

DESIGNING NEW MUSICAL INTERFACES AS RESEARCH: WHAT'S THE PROBLEM?

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Abstract

Practice-based research in NIME is rooted in the practices of design and musical performance. Perspectives from HCI on the relationship between design and research, examining the role of questions or design problems in research, and considering the wickedness of the task help us frame and understand our work.

We engage in design when we intentionally create new artifacts or systems with which people make music, and this is true whether our goal is to create a new musical work or whether we seek to generate new knowledge by conducting research. As a field of research, New Interfaces for Musical Expression (NIME) inherits many of its methods and perspectives from Human-Computer Interaction (HCI). HCI is a “field oriented towards design” [1], and this is also a proper description of NIME. We do not study phenomena from a disengaged distance. Rather, we must proactively engage in making new instruments.

NIME also takes place within the greater context of human musical activities and in particular is focused on the creation of new instruments for performing music. We cannot divorce our design practice from its application in musical performance, for it is through performance that our ideas, embodied as design prototypes, become testable.

Thus, design and musical performance constitute the practices by which and within which practice-based research takes place. The practices of design and conducting research through design connect us to the traditions of HCI, while the practice of performance immerses us in the traditions of music.

In this article I review work by Daniel Fallman on the relationship between research and design in HCI, discuss how it applies to practice-based NIME research and try to understand the nature of our work by examining the role of research questions.

Which Quadrant Are We in?

“Research” refers to a wide range of activities. Stokes [2] notes that the traditional axis between basic research, which strives for understanding, and applied research, which is oriented towards use, is inadequate to describe the work of Pasteur, who sought both to understand how micro-organisms work and to apply that knowledge to improve human health. Stokes proposes a two-dimensional space in which research is located by whether it is a quest for fundamental understanding, and whether it is guided by considerations of use. The works of Bohr, Pasteur and Edison are provided as examples (Fig. 1).

Where does practice-based NIME research fall? Our place within the tradition of musical performance requires that we consider use. It is more difficult to say whether our research is a quest for fundamental understanding. Understanding the limits of human dexterity on keyboards would seem to be fundamental and can be applied to the design of new instruments, thus placing it in Pasteur’s quadrant. But such research is not practice-based, because it does not engage in the NIME prac-

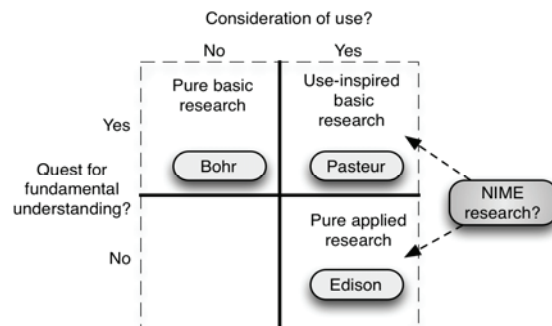


Fig. 1. Stokes’ research quadrants.

tices of design and musical performance. Where we fall on the vertical axis depends on what research questions we ask.

Problems and Questions in Design

When we begin to design a new instrument we may not have a specific question or problem in mind. Yet we often find in the process of design that the question we are answering emerges simultaneously with the artifact we are designing to answer it.

The proper role of problems in design depends on how one thinks of design. Fallman [3] describes three accounts of what design “is.” In the *conservative account*, design begins once the problem is defined. It assumes that the problem can be well-described and broken into smaller sub-problems. Design then consists of finding solutions to these problems.

In the *romantic account*, design is akin to art, where results should be not only useful but also aesthetically pleasing. It emphasizes the role of the designer as a sort of genius who relies on creativity and intuition. The problem being addressed does not play a central role. From reading the NIME literature one might get the impression that most new instruments are designed in a flash of inspiration. But is this really how we work?

The *pragmatic account* most accurately describes how most NIME design actually takes place. Rather than science or art, design is a process of interpretation and creation of meaning, where designers iteratively interpret the effects of their designs on the situation at hand. It is a reflexive conversation with the materials of the design situation. For us these materials might be a new sensing technology, a software framework or the parameters of a proposed performance scenario.

The NIME designer (and practice-based researcher) is situated within the practice of musical performance, which provides the context within which to interpret the new instrument. The design problem and its solution become gradually more specific through a conversation between the designer and his/her interpretation of the instrument within this context.

Wicked Problems

In the conservative account of design the problem is defined before design commences. Why can’t we conduct our practice-based NIME research in this manner? Because designing new interfaces for musical performance is a wicked problem [4]. Wicked problems are a “class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” [5].

