finding that their *intrinsic* translational skills can *explicitly* support knowledge flow and sense-making throughout these impact-oriented, multidisciplinary research projects. In the past designers may have been concerned with the relatively simple tasks of translating knowledge, such as ergonomics, manufacturing, and ethnographic research into new combinations of form and function (Buchanan 2001a) to satisfy human needs and desires, as Koskinen describes "a time that feels innocent now" (Koskinen 2023:3). Whereas the world of transdisciplinary research presents designers with new translational problems to solve, from early in the collaboration through to the final delivery of outputs (Hornbuckle 2022; Page & John 2019; Wizinsky 2019).

We have previously highlighted the emerging role of designers in research translation (Page & John 2019) and multidisciplinary collaboration (Hornbuckle 2023; Page & John 2020). The aim of this paper is to explore the emergence of Translational Design Research discursively, by drawing on key theories from the literature on multidisciplinary boundaries, taking examples from design practice and our conversations with other disciplines, where design research comes face to face with new challenges and alternative perspectives on its role and identity.

Translational practices are performed in many contexts of boundary-crossing: in the social sciences, applied sciences and humanities, and by individuals in most – if not all – industry sectors. Therefore, a further aim for this paper is to begin to explore how design research might define its translational role as distinct in these new contexts of complex collaboration. Asking, what is different about the nature of translation when design is practiced to explicitly translate research?

During the preparation of this paper, we have uncovered more questions than answers. Though not yet in a position to propose a model or framework, we hope that by laying the foundations we can give Translational Design Research a shape so that it may be examined and critiqued by other researchers. We begin this endeavor by exploring analogies of translation and how translational practices are understood in non-design disciplines.

[1] Here we use 'practice research' as a catch-all for applied design research epistemologies and approaches including Research through Design (RtD) (Findeli et al 2008)

2. What is translation?

Translation occurs in many contexts and histories; it is the way all manner of things communicate information between different worlds “from one code to another code” (Rice 2023). Translation makes it possible for new acts to take place, for example in microbiology when DNA is translated into a series of amino acids that enable specific biological functions to take place.

Likewise, the literal translation of the spoken word enables knowledge to flow from a native speaker to someone for whom the language is unfamiliar. This can be seen as a simple task, for example translating a menu in a restaurant. Translation of written language can also be more complex and subjective than this literal translation, such as translating a poem from one language into another, where the role of the translator takes on more importance as they draw on multiple sources of knowledge (perhaps including their own tacit knowledge and histories, biographies and other translations) to craft their translation with respect to culture, metaphor, humour, wordplay, and so on.

Another parallel can be drawn with the orchestral conductor, who applies their artistry to translate a written piece of music into an arrangement, which may need to be iterated many times through rehearsal with an orchestra before they are satisfied with the music performed. We recognise that the translation of these written notations into music is more complex than playing the notes, that the musician themselves plays an artistic role, and that the artefact of the sheet music, while a central piece of information, is an incomplete ‘translation’ from one musician to the next. Moreover, it is the combination of collaborators, and the iterative approach to refinement, that brings the piece together through the complex interplay of the individual instruments and musicians.

These analogies serve as a tool for reflection and comparison when exploring the nature of translational practices in other contexts, such as research. We find these analogous challenges of translation resonate with the challenges and approaches of design when practised in complex contexts drawing on multidisciplinary knowledges.

2.1 Translation in the sciences

Translational practice has been observed in several disciplinary fields and industry sectors outside the arts and humanities.

Engineering has long been a key translator of scientific discovery so that it may be applied in the real world. For example, modern transportation systems with their bridges, automotive engines, and roads, would not have happened without engineering’s translation of scientific principles into real-world infrastructure and technology. Increasingly the sciences have recognised that building a ‘translation process’ into research can lead to more impactful and results and take-up from industry. New materials developed by scientists can have huge

market potential if an appropriate application or 'killer app' can be identified or created (Miodownik 2007). A person who becomes bilingual in materials science and design language can translate material characteristics – which may have been presented in the form of numeric data in the sciences – into benefits for design using dialogue, image, touch and other sensory language (Hornbuckle 2013; 2021).

Rieple et al (2005) have observed translational phenomena in organisational research, where 'boundary-spanners' are central to the relationships between different organisations, as they become bilingual – in the sense that they can speak to the meaning and value of more than one organisation – and can therefore ease multi-organisation relationships and value chain transformation. Here, the act of translation increases in complexity as it becomes a means of negotiating, interpreting and sense-making whilst interacting with multiple notions of value and meaning. Translation ceases to be a one-way street – 'from one code to another code' – and instead becomes a multifaceted dialogue.

More recently Translational Research, with its subdisciplines of Implementation Science (Bauer 2015) and Knowledge Mobilisation (Ward 2017), has been formalized as a field of applied research where knowledge generated by 'basic' or fundamental research is translated into real world practices (Figure 1). This is seen as an important part of achieving impact from scientific research. In the medical sciences, there is a clear need for Translational Research; if translated into new device or therapy that successfully 'treats' patients in large numbers, basic results can improve the healthcare of thousands of people, whilst also providing economic benefits for diverse stakeholders (Page & John 2019).

