Integrative Objects in Sociotechnical Contexts: Constructing Digital Well-Being with Generic Epistemology

Magdalena Krysztoforska
University of Nottingham
United Kingdom
magdalena.krysztoforska@nottingham.ac.uk

Niall Docherty
University of Sheffield
United Kingdom
n.docherty@sheffield.ac.uk

Asia J. Biega
Max Planck Institute
for Security and Privacy
Germany
asia.biega@mpi-sp.org

ABSTRACT

This paper presents a generative approach to interdisciplinary collaboration based on *generic epistemology*. Informed by the work of philosopher Anne-Françoise Schmid, we introduce the concept of the *integrative object* as a means to reorient interdisciplinary collaboration toward the requirements of the object of research itself, rather than via the requirements of particular disciplinary languages, methods, or operative logics. We show how such an approach is useful for research into sociotechnical phenomena that exceed the boundaries of discrete disciplines and their convergence. We introduce digital well-being as a case study, drawing on the authors' own interdisciplinary collaborative experiences in this area as its empirical matter. From this, and in order to aid future research into similarly complex sociotechnical objects, we then provide practical tools to help those in the HCI community prepare and conduct interdisciplinary research in a similarly generative, non-dogmatic, and non-hierarchical manner.

KEYWORDS

generic epistemology, interdisciplinarity, digital well-being, integrative objects, sociotechnical objects, critical theory, collaborative practice

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1 INTRODUCTION

Contemporary sociotechnical phenomena are often characterized by their multiscalarity, complexity, and heterogeneity, posing numerous challenges for a research landscape delineated by disciplinary boundaries. Consequently, the need to better integrate different forms of knowledge is well acknowledged, especially in fields with interdisciplinarity at their core, such as human-computer interaction (HCI) [9, 86]. However, research objects that cannot be fully accounted for by a synthesis of existing disciplinary approaches risk being reduced to partial perspectives. This limits the scope for productive engagement with contemporary problems, and threatens the efficacy of interdisciplinary research as a result[1].

This challenge resonates with questions that two of the authors of this paper, a computer science scholar (CS Scholar hereafter) and a critical theory scholar (CT Scholar hereafter), grappled with during a previous interdisciplinary collaboration on digital well-being: *Why was that so difficult?* And, *were we actually studying the same thing*? Their work together resulted in a paper being accepted at a leading HCI conference, and a shared research agenda that continues to grow. The project could reasonably be considered a success, however during the year-long research stage prior to the publication of their work, the authors encountered several bumps in the road that arose due to fundamental epistemic, ideological, and personal differences extant between them. More importantly, they found that even resolving these differences didn't allow them to orient their understanding of digital well-being towards the future, and did not help them produce new ways of designing 'healthier' computational objects. Essentially, they discovered that digital well-being exceeded the rigid bounds of their disciplinary training and could not be understood through simply combining their different epistemic and methodological frameworks. In other words, they found that a mere synthesis of their disciplinary tools and perspectives was not sufficient to explore digital well-being's complexity as an object of present-day sociotechnical concern.

In scholarly, media, and political discourse, digital well-being is used to describe the ambivalent experiences and effects that various types and levels of technological engagement have on individuals, groups, and societies. Definitions often adopt a normative standpoint, with digital well-being sometimes taken to mean "the impact of digital technologies on what it means to live a life that is good for a human being" [13] (p. 2313), or "a subjective individual experience of optimal balance between the benefits and drawbacks obtained from mobile connectivity" [108] (p. 7). As well as computer science and critical theory, several other fields are invested in the study of digital well-being. These include philosophy [13], media studies [107], clinical psychology [114], media psychology [100], science and technology studies [58], sociology [47], and public health studies [82], to name a few. Each of these fields constructs a different dimension of digital well-being, for example: its philosophical breadth [21], its saliency as a sociological object of inquiry [39], its operationalization as a vector of power [24], its psychological

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[1] We use this term to mean any form of working across disciplines, including transdisciplinarity, multidisciplinarity, cross-disciplinarity, etc. We acknowledge that there are ongoing debates related to the specific differences between these terms (see for example Klein [55]), however this is beyond the scope of this paper.

measurability [23], or its technical configuration in computational systems [17]. As we can see from these myriad approaches, digital well-being encompasses multiple aspects of human experience that operate on several scales at once. Consequently, as CS Scholar and CT Scholar learnt first-hand, selecting one particular spatial, temporal, or analytical disciplinary lens through which to study digital well-being loses much that is central to it. For example, how can we present digital well-being solely as a technical concern that better design can fix, when we know that users engage with technologies in unexpected ways beyond their intended use? Do we leave it to clinical psychologists to diagnose the well-being issues surrounding technology, at the expense of understanding technologies' sometimes positive cultural benefits? And can digital well-being reasonably be treated as a large-scale issue for public health and policy researchers, when the effects of technology use are felt on a deeply personal level by individual users themselves? Each of these distinct disciplinary approaches can only provide partial, fragmentary accounts.

When we take a step back from digital well-being, we can notice similar challenges in relation to other contemporary sociotechnical phenomena. For instance, we may think of artificial intelligence, platform infrastructures, information access, sustainable computing, fairness, or data governance. In the field of HCI specifically, interdisciplinarity is highly valued as an approach to issues such as the interface [38], the user [5], or, more recently, the technological enabling of human community, creativity, and action [41]. Indeed, the origin stories and historical developments of HCI are often told as a tale of disciplinary synthesis [9, 86], with some scholars conceptualizing HCI as a design discipline that requires 'radical interdisciplinary dialogue' to problematize, and find solutions to, its areas of concern [112].

This paper resonates with some of the existing debates in HCI. However, we wish to introduce a different perspective to them by drawing on CT and CS Scholar's personal reflections on their collaboration on digital well-being, and on a subsequent encounter with *generic epistemology*. Generic epistemology is a research and practice paradigm developed primarily by philosopher Anne-Françoise Schmid, and cultivated alongside her various collaborators across different fields (including the sciences, the arts, and design theory) for over two decades. One of the main aims of this approach is to expand and transform relations between disciplines, and to transcend the impasses currently preventing progress in a variety of research areas. Generic epistemology is particularly interested in objects that exceed disciplinary boundaries, and that do not depend on any particular disciplinary framework for their study and interpretation (we can think for example of planetary-scale issues such as climate change, sustainability, or issues pertaining to global governance and trade flows). Schmid refers to such problems as *integrative objects*, and proposes a non-hierarchical approach to studying them. Specifically, this approach advocates for a logic of interdisciplinarity that doesn't privilege any specific disciplines, theories, or methods. Crucially, it allows for the construction of a heterogeneous research space where disciplinary knowledge can serve to establish the dimensions of objects without reducing them to partial perspectives.

Considering some of the complexities of digital well-being we have presented above, this paper proposes a framing of digital well-being as an integrative object. Using CT and CS Scholar's own experience as empirical texture, we introduce the key pillars of generic epistemology, and argue that a similar approach can help future HCI researchers study other comparably complex sociotechnical problems. The latter parts of the paper offer practical suggestions and prompts that other researchers can experiment with in their own collaborative projects. Section 2 of this paper provides a brief introduction to generic epistemology and its key orientation. Section 3 focuses more specifically on integrative objects, situating the concept in its wider theoretical context, and illustrating its productive potential for studying digital well-being. This section also proposes other objects of HCI research that could be framed in a similar manner. Section 4 discusses generic epistemology's particular approach to the issue of interdisciplinarity in more depth, reflecting on the challenges encountered by CT and CS Scholar in their earlier collaboration as a point of reference. Finally, Section 5 explores the relevance of generic epistemology to questions of design, and presents examples of our own engagement with some of its proposed methods in the context of digital well-being. Overall, by focusing on digital well-being as an integrative object, our aim is to introduce generic epistemology to the wider HCI community, and to offer practical suggestions that can help foster productive and non-dogmatic collaborative approaches to other pressing sociotechnical issues.

