

Why are we discussing intermediate design knowledge forms so intensely right now? While RTD is徘徊在设计知识设计中，RTD研究人员希望从任何点开始，都能够方便地设计出满足需求的原型。他们希望设计能够通过讨论、反思和修改，逐步完善，而不是通过预先定义好的模板或框架。这种设计方法强调的是设计过程中的动态变化和迭代改进。

在最近的一次CHI研讨会(CHI [1])上，我们询问了与会者关于他们对RTD的看法。他们普遍认为，RTD是一种有效的设计方法，能够帮助设计师更好地理解用户需求，并在设计过程中不断调整和优化。然而，也有一些人对RTD持怀疑态度，认为它可能过于强调主观性和不确定性，而忽视了客观事实。尽管如此，RTD仍然被认为是一种值得探索的设计方法，特别是在复杂和不确定性的设计任务中。

在最近的一次CHI会议上，我们讨论了RTD可能带来的影响。一些人认为，RTD可能会导致设计过程变得更加混乱和耗时，因为设计师需要不断地重新评估和调整设计。然而，其他人则认为，RTD可以帮助设计师更好地理解用户需求，并在设计过程中不断调整和优化。尽管如此，RTD仍然被认为是一种值得探索的设计方法，特别是在复杂和不确定性的设计任务中。

Knowledge IXD Framings

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affiliations, and so forth.

A similar but not identical problem is how we legitimate this research beyond our immediate community, for example, to computer scientists in the CHI community, designers in the industry or architects, scientists in social media studies, and so on. The need to do so is a reflection of IxD researchers' situatedness in other communities — where we publish our research, apply for research grants, hold institutions — and so on.

Central to both of these challenges is the highly interdisciplinary position of IxD research. For example, this ACM CHI, an HCI conference whose epistemological commitments are interdisciplinary. Yet the composition of the participants was more diverse than suggested: In the room, in addition to social scientists and computer scientists, were also designers and humanists—all self-identified researchers in the CHI as IxD researchers in the CHI community. We view this intellectual heterogeneity not as a problem to be solved by “purifying” the label, but rather as an asset. And yet, somehow, this is such (in the first place) and a good or bad instance of it (in the criteria by which we recognize IxD build at least broad consensus in the research as a research community, we must rather as an asset. And yet, somehow, among others.

Our view is that legibility is an ongoing challenge. At present, we understand this as both an internal and an external challenge. The internal challenge is for those who identify as LD researchers to form as a community around a set of widely recognized criteria. The external challenge is for members of that community to speak more broadly to other closely related research communities, for example, human-computer interaction (HCI), design theory, and media studies,

- highest standards, help peer reviewers assess the quality of paper/grant submissions, help identify the best of what we do, and help the research community build on one another's contributions to foster a research culture and to advance knowledge within the domain.

their own projects while guided by the

The legitimization of ITxD knowledge in HCI and beyond. Every scholarly discipline operates with a set of criteria by which its potential for doing good is socially recognizable. For example, philosopher of science Harold Kincaid identifies several “sympathoms” of good science: It is explanatory (i.e., “getting at causes, as evidenced to offering mere descriptions and formal (i.e., “organized for knowledge in ITxD research, The question of legitimization then, is to identify its symptoms of excellence. Such qualities will help this community of researchers pursue changing game.

Intermediate knowledge forms such as strong concepts and annotated portfolios then also make particular sense within the language games of design and design research. They depend on a particular appreciation of what such theory is for—generative principles combining understandings of the real, true, and ideal [5] to support investigations of *what may be* rather than simply *what is*.

It is no surprise that intermediate knowledge from 1xD research (and its constituents artefacts and accounts) is then more readily understood in design practice and design research practice. The challenge is thus in making it understood in other practices/

Writtentheaccounts of design and use have a further complication in that they are unable to capture the tacit knowing present. This is not to say that such knowledge cannot be communicated—rather, that it depends on expression through the practice itself. Tim Ingold makes a distinction between knowing and telling in this respect, describing how a maker's ways of knowing and doing can be told by hand [4]. Artifacts have another role here in explicating the process of design in terms familiar to

IxD researchers typically use, and account of design and use, and discussions relating these elements outside the same program) to develop other design research (within and outside the same program) to develop concepts, mappings, frameworks, annotations. How, then, can design researchers, and educators understand the knowledge expressed in such artifacts, accounts, and theories such as theory of these knowledge forms the nature of these knowledge forms particularly by researchers less familiar with design, is a barrier to IxD knowledge being more widely accessed.