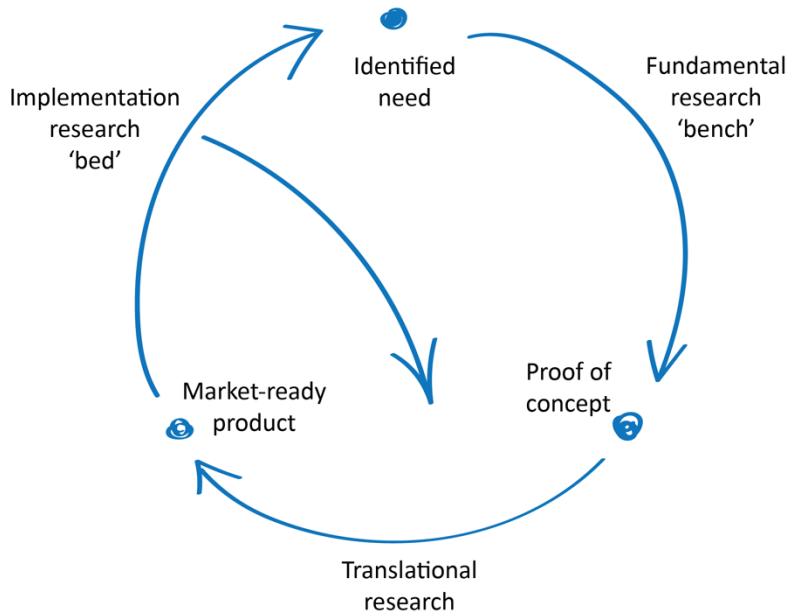

Figure 1: The Translational Research Cycle (adapted by the authors from Leppin et al 2019)

Strand (2020) describes the emergence of Translational Research discourse and practice in the biomedical sciences as a direct response to "Debates, theorizing, and policy initiatives aiming to close the 'bench-to-bedside gap'" (Strand 2020:1). In their ethnographic study of how Translational Researchers perform and perceive their role, they observe four main understandings of Translational Research (Strand 2020:4-7): as knowledge flow from theory to practice; as a political buzzword; as interdisciplinary collaboration and exchange; as competencies and skills. Here they recognize the plurality of practices in Translational Research as an applied, reflexive and adaptive collection of research methods. While Translational Research is seen as a powerful concept in policy discourses it proves to be amebous and non-standard when performed. Translational Research introduces the challenges of interdisciplinary collaboration, communication, and the need for a different skillset to the established methodologies of the biomedical and social science disciplines.

It could be argued that the term 'translation' is too linear, too simple, to describe the craft of synthesis, interpretation, and reconciliation, that goes into the real-world practice of Translational Research. Although Translational Research may take on the role of 'buzzword' in policy and other non-technical discourses, the universality and familiarity of 'translation' makes it a rare occurrence of shared language between disciplines (Kapsali 2022). Therefore, we argue that setting aside the imprecision of the term, for describing exactly what design research does, may be an acceptable compromise if using 'translation' as a descriptor allows design researchers to expedite meaningful dialogue with other disciplines.

2.2 Translation in the new contexts of research

The examples of translational practices in various disciplines and sectors, discussed above, have their foundations in conventional disciplinary and sectoral ecosystems which also have strong histories of interaction and shared languages, whether they are within the medical field, dealing with the relationships between medical science and patient care or in engineering, dealing with the relationships between the physical sciences and transport or production systems.

However, the increase in emphasis on addressing intractable societal and environmental issues, such as public health, crime, resource scarcity and climate change, means that the conventional partnerships are no longer enough. For systemic change, different, more complex, relationships are needed between disciplines, for example between public health, food systems and climate change, or between food systems, energy, transport and farming. Interdisciplinarity isn't sufficient, translation is needed between the different spheres of knowledge production, as represented by the quadruple helix: research, governance, industry and society (Carayannis & Campbell 2009). As research becomes systemic, translation also becomes systemic (Figure 2).

The drive for systemic change presents a very challenging scenario for collaboration. In 1989 Star & Griesemer described the challenges of multiple actors with different forms of knowledge working together within the context of the museum:

> "When the worlds of these actors intersect a difficulty appears. The creation of new scientific knowledge depends on communication as well as on creating new findings. But because these new objects and methods mean different things in different worlds, actors are faced with the task of reconciling these meanings if they wish to cooperate. This reconciliation requires substantial labour on everyone's part. Scientists and other actors contributing to science translate, negotiate, debate, triangulate and simplify in order to work together." (Star & Griesemer 1989:389)

The authors describe a way of working that becomes increasingly important in the types of research which seek to address systemic challenges: multi-disciplinary and multistakeholder collaboration. With a large number of actors complexity increases, and the challenge of translation transcends the abilities of one bilingual person, meaning that new translational methods and approaches are needed.