2 SITUATING GENERIC EPISTEMOLOGY

Generic epistemology is in many ways an unorthodox approach. The origins of the approach are rooted in Anne-Françoise Schmid's work on the relations between philosophy, science, and epistemology [91–93], however generic epistemology is neither a philosophy of science, nor an epistemology in the standard sense. Secondly, although the approach has been cultivated by Schmid and her collaborators across many different fields, spanning the sciences, the arts, and design theory, generic epistemology is not reducible to any of these particular collaborations or contexts. Thus, while generic epistemology is certainly interested in the role that philosophy, science, and design play in the processes of knowledge production and invention, it sees traditionally constructed disciplines as limited in their ability to respond to contemporary problems. It therefore advocates for a remodeling of relations between disciplines, and is chiefly concerned with creating spaces for research and collaboration that do not necessarily follow traditional methods and paths.

The key to understanding the orientation of generic epistemology is through its main operator - the generic. Schmid's way of using the term is aligned with that of François Laruelle [59, 60], where the generic serves as an agent of extension and underdetermination. This works to transform any discipline it engages with into raw material that can be used in ways not constrained by the rules and conventions of the source domain. To this end, generic epistemology seeks points of intersection and resonance with other domains, concepts, and problems, and it is not obliged to evaluate its outcomes according to the categories originally prescribed by its source discipline. The generic is invoked to signal that a fragment of a discipline can be implemented in a different context to produce new knowledge, without the wholesale import of the methods

and structures of the original discipline. The generic renders disciplinary concepts autonomous, so as not to replicate the dogmatic and rigid aspects of disciplines that often impede interdisciplinary work. At the same time, the generic recognises the value of disciplinary knowledge and draws on it as its raw material. As such, generic epistemology is neither a specific method, a theory, nor a domain of research. Rather, it should be understood as a general posture and orientation adopted towards research and invention, characterized by its commitment to openness, heterogeneity, and democracy of thought.

The aim of generic epistemology is not to abolish disciplines, but to recognise that many contemporary objects of research require heterogeneous modes of collaboration. Such objects are referred to by Schmid and her co-authors as integrative objects, and they are characterized by not belonging to any specific domain, and by the impossibility of producing them through a synthesis of existing disciplines. It is through an encounter with the concept of integrative objects, and the approach to interdisciplinarity that they entail, that this project began exploring the resonances of generic epistemology with digital well-being, and other sociotechnical phenomena. As outlined in the introduction, the earlier research on digital well-being conducted by CT and CS Scholar demonstrated not only the limits of singular disciplinary perspectives in addressing the complexity of this object, but also the limits of straightforward disciplinary convergence. In what follows, we will discuss some of the key aspects of generic epistemology that have proven useful for our understanding of digital well-being, namely: integrative objects, interdisciplinarity without disciplinary continuity, and a generic approach to design. Overall, the aim of generic epistemology, as well as this paper, is not to invalidate existing paradigms of research, but to experiment with an alternative paradigm that shows promise for productive engagement with contemporary sociotechnical objects.

3 INTEGRATIVE OBJECTS

3.1 Integrative objects, complex objects, and boundary objects

Integrative objects are objects of research that pose significant challenges for modes of knowledge production guided by disciplines, as well as for modes of interdisciplinarity predicated on the merging of multiple disciplinary frameworks. One of the key impulses leading to the formulation of this concept was Schmid's collaboration with a biologist, Jean-Marie Legay [67], and their observation that a number of their colleagues from a range of disciplines often struggled to interpret their results. This led them to a hypothesis that perhaps the objects of inquiry and the criteria for interpreting results were not matched. In response to these difficulties, Legay introduced the concept of a 'complex object', characterized by the multiplicity of its components originally studied by distinct disciplines, and requiring the convergence of those disciplines in order to be approached comprehensively.[2] Drawing on and adapting Legay's work, Schmid introduces the notion of an integrative object, referring to heterogeneous phenomena that pose challenges for both disciplinary and interdisciplinary research (for example global warming, obesity, or genetically modified organisms).

Schmid differentiates integrative objects from complex objects based on significant methodological insufficiencies - integrative objects cannot be adequately framed or constructed by the same methods that were sufficient for complex objects. Contemporary problems are indeed complex, in the sense that they exceed the limits of any singular discipline, but they are also integrative, meaning that they also exceed the productive capacity of a simple synthesis of multiple disciplines. Schmid writes: "such an object is not the consequence of one discipline along with the collaboration of others. Rather, its dimensions are constituted by fragments of disciplines, and it is a sort of disciplinary 'hole'" [97] (p. 137). In order to productively engage with integrative objects, a simple convergence, overlapping, or synthesis of pre-given disciplines is not enough. The 'disciplinary hole' created around such objects means not only that no singular discipline can speak directly about them, but also that the mode of collaboration between researchers needs to move away from hierarchies and from modes of interdisciplinarity predetermined by disciplinary dogmatism. Instead, researchers need to recognize the fragmentary nature of their disparate areas of knowledge. In this way, the fragments and aspects of expertise that are relevant to the object can enter the problem space as *parameters*, rather than as authoritative claims. The concept of integrative objects has already been explored in a variety of contexts, including: Robin Mackay's reflections on contemporary art [71, 72], Léo Coutellec's research on Alzheimer's [18], Annie Gentès's work on interactive media technologies embedded in a museum context [31], or Muriel Mambrini-Doudet's research on genetically modified fish [74]. This paper argues that the concept of an integrative object is not only equally useful for the study of digital well-being, but also other objects of HCI research, as we discuss in more detail below.

The concept of integrative objects shares certain characteristics with Susan Leigh Star's notion of 'boundary objects' [10, 68, 105], which has been widely used in a variety of HCI-related contexts.[3] However, the two concepts function in different ways and entail different practices. Both of these concepts refer to objects that are heterogeneous, that are constantly evolving, that involve collaboration across disciplinary boundaries, and that motivate continuous development of new research methods. Both concepts are also undoubtedly useful in exploring some of the complexities and challenges of interdisciplinary projects. Nevertheless, there are distinct differences in the overall orientation of the two concepts. Boundary objects are characterized by their interpretative flexibility, and are often intended to facilitate communication between different disciplines. They can be frequently located in the dynamics of collaboration without consensus, where different research communities have their locally-specific interpretations of the objects in question, and collaboration often proceeds by moving back-and-forth between those distinct interpretations. The notion of integrative objects, on

[2] One of the examples proposed by Legay is that of membranes and chemiosmotic theory. Legay sees the separation between biology and chemistry in academia as the reason for the relatively late discovery of chemiosmosis - the knowledge of electrochemical potential of membranes was not within the purview of biologists in the 1960s [66].

[3] For example: in collaborative design of wearable musial instruments [115], in relation to an AI Playbook for considering potential failures of AI tools before deployment [49], human-AI onboarding materials [15], or to help understand the changing nature of clinical practices influenced by the adoption of computerized systems [116].

the other hand, serves to highlight a different phenomenon. These objects are not produced by disciplines and cannot be contained within them. Therefore, ideas of a shared identity across disciplines, or a disciplinary consensus, are an impossibility. Moreover, integrative objects are non-manipulable, and whilst establishing modes of communication between researchers from different disciplinary backgrounds is certainly an important aspect of generic epistemology, disciplines can only ever offer partial perspectives on these objects. Accordingly, integrative objects cannot be reintegrated back into disciplines and cannot, as such, be fully grasped by them.

While each of the concepts outlined above (integrative objects, complex objects, and boundary objects) can be useful in considering some of the challenges of interdisciplinary research, it is the notion of integrative objects that particularly resonated with our focus on digital well-being, as we will show below.