Designing new instruments may not have the same degree of consequence as addressing truly wicked problems such as poverty or urban planning. Yet our work involves

many interacting components, few clear guidelines exist, and the criteria for success are seldom explicit.

Wicked problems “have no definitive formulation, but every formulation of a wicked problem corresponds to the formulation of a solution” [5]. Thus we return to the pragmatic account of design as an iterative conversation with materials through which problem setting and problem solving co-occur. Prototyping is an integral part of this process.

Sketching and Prototyping

Sketching, an archetypal activity in design [3], is not merely a way for a designer to communicate an idea. As the designer examines their sketch, it “talks back,” suggesting aspects of the design and its problem that were not evident before the sketch was made. For most HCI research the visual form of a design alone is insufficient to evaluate its success. Interactivity, temporality, and tangibility are crucial aspects of the design, and so a working prototype is required [3]. NIME research requires even higher fidelity prototypes, which respond sonically to gestures with precision and minimal latency. We require a performance to know if our design is successful, and performance requires “the whole thing.”

Do We Produce Knowledge or Products?

We return now to the question of what type of research we are conducting. Fallman distinguishes between design-oriented research (DOR), where research is the field and design is the means, and research-oriented design (ROD), where design is the field and research the means [3]. In DOR the goal is to produce new knowledge, and the validity and quality of the result are determined by the researcher’s peers. In ROD a research component exists, but the objective is the creation of new products and solving the real-world problems that arise in that process. The guarantors of quality are the client and the marketplace.

Which are we engaged in? An audience does not attend a performance to answer a research question. They come to take part in the complex cultural ritual that is a musical performance. Our commitment to performance aligns us with ROD, while our intention to conduct research pulls us towards DOR.

Wickedness in Evaluation

Consider the research question, “What makes an instrument feel expressive to the performer?” The answer would allow us to know before building a new instrument whether it is likely to aid or inhibit a satisfying musical experience for the performer and audience. In order to answer this question in general we must build a specific prototype, assess musicians’ experience of using it, and ultimately evaluate its success in a performance.

We will then be left with the challenge of determining whether the success of the prototype was due to the quality we are researching (its expressiveness) and which aspects of our prototype contributed to this quality. However, due to the wickedness of the problem (i.e. the tight interdependence of all aspects of the design on its success) these questions are difficult to answer definitively. Evaluation is made more difficult because music, being part of human culture, is a moving target. What was once interesting or provocative may quickly become commonplace or passé.

Design Exploration

Fallman describes three traditions, or perspectives, within which interaction design research takes place [6]. *Design practice* covers the type of activities that designers outside of aca-

demia engage in and is similar to ROD in its focus on the designed artifact and its success in the world.

Design studies include work in design theory and methodologies, and shares with DOR the goal of accumulating knowledge. The goal is not to create something new, but rather to understand how it came about. If our research asks, “What design practices lead to the creation of better new instruments?” we may be adopting the perspective of design studies.

Design exploration seeks to explore possibilities outside of current paradigms, to transcend and provoke. Problem setting is more important than problem solving, and the most important question is, “What if?”

“*Design becomes a statement of what is possible, what would be desirable or ideal, or just to show alternatives and examples. [...] Design exploration is a way to comment on a phenomenon by bringing forth an artifact that often in itself, without overhead explanations, becomes a statement or a contribution to an ongoing societal discussion.*” [5]

Much NIME work can be seen as design exploration, as provocative explorations of what is possible to do with technology within the realm of music performance. It is not research in the sense that it generates explicit generalizable knowledge. But it is a type of cultural research, which tries out new possibilities and (ideally) reflects on their effects.

Summary

Practice-based research in new interfaces for musical expression is rooted in the practices of design and performance. As such, and due to the wicked properties of the design domain, it relies on an iterative conversation that takes place through high-fidelity prototype instruments and is best described by the pragmatic account of design in which problems and design solutions co-emerge.

Attempts to locate our research projects within various classifications of research are complicated by the difficulty of defining what knowledge we are generating, or whether knowledge is even our goal. When we use our designs to understand something fundamental, we engage in design-oriented research. Yet our work must lead to performance, where the result becomes central, suggesting that we are conducting research-oriented design. If we study our own process of instrument creation, we take the perspective of design studies. When we treat our work as a creative exploration of what music performance can be, we are engaging in design exploration. Perhaps we can think of these as modes that are excited to varying degrees by each of our practice-based NIME research projects.

References and Notes

*Based on a presentation given at the Practice-Based Research workshop at the 14th International Conference on New Interfaces for Musical Expression (NIME), 30 June–4 July 2014, Goldsmiths, University of London.

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