

Designing Design – Building the Conceptual Framework for a Design-led PhD

Mette Ramsgaard Thomsen
Karen Honour

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This paper discusses the role of the conceptual framework in design-led research. Identifying the conceptual framework as the consolidation of an interdisciplinary positioning merging historical, theoretical and technological, creates a platform from which a research project can contribute new theories and solutions. Taking its point of departure in a series of design-led PhDs undertaken at the Centre for Information Technology and Architecture (CITA) at the Royal Danish Academy - Architecture, Design, Conservation, the three discussed PhDs demonstrate how design is used as a driver for material-technological as well as conceptual-spatial contributions. One of the PhDs (Karen Honour's) conceptual framework is further illuminated through the generation of a conceptual *Wunderkammer* which activates driving concepts within a tradition of knowledge acquisition, reflection and dissemination. This paper argues that the construction of a conceptual framework empowers the specifics of a design experiment to provide novel contributions to the field of architecture and design.

#design-led research

#design driven theory building

#textiles practice

#crafts based design

#architectural research

Introduction: Design Knowledge and its Applications

A fundamental enquiry for the 21st century is to ask what kinds of knowledge design can achieve. The last three decades' focus on inter-, cross- and trans-disciplinarity has emphasised the importance of breaking down disciplinary silos and allowing them to intersect to discover new knowledge at the edges of well-defined fields. This action has foregrounded design as a particular method for interfacing diverse knowledge traditions – problem definition, experiment, analysis and evaluation – providing situated enquiries that can integrate their associated methods of knowledge creation. Design has famously been classified as a wicked problem in which the *'information needed to understand the problem depends on one's idea for solving it'* (Schön 1983). Design here is understood as an active process by which the designer develops the dimensionality of solution in the context of a given problem. Solutions are assessed not absolutely as true or false but rather qualitatively as better or worse. Employing a design-led method allows an individual research project to engage with a solution-led process of creative troubleshooting that characterises the design process. If the 21st century has brought forth increasingly important questions of how to live and act in a more sustainable, climate-aware and biodiversity-promoting manner, then design can be foregrounded as a means of capturing and understanding the complexity of these new questions. In this manifold multicriteria enquiry, in which actions within one solution space impact and change others (Walker and Salt 2012), design can be foregrounded as a means of solving situated problems and understanding their interactions. However, above this, design can also be understood as a means of defining the questions in the first place. To do so, it is as important for a design research project to construct the context of the enquiry as it is to situate its solution.

This paper discusses the role of the conceptual framework in design-led research. By taking its

point of departure in a series of design-led PhDs undertaken at the Centre for Information Technology and Architecture (CITA) at the Royal Danish Academy – Architecture, Design and Conservation, in which design is the driver for material-technological as well as conceptual-spatial contributions, this paper identifies the conceptual framework as the consolidation of an interdisciplinary positioning merging historical, theoretical and technological positions to create a platform from which a research project can contribute new theories and solutions. This paper argues that the construction of a conceptual framework enables design-led research to achieve speculative contributions that empower the specifics of a design experiment to discuss overarching theoretical propositions that reach beyond the immediate contexts of usability and technology. Three research studies are shown to demonstrate the role of the conceptual framework of which the third project, Karen Honour's *'How to Dress a Room?'* and its use of moodboards as a Wunderkammer is explained in detail. Here, the conceptual framework entwines historical and contemporary references to examine state-of-the-art textile production technology through the generation of a series of design-led experiments. The conceptual framework engages with the past, present and future, inventing a uniquely tailored research method. New knowledge is produced through epistemic artefacts (Hansen 2009) that are generated by a process of *research through design* (Thomsen and Tamke 2009).

The Role of the Conceptual Framework

CITA examines how computation and digital technologies for fabrication, registration and localisation challenge and change material culture in the built environment. The focus is, therefore, on both the material-technological changes that new digital workflows afford and the conceptual-spatial drivers that underpin these. The central remit is to understand how digitisation of technologies and

the ability to interface these in new shared digital workflows enable us to rethink *how architecture is performed* (through methods of design, analysis and fabrication) and *how it performs* (by engaging material performances such as embedded structural attributes or controlled state changes). The focus on the technological is informed both by a straightforward, more application-led enquiry into innovation, control and optimisation and ground research questioning how these new performances challenge our conception of what architecture is, how spatial identity, enclosure and boundary can be defined and what the foundational conceptions of the architecture design space can be.