Yet beyond these initial attempts at formal chatenges, IxD knowledge remains broad. It is unclear exactly what the outcomes can be and how wide the scope of those outcomes is. Third discussion theme picked apart knowledge to others. Setting the problems of representation forms aside for the moment, there are many who could potentially benefit from IxD knowledge. This knowledge can have relevance to designers, researchers in other disciplines, and design and discipline researchers. The challenge is ensuring that such knowledge is used effectively to each of these practitioners or, more particularly, is understood by them.

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• **Endnotes**

that the nature and significance of
However, I should start by noting
forward, thus filling the hole.
summarizes it, and also proposes a way
work of Liu and Kosarakos. This article
had also been written in response to the
an "interdisciplinary" [3]. My own paper
CHI conference with the title "HCI as
a paper I had presented at this year's
suggestions by Yvonne Rogers, and on
an argument drawing on previous
discipline but rather as an *interdisciplinary*,
that we should think of HCI not as a
article, Stuart Reeves [2] recommends
in responding to their *Interactions*
which the discipline can be defined.
are no persistent ideas or methods by

maintain an academic discipline if there
colleagues observed that it is hard to
Quite reasonably, Kosarakos and his
research themes.
technological fashion rather than long-term
showed that the field seemed to follow
CHI publications over the past 20 years
bibliometric analysis of key words in
That article by Vassilis Kosarakos drew
on his work with Liu and others, whose
intellectual or methodological core [1].
HCI does not seem to have a solid
in HCI research—the concern that
was initially perceived as a "big hole"
the disciplinary status of HCI. This
creates new relationships
the groundbreaking for a debate about
Recent issues of *Interactions* have laid
in research is the way it
between disciplines, not
as a discipline in itself.
← Because design insights
involve resistance and
dipломacy and personal
computer science,
critique of mainstream
and innovation often
involve design insights
skills are essential.

