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**Critical Reflection —**

***Making Sense of Sensors: Discovery Through Craft  
Practice With an Open-Ended Sensor Material***

CART 360: Tangible Media and Physical Computing

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This report explores sensors material through the movement of conductive elements within a magnetic field. Craft-based research and Material Driven Design methodologies are effective in this study. These methods show how using craft-based processes, exploring the material uses and understanding materials' agency allow designers to create meaningful projects.

Craft-based research allows effective and refined results. The craft itself means learning and understanding through material experience.<sup>1</sup> In this process, artists need to indicate the research issue, demonstrate an understanding of the research process, acquire research methods, and consolidate them while verifying the results and contribution of the research.<sup>2</sup> Positioning craft practice in research facilitates reflection and articulating practitioner knowledge and experience. Hybrid crafting techniques and processes used in this study are all principles of craft research. Making sensors from “craft materials” and focusing on craftsmanship with technology can lead to inclusive use of technology. The study acknowledges that effective digital handcrafting processes require stepping back from the technologically driven desire to produce “toolkits,” limiting unique craft responses.<sup>3</sup> The paper experimentation followed the process by dividing the research into three stages. The first one was a design exploration done by one of the researchers, Charlotte Nordmoen. The second was a workshop gathering eight designers, and the third was a longer-form exploration workshop involving four designers. In the first exploration, Nordmoen desired to understand how sensors work. The inquiry was divided into two main steps. The first step served at finding the different characteristics of a signal. This exercise aimed to check the possibility of producing a signal with this method and visualize the magnetic field. The second step of exploration focused on finding the parameters of the sensor material. This first stage investigates their abilities, richness of gestures and nuance. Two workshops happened during two half-days for the second and third stages. The workshops focused on teaching participants how to make their sensors. The first workshop has a formula of constant discussions and presentations between the eight participants while creating their objects. The second workshop was divided into two parts: the first one allowed the four participants to explore the material and the second part served to iterate their sensor object. The purpose was to observe how designers came to terms with the sensor material and these improvisatory explorations and investigate their meaning-making processes. This process allows putting the craft into a scholarly perspective, defining better the properties of sensors.

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<sup>1</sup> Nithikul Nimkulrat, “Hands-on Intellect: Integrating Craft Practice into Design Research,” (Report, Loughborough University, 2012), 1.

<sup>2</sup> “Hands-on Intellect,”2.

<sup>3</sup> “Hands-on Intellect,”2.

Exploring sensor materials through Material Driven Design (i.e., MDD) allowed designers to understand better their used components. The Material Driven Design aims to support designers to design meaningful experiences with the material at hand, qualifying material for what it expresses to designers and making them do.<sup>4</sup> This methodology facilitates creating meaningful experiences when the material is the starting point in the design process. It allows the material to afford curiosity and exploration of possibilities. Material Driven Design processes are found in HCI, where interactions between the designer and the material develop an implicit or explicit understanding of its properties and characteristics. Sensors' study was based on HCI's "material turn" in which the physical and digital are intertwined. Material Driven Design challenges designers' capability to design and restrict affordances with hybrid physical-digital objects. The "potentially endless" use cases make it harder to designers to constrain the affordances of the materials. The study experiments a wide variety of conductive and non-conductive materials from which the sensor can be crafted. Many outcomes emerged from these experimentations. They were three processes where the designer responds to the material that share the well-established baseline that designers "follow the materials": *Logical*, *Conceptual* and *Intuitive* approaches. In the *Logical* approach, understanding emerges through exploration and precedes application. An exploratory process directs toward an established conceptual goal in the *Conceptual* approach. In the *Intuitive* approach, artifacts and material understanding are co-created in an improvisatory way, with the possibility for understanding is inferred retrospectively from specific application scenarios. The explorations, particularly those following the Intuitive approach, could be described as material improvisation: co-creating interactive objects and material understanding without a solid preconceived notion. These approaches found through Material Driven Design allow a better understanding of how to play with sensor material.

Agency provides a way to talk about how creativity emerges in situated interactions between designers and materials. The notion of agency focuses on emerging properties of materials and how they actively contribute to how design activity unfolds.<sup>5</sup> Materials are performative objects that actively contribute to the design process. Continuous additions of physical properties in various materials actively shape the ongoing design and provide a specific direction and possibilities for generating new ideas.<sup>6</sup> It is through unfolding that agency emerges. By assuming people and technology interplay, it is possible to scrutinize

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<sup>4</sup> Taner Olcay, "How Can Material Driven Design Create Playful Interaction?," (Report, Malmö University, 2017), 2.

<sup>5</sup> Jakob Tholander, Maria Normark, Chiara Rossitto, "Understanding Agency in Interaction Design Materials," (Report, Stockholm University and Södertörn University, 2012), 2499.

<sup>6</sup> "Understanding Agency," 2504.

how design materials shape the design process.<sup>7</sup> In the study, organizers noticed that the created objects' interactivity during the workshops could be classified into two categories: proximity and deformation. In proximity-oriented objects, the conductive material and magnet are separated by air. The proximity of the two materials creates various interactions. Deformation-oriented objects were situations where the magnet and conductive material are part of an ordinary object but separated by material. Any exchange that causes the material to deform triggered this type of interaction. Agencies allow a better understanding of the material properties.

The methodologies used allowed participants and researchers to develop further the study and discover more about the studied material. Craft-based research, Material Driven Design, and agency structure the design process. Participants had various ways to approach unfamiliar sensors material concerning their ideas and concepts of what they wanted to make. Many similarities emerged between the projects, but all had different meanings. This whole process shows how craft can be used in a scholarly environment.

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<sup>7</sup> "Understanding Agency," 2501.

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