The ability to bridge this duality is grounded in the conceptual framework. It is through the conceptual framework that driving concepts are identified and brought across disciplinary boundaries. In support of the more traditional state-of-the-art section, which identifies current practice, emerging research and novel contributions, the conceptual framework defines the dimensions of the material-technological that can intersect and affect the conceptual-spatial dimensions. The conceptual framework combines technological insights with historical, conceptual and theoretical traditions to ask what part of design thinking – its method, design practice, perception or inhabitation – technology can affect. In this way, technology-led research is expanded to provide real contributions to the fields of architecture and design.

The research method of building the conceptual framework as a site for research has deep roots in the CITA research tradition. In Aurelie Mossé's theses 'Gossamer Timescapes Designing Self-Actuated Textiles for the Home' the conceptual framework problematises the conceptualisation ideas of time as understood in the era of industrialisation and the 20th century, outlining its effects on current design culture and our understanding of domestic space (Mossé 2014). By differentiating between a pre-modern perception of time as 'lived time', an

industrialised commodification of time through 'clock time' and a post-modern perception of 'time as a dimension of interconnectivity', Mossé defines a cultural site by which to understand the performances of smart materials and how their integration into the built environment can allow new concepts of temporal connectivity of domestic space to a constructed understanding of exteriority and environment (Figure 4). The thesis therefore contributes not only to the exploration of smart materials and their application but also to the theorisation of spatial practice.

Similarly in Astrid Mody's thesis 'Textilisation of Light: Using Textile Logics to Expand the Use of LED Technology from a Technology of Display towards a Technology of Spatial Orientation' (Mody 2016) the investigation of LED lighting technology as an architectural light source is understood in context of the history of urban street lighting and architectural lighting, extending Johannes Teichmüller's early 20th-century architectural theory of *Lichtarchitektur*. By discussing the difference between an illuminated and an illuminating architecture, she develops concepts by which the methods of light integration and light steering can become spatial properties, challenging our conception of LED light as a replacement for existing light sources and instead proposing ways of creating spatial identity and boundaries through light. In this way, the thesis enfolds a material-technological study examining new textile-informed methods of making steer light environments with a conceptual-spatial proposition of a new kind of architecture.

How to Dress a Room: A Conceptual Framework Bringing Together Textile History and Technology

To exemplify the notion of a conceptual framework, this paper presents the PhD research of Karen Honour. This industrial PhD is a collaboration between the Danish textile company Kvadrat and the Royal

Danish Academy - Architecture, Design and Conservation, the Institutes of Architecture and Design, Architecture and Technology and CITA with the support of the Innovation Fund Denmark. The profile of the stakeholders combines expertise in the field of textile design, research, spatial design, architecture and digital fabrication. Through her background as a fashion and textile designer, Honour has focused specifically on knit, which is the lens and motivation for this enquiry. This doctoral research examines how textile traditions in fashion and garments can be employed to expand our thinking of interior textiles. With a particular focus on digital knitting technologies, it asks how textiles can challenge and inform a sense of identity and intimacy within an architectural space.

Conceptual Framework of *How to Dress a Room?*

The conceptual framework of ‘*How to Dress a Room?*’ enables the research to transition between conceptual, material and spatial drivers of the enquiry. The transformative abilities of textiles are investigated through an understanding of human engagement with textiles and how they have historically been used to add personality and performance to architectural space. Applying Gottfried Semper’s understanding of textiles as the original foundation of architecture, the conceptual framework takes point of departure in his 1863 *Bekleidung Prinzip* (principle of dressing) (Semper 1980) and extends with Adolf Loos’s 1898 *Gesetz der Bekleidung* (laws of cladding) (Loos 1982). The works of Semper and Loos provide an understanding of the formative relationship between textiles and architecture in which they argue that the true role of a wall is to support textiles in delineating space while adding flexibility and comfort. Within these theories a spatial relationship is constructed. For Loos, this was developed in his ideation of the *Raumplan*, working with thresholds and boundaries in his architecture where his subjects inhabit the walls (Colomina 1992). The notion of

thresholds and inbuilt intimacy is implemented in the conceptual framework.

Textile designer Annie Albers wrote in her 1957 essay, ‘*The Pliable Plane*’, about the relationship between textiles and architecture: ‘*If the nature of architecture is the grounded, the fixed, the permanent, then textiles are its antithesis*’ (Albers 1959). Incorporating the work of Albers into the conceptual framework recognises the inherent flexibility of textiles, which provide adaptable situations within interiors and enhance the spatial setting through material interactions.