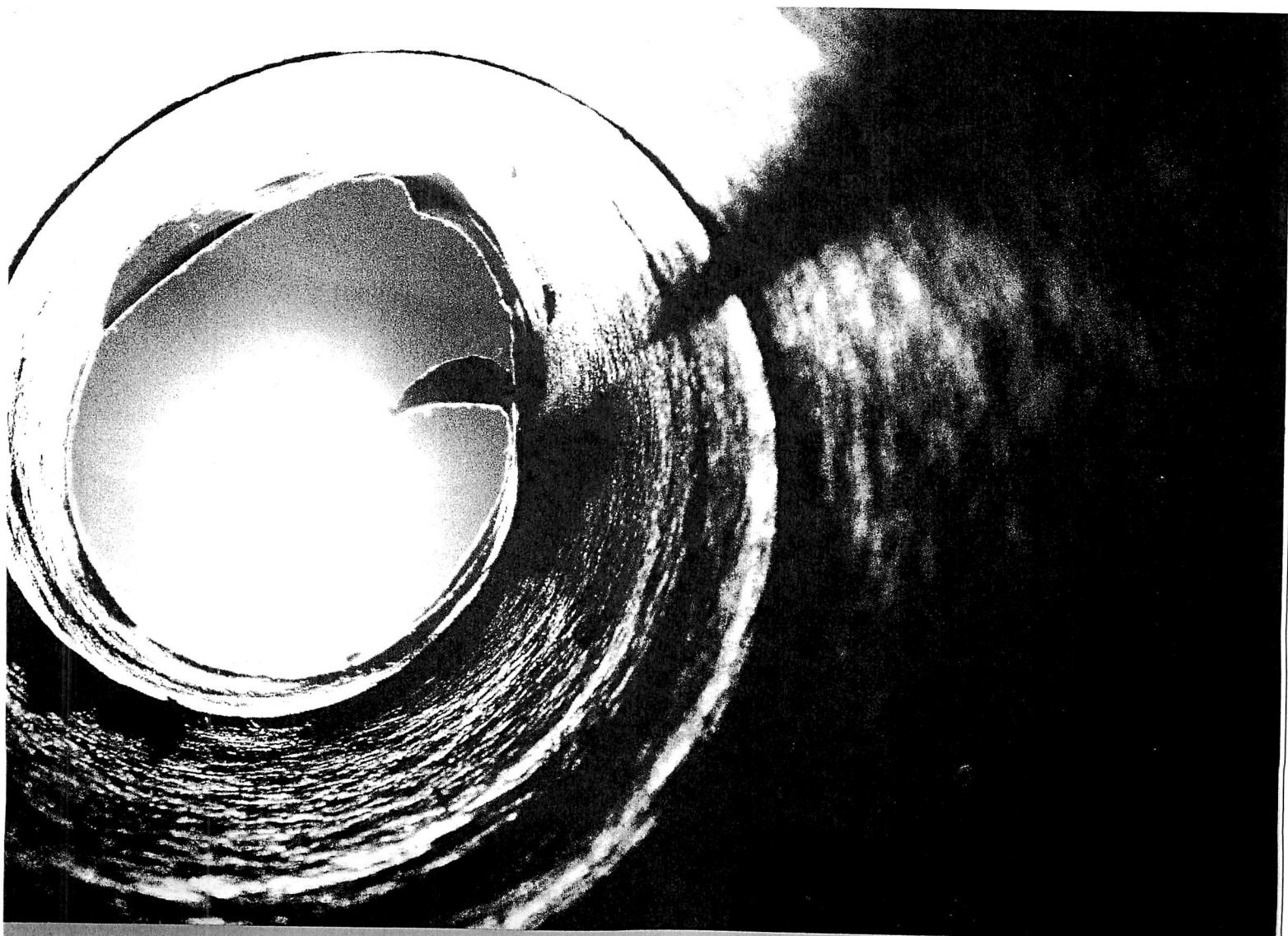
Research in HCI Big Hole Filling the

innovation, a study we undertook through a snowball sample of leading interdisciplinary innovators, followed by intensive reflective workshops with a selection of those leaders, contextual interviews, and in-depth development of grounded theory to describe the phenomena we observed. These studies have also provided an opportunity to reflect on my own use of theories and methods, and the ways in which I draw on other disciplines to do HCI work. Originally trained as an engineer and with a master's in AI, I had spent many years designing user interfaces and understanding and evaluating user requirements in academic research and in business. My commercial design projects always involved multidisciplinary teams — people trained with skills in software, electronics, packaging, marketing, finance, and others. It was clear what responsibilities each would take, and there was no anxiety about the combination being interdisciplinary.

humanities, and social sciences. These projects were initiated without asking whether they counted as HCI—from any definition of the term. Much of this work has not been published in HCI, and never will be. For example, although several eminent anthropologists have been involved in this work, they would receive little recognition among their peers for HCI publications. Because anthropology does not have an extensive culture of co-authorship, I do not work with them to translate our interpretations into findings. Nevertheless, despite the resulting distance from mainstream HCI, I argue that analyzing this large corpus of work can help us understand the motor component of my innovation. This work was originally commissioned by Nestle, a national agency concerned with creative innovation in the U.K. My team had been asked to explore the relationships between interdisciplinary and innovation in the U.K.

the hole is open to questions. Drawing attention is like drawing attention to the hole at the center of a horse and carriage. It is true that the space between the horse and carriage is mostly empty, but this is an important feature of the whole apparatus—filling it up would miss the point of having a separate horse and carriage in the first place! I hope to explain why there is little need to worry about the hole in HCI research, for realted reasons. In my slighlty Hippocratic analogy, the horse and the carriage is technological innovation. The space between is a different kind of thing—neither a horse nor a carriage, but essential to the overall enterprise.