3.2 Digital well-being as an integrative object

Issues around digital well-being are now highly mediatized, with newspaper reports highlighting the 'addictive' qualities of devices such as the smartphone [102], and whistleblowers decrying technologies' damaging impacts on young people, particularly social media [53]. NGOs, such as the Center for Humane Technology, and charities, such as Mind, lobby for greater awareness of the individual and corporate responsibilities of living well with technology, and national governments, such as the UK's, have proposed legislating against its harmful effects [36]. In response, public media outlets, such as the BBC [87], and private technology companies, such as Google [33], have prioritized digital well-being in their research and development strategies. Overall, these wide and varied usages of the term have led scholars, such as Abeele and Nguyen [109], to describe digital well-being as a "fuzzy concept" (p.176), which resists the constraints of distinct disciplinary approaches, media news cycles, or the proclamations and intentions of interested stakeholders. While the need for the interdisciplinary study of digital well-being has been well articulated [12], it remains an underdeveloped field.

This multiplicity has established digital well-being as a productive concept for several disciplines. However, digital well-being frequently exceeds the epistemic and practical obligations of these disciplines. Clinical psychology, for example, can offer practitioners diagnostic frameworks for pathological usage of certain technologies, such as internet addiction [114], but sometimes struggles to situate problematic technological use, or even its benefits, within its social context. Media psychology, on the other hand, helpfully explores the social situatedness of digital well-being, and the ambivalent value of technological engagement [100], yet elsewhere relies on reductionist behavioral models, such as frameworks of evolutionary cognitive development [107], or neoliberalized social capital [23], to do so. Philosophers of technology provide useful thematic reviews that examine the ethical stakes of digital well-being [13], but are not obliged to explore issues to do with technical mediation and the co-construction of healthy tools and their users. Science and technology studies, in contrast, could provide the missing sophisticated sociotechnical analysis of digital well-being [58], but is not always committed to a normative standpoint that can guide what we do with it [63]. In related domains, sociology provides useful topological overviews of the problem space of digital health in general [47], but likewise is not obliged to critique what is to be found. Finally, public health studies can generate digital well-being insights that are useful for policy makers but, in doing so, these insights could unwantedly result in the perpetuation of operative inequalities depending on the specific socio-political context [82]. While these examples are supplied with very broad brushstrokes, they are included here to illustrate, rather than comprehensively document, the myriad renderings of digital well-being that currently exist in media, governmental, academic, and clinical realms. It is clear that there is no one accepted framework through which to study digital well-being and account for its complexity.

Digital well-being is also an object that escapes the productive capacity of disciplinary convergence. The collaborative work at the intersection of critical theory and computer science that originated this project ran up against precisely this problem. The process of CT Scholar and CS Scholar working together revealed the divergent expectations, methods, and ways of thinking about digital well-being as artifacts of their personal disciplinary training, rather than as optimal or universal responses to the problem space. For example, CT Scholar's training in critical theory and cultural studies had previously led them to treat digital well-being as a historicized discursive formation, paying attention to how it functioned within apparatuses of neoliberal capitalism. Initially for their collaboration with CS Scholar, CT Scholar sought to add technical specificity to their existing research agenda, hoping to examine how the metrification of well-being within computational systems problematically relates to current forms of biopolitics. CS Scholar, on the other hand, approached the problem of digital well-being through the lens of their training in computer science, and in particular in the area of information retrieval, which is chiefly concerned with building information access systems as well as modeling and measuring user behavior and satisfaction. CS Scholar's original intention was to come up with a measurement methodology for quantifying pathological user engagements with a platform. They intended to base the measurement dimensions on the clinical diagnostic framework of digital addiction. For their collaboration with CT scholar, they hoped to use progressive insights from critical theory to curtail the potentially exclusionary ramifications of engaging with such medicalized frameworks. It is clear to see, then, that these disciplinary frames differ in how they conceptualize digital well-being as an object of inquiry. However, it is difficult to say which is the 'correct' approach. Rather, *both* seem to be apt, yet in a limited way. This realization was the starting point for our exploration of digital well-being as an integrative object, and the catalyst for our further engagement with generic epistemology and its methods (discussed in more detail in the following sections).

3.3 Integrative objects in HCI and adjacent fields

While this paper focuses on digital well-being as a case study, many other concepts in HCI and adjacent fields, including CSCW or FAccT, could be also approached as integrative objects. Looking just at last year's CHI proceedings [2], we can distinguish examples such as fairness, trust, sustainability, child welfare, nudging, and others. Even though a systematic study of these concepts through the lens of generic epistemology is beyond the scope of this paper,

we will now briefly outline its broad relevance using fairness as an example.

Multiple disciplines now study fairness as part of their core research agendas. This includes not only disciplines that have traditionally focused on fairness (such as philosophy, psychology, economics, or law) but more recently also different areas of computer science (including machine learning, or information retrieval), as well as interdisciplinary communities (such as those focused around conferences like CHI, CSCW, or FAccT). These disciplines focus on different aspects of fairness, apply different methodologies, disagree on definitions, and often reject each others' perspectives. For example, computational approaches to fairness focus on mathematical definitions that allow for the algorithmization of fairness [3], critical humanities scholars warn about the harms of these computational abstractions [103], while legal perspectives question the possibility of meaningful automatization of fairness measurement [110].

Moreover, interdisciplinary research spaces often seek to translate and mediate between these different perspectives and demands. Various studies in HCI, for instance, examine user perceptions of fairness that could inform algorithmic designs [37, 106, 111], or probe the needs of various communities of practice when it comes to the prioritization of fairness research directions and driving practical tool development [48, 64]. Among these syntheses of approaches, the community recognizes the need for new ways of working and collaboration. Indeed, Mulligan et al. have experienced many of the challenges we touch on in this paper and, in response, developed a discursive framework for initiating interdisciplinary collaborations on fairness [77]. Whilst the increasing interest in approaching concepts such as fairness in more collaborative and innovative ways attests to the growing recognition of the limits of disciplines, many of these approaches ultimately rely on disciplinary conventions of rigor in order to evaluate their results. As we discuss in the next section, generic epistemology proposes that reverting to disciplines in this way is not compatible with integrative objects, and a different mode of interdisciplinarity is needed.

4 GENERIC EPISTEMOLOGY AND INTERDISCIPLINARITY

The way in which generic epistemology approaches the question of interdisciplinarity is deeply connected to the concept of integrative objects. Since these objects are not given within disciplines, and cannot be constructed through a convergence of disciplinary approaches, they require a reconfiguration of both the role of disciplines and forms of interdisciplinarity. This realization developed over time, as Schmid and her collaborators kept noticing an increasing number of scientific debates lacking satisfactory solutions for given problems, and relying on deficient conceptual frameworks. Even increasingly common interdisciplinary practices were often stuck at a dead end. The transfer of epistemological frameworks from one discipline to another often proved inadequate, and the differences between the languages of separate disciplines created additional difficulties.

These observations on the challenges of constantly evolving research landscapes are of course not unique to generic epistemology. Numerous scholars have pointed out the increasing importance of interdisciplinarity, with some theorizing it as a shift from 'Mode 1' to 'Mode 2' of knowledge production, moving from a homogeneous view of science to a diversification of research application and evaluation [32, 78]. Others have also articulated the need for a critical interdisciplinarity that does not replicate disciplinary modes of research, but instead expands in line with broader dynamics of knowledge production [29]. Disciplines with interdisciplinary research at their core (such as: science studies [7], ecological economics, technology assessment, science and technology studies [54], or indeed HCI [9, 86]) can be also seen as part of this expansion. The status of HCI as a discipline is itself contested [16, 22], with different tensions at play. Scholars have discussed the different implications of conceptualizing HCI as craft, applied science, and engineering [70], as well as the tension between HCI's relationships with both science and design [85]. Alongside the anxieties around the status of HCI as a discipline, some scholars see these frictions as a positive dynamic, motivating innovation within the field [8, 9].