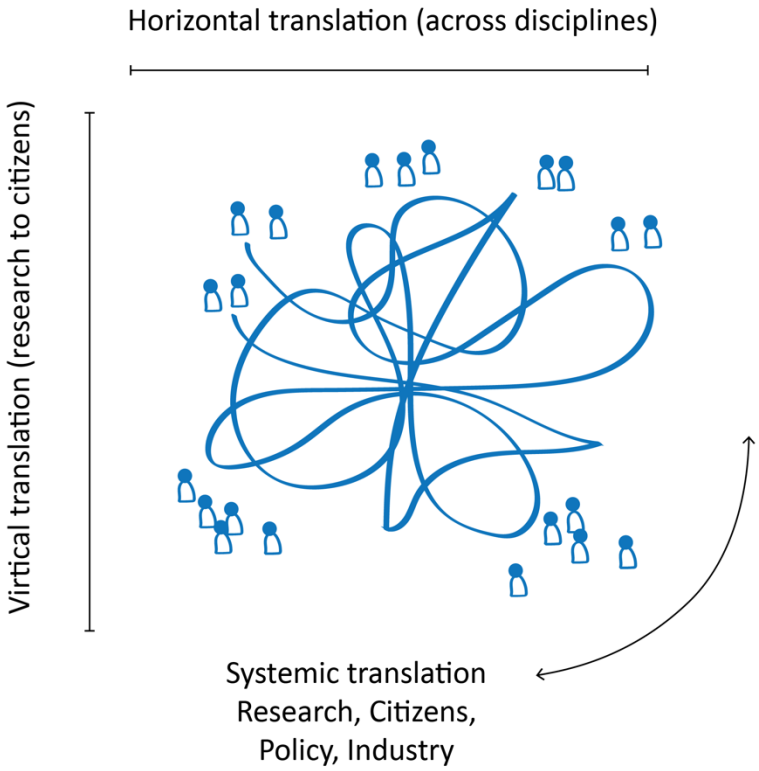

Figure 2: From vertical translation (research to citizens / bench to bed / knowledges to artefacts & interventions) and horizontal translation (across disciplinary & knowledge boundaries) to systemic translation (research, policy, citizens, industry)

This is far from an easy transition; it requires all researchers to face inconsistencies and move out of their 'comfort zone', to work against the tide of their usual rhythms and it may expose their practice to the messiness of the world, forcing compromises and imperfection (Hornbuckle 2022; Niinimakki et al 2017).

We think there is something important here: there is a gap between knowledge and practice that the design research community could help to fill (Page & John 2019), but there are things the design field first needs to resolve.

3. Translational processes in design

Design work is also translational. Design is fundamentally about translating needs or desires into symbols, things, actions or thoughts (Buchanan 2001), to enable innovation of meaning (Verganti 2009). If you try to disentangle the translational processes that occur in even a simple design task, it very quickly becomes complex and difficult to explain. This is because designers make these translations instinctively, balancing functional requirements, perspectives, user insights, meanings, codes and values to create something that embodies these aspects in a 'thing' that the designer (like the composer) believes is a fitting output, given the constraints, be that a product, service, typeface, graphic identify, or system. This type of translation is *implicit* and *intrinsic* in design practice, as it is in the practice of conducting a piece of music.

3.1 Intrinsic translational processes in design

Intrinsic translation can be illustrated by examining the design of a simple artefact, such as a coffee cup. The design of a coffee cup might involve only the designer; they may take inspiration from natural forms and translate these into the form of the cup, whilst also translating the functional human needs of holding and drinking from the cup, the material requirements for containing hot liquid, and the cultural expectations of size, volume, and colour. They may then also intuitively translate trends, the limitations of production, and cost to determine how the cup looks, what is it made from and how it is made. These are all relatively familiar tasks in design, of translating various knowledge inputs into a 'thing'. These translations can occur from other disciplinary knowledges, such as engineering knowledge on ceramic mass production casting, and often rely on incomplete, 'good enough' intuitive understandings established by the designer, reinforced through practice and experimentation. They are also relatively simple translations because they rest on tacit knowledge, or at least knowledge that is in relative proximity to the designer.

What if the coffee cup is for a client, does this change the translational workload? When the designer is confronted with a new collaborator, this brings in a new form of knowledge; they may have different requirements for materials, use or production, a different human 'user' with different needs and desires, or approach the design problem from a set of different cultural expectations. So far, this is still familiar, and the types of translation are still intrinsic in conventional design.

3.2 Expanded translational processes in design

What if the coffee cup has been proposed as part of a multidisciplinary research project looking at, for example, how dementia patients can be better supported in their homes, or

as part of a circular economy project looking at systemic approaches to reducing disposable packaging. How does the translational workload change? The forms of knowledge needed to understand the experiences and clinical needs of dementia patients are likely to be diverse and unfamiliar to design researchers, therefore the collaboration expands to include Health Care Professionals, patient advocacy groups, and social scientists, and the translational workload increases. For collaborators, it is not only more difficult to understand all these different perspectives on what is needed, but it is also more difficult to work out how to synthesise it back into the artefact of the coffee cup whilst negotiating the inherent conflicts and trade-offs.

In this context, there are two translational workloads: 1/ understanding the knowledge space (which involves translation between knowledges) and 2/ the translation of knowledge into the artefact or intervention. The translational workload increases exponentially as both get harder (Figure 3). Similarly, when confronted with the circular value chain of coffee consumption in the UK, design researchers would need to apply their translational skills differently, expanding their discipline-bound practice beyond what is normally expected of a designer, with and in between other forms of knowledge, perhaps relating to materials science, recycling technologies and infrastructure as well as the coffee houses, coffee-farmers and those who drink coffee.