My argument is supported by evidence from two large-scale case studies, reported in more detail in my recent CHI paper [3]. The first is a systematic analysis of 180 collaborations projects in my Crucible network for research in interdisciplinary design, carried out over 15 years with more than 450 collaborators across the arts,



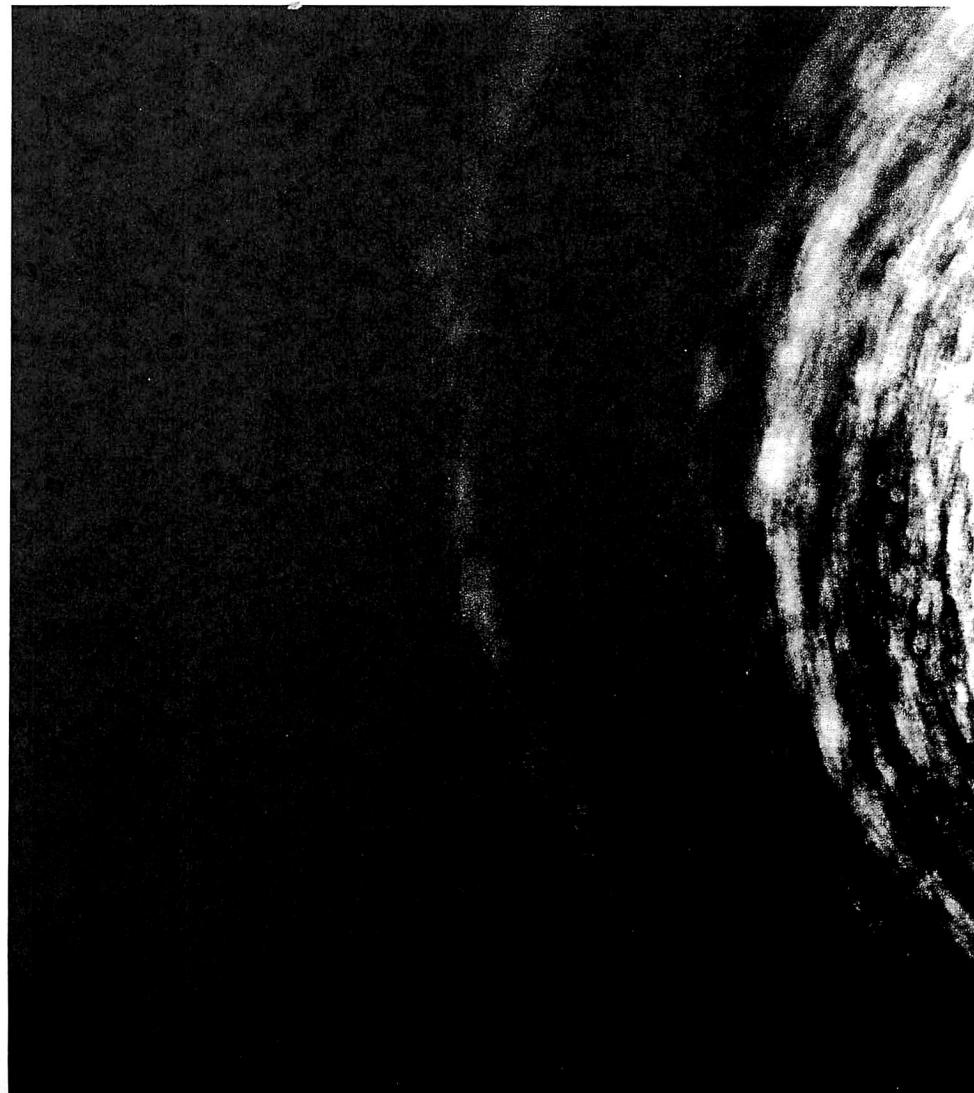
Kim concluded that discipline is the wrong way to think about the value inherent in a field like rather than calling it a specialty. The suggests that an interdiscipli- might be called a generality.