Nevertheless, generic epistemology identifies modes of interdisciplinarity that rely on a synthesis of, or a friction between, disciplines as insufficient. Interdisciplinary collaborations often import rigid disciplinary frameworks and logics into their research space, leading to potential deadlocks. This assessment resonates with a broader discourse on the different logics of interdisciplinarity [4, 52, 55], and on the challenges related to interdisciplinary work (such as institutional barriers [52], barriers to funding [81], cognitive obstacles [73], and divergent worldviews constituted by the different metaphysical and epistemological commitments of different disciplines [80]). In HCI specifically, the community has made continuous efforts to develop practices that can help overcome obstacles in interdisciplinary collaborations. As will be discussed in more depth in Section 5, 'action design research' [101], 'contact-zones' [19], and practices of 'co-design' [89], for example, have been developed to facilitate the study of 'wicked problems' [88] that defy disciplinary conventions. Elsewhere, some HCI scholars propose 'disciplined transdisciplinarity' as a model for interaction design [76], whilst others advocate for a practice of ongoing critical self-reflection [25]. The problem of interdisciplinarity has also been presented as a problem of clear communication, with some arguing for a 'Liberal Arts of HCI' education that supplies practitioners with skills to foster better disciplinary relations in the future [112]. Other scholars propose spaces for equitable conversations about the challenges of interdisciplinary research [50], as well as protocols for developing trust between researchers [113].

This multiplicity of approaches to collaborative research is certainly seen by generic epistemology as positive, since it allows for increasing openness of research, and for more dialogue between different areas of knowledge. Nevertheless, approaches that see contemporary objects[4] as givens, and as knowable by disciplines (or their convergence), are ultimately different from the orientation proposed by Schmid and her collaborators. **A productive engagement with integrative objects requires a generic space where different fragments of knowledge and 'non-knowledge' can create new relations, without a wholesale import of pre-existing disciplinary logics, and without recourse to disciplines to evaluate research outcomes**. This key point differentiates the

[4] The term 'contemporary object' is used throughout this paper as equivalent to 'integrative object', in line with Schmid's use of these terms; see for example Schmid [94].

approach of generic epistemology from numerous other interpretations of exchanges across incompatible research paradigms. For instance, one commonly used metaphor is Peter Galison's concept of a 'trading zone', which is used to describe research communities working together that often don't share the same scientific language or even the same interpretation of the meaning of the collaboration [30]. The concept has been used in a wide variety of interdisciplinary contexts, not least in relation to socially-relevant technologies [34], sociotechnical networks [35], or to describe the HCI community more broadly [9]. While the approach of Schmid and her collaborators certainly resonates here, generic epistemology is not primarily concerned with disciplinary languages and negotiations between different local interpretations of an object of research. Instead, it advocates for the creation of a space outside of these dynamics in order to study integrative objects. Moreover, while generic epistemology does not overlook the problem of incommensurability in research, its approach to it is also different from that of Feyerabend [27] or Kuhn [56]. This is because generic epistemology is not invested in comparisons between theories, nor does it participate in a process where a new paradigm makes the previous one obsolete. Instead, the generic enacts what Schmid calls 'a paradigm shift without crisis', which occurs without the need to disavow disciplines. The generic works here to create an 'outside discipline' to be filled with new modes of inquiry.

The non-hierarchical nature of generic epistemology allows for all paradigms to continue, and enables a process where fragments of existing knowledge can be used as raw material for new modes of thinking, unbounded by the rules of their source paradigm. This approach is motivated by what Schmid calls 'Poincaré's criterion', inspired by the logic of invention she sees as underpinning the work of Henri Poincaré[5], and his interpretation of scientific generalization. Generic epistemology posits that in the absence of disciplinary criteria for scientificity, the rigor of an interdisciplinary practice cannot be assessed in relation to disciplinary coherence. In its absence, Schmid proposes the logic of invention as an alternative means to establish the rigor of a collaboration. As written by Schmid and Mambrini-Doudet: "Poincaré's criterion combines decomposition and hypercompatibility. It supposes a space that is common to a series of disciplines, which is ordered in a way that makes possible the decomposition of disciplinary propositions. In this space, if we construct a model, we can construct an infinite number of others, none of them having more descriptive force than the other. The models make the knowledge hyper-compatible but they are not the only possible orders" [98] (p. 122; our translation). Since disciplines can only constitute specific dimensions of integrative objects, and offer only partial perspectives on them, such objects require a more open approach to collaborative research. Schmid and her collaborators propose the term *collective intimacy*[6] to describe the conditions for collective research that encourage interactions between knowledge and non-knowledge. This works to form "a collective *cogito*" [99] (p. 38). Unlike boundary objects, therefore, integrative objects are not passed on from one discipline to another (or shared between them). As a result, integrative objects require different, *generic* conditions for collaborative research and invention. The following section will now present some of these methods in more detail.

[5]Schmid's own style of writing and thinking has been significantly influenced by Poincaré, whose work she devoted her first monograph to [92].

[6]The term was first coined by ethno-psychiatrists Lucien Hounkpatin, Henny Wexler-Czitrom, Avner Perez and Laurianne Courbin as a non-dogmatic therapy paradigm that doesn't simply apply psychiatric knowledge to patients, but instead fosters multiple relations between this knowledge and patients' own socioculutral experiences [51].

4.1 Digital well-being and making visible the components of disciplines

Generic epistemology doesn't aspire to be a rigid framework and certainly doesn't take a dogmatic stance on suitable methods and approaches. Nevertheless, several general practical recommendations for fostering interdisciplinary research have emerged through Schmid's various collaborations. Principally, generic epistemology posits that a collaborative practice that doesn't impose a hierarchy of knowledge, and isn't constrained by disciplinary conventions, requires space for new relationships between disciplines to emerge. To enable this, Schmid encourages experimentation and creating space for 'theories of intermediate scope' [98] (p. 37; our translation) that are particular to the object of concern. A key step towards this process is for researchers to recognize the limits of their disciplines and to consciously map their internal landscapes by breaking them down into their separate components. Schmid and Mambrini-Doudet outline six key components of the internal landscape of any discipline that can help this orientation. These are: intellectual apparatus, temporality, modes of organization, a regime of scientific recognition based on appropriation and critique, a social system for producing peers, and an implicit knowledge of science [98] (pp. 23-24; our translation). The internal balance and relative differences between these elements are what differentiates and individualizes disciplines. In what follows, we discuss the different components outlined by Schmid and Mambrini-Doudet in turn, illustrating them with examples from CT and CS Scholar's collaboration on digital well-being. We hope to show how engaging with this way of understanding disciplines sheds new light on the subjective experience of personal interdisciplinary collaborations.

- **Intellectual apparatus** – the main goals and intellectual motivations of a discipline.

  Through their collaboration, CT and CS Scholar discovered that their respective disciplines had vastly different ways of conceptualizing digital well-being, and vastly different motivations for doing so. As already mentioned, CT Scholar initially sought to examine digital well-being as a contemporary location of biopolitics. This can be seen as a reflection of critical theory's overarching motivation to clarify oppressive power relations, and forms of subjugation, operative in the world at differently technologized junctures. However, through the encounter with CS Scholar, CT Scholar began to see the limits of this apparatus of thought. CT Scholar realized that although their training allowed them to clarify and critique the broad capitalist functioning of digital well-being, practical suggestions to improve the situation were not always a priority, or even a possibility, within the field. Conversely, CS Scholar began the collaboration with an intention to

create a new metric for digital well-being, in order to help rationalize and standardize its future study and technical application. However, through their encounter with CT Scholar, CS Scholar started to clearly see how this drive was not universal to all disciplines. Rather, it was a reflection of their trained computational instincts to design concrete solutions to digital well-being, which often entailed uncritical application of imported models and concepts.

- **Temporality** – the timescales of research within a discipline, as well as the evolution of a discipline and of its ideas over time.

  One of the possible interpretations of this category refers to practical matters associated with working schedules, publication timelines, and the expected duration of projects in each respective field. The differences between critical theory and computer science in this regard was most obviously felt when it came to the timelines associated with publication. For instance, CT Scholar had to familiarize themselves with the conventions of peer-reviewed conference proceedings and the fairly strict deadlines for submission to large computer science venues at set times of the year. Working toward a deadline for submission was not something CT Scholar was used to, as submitting to the humanities venues where critical theory scholars usually publish occurs on a rolling basis. Moreover, the revise and resubmit process of CS venues similarly followed a standardized timeline, which was again novel to CT Scholar, considering the months, and sometimes years, that a humanities paper could languish in peer-review and editorial processes, which change from journal to journal.