Lilly Reich, also a textile designer, used suspended fabrics to create spaces situated between a built and a textile architecture in her collaborations with Mies van der Rohe during the 1920s. ‘*The very solidity of the wall is subverted by Mies and Reich’s fabric curtain wall*’ (Eggler 2009). In their work, the curtain was elevated into a space-shaping tool, defining more intimate interior spaces while adding movement and flexibility to the architectural space. Reich’s work introduces the notion of textile-generated interstitial spaces into the conceptual framework.

Additional representations of fashion and clothing inform the conceptual framework of how the body inhabits textiles, transforming them from 2D materials to 3D garments and forms. In the relationship between fashion and textiles, garments add comfort and privacy to our lives while simultaneously communicating and expressing the identity of the wearer. Textiles define the boundary between where the private person and the clothed individual meet others in the outside world. The garment tradition provides opportunities to unfold this space generated between textile and body, informing the research process with spatial concepts positioned more closely to the body. Hidden volumes, as pockets within clothing, provide a physical space where an identity can be constructed and guarded as a place of privacy, comfort and spatial habitation. Using the notion of the pocket and expanding it

to create pockets of space within the interior, the conceptual framework directs the research towards intimate and adaptable spaces situated close to the body and usable according to personal needs.

The intertwining of these theoretical and conceptual themes allows unique combinations to emerge and interconnect, foregrounding notions of identity, comfort, privacy and protection within textile-constructed spaces. The conceptual framework highlights the pivotal role of textiles, which allow the body to comfortably transition between the scale of the body and the architectural setting, between the interior and exterior and between the private and public. The knitted epistemic artefacts designed and created in the PhD research unify and communicate the narratives of the conceptual framework, physically producing habitable interstitial spaces as intimate pockets of space. These knitted spaces are positioned closer to the body, holding a more intimate relationship with a user associating themselves with the familiarity of our knitted garments, as opposed to the more planar role of textiles in the interior, which traditionally line the walls of a room. The conceptual framework enables the generated knitted textile architectures to manifest these spatial relationships, allowing them to focus on their spatial roles rather than purely on design functionality. Fundamentally different from the traditional presence of textiles, which is added to the architectural space, these knitted architectures are developed with an autonomous relationship to the body.

Hybridised Methods from a Design Practice to a Research Practice

Fashion designers habitually borrow and reinterpret visual stimuli and cultural references to innovate and reinvent fashion garments, frequently synthesized into moodboards. The ability to reapropriate becomes a valuable tool when applied to the context of a research through design, practice-based PhD. The moodboard tool is superimposed

onto the research strategy, providing a holding place to situate the thoughts and driving concepts of the conceptual framework together. The use of moodboards as a mode of inventing and establishing an identity for a fashion and textile collection references the historical tradition of 17th-century *trompe l'oeil* letterboard paintings that constructs an identity through clues and symbols in assembled imagery and personal objects (Wahram 2012), acting as a portrait without showing the subject's face (Figure 1). The paintings occupy an interstitial place between reality and perception, situated at the threshold of private and public, where the concealed individual is revealed to the outside world.

The PhD's moodboards (Figure 2) were supplemented with found objects, which included the natural architecture of nests, shells, cocoons, seed pods and caves. These inform the notion of habitation by proposing intimate and protective spaces that contour their inhabitants within interstitial spaces. Contemporary textile art is also included as a practice of creating ephemeral soft spaces that are not limited by function. In addition, the changing technologies of knitting are represented by the inclusion of antique knitted socks, gloves and state-of-the-art knitted trainers. These highly personal garments that signify intimacy and comfort for the user furthermore provide technical inspiration for knitted textile probes and prototypes. These knitted artefacts direct the practice-based explorations with a study of three-dimensional and seamless knitting, using the technique of 'goring', which links directly to the knitting processes used to create gloves, socks and, specifically, the heel of the sock.

The moodboards were used by the researcher in the knit workshops to inform the design-led experiments. Using a research method developed in CITA, design probes, material prototypes and full-scale demonstrators were produced (Thomsen & Tamke 2009), allowing for increasing complexity and feedback. Transitioning from analogue knitting machines, such as Brother and Silver Reed, to Dubied

and finally computer numerically controlled Stoll knitting machines, the knitted samples increased in complexity and size, from textile samples to scale models and ultimately inhabitable textile spaces. In the development of practice-based research, the elements of the moodboard shifted from secondary to primary sources, supplementing it with design probes, material prototypes and found objects. The moodboard expanded from a 2D collection of imagery to a 3D assemblage of accumulated artefacts, a Wunderkammer of design research.