It was with this background in mind that I approached the analysis of 180 projects from the Crucible network, an organization established to encourage collaboration between technology researchers in the arts, humanities, and social sciences. Crucible had been a strategic response to two specific opportunities at the University of Cambridge. The first was that the 50 percent of Cambridge undergraduates in humanities disciplines represent an untapped resource for the large Cambridge technology sector. The second was that it is so easy to conduct interdisciplinary research in a university, because each college brings together students and faculty across many disciplines.

to understand the things that happen in an interdisciplinary, but it is perhaps more important to ask why interdisciplines occur in the first place, and why they are a necessity of both professional practice and public policy. Donald Stokes describes the value of public funded research in *Pastor's Quadrant*, where basic research is driven by practical needs and a quest for fundamental understanding. This aligns nicely with Donald Schön's characterization of the reflective practitioner, which is often cited as a model for HCI as an intellectually engaged professional endeavor.

day-to-day operation of HCI initiatives can be taken from Susan Leigh Star and James Griesemer's description of the boundary object as a fluid construct able to accommodate different interpretations within different knowledge systems. Organizations have drawn attention to the bounded communities that act somewhat like "disciplinary" centres within large organizations, but also rely on mavericks and brokers to achieve effective work across those boundaries. These are useful ways in which

that *discipline* is the wrong way to think about the value inherent in a field like HCI. Rather than calling it a *specialty*, he suggests that an interdisciplinary field might be called a *generality*. We do have more sophisticated ways through the sociology of knowledge to describe and analyze these dynamics after Garrison's metaphor of the trading zone can be used to describe the technologies through which engineers and researchers are able to achieve productive exchange with other disciplines offering insight into user experiences and behavior. Pragmatic advice for the



Rather than arising through crude metaphors of "cross-fertilization" or "breaking down silos," innovation arises where disciplines challenge one another's definitions of knowledge.

These insights into the nature of interdisciplinarity innovation highlight the need for time and resources in which members of the team can accept that they are wrong—or at least in need of a new understanding. Humility is invaluable, but it is never easy for skilled professionals to accept challenges to their understanding. Since professional skill is acquired within a discipline, innovation from elsewhere is always challenging. The response often occurs

This challenge is achieved, practically university, through collaboration—between members of a team who hold different understandings of the world but work together to reach a new one. Any partner must be able to challenge disciplinary assumptions, as observed by Scott Kim. Once again, a common metaphor for interdisciplinary work is insufficient—it is not simply the case that disciplines specialists, “speak different languages” and need a “translator” to be able to understand each other. On the contrary, skilled researchers are often skilled at appreciating, as we identified it, is that different disciplines are actually different disciplines of their collaborators.

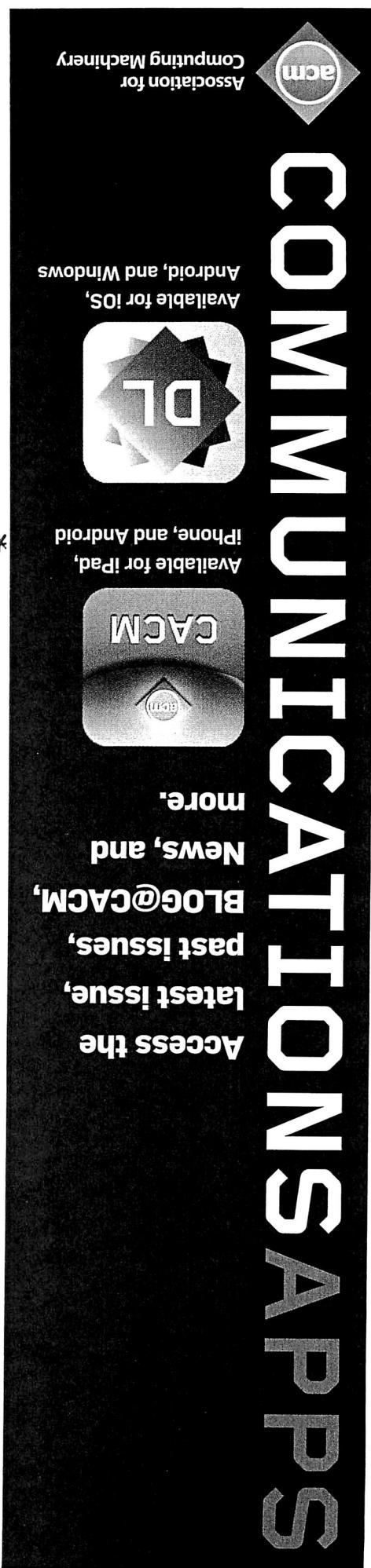
the research question. Well-posed existing bodies of knowledge by Posed only in terms established by inferiorants in this project often drew attention to the ways in which their interdisciplinary research answered questions that did not even exist at the outset. Rather than arising through crude metaphors of "cross-fertilization" or "breaking down silos," innovation arises where disciplines challenge one another's definitions of knowledge.