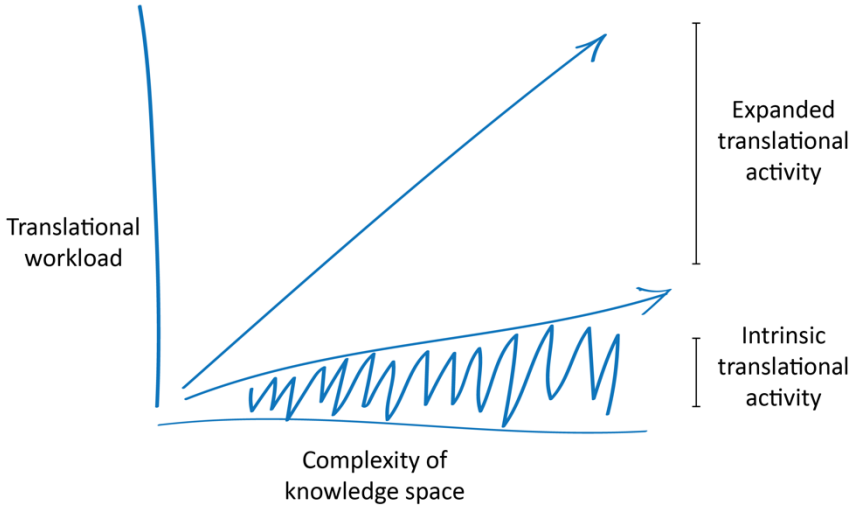

Figure 3: The translational workload increases as the knowledge space increases in complexity. This is not only the conventional translation of diverse knowledge into an artefact or intervention which is intrinsic to design practice (shaded area), but also the translation between knowledge areas which is an expanded area of design research. Taken together, this means the overall translational workload increases for design researchers.

When the design researcher translates knowledge in this context, it becomes visible and externalized. This knowledge is also synthesised, reduced to the elements essential for the design project, and embedded in an artefact. The artefact could be a visualisation, toolkit, or

object of design, an intervention that could take any form[2]. This is often a complex, creative, and interpretive act (Koskinen 2023) that might leave some knowledge behind. Designers are drawing on this foundational material and through translation, intuition, and creative practice are transforming it. Similarly to the musician or translator of literature, designers are not only explaining the information in a different context but also synthesizing it and reinterpreting it through the lens of their creative practices. Within these complex contexts, the translations are not one-to-one but are rather integrative of a range of diverse multidisciplinary perspectives. The resulting artefacts often open the knowledge up to different interpretations and act as boundary objects between these different disciplines (Star & Griesemer 1989). Boundary objects further discussion, and thus encourages co-created knowledge to emerge, progressing the research and challenging assumptions. This changes the design process, the translational practice must be explicit – collaborative, open and visible – to make it possible for all knowledge producers to accept the synthesis, and the inevitable trade-offs. This is another balancing act, between the intrinsic and expanded translational practice of design. This is because design research's distinction and acceptance into these multidisciplinary spaces is for the intrinsic (often solitary) part, the practice that results in surprising creative outputs that other disciplines would not have produced on their own, as well as the translational questions and methods that are explicit, collaborative and visible (Verganti 2009).

4. The distinctiveness of design research as a translational practice

Given the prevalence of translational activities in other fields, defining what design research uniquely brings to impact-oriented research has not come easily. Page & John describe a translational designer as someone "who works with uncertainty and complexity, embraces iterative investigations, is a master of synthesis and interdisciplinary communication, disseminates research to wide and general audiences, asks naive questions, and encourages comfort with risk" (2019:702). They observe that translational design research seeks to address 'gaps' and 'chasms' not only from basic to applied scientific research but also between actors in the development of impactful outcomes. However, the game design researchers play time and again in opening multidisciplinary discussions is to adopt the language and methods of other disciplines or introduce simplified (even reduced or gimmicky) creative method concepts as 'buzzwords'. Design research often hides behind 'trickery' to work within contexts where the value of design is little understood (Fisher & Gamman 2019).

4.1 Design at the boundary with other forms of knowledge

During the forming and initiation of complex collaborative projects, all partners first seek to make sense of what one another can offer the partnership, and what roles they will take.

[2] Hereafter all outputs of design are described as 'artefacts' for simplicity, but these may be collections of material and non-material things rather than a single object. The coffee cup is used as an easy example but can be substituted for any output of the design process: service, system, policy, and so on.

When faced with researchers who have a limited understanding of design research, a common misconception is that design researchers will provide an aesthetic treatment to knowledge (styling) *at the end of the project*, when the work of knowledge production is complete. Whereas, it has been argued, that design research offers the most value - in terms of making sense of the challenge space and identifying opportunities for innovation - when involved in the conception and framing of 'the project' (Lee et al 2018). Therefore, in multidisciplinary forums, it becomes increasingly important to be able to articulate *what design does* in a way that is both relatable and valuable to non-design partners as well as to understand how the research of other disciplines influences the design frame. There is a need for reciprocity here, as designer researchers, we also need to question our own assumptions and understandings of other fields of research and be thoughtful in how we translate these knowledges into our practice thoughtfully. There are cultural nuances and wider contexts to these research communities, their epistemologies and ontologies, that we need to understand if we are to position ourselves in this central role of facilitating multidisciplinary collaboration and knowledge integration. To be a good translator, design must be sensitive to the needs of these diverse research contexts.

This dialogue at the boundary with other disciplines and forms of knowledge can be seen as paradoxical, at once a site for learning as well as a point of initiation and acceptance into an alliance. Akkerman & Bakker observe:

> "This multivoicedness and the unspecificity at boundaries trigger dialogue and negotiation of meaning, explaining why encounters of boundaries are often described not only as challenging but also as worthwhile to investigate in relation to learning." (Akkerman & Bakker 2011:150)

There is the suggestion that this 'unspecificity' may be inevitable or even necessary for transformative learning to emerge from these misunderstandings at the boundaries with other disciplines (Akkerman & Bakker 2011). If so, how can the design research community negotiate this challenge when seeking to improve the uptake and quality of design research in multidisciplinary research?

4.2 Translational design questions andaApproaches

To explore design research's distinctive approach to translational challenges, we have collected five scenarios from the boundary with other disciplines, presented in Table 1. These quotes are drawn from recent discussions with scientists and social scientists where they expressed their motivation to enter alliances with design research.