Conceptual Wunderkammer

The established and applied method of the moodboard was extended by supplementing them with the characteristics of the *Wunderkammer* (Figure 3). The historical practice of the Wunderkammer (a ‘room of wonder’ or a ‘cabinet of curiosities’) (Impey & MacGregor 1985), as a mode of collection and display for nobility, naturalists and scientists, was used to generate and communicate an understanding of the world and the personal curiosities of the owner. The accumulation of artefacts combined themes of *naturalia*, *scientifica*, *mirabilia*, *artificialia* and *exotica* (Listri 2020), demonstrating the wealth of knowledge of the owner and making the Wunderkammer a representation of their identity. The Wunderkammer served the role of a communication device as a narrative for storytelling as well as a study resource for the court and royal craftsmen (Impey & MacGregor 1985).

Just as the Renaissance Wunderkammer collections were a resource of new knowledge and information for study and analysis, the Wunderkammer of this PhD performs a similar role and contains the same thematic components. Reimagined in the context of research through design, the Wunderkammer constructs and communicates the universe of the PhD, providing a methodological foundation for the research as well as an inspirational resource and a narrative of the project. The hybridisation of a

historical phenomenon provides a reference point from which to engage with and understand the objectives and motivations of the PhD.

The conceptual Wunderkammer provides a space in which new kinds of epistemic artefacts can exist. Here, the abstract design probes allow for spatial ideation to merge with technically driven solutions of knit construction and shaping proposed by the combination of socks, gloves and pockets. These modes of thinking and techniques of making combine in the conceptual Wunderkammer with fashion and spatial practices informing knitted textile architectures.

The research method of this PhD study uses a hybridised moodboard and Wunderkammer to create a conceptual Wunderkammer appropriate for the context of a research through design practice. The collecting, interacting and juxtaposing of primary and secondary artefacts generates new knowledge pathways, stimulating originality through unexpected and unique combinations thereby initiating new lines of thought and exploration, which drives the practice-based work of the PhD. The components of the Wunderkammer become epistemic artefacts when unpacked through observation and analysis; the conceptual Wunderkammer becomes a physical space in which to immerse within the conceptual framework. Functioning as a tool for ideation, to generate and process new knowledge and to inform technological explorations, it represents and communicates the identity of the PhD.

Summary

The reappropriation of concepts of knowledge acquisition, study, assimilation and communication, the conceptual Wunderkammer creates an entwined situation for thinking, production and reflection that is highly relevant for a practice-based PhD that generates new knowledge through a process of research through design. The

results of the practice-based experiments informed by the Wunderkammer continually propagate it with new epistemic artefacts, such as scale models and inhabitable textile spaces. The knitted architectures are the result of an enquiry into the spatial properties of textiles, which supplement the architectural space with an identity and intimacy. This enquiry was generated and further amplified by the conceptual frameworks.

The conceptual Wunderkammer allows seemingly abstract references in the conceptual framework to sit alongside in a new site of study. This juxtaposition creates a beneficial level of abstraction in which the references are neither applied nor conceptual, allowing the concepts to unfold and interconnect in a narrative of how we can create and inhabit textile spaces. Informed by the technical techniques of going and pocket shaping, knitted architectures provide an interstitial space for reflection, both physically and metaphorically, as spatial interventions that incorporate the body within the physical and conceptual, associating themselves with a garment tradition. As epistemic artefacts, they allow the role of textiles within architecture to elevate in status, posing more meaningful questions about what space is and how it can be created.

Conclusion

In these studies the conceptual framework acts as a method by which to situate the research within an architectural and design driven enquiry. Each of the PhDs include technological and designerly contributions, which are continuously and critically positioned within a larger poetic enquiry. The three projects all include interdisciplinary approaches in which textile design, its traditions of referencing, sampling and material thinking are incorporated. Here, architecture acts as a poetic domain, a place through which the researched textiles systems can be situated, where textile design itself facilitates an interface through which new technologies can be integrated.