- **Modes of organization** – the main operative logics and practices within a discipline.

  During weekly project discussions, certain practical issues had to be resolved. Firstly, CT and CS Scholar had to decide what technological tools to use to share ideas and draft their work. This was not as straightforward as it may seem. For example, CT Scholar preferred MS Word and its privileging of prose, while CS Scholar used LaTex and Overleaf, valuing their greater capacity for tabulation and automatic reference numbering needed in ACM formats. Another key issue was the publication venue. CT and CS Scholar had to discuss where their analysis and findings would be best placed, and consider what disciplinary conversations would 'hear' their interventions. As we shall show below, this had significant implications for the job security for both.

- **Regime of scientific recognition based on appropriation and critique** – the way a discipline constructs itself in terms of what it embraces and what it rejects.

  A key point in CT and CS Scholar's discussions was how best to align their ideological expectations of the project. This chiefly meant resolving the tension between the desire to design metrics of digital well-being versus analyzing such metrics as vectors of normalizing contemporary power structures. Critical theory's distaste of easy fixes ran up against computer science's deeply rooted need for projects that have practical, measurable outcomes - a tendency often termed 'technological solutionism' [104]. The tension was particularly visible in the writing of the 'Design Implications' section of the paper, which was a key priority of the computer science venue they had chosen to target. Here, the level of concreteness of the design implications was subject to particularly intense negotiations. It was at this stage, when it came to actionable 'solutions' to digital well-being, that the differences between CT and CS Scholar were most clearly felt.

- **A system for producing peers** – the social dynamics of the research environment within a discipline.

  Interdisciplinary research is highly valued by the European higher education institutions and governmental funding bodies that both CT and CS Scholar wished to join and engage with after their postdoctoral positions.[7] For CT Scholar in particular, coming from a United Kingdom arts and humanities background, being able to demonstrate collaboration with fields that were perceived to be more instrumentally valuable, such as computer science, granted a sense of legitimacy to a threatened research area [6]. In this way, interdisciplinary research projects offer early career humanities researchers a valuable foothold in the increasingly competitive academic world. For CS Scholar, however, a different set of institutional logics was at play. For example, while computer science as a field shows increasing interest in hiring scholars with interdisciplinary interests, it remains to be seen whether faculty evaluation and promotion criteria have been sufficiently adapted to account for interdisciplinary outputs. There are issues around how to value and compare different publication venues, or how to account for the slower time frames of working and publishing across disciplines. For computer scientists, it could be considered less risky to prioritize publishing in CS venues, and only engage with other fields as a source of inspiration and a guiding input.

- **Implicit knowledge of science** – the way in which a discipline establishes its criteria for rigor.

  As discussed earlier, CS and CT Scholar became aware of each other's disciplinary differences early on in their collaboration, when the conflicting nature of their initial goals for the project became apparent. The process of working together enabled the researchers to venture outside of their respective disciplinary boundaries, however the fact that even interdisciplinary research is often evaluated by disciplinary standards created a significant problem. Whilst both CT and CS Scholar started seeing

[7] For example, two of the largest public funders in this region, the European Research Council and the UK Research and Innovation non-departmental government body, both emphasize the value of interdisciplinary research.

their individual perspectives on digital well-being as only partial, they still felt obliged to produce research outcomes that conform to their respective discipline's standards of rigor. As a result, the tension between metrification and critique could not be fully resolved.

The above categories are able to help map the internal landscapes of disciplines. According to generic epistemology, doing so helps distinguish the key modes of knowledge production that disciplines engage in. This, in turn, opens up the possibility of their underdetermination and of compatibility between different fragments of knowledge. Schmid and Mambrini-Doudet distinguish six main modes of knowledge production: dissociating, appropriating, linguistic, cultivating, illusory, and variety [98] (pp. 24-27; our translation).[8] Exploring the dynamics of research in this way can be useful in recognizing their insufficiency. It can help us recognize our own orientation as partial, and conditioned by the specific conventions of our own disciplines. In what follows, we will discuss each of these modes in more depth, drawing on the experiences of CT and CS Scholar to illustrate their workings.

- **Dissociating mode** – refers to the way the discipline self-evaluates its own progress based on logics of justification and invention. Recognizing the particular expression of this mode within a discipline allows us to reposition it, and place it within a plurality of other approaches without undermining its efficiency.

  In relation to this mode, we can see how the original motivations for CS and CT's interdisciplinary collaboration could not have been further apart: one researcher wanted to critique the measurement of digital well-being, the other wanted to construct new metrics for its administration. Upon this recognition, the project progressed beyond the limitations of each respective disciplinary approach, ultimately combining in a way that could not be understood through each approach singularly conceived.

- **Appropriating mode** – relates to the ways in which a discipline distinguishes itself from others based on what it appropriates and what it critiques.

  Critical theory adopts overarching theoretical frameworks through which to examine the world from the perspective of the oppressed and subjugated. Frequently, capitalism, colonialism, or power are invoked as such overarching concepts that link disparate empirical analyses together. Conversely, critical theory rejects concepts that are used to maintain unequal social systems that privilege certain groups over others. For example, this could include conceptual tools associated with neoliberal differentiation and administration, such as social capital. In the realm of computing and data science, statistics and machine learning seek to distinguish each other in ongoing debates. Some argue that the difference lies in typical tasks and methods the fields engage with [14], while some claim that the two are no different except perhaps for marketing [1].

- **Linguistic mode** – relates to the various layers of the specific language used by a discipline, including specialized vocabulary and specificity of knowledge (theorized by Galison as scientific 'pidgins' and 'creoles' [30]). It clarifies the stakes involved in developing modes of compatibility with other disciplinary dialects (encounters between vastly different disciplinary contexts can lead to 'culture shocks').

  When CT and CS Scholar started discussing their intentions for the project, they quickly realized that they were often speaking at cross purposes, using the same terms to refer to vastly different objects or concepts, or using jargon that had no disciplinary equivalent for the other. The meaning of the terms and concepts that grounded CT and CS Scholar's respective research often dissolved in their attempted translation, along with their usefulness. To use a slightly unorthodox comparison, we may think of these initial meetings in terms of a 'first contact' scenario, whereby distinct alien species attempt to communicate with each other across their radical communicational differences.[9] In trying to stabilize terms, both scholars revealed implicit disciplinary values that had, until then, slipped below their conscious consideration.

- **Cultivating mode** – makes visible the 'thickness' of a discipline, characterized by the density and rigidity of the logics of cultivating new ideas within the discipline. This determines to what extent a discipline might want to either close itself off or enable a space of exchange with other forms of knowledge.

  The experiences of CT and CS Scholar attest to the generally porous nature of both critical theory and computer science, despite their sometimes dogmatic tendencies. Aside from some of the difficulties outlined above, this year-long project led to a successful completion and motivated the next stage of the collaborative exchange. By exploring computer science and critical theory through the lens of the notion of cultivating mode, both researchers were able to

[8] Schmid and Mambrini-Doudet use the term 'machine' instead of 'mode' here, drawing on the work of Jacques Lafitte, and Gilles Deleuze and Félix Guattari. Given that the term 'machine' might have different connotations for the audience of this paper, and that the work of Lafitte and Deleuze and Guattari is beyond the scope of this current discussion, we chose the term 'mode' in order to preserve the same dynamic, production-connoting meaning, without adding an unnecessary layer of opacity to the concept.

[9] This framing of interdisciplinary communication is of course not too dissimilar from the anthropological idea of first contact and its colonial history (also directly relevant to Galison's theorization of trading zones and the communicational issues they entail). Nevertheless, exploring the linguistic mode of disciplines more speculatively, in terms of xenolinguistics rather than anthropological linguistics, enabled us to interrogate the dynamics of interdisciplinary exchange on an even more fundamental level. How would we approach the task of collaborative research if we could not make any assumptions about the key building blocks of a discipline we were interfacing with? And, more importantly, how would we go about explaining our own disciplinary culture in such a scenario? Sending messages into outer space with the hope of establishing contact with an alien species has a long and rich history, and points to numerous challenges of communicating over vast distances, and without the possibility of making any assumptions about alien interlocutors. Many of the messages sent into space have relied on visual and mathematical ways of encoding information, considering these more universal than natural language. For a detailed account of this history, see [79].

recognize their respective disciplines as responses to particular societal and technological shifts, and as mediators between disciplines that predate them. This put in perspective the particular ways in which these disciplines have been historically constructed, and, consequently, helped shed light on how the knowledge they produce can be entered into 'spaces of interdiscipline'.