study, based on our national survey of interdisciplinarity innovation, offers some helpful public funding and commercial sponsorship. Both public funding and commercial sponsorship impose an expectation on the CHI community to be a generator of innovation, which Erik Stoltzman and Michael Wiberg observe to be a key criterion for concept-driven research [5]. Our key finding was that the relationship between interdisciplinary innovation and innovation research has to do with unexpectedness. Disciplinary research sets up a framework that defines and thus constitutes the outcome. Innovative research, on the other hand, has results that were not expected. More surprising is that it may not even be possible to describe the nature of

Projects—they included technology in architecture, engineering, biotech, and others—so the classification of interactivity associated with digital technologies, and “interactivity” in these other contexts. The results, as seen in Figure 1, showed that there seems to be no predetermined natural mapping between disciplinary concerns and the ways in which the CHI community structures itself.

More detail of this analysis, and of the lessons it offers with regard to the role of specific CHI communities, can be found in the CHI paper [3].

Using the historical corpus of Crucible Projects, I set out to test whether there had been any convergence on a set of disciplinary concerns (either theoretical or methodological) of the kind that Kostakos and his colleagues hoped classified each of the 180 Crucible projects according to which HCI review subcommittee might be willing to publish it. Of course, the projects in this sample were not all HCI



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TURNOVERS

ENDNOTES

to this core mission, we are unlikely to become a discipline. However, if we can de an effective interdisciplinary, we will still a very important hole.

A more likely outcome is that we will remain an interdiscipline, a kind of parasite, dependent for our existence on the other disciplines that we couple together in the interests of innovation. If this is the case, then we must remain not only diplomats (as Kim observes) but irritants. Articles such as this one are HCI businesses as usual, but I believe that HCI itself is a perennial irritant within its host discipline of ACM-defined computer science. By drawing attention to social obligations, intellectual flaws, playful creativity, and alternative kinds of knowledge, HCI does not make computer science a more comfortable place. If we continue to pay attention

to return to the horse-and-carriage analogy presented earlier, readers will no doubt have observed that separate horses and carriages are not as common as they once were. Surely we should just combine the horse and carriage into an automobile, in which case the whole disappears, and the problem goes away? In the terms of my argument, this would be like saying that humanity would merge into a single super-discipline, with no intermediate holes, and the new community and computer science should be merged

innovationably risky process, management of risk is also a high priority. This cannot take the form of *removing* risk, which would render the innovation process meaningless. Instead, necessary risk must be managed as in a financial portfolio, but here the portfolio is an intellectual one, with a good mix of methods, theories, and discursive or practical styles.

over a period of years rather than months, during which it may turn out that the original objectives of a project must be abandoned in light of the understandings gained.

Although these processes are role of the leader was critical. The leader must articulate a vision that persuades partners and publics to commit the necessary resources, shared moral purpose that overrides also recruit team members to a the commitments of their disciplinary training. More surprising, the leader must then be able to re-orient the whole enterprise when unanticipated opportunities arise. We found that certain productions—theater producers, product designers, journalists—appear to be particularly effective in nurturing these pragmatically collaborative techniques. In an

• Infine è utile apprendere i concetti di base della disciplina e gli obiettivi da cui dipartono i vari programmi.