Table 1: Translational challenges expressed during dialogue with other disciplines; the gaps between forms of knowledge presented by these challenges; and the instinctive design research questions and approaches that these challenges might invite.

Translational challenge	**Gaps identified**	**Instinctive Design Research questions and approach**
A/ "I've spent the last 20 years researching the benefits of oily fish in preventative healthcare, and very little has changed, we don't know how to achieve impact in the real-world" *Paraphrased from a conversation with a nutrition academic during bid-writing discussion*	Between scientific knowledge and real-world behaviours; where despite scientific evidence these researchers feel they have been ineffective at influencing the behaviours of people in their everyday lives	Explore values, benefits and barriers to better understand this gap: for example, eating oily fish may require people to adapt to unfamiliar tastes and cooking styles, they may find the health benefits too distant when compared to more pressing challenges such as cost, or they may not want to consume fish due to perceptions of unsustainable fishing practices.
B/ "We know that design decisions have a huge impact on the environment, but we don't know how to influence those decisions with our evidence" *Paraphrased from a conversation with environmental scientist during a workshop discussion in the HEREWEAR.eu project*	Between scientific knowledge and industry (in this case where fashion and textile designers are identified as people who could act on scientific knowledge).	Explore the language and communication barriers, co-create garment prototypes to explore areas where environmental science can suggest alternative actions. Explore fashion and textiles designer's concerns and questions.
C/ "Even though policies are science-informed, the adoption rate is low. Policymakers assume 'people' will automatically be motivated to change as per the policy, taking a very techno-scientific view and forget that at the end we all are humans who have ;; value systems, cultures, livelihood, and industry" *Paraphrased from an email from a supply-chain academic during bid-writing discussion*	Between policymakers, scientific research and citizens - exemplifies the need for systemic translation	How is the research addressing (or at least acknowledging) the priorities of these other actors? How can we better understand the common values of these actors? What common artefacts can we work on together to better understand one another and the opportunities to move forward together?
D/ "As scientists we know the pathway of rationalizing and explaining but in addition to that I think for the general population this is probably not the main pathway to understanding. For these people, feeling, touching	Between scientific knowledge and publics – the realization that science doesn't necessarily 'speak' to people in the same way as more tactile,	Explore the benefits of biotechnologies from a patient perspective. Explore the fears and concerns of technologies, test these with scientists, identify the rational and irrational fears and communicate a meaningful

and proximity brings it closer. So, whether we like it or not this is nowadays one of the main pathways to get people acquainted with the benefits of our research." *Paraphrased from a feedback session with a biotechnology academic*	experiential or narrative language	narrative to improve public literacy and understanding of biotechnologies.
E/ "The activities undertaken by design researchers proved highly effective in fostering the collaboration and engagement of partners within our large cooperative project" *Paraphrased from an email from a fibre scientist and project co-ordinator*	Between project partners in multidisciplinary collaborations - acknowledges that design research 'activities' can bridge gaps between different disciplines in a consortium research project	What could enable different people to work in this space together? What is the common narrative? What might be a common object we can experience together? What might enable an equitable dialogue between these different people?

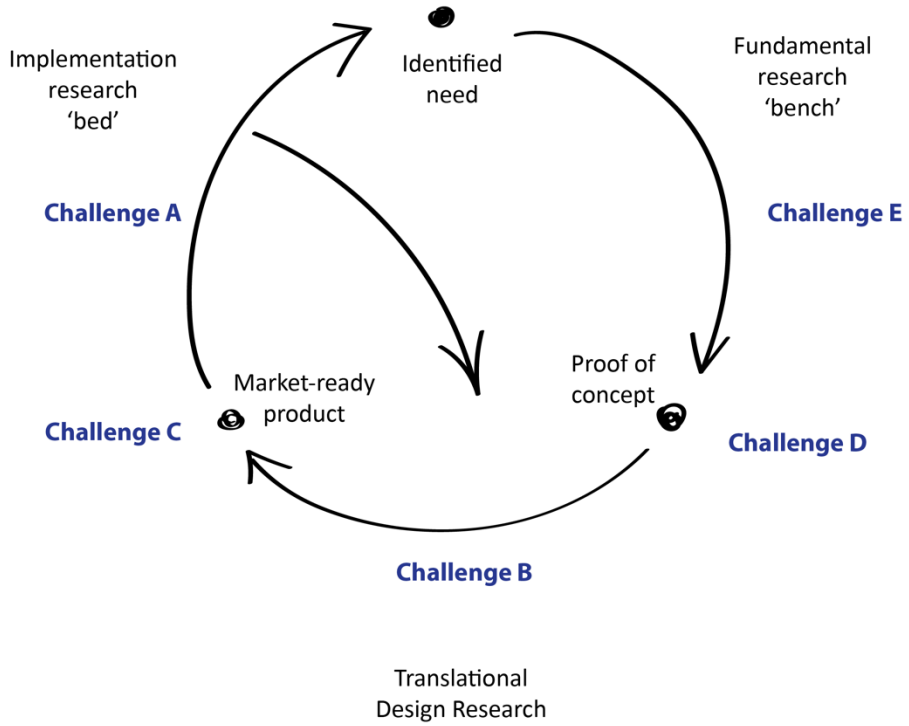

Figure 4: Challenges identified in Table 1 mapped to the Translational Research Cycle (figure1)

It is apparent that scientists recognize the challenge in achieving impact from their research; the gap between their evidence and what people in the real world actually do in response to that knowledge. Figure 4 shows how the challenges relate to different areas of the Translational Research Cycle. What emerges from these scenarios, is a web of knowledge gaps between different actors and beneficiaries in research that must be bridged if research is to be usable and 'impactful'. Design researchers seek to understand how the knowledge relates to the interests of the various actors and how it can help them to reach their goals (Latour 1987), yet their translational approach and questions may only reveal themselves when they encounter and enter into a dialogue with these challenges.

