The Evolution from Hybrid to Blended to Beyond Prototyping

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The traditional understanding of prototyping among different disciplines comprises technological and conceptual limits. With respect to user-oriented design of complex products, systems and services, new opportunities are emerging through innovative information, communication and manufacturing technologies. The growing technical complexity and the increasing individualization of products in turn require intelligently designed representations and test environments. In this way, design, production and interaction processes can be optimized for the respective users.

Research in this field requires the collaborative investigation of engineering and creative design disciplines covering close-to-engineering prototyping, the integration of mobile communication into prototyping and alternative design and production processes beyond prototyping.

Three mixed research groups from this research institution, along with two universities, Technische Universität Berlin (TU Berlin) and the Berlin University of the Arts (UdK Berlin), committed to work together in a new hybrid form by applying their complementary research expertise in order to investigate different prototyping perspectives in a symbiotic approach. Contemporary concepts and alternative models infuse the traditional and creative development processes by means of new prototyping elements.

Within the project, the diversity of ideas that are associated with different methodologies and discipline-specific approaches were combined in order to create a new transdisciplinary understanding of prototypes and prototyping. This approach necessitated the transdisciplinary cooperation of the involved disciplines because the issue goes beyond a single professional or disciplinary definition. The integration of different disciplinary perspectives, the creative design and the applied

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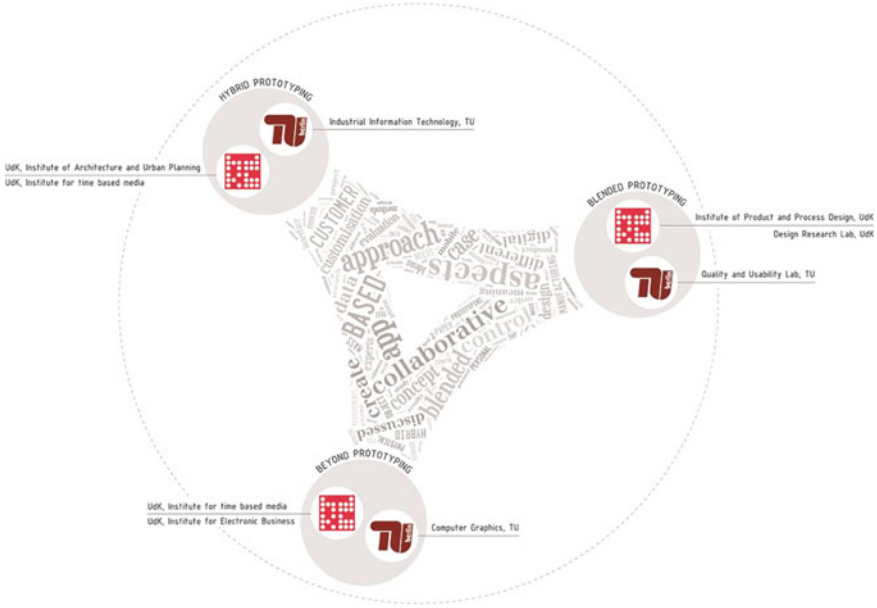

Fig. 1 Overview of the "Rethinking Prototyping" research project

engineering perspectives serve to comprise the transdisciplinary approach (cf. Part III in this volume). In this way, scientific investigations are defined from different design perspectives. Due to the fact that the transdisciplinary working principle goes beyond modest networking or solely linking multiple disciplines, this flexible approach grants participants the opportunity to reach out to the core of understanding the concept and the operation of prototypes and prototyping. The transdisciplinary research groups' knowledge and methods were interlinked and integrated in order to raise awareness of different prototyping definitions and to investigate the prototyping aspect of various scientific working principles and competencies (Fig. 1).

The research partners involved developed a common understanding of prototyping in an iterative process. Moreover, the interfaces of a transdisciplinary design process were examined and the divergences of prototypes for productive design approaches were investigated. The following chapters offer novel insights and findings about the hybrid, blended and beyond prototyping approaches. As part of the transdisciplinary research project the prototyping streams were addressed as below.

The research stream "Hybrid Prototyping—New approaches of prototyping for testing and validation of integrated products and services in the context of urban living space" investigated the role of prototyping for the integrated development of products and services, so-called Product-Service Systems (PSS). The development of PSS prototypes was placed in the context of rapidly changing urban

environments in order to explore new utilization concepts, use of thresholds and related design options. On the transdisciplinary basis of this research stream, user needs had been identified in the urban living space and were investigated in representative scenarios. The hybrid combination of products and services was tackled by means of a hybrid prototyping combination of physical prototypes and digital models in virtual reality (VR), thus linking two different prototyping fidelities for enabling a PSS realistic experience. The research stream "Blended Prototyping—Research and development of mixed prototypes for mobile communication" linked research of design and styling in engineering with research of usability in software engineering. Based on the new "Blended Prototyping" approach, it demonstrated that the benefits of low-fidelity prototyping are retained while a sufficiently product-driven interface can be provided in order to extend the coverage area of usability problems. This project combines different prototyping fidelities as well, yet takes another step and merges them in such a way that boundaries between the prototyping approaches disappear. The research stream "Beyond Prototyping—Opportunities and limitations of alternative design and production processes beyond prototypes" investigated the role of prototyping in the focus of the novel production technology "Rapid Manufacturing". It addressed specific design and technological issues, as well as economic ones, and also focused on the role of stakeholders in the design process. The prototype will likely become obsolete while the customer self-designs each product which in and of itself can be regarded as a unique piece. Thus the meaning evolves from experiencing and usability testing to eventually become the final product itself. The following chapters describe these main research streams in detail.