- **Illusory mode** – also related to this potential for exchange or isolation, refers to a disciplinary culture as marked by the illusion of wholeness. This is manifested in constructing macroscopic theories or limiting the interactions with other disciplines to superficial exchanges such as criticism or projection of one onto another.
  While an illusion of wholeness is perhaps easier to observe in the case of philosophy, which often grants to itself the authority to speak on behalf of other domains[10], CT Scholar noticed similar tendencies in their own discipline during the collaboration. Critical theory tends to perceive most contexts concerning society as material ripe for critique, and being aware of this predisposition allowed CT Scholar to recognize some of their initial instincts in approaching digital well-being as motivated by this particular illusion of wholeness, rather than as necessity.

- **Variety mode** – helps to understand a discipline as a heterogeneous system. The constant evolution of disciplines points to the implicit understanding that disciplinary knowledge is insufficient, and that there are areas of non-knowledge; disciplines do not therefore fully cover the scientific horizon.
  Reflecting on their initial motivations for starting a collaborative project enabled CT and CS Scholar to notice some of the differences in how their respective disciplines value heterogeneity of research and knowledge. Critical theory, similarly to many other disciplines within the humanities, increasingly recognizes its own local character and scope, which is also why interdisciplinary work is highly valued in the humanities. In computer science, institutional logics have not yet adapted to evaluating interdisciplinary work on an equal footing, however researchers show increasing interest in diversifying the variety of knowledge they engage in. An analysis of these broader dynamics motivated CS and CT Scholar to question even further the processes within their disciplines that distinguish areas of knowledge and non-knowledge.

4.2 Internal landscapes of disciplines and modes of knowledge production – prompts for an interdisciplinary dialog

Based on our engagement with generic epistemology, as well as the retrospective reflection on the experiences of CT and CS Scholar, we propose that a dialog focused on examining the limits of disciplines involved in a collaboration can open up the possibility of a non-hierarchical research space. We suggest that this type of reflexivity can help curtail the transference of disciplinary dogmatism into a collaborative project. To help guide researchers in this process, we have developed a semi-structured script based on the components of disciplines outlined by Schmid and Mambrini-Doudet. These are reflected in Table 1 and Table 2. We hope that by engaging with these prompts, researchers can help themselves shed light on the incompatibilities in values and incentives early on in a collaboration, and, more importantly, help steer the project towards a mode of interdisciplinarity without disciplinary continuity.

Table 1 presents an overview of the elements of disciplinary landscapes, our reading of why understanding these elements is crucial in the context of an interdisciplinary collaboration, and our proposed inventory of example prompts that researchers could include in their initial exploratory dialog. Table 2 proposes a series of prompts intended to help identify the particular forms of expression of the modes of knowledge production within any discipline. The scripts do not seek to be dogmatic or exhaustive; our goal is to provide intuitions and example interpretations of the framework, leaving their application and adaptation up to individual researchers and the specifics of their projects. Importantly, we should note that the process of engaging with these scripts does not itself constitute a method for working with integrative objects. Rather, engaging with the prompts is just one of the initial steps a researcher could take to avoid importing disciplinary dogma into an interdisciplinary research space. Methods that are more directly intended for working with integrative objects will be discussed in more detail in the next section.

5 GENERIC EPISTEMOLOGY AND DESIGN

Generic epistemology is also interested in questions of design, especially as an exploration of interactions between philosophy and processes of invention. An integrative object is posited in the context of design as an *unknown object*, or 'object X' [95], the properties of which are often redistributed in unexpected ways. Much of this aspect of generic epistemology has been developed by Schmid in collaboration with Armand Hatchuel, a design theorist, and some of the methods they engage with are related to Hatchuel's C-K Design Theory (which he developed together with Benoît Weil) [42–44]. This theory, also called concept-knowledge theory, posits design as a process of extension, one involving constant movement between the space of concepts (C) and the space of knowledge (K). Similarly to how generic epistemology emerged as a response to the observed limitations of conventional forms of disciplinary research, C-K theory developed in response to certain limitations of the dominant approaches to design observed by Hatchuel. In his view, the scope for invention in design is often limited by an excessive focus on problem solving, as well as by classic design theories being too reliant on specific domains of implementation and too separate from theories of creativity. Generic epistemology is interested in design primarily as a non-dogmatic process of invention and extension, allowing for unexpected conceptual formulations. The key driver of this process is again the notion of the generic, and Schmid and Hatchuel developed a number of general recommendations for creating generic-like conditions for this process to flourish. They outline five main procedures [97] (pp. 136-137), which rely on extracting concepts from their original disciplinary contexts in order

[10] As repeatedly pointed out by Laruelle, see for example: [61, 62].

Table 1: An inventory of example prompts for a first contact interdisciplinary discussion based on the elements of landscapes of disciplines in generic epistemology.

Elements of the landscapes of disciplines according to generic epistemology	Reasons for understanding the element in an interdisciplinary collaboration	Example discussion prompts
Intellectual apparatus	Understand the main intellectual motivations of the discipline.	What are the research goals of your discipline? What is your current research agenda? What are some research questions your discipline is interested in directing at the object?
Temporality	Understand the general evolutionary trajectory of the discipline and its ideas over time. Understand to what extent the discipline values innovation over preservation of knowledge.	What is the typical publication timeline in your field? How quickly does published research lose relevance in your field? In a typical paper in your field, how much weight is there on aspects of novelty vs building on existing scholarship? What is your personal timeline for this project? By when would you like to (need to) have this project wrapped up? Is the study of this object in your field considered traditional or innovative?
Modes of organization	Understand the main operative logics, methods, and practices used within the discipline.	What are the typical publication venues in your field? How would you attempt to study the object? What methods would you apply? How do you personally structure a project? How do you typically organize your work?
Regime of scientific recognition based on appropriation and critique	Understand how the discipline constructs itself in terms of what it embraces and what it rejects. Understand which perspectives and pursuits are valued within the discipline, and which are critiqued.	What kinds of objects and problems does your discipline consider worthy of research? How do you judge the quality of a paper in your discipline? What kind of examination of the object would your field find outrageous?
A system for producing peers	Understand the career progression requirements of collaborators, and the broader social dynamics of the research environment.	How are people evaluated for hiring/promotions in your field? In your field, how do people of different seniority typically contribute to projects? How could this project help you advance your career right now? What brought you to your discipline? Who are the people in your field who have studied the object?
Implicit knowledge of science	Understand the state-of-the-art knowledge in the field. Understand what constitutes rigor in the discipline.	What are the research questions at the frontier of knowledge in your field? What are some contemporary 'must knows' in your field? What makes a paper in your discipline good? What is the dominant research paradigm in your field? What methods and approaches are considered rigorous in your field?

to reconfigure them and produce them anew. These include: allowing for the autonomy of concepts; approaching disciplines as parameters rather than content; writing experimental texts in order to construct hypotheses on objects and their properties without the need to restrict the objects to their properties known in the present; constructing cartographies of research where all the components are in dynamic relationships with disciplines; and forging connections between scientific and extra-scientific domains.

The pursuit of experimental methods of invention also led Schmid and her collaborators to develop the technique of *fiction* and 'the method of without' [95], which can help reimagine the problems at hand, and hypothetically design alternative ways of approaching them. The concept of fiction is used to signal generic epistemology's orientation towards the future and its embracing of the unknown. Examining objects from the point of view of their futural extension is a challenge that traditional disciplinary methods often struggle to grapple with. Accordingly, Schmid operationalizes the notion of fiction to emphasize that integrative objects cannot be reduced to what is currently known and accepted by disciplines. The technique of fiction approaches objects as not fully realized, and searches for their invariant characteristics across different fragments of knowledge.