4.3 Weaving design methods through Translational Research

It becomes clear that these scientists are seeking new ways to overcome the gaps between research and impact. With translational capabilities, design researchers can expand their translational practice to support knowledge flow to bridge these gaps. As illustrated in the previous sections, it is perhaps as much about the questions that design researchers ask which are at once explorative, responsive, purpose-driven and relational, as the tools and methods they bring, to subvert research knowledge and assumptions.

A meta study of design practices in complex multidisciplinary projects revealed 30 methods employed by designers to bridge the gaps between research stakeholders, both within the formal research project and with external stakeholders and publics (Hornbuckle 2022). The research revealed that translational tactics often involve making knowledge tangible, for example through experiential dialogue, prototyping, scaffolding, and other forms of making. These acts of materialization address the need for boundary objects in complex collaborative research, to mobilise knowledge through a 'thing' that is relatable and meaningful in each 'world' (Hornbuckle 2021; McQuillan 2023; Akama & Prendiville 2013). Returning to Star & Griesemer (1989), boundary objects are seen as an important anchor for convening different forms of knowledge, simultaneously belonging to many worlds and therefore allowing knowledge to flow across boundaries.

However, we argue that these methods are not standalone or off-the-shelf creative tools or workshops brought in as token gestures or towards the end of the scientific process when opportunities for collaborative innovation are closed (Hornbuckle 2022). To translate across these gaps, a dialogue needs to be built early on in the research process, to develop a deeper understanding of values, motivations and meanings (Prendiville at al 2023). The unique practice of the Translational Design Researcher is to understand the gaps as problems of translation, then to assemble and weave design methods through the project to form a coherent (responsive and emergent) methodology that wraps around the project (Louridas 1999).

The formulations or assemblages of methods can be built with other disciplines to interconnect the various research actors and those impacted by the research. Far from there being a model that design research might follow in multidisciplinary research, translational

research is a complex series of interactions between different collaborative events or activities, as well as independent work. Design research also brings a criticality which seeks to explore, reveal and challenge research assumptions before the project is closed, often through a user-centred or systemic lens (Prendiville et al 2023).

Designers working in multidisciplinary projects are building a new competency which is intuitive and difficult to extrapolate. The translations performed are entangled: the gaps are instinctively identified, and the process is developed in response to the unfolding context. Translational Design Research wraps around a scientific research project and aligns to the applied field of Translational Research (Figure 5), albeit with different questions, processes and methods.

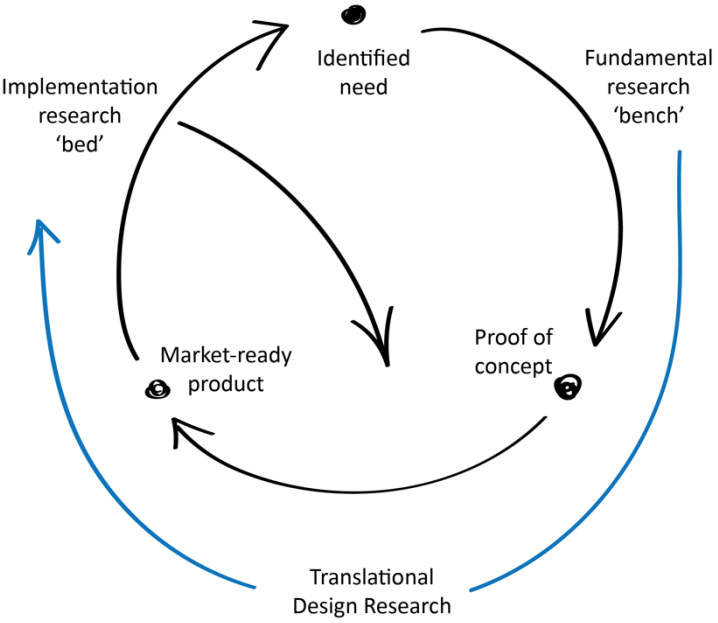

Figure 5: Translational Design Research can wrap around the Translational Research Cycle, providing alternative questions and approaches to the 'project' of research transition and impact.

5. Closing remarks

Translation has, until recently, been implicit in design practice. Designers and design scholars understand that design is a translational practice, but it has not been considered a characteristic to raise above others. Yet design research is changing, design cannot continue with the pretense that it can somehow 'solve' increasingly complex social and environmental problems from the studio. Design research needs to interact with other, unfamiliar forms of knowledge, and multidisciplinary research may find it too needs design research to bring different questions and approaches to the challenges they face.

Translational Design Research has come into being as a direct response to the increasingly challenging projects design researchers are encountering, where knowledge needs to be convened and disciplinary gaps bridged before they can begin to understand how the collaborative goal can be framed or what their creative response or intervention might be. Part of the design intervention and the expanding skillset of the design researcher is the act of translating different forms of knowledge to enable mutual understanding so that the innovation space can be activated, not only by the designer, but by multiple collaborators. Design researchers cannot begin 'design work' without expanding their practice beyond the conventional remit to negotiate complex collaboration through translation.