The projects do not only ask how to deploy a technology or how to integrate them within design thinking, but also what does it mean to enfold these novel technologies into the practice of design and architecture and what novel concepts can they produce. Each project finds ways to situate the studied technologies into productive relationships of how architecture and design acts, how it is designed and how it performs. In this way, the conceptual framework is a means of establishing and criticality linking to heritage with new technologies in ways that are able to foreground their poetic traditions.

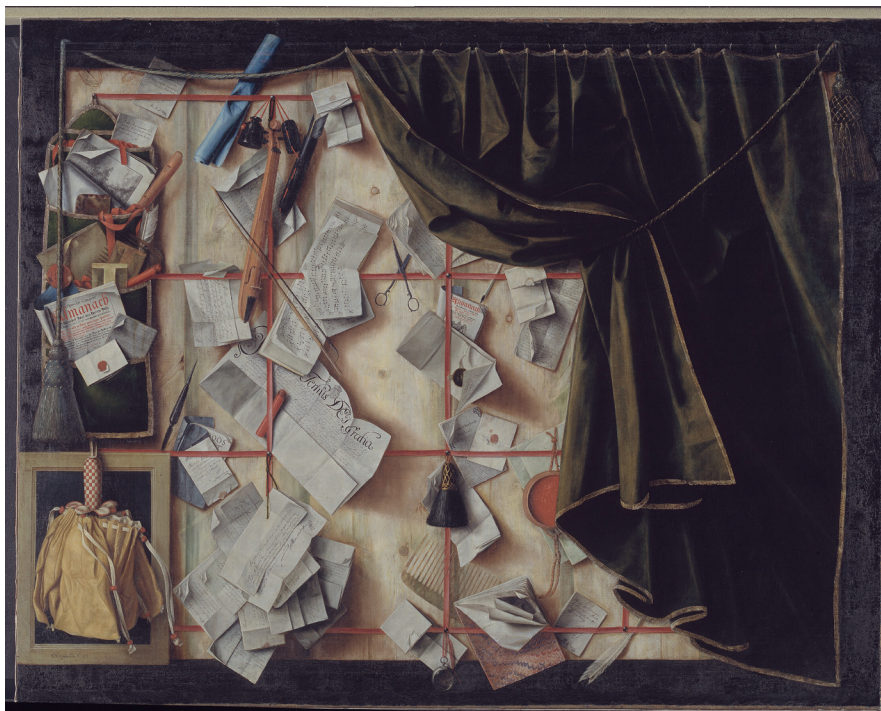


Figure 1. Trompe l'oeil of a Letter Rack with Christian V's Proclamation (1671), Gijsbrechts–Cornelius Norbertus. *Source: National Gallery of Denmark. Image in the public domain.*



Figure 3. Engraving to Ole Worm's Museum Wormianum, Copenhagen (1655). *Source: © The Trustees of the British Museum. Published under the (CC BY-NC-SA 4.0) licence.*





Figure 2 (previous page): Karen Honour's section on the conceptual Wunderkammer. *Source: Author.*

Figure 4. Aurelie Mossé's 'Gossamer Timescapes Designing Self-Actuated Textiles for the Home' (2015). *Source: authors.*



Figure 5: Astrid Mody's 'Textilisation of Light: Using Textile Logics to Expand the Use of LED Technology from a Technology of Display towards a Technology of Spatial Orientation' (2016). *Source: Authors*

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Bio

Mette Ramsgaard Thomsen examines the intersections between architecture and advanced computational design processes examining the profound changes that digital technologies instigate in the way architecture is thought, designed and built. In 2005 she founded the Centre for IT and Architecture research group (CITA) at the Royal Danish Academy of Fine Arts, School of Architecture, Design and Conservation, where she has piloted a special research focus on the new digital-material relations that digital technologies bring forth. CITA has been central in the forming of an international research field examining the changes to material practice in architecture. This has been led by a series of research investigations developing concepts and technologies as well as strategic projects such as the international Marie Curie ITN network Innocchain and the ERC project "Eco-Metabolistic Modelling for Architectural Design" that fosters interdisciplinary sharing and dissemination of expertise and supports new collaborations in the fields of architecture, engineering and fabrication.

Karen Honour is a designer, practice-based researcher and educator situated at the Royal Danish Academy of Fine Arts, School of Architecture, Design and Conservation. Frequently working with the medium of knitted textiles, her work transitions in scale from garments to soft architectures, exploring the relationships between body, textile and space. Honour has been investigating these notions in an industrial PhD in collaboration with Danish textile company Kvadrat.