Table 2: An inventory of example prompts for a first contact interdisciplinary discussion illuminating different modes of knowledge production in a discipline according to generic epistemology.

Mode of knowledge production according to generic epistemology	Reasons for understanding the mode in an interdisciplinary collaboration	Example discussion prompts
Dissociating mode	Understand how the discipline thinks about progress and innovation. What will the collaborators want to achieve? What counts as a novel contribution?	What would have to be included in a paper for it to count as a novel contribution in your field? What would be some natural next steps in the study of the object in your field?
Appropriating mode	Understand which methods and approaches collaborators would consider valid and appropriate in the study of the object. Which methods and approaches collaborators would be resistant to using.	Which research methods or discourses does your field find (un)acceptable in the study of the object? Which of the research methods/discourses in my field does your field find (un)acceptable?
Linguistic mode	Learn the terminology a field uses in the study of the object and related topics. Are there any ideological stances encoded in the language and jargon of the discipline? Can it lead to 'cultural shocks'?	What is the broader set of terminology that your field uses when discussing the object and related topics? When I use the following terminology related to the object, what do you hear, and how would you understand it?
Cultivating mode	Understand the ways in which the discipline forms its operational logics and rigor. Understand the conditions which allow for knowledge exchange with other disciplines.	How do you typically share your research with others in your field? What are some of the events where scholars typically meet? What are the main publication venues? How does peer review work in your field? Is it common for scholars in your field to collaborate outside of the field? What do these collaborations typically look like (topics, processes, outcomes)?
Illusory mode	Understand how the collaborator's discipline typically perceives its own limits (if at all) and its compatibility with other disciplines. Does the discipline consider itself universal in scope?	How broad is the scope of your discipline? How does your discipline relate to mine and other disciplines? Is there something lacking in your disciplinary framing of the object?
Variety mode	Understand what the discipline sees as its own constitutive elements and how they evolve. Understand what the discipline acknowledges not to know or what is not included within its purview. Understand what productive potential the discipline sees in an interdisciplinary collaboration.	In what ways has your discipline changed in the last few years/decades? What are the most dynamic aspects of your discipline? What does your discipline explicitly not study? What does it acknowledge not to know? How can your discipline benefit from interacting with my discipline?

Generic epistemology's investment in methods of invention could be of particular interest and relevance to the HCI community, given the field's affinity with design. Scholars such as Daniel Fallman [26] have described HCI as a 'design-oriented field' (p.225), and Wright et al. [112] frame HCI as aligned with designerly disciplines and their creative problem solving. Here, HCI practitioners are encouraged to bring their designerly attributes to the study of contemporary sociotechnical objects, and problematize them in a way that compliments, and may help re-imagine, other disciplinary expertise working on the project. This ability of design thinking, conceptualized by Buchanan in terms of the 'doctrine of placements' [11] (p.8), is seen as able to offer new perspectives, which can lead to new insights, and solutions, to emerge as a result. This approach to problem-solving, (dis)placement, and contextual relevance has led some design theorists to frame designerly thinking as a 'meta-disciplinary methodology' [69] (p.35). HCI literature also often invokes the value of 'designerly ways of knowing' as developed by Nigel Cross [20], offering a transcendent vision of design as a research culture fundamentally tasked with creative and practical solutions to problems across almost unlimited domains. Furthermore, the notion of the 'wicked problem' has proven useful in HCI to conceptualize complex sociotechnical issues that require innovative and multi-disciplinary design interventions [57, 65, 101]. The term is often imported from design theory, and defined as: "problems that are ill-formulated, potentially unbounded, open to alternative formulations with no obvious means of choice or stopping rule and are particular to a situation, setting or context [11] (p.9). In an influential paper, Zimmerman et al. [117] argue that these types of 'under-constrained problems' are natural concerns of HCI due its span across a wide swathe of interrelated technical, human, and social processes. The authors advocate a move away from strictly instrumentalized approaches to their solution, and recommend a more holistic mode of intervention.

Whilst generic epistemology is not in itself a design theory, it certainly resonates with numerous design-related discussions in HCI literature. The welcoming of new ways of thinking, and the general

position of openness that characterizes generic epistemology can be also attributed to many of the perspectives outlined above. Nevertheless, there are also some distinct differences that are important to note, and while designerly ways of knowing are often, if not always, concerned with finding solutions, the methods of working with integrative objects are not predicated on the same need. Simply put, there is no obligation to find timely practicable solutions to problems posed by integrative objects, even though actionable responses to research findings are very welcome outcomes of such collaborations. It is important to state that this outcome cannot be known or even planned from the outset, and any collaboration could result in the identification of more problems 'all the way down' [90]. A generic approach to design is primarily concerned with decomposing the existing modes of knowledge production and invention, in order to enable their new modes of compatibility.

Generic epistemology's lack of obligation to solutionism or disciplinary maintenance perhaps has stronger resonances with more recent work in HCI that foregrounds non-instrumental, non-hierarchical, and progressive approaches to sociotechnical design [83]. Anna Croon [19], for instance, puts forth an idea of 'thinking with care' in HCI that brings together diverse voices in the design process according to feminist principles of situated knowledge, incommensurability, and critical sensibilities. Drawing on feminist STS theorist Donna Haraway's concept of the 'contact-zone' [40], which itself was originally coined by literary theorist Mary Louise Pratt [84], Croon argues that the design process of sociotechnical objects must incorporate a wide variety of stakeholders if they are to curtail the entrenchment of existing inequalities and systematic oppression through their operationalization. Such an approach is radically equitable, and differences between stakeholders may ultimately be irreducible. A set of related practices emerging from HCI are encapsulated in 'co-design spaces', as understood by Sanders and Westerlund [89]. Here, the authors seek to create the conditions through which differently embodied knowledge can come together to imagine new design futures for HCI in a shared, physical space. Whilst the general orientation of these approaches is in some ways parallel to that of generic design, the latter emerged from a different context, and uses different conceptual material. As a result, it proposes a range of methods and practical tools that might not yet be familiar to the broader HCI community. In what follows, we outline some of these methods, and illustrate them with our own examples related to digital well-being.

5.1 Digital well-being in generic space

A number of the aforementioned procedures for producing the generic served as the basis for developing our own approach to digital well-being, and guided us in constructing a generic space for this particular research object. More specifically, our project explored the possibility of generating new research hypotheses and perspectives on digital well-being through the process of disciplinary underdetermination. In Section 5.1.1 we discuss this method in more detail, and provide an example of how critical theory and computer science can be decomposed into their specific parameters. We then use these insights to construct hypotheses and partial models of digital well-being that can be developed further in the future. Moreover, the method of fiction proposed by Schmid and her collaborators has also proven fruitful for our understanding of digital well-being. Section 5.1.2 explores possible applications of this method, and proposes ways of approaching digital well-being as a hypothetical object of design.

Our way of working with these methods was rooted in Schmid's and Hatchuel's recommendation of writing *experimental texts*. Experimental texts help create models, sketches, and logical maps, diagramming the parameters of disciplines relevant to the objects of inquiry, and helping to identify the points of intersection between disciplines, as well as their blind spots. They are experimental in the sense that they often do not follow traditional formats of academic or scientific inquiry, and they do not require a definitive research outcome. These are texts "from which a certain number of hypotheses can be constructed for the work that follows" [96] (p. 110; our translation). What we present below can also be understood in terms of experimental texts – our examples are not meant as definitive or prescriptive. Their primary function is that of *hypotheses*, which we intend to build upon in our further research.