With this expansion of translation beyond tacit and familiar knowledge towards complex and diverse knowledge, comes the need for translational design to become an *explicit* form of design practice in research contexts. This is for three connected reasons: 1) so that the trade-offs and reconciliations in knowledge synthesis are open and visible to collaborators to build trust in the process and output; 2) so that design researchers can better understand how their methods can be applied in multidisciplinary and multistakeholder research, and 3) so that design researchers can better articulate their potential role and value when planning complex collaborative projects with researchers from other disciplines.

Design only reveals itself at the boundary with other forms of knowledge, in the same way that a designer doesn't know how they will attend to a 'brief' until they enter a dialogue with it; there will always be a sense of the unknown, uncertainty and risk in entering partnership with design research. The challenge that lies before us is to strike a balance between articulating the role and benefits of bringing design into Translational Research and allowing learning at the boundary, during dialogue with other disciplines.

Explaining design research in a way that resonates with researchers (and funding reviewers) from other fields, is far from straightforward. The characteristics of the translational challenges faced by these researchers speak to relationality, an understanding of people akin to empathy, to better understand the meaning and value of the research to those who are expected to use, or act upon the evidence. These challenges can be turned into design questions and approaches, yet few researchers outside the field of design understand that design research can be applied in this way. 'Translation' as an explicit form of design research and practice could form the basis of a shared language between disciplines in impact-oriented multidisciplinary research.

Concurrently design researchers should be conscious of the power they wield when they are involved in the interpretation of knowledge, and therefore the ethical implications. Bruno Latour (1987) cautions about the unequal power distribution of translation: how this power is exerted when design researchers recruit participants and use their experiences to support research agendas and goals. Otto Von Busch (2023) also calls into question the unjust structures design research may be reinforcing when working collaboratively, and as Translational Design Researchers, we must be even more critical about the knowledge spaces we occupy and move between.

Some of these potential pitfalls might be overcome through careful consideration of the purpose of a given research topic, and by facilitating collaborative dialogue early in the research process when the 'black box' is still open. However, there is a limit to how much design research can do. A systemic, wraparound, translational methodology is a huge undertaking for a design research team, and in Von Busch's words – design research needs to be realistic: how much can we really do? Certainly, we need to build capacity in design research by equipping Early Career Researchers with an understanding of how to work with multidisciplinary languages and diverse disciplinary cultures. Translational Design Researchers will also need to be able to publish with other disciplines and in the voice of different disciplinary languages. The implications for impact-oriented universities cannot be overstated. It means creating design research teams of skilled practitioners, makers, visualizers, facilitators, and researchers with deep understandings of other disciplinary cultures. This will likely involve devising new modes of collaborating with other disciplines, in proximity and at distance (Hornbuckle 2023). Until capacity improves, design researchers need to be wary of over-promising and overcommitting.

There is still much to understand and define as translation emerges as an expanded and explicit practice in design research. Although beyond the scope of this paper, the ethical questions of Translational Design Research need greater interrogation, we need to study the conversations at the boundaries between knowledges, and bring together a wide range of case studies of Translational Design Research, so we can develop knowledge, build frameworks and identify new methods.

6. References

Akama, Y., and A. Prendiville. 2013. "Embodying, Enacting and Entangling, a Phenomenological View to Co-Designing Services." Swedish Design Research Journal 13 (1): 29–40

Akkerman, S. F. & Bakker, A. (2011) Boundary Crossing and Boundary Objects REVIEW OF EDUCATIONAL RESEARCH 2011 81: 132 originally published online 19 April 2011. DOI: 10.3102/0034654311404435

Bauer M.S., Damschroder L., Hagedorn H., Smith J., Kilbourne A.M. An introduction to implementation science for the non-specialist. *BMC Psychol.* 2015 Sep 16;3(1):32. doi: 10.1186/s40359-015-0089-9. PMID: 26376626; PMCID: PMC4573926.

Buchanan, R. (2001a) Human Dignity and Human Rights: Thoughts on the Principles of Human-Centered Design. *Design Issues*, Vol. 17, No. 3 (Summer, 2001), pp. 35-39

Buchanan, R. (2001) Design Research and the New Learning. *Design Issues* , Autumn, 2001, Vol. 17, No. 4 (Autumn, 2001), pp. 3-23

Carayannis, E.G & Campbell, D.F.J. (2009). "'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem". *International Journal of Technology Management*. **46** (3/4): 201. doi:10.1504/IJTM.2009.023374

Campillo, I., Nunes, G. & Puertas, I. (2023) Defining impact: a shift in thinking, acting and being. Times Higher Education (online – accessed 5/03/24) available at: https://www.timeshighereducation.com/campus/defining-impact-shift-thinking-acting-and-being.

Drolet, B.C. & Lorenzi, N.M. Translational research: understanding the continuum from bench to bedside. *Transl Res*. 2011 Jan;157(1):1-5. doi: 10.1016/j.trsl.2010.10.002. Epub 2010 Nov 13. PMID: 21146144.

Findeli, A., Brouillet, D., Martin, S., Moineau, C. & Tarrago, R. (2008). Research Through Design and Transdisciplinarity: A Tentative Contribution to the Methodology of Design Research.

Fisher, T. & Gamman, L. (eds.) 2019. *Tricky Design: The Ethics of Things*. Bloomsbury

Hornbuckle, R. (2023) Hands-on hands-off: on proximities to materials and systems in design research. (chapter) in Earley & Hornbuckle (Eds) Materials and Making for Change: from the materials we make to the materials we wear; Design Research for Change Series; Routledge.

Hornbuckle, R. (2022) Project Proximities: how design research addresses distance in complex collaborations. *DRS 2022 Bilbao conference proceedings*

Hornbuckle, R. (2021) Mobilizing Materials Knowledge: exploring the Role of Samples for Supporting Multidisciplinary Collaborative Design for Materials Development, The Design Journal, 24:2, 277-297, DOI: 10.1080/14606925.2020.1849963

Hornbuckle, R. (2013) Materials Translators: observations from a study of sustainable materials information provision and design behaviour in London, UK. Sustainable Innovation 2013 conference, Epsom, UK

Kapsali, V. (2022) *Method of mapping interdisciplinary research and practice at the intersection of biology and design.* DRS Conference 2022: Bilbao. ISSN 2398-3132

Kaszynska, P., Kimbell, L. & Bailey, J. (2022) Practice research in design: Towards a novel definition. Working Paper for *The Social Design Institute, University of the Arts London* (online – accessed 5/03/24) Available at: https://ualresearchonline.arts.ac.uk/id/eprint/19062/1/SDI_Working.Paper_6_Final_Tagged.pdf

Kolko, J. (2010) Abductive Thinking and Sensemaking: The Drivers of Design Synthesis. *Design Issues* (2010) 26 (1): 15–28 https://doi.org/10.1162/desi.2010.26.1.15

Koskinen, I. (2023) *Design, Empathy, Interpretation*. The MIT Press, Cambridge, Massachusetts

Latour, B. (1987) *Science in Action*. Harvard University Press, Cambridge Massachusetts

Lee, J-J, Jaatinen, M., Salmi, A., Mattelmäki, T., Smeds, R. & Holopainen, M. (2018) Design Choices Framework for Co-creation Projects. *International Journal of Design* Vol. 12 No. 2 pp15-31

Leppin AL, Mahoney JE, Stevens KR, Bartels SJ, Baldwin LM, Dolor RJ, Proctor EK, Scholl L, Moore JB, Baumann AA, Rohweder CL, Luby J, Meissner P. (2019) Situating dissemination and implementation sciences within and across the translational research spectrum. *J Clin Transl Sci.* 2019 Jul 29;4(3):152-158. doi: 10.1017/cts.2019.392.

Louridas, P. (1999) Design as bricolage: anthropology meets design thinking. Design Studies Volume 20, Issue 6, November 1999, Pages 517-535

McQuillan, H. (2023) Multimorphic Textiles: prototyping sustainability and circular systems. In Earley, R. & Hornbuckle, R. (eds) (2023) *Design Materials and Making for Social Change.* Routledge

Miodownik, M. A. (2007) Toward designing new sensoaesthetic materials, Pure Appl. Chem.79 (2007) 1635–1641.

Niinimäki, K., Tanttu, M. & Kohtala, C. (2017) Outside the “Comfort Zone”. Designing theUnknown in a Multidisciplinary Setting Design for Next. 12th EAD Conference Sapienza University of Rome 12-14 April 2017 doi: 10.1080/14606925.2017.1352940

Page, R., & John, K. (2020). Design prototyping as a translational tool for medical device commercialization. Journal of Design, Business and Society, 6(2), 215-232. https://doi.org/10.1386/dbs_00012_1

Page, R. & John, K. (2019) Commercializing Academic Medical Research: The Role of the Translational Designer, The Design Journal, 22:5, 687-705, DOI:10.1080/14606925.2019.1629776

Prendiville, A., Hornbuckle, R., Grimaldi, S., Albuquerque, S. & Fuller, S. (2023). Deep and Meaningful: An Iterative Approach to Developing an Authentic Narrative for Public Engagement for Plant Molecular Technologies in Human and Animal Health. 10.1007/978-981-99-4859-8_15.

Rice, G. (2023) Translation: Messenger RNA Translated Into Protein. *Microbial Life Education Resources.* Retrieved 25/10/23 from https://serc.carleton.edu/15913

Rieple, A., Haberberg, A. & Gander, J. (2005) Hybrid Organizations as a Strategy for Supporting New Product Development. *Design Management Review.* Winter 2005 pp48-55

Star, S. & Griesemer, J. (1989) Institutional ecology, 'translations' and boundary objects: amateurs and professionals in Berkeley's museum of vertebrate zoology, 1907–39 *Soc. Stud. Sci*., 19 (1989), pp. 387–420

Strand, D.L. Everyday characterizations of translational research: researchers' own use of terminology and models in medical research and practice. *Palgrave Commun* **6**, 110 (2020). https://doi.org/10.1057/s41599-020-0489-1

Verganti, R. (2009) *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean*. Harvard Business Review Press. ISBN: 9781422124826

Von Busch, O. & Palmas, K. (2023) *The Corruption of Co-Design: Political and Social Conflicts in Participatory Design Thinking*. Routledge.

Ward, V. (2017). Why, whose, what and how? A framework for knowledge mobilisers. *Evidence and Policy*, *13*(3), 477-497. Retrieved Mar 8, 2024, from https://doi.org/10.1332/174426416X14634763278725

Witney, P. & Nogueira, A. (2020) Cutting Cubes Out of Fog: The Whole View of Design. she ji The Journal of Design, Economics, and Innovation Vol. 8, No. 4, Winter 2022

Wizinsky, M. (2019) "HIV saved My life": toward a translational model of design research through participatory design in public history and public health, Design for Health, 3:1, 4-26, DOI: 10.1080/24735132.2019.1583400

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