5.1.1 Decomposing disciplinary perspectives on digital well-being. When singular disciplines or their composites claim authority over a specific object of research, the dimensions of the object are restricted to the space delineated by operative disciplinary parameters. Conversely, generic epistemology proposes a process where disciplines are decomposed into their key components in order to extract them from their disciplinary context, and place them within the generic space of the object. As a result, the features and dimensions of the object previously considered exhaustive by the disciplines are revealed as partial, and the object is rendered unknown or underdetermined. This enables new interactions between those partial perspectives, unbounded by the rules of the disciplines that produced them. There instead emerges a multiplication of "disciplinary dimensions, while [also] allowing, where they do not meet or intersect, constitutive zones of unknowing" [98] (p. 68; our translation).

In our own project, we experimented with this process by using critical theory and computer science as means to sketch out possible dimensions of digital well-being. The first step of this process was facilitated by the tools presented in Tables 1 and 2. The exploration of the internal landscapes of critical theory and computer science allowed us to identify the key components (operative logics, main foci, and key priorities) of the two disciplines that were inadvertently entering into the problem space of digital well-being. This in turn allowed us to recognize the perspectives on digital well-being produced by our disciplines as partial and clearly driven by the specific orientation of each discipline. Recognizing this partiality meant that we no longer saw the emerging perspectives as defining the identity of the object. Instead, the resulting insights served as material for constructing new dimensions and partial models of digital well-being, as well as identifying crucial blindspots and key questions for further research. Table 3 summarizes our engagement with this method and the resulting hypotheses.

5.1.2 Digital well-being and the practice of fiction. Another method proposed by Schmid to enable further underdetermination of integrative objects is the practice of fiction [95, 97]. As introduced above, this design practice is oriented towards the future, where the

Table 3: Example construction of dimensions of digital well-being through the parameters of disciplines (computer science and critical theory).

	Computer science	Critical theory
Components and parameters of the discipline	Operative logic of quantification, metrification, and optimization. Focus on the computable. Prioritization of measurable outcomes. Deriving value from specificity and efficiency.	Operative logic of critique. Focus on power structures. Prioritization of social, cultural, and historical specificity. Deriving value from demonstrating relevance to concrete problems.
Partial perspectives on digital well-being	Normative (revolving around the algorithmization of 'good life' or 'human good'). Individualized (related to user experience; driven by user interactions with particular devices, platforms, etc.). Quantifiable (can be determined by data collection and engagement metrics).	Discursive (mobilizes different assumptions, worldviews, and agendas; particularly entangled with the discourse of neoliberal capitalism). Culturally situated (dependent on divergent culturally-embedded values). Political (entangled with power dynamics).
Emerging dimensions, partial models, and zones of unknowing	Biopolitical dimension (constructed by metrification as a vector of power). Digital well-being as a scalar object (requires a dynamic model with variables corresponding to different scales - the scale of the individual, of a community, planetary scale, etc.). Which aspects of digital well-being are unmeasurable? Undefinable? Independent from discourse?	

Table 4: Example construction of digital well-being through the practice of fiction.

Procedure	Possible examples of hypothetical perspectives
Removal of one of the components of one's disciplinary training	Critical theory: digital well-being beyond the guiding concept of capitalism. Computer science: digital well-being beyond its computational tractability.
Removal of personal theoretical thresholds that may have structured particular modes of inquiry in the past	A humanities scholar trained in Foucauldian theory: imagining digital well-being beyond a capillary notion of power, or biopolitical subjectivation. A computer science scholar trained in user modeling: imagining digital well-being beyond the lens of user engagement.
Removal of specific properties of the object	Digital well-being without a notion of 'the good'. Digital well-being without the user.

future is not treated as a simple continuation of the present, and objects of design are not approached as fully realized. The future as a generic operator allows for concepts such as digital well-being to be conceived of independently of their current conditions, as partially unknown scenarios projected from the future to the present.The notion of fiction functions here not as a story or a narrative, but as a link between different disciplinary fragments and different temporalities of design, enabling new relations between objects and sets of knowledge. The technique of fiction consists of selecting certain properties of a given discipline or object and reimagining those disciplines or objects without those properties. Examples of this type of thinking can be found in numerous contexts, such as philosophy of science and philosophy of mathematics (science without numbers [28], structuralism without structures [46], mathematics without numbers [45]), or in design theory (a house without a roof [42], a chair without legs [75]). The property we subtract cannot be one of the most essential, otherwise the endeavor will lead to an impasse, nor too insignificant, otherwise the practice will not lead to the creation of new objects. Instead, the initial object, such as digital well-being, is rendered as an unknown object 'X' to which properties can be added or subtracted, bringing fragmented knowledge together in new formations. The aim is not to try and construct that new object (which would be actively enacting a lack), but to use the hypothetical to mobilize thought in a previously unexplored way. Hypothetically depriving disciplines and objects of one of their significant properties forces us to reorganize knowledge, opening the door for new insights and for designing these objects differently in the future.

Using this approach in relation to our case study, we propose three procedures as a springboard for further expansion of collaborative research on digital well-being. We summarize the procedures and their applications in Table 4.

5.1.3 Future use of these methods. While our own use of these methods have so far been related to critical theory and computer science, the same tools could be applied to other disciplines invested in digital well-being, as well as other integrative objects. For example, the examples proposed in Table 3 can help other researchers engage in the process of disciplinary decomposition and sketch out emerging dimensions of the integrative objects they study. In particular, the first section of the table can help identify

the key parameters of disciplines when entering into a given problem space. By drawing on these prompts, future researchers may wish to ask questions such as: *What are the main priorities and operative logics of my discipline?* This in turn can help crystallize the partial perspectives produced by disciplines in relation to the studied integrative object: *How do the priorities of my discipline influence its view of the object? What perspectives do they produce?* Researchers can then gradually outline the emerging dimensions of the object and identify potential new models, hypotheses, and 'zones of unknowing': *What remains unknown or unknowable about the object?* Similarly, and more attuned to the question of design, the procedures proposed in Table 4 can be also applied in other contexts to offer new perspectives on particular objects of inquiry: *What would my perspective on the object be if I subtracted from it an aspect of my disciplinary training? What would my research object be without one of its properties that I take for granted?* Our hope is that other researchers might find these questions and methods useful in generating new hypotheses and productive questions for integrative objects in HCI and adjacent fields.

6 CONCLUSION

As a multifaceted discipline with a huge variety of epistemic, analytical, and practical interests, HCI is inevitably concerned with phenomena that defy attempts to impose discrete disciplinary boundaries upon them. Accordingly, this paper has answered a pressing need to better understand how to conduct collaborative, interdisciplinary research that can account for the complexity of contemporary objects of sociotechnical concern. This paper is positioned as a contribution to the existing research on digital well-being, as well as to the ongoing discourse surrounding the challenges of collaborating across disciplines. In line with generic epistemology's key principle of non-dogmatism, and its prioritization of invention over negation, we do not aim to critique existing scholarship, rather we have proposed an alternative perspective, rooted in our own experiences, and guided by the framework developed by Schmid and her collaborators. The aim of this approach, put simply, is for researchers to recognize their disciplinary blindspots and leave their disciplinary identity at the door as they enter a collaboration. This process seeks to strip away any implicit assumptions about the object of inquiry brought into the research space. To this end, this paper has provided practical recommendations for researchers and practitioners in the HCI community and beyond to build on in the future, in the hope of facilitating non-hierarchical and non-dogmatic modes of knowledge expansion.

The recommendations we have proposed in this paper are by no means definitive or exhaustive; they are meant more as an invitation to further experimentation and discussion. Our intention is to develop a research space where new paradigms of thinking can flourish and where integrative objects, such as digital well-being, can be re-imagined and re-designed according to collectively established priorities, rather than unilaterally imposed protocols. While ideas of disciplinary forgetting, dissolution, and subtraction might be possible to grapple with conceptually, putting generic epistemology to practice can be seen as a balancing act. The need to publish the results of a collaboration as a paper within a discipline, or to explain findings to disciplinary colleagues, often pull researchers out of the space of the generic. We might need to become comfortable producing outcomes unintelligible to our own home disciplines. As such, we see this current paper as taking a step towards a more extensive exploration of generic epistemology as a generative approach for engaging with sociotechnical objects in HCI and other related fields.

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