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THE CONTEXTUAL KNOWLEDGE OF DESIGN

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ABSTRACT
Current industrial practice requires industrial designers to perform a range of professional roles. In order to prepare design students for a variety of challenges posed by different industrial settings, most design schools mix teaching and training, with context independent knowledge and skills and the application of these to specific cases. Although the examples used are often inspired from real life industrial settings, some design graduates experience a discrepancy between their educational training and their real life practice. They lack the experiential knowledge needed to cope with the contextual characteristics of different industrial settings. In order to design educational examples that prepare design students for the contextual challenges posed by current practices, there is a need to understand what constitutes context specific design knowledge in different industries, and what industry characteristics may have a bearing on it. In this paper, which is based on an initial analysis and reflection on qualitative interview data collected in three industries, preliminary conclusions regarding the content and need for context specific design knowledge in different industries are outlined and discussed. In addition, the conceptual strength of activity theory as a framework for making explicit and understanding the contextual knowledge of designers in different industries is illustrated. It is argued that the content and relative weight of context specific knowledge in different industries is connected to dimensions such as product type and industry complexity, main product value in relation to design, and industry life cycle and competitive climate.

Keywords: Contextual design knowledge, design education, activity theory

1 THE MANY FACES OF DESIGN AND IMPLICATIONS FOR EDUCATION

There is great variety in the way design is recognized and used in different industries. The specific mix of design contributions that is accentuated in an industry is generally connected to the main value of the product in question [1], the industry life cycle, and the competitive climate within the industry [2], [3]. While a machine manufacturer who markets products by referring to functionality may prefer to collaborate with a designer who is experienced in the field of ergonomics or expert in human behaviour under stress, a lamp manufacturer who serves a trend aware clientele may emphasize the aesthetic skills, the expert knowledge of light, or even the name of their design partner. Both companies use design, but with a different focus. Correspondingly design graduates are expected to be able to contribute to a wide range of industries with appropriate expertise. Falin found that Finish designers experience a discrepancy between their real life practice and their education, and called for a reconsideration of design education [4]. If design education is to prepare students for the variety of situations that current industrial practices generate, the corresponding knowledge needs to be mapped and incorporated into educational examples. In this paper, preliminary insights from ongoing qualitative case studies of design practice and expertise in three different industries are discussed and reflected upon from an activity theory perspective. The study exemplifies the conceptual strength of activity theory as a framework for understanding the particular and situational aspects of a design setting. Further, it discusses examples of industry characteristics that appear to influence the need for contextual design knowledge, and that are thereby relevant to design education.

2 PARTICULAR AND GENERAL KNOWLEDGE OF DESIGN

Although design has been described as an expert discipline of not-knowing, where patterns underlying seemingly distant design situations are recognized and dealt with or used by experienced designers [5], [6], knowledge of situational peculiarities can make a designer more "proficient" in specific situations. Schön conceived designing as a dialogue between a designer and a design situation [7], where the

arguments of the designer are structured by his or her previous experiences. Specialist experience from a field facilitates the framing of what is relevant, and what will be attended to in a design situation [8], [9]. However, while in-depth knowledge of a field may bring advantages in terms of reduced risk of time consuming feedback loops, it may restrain the creativity that comes from analogies made between seemingly distant fields. The co-existence of in-house designers and external design consultants can be considered a manifestation of the need for both context specific and context independent design expertise. In-house designers are appreciated for their deep product- and industry-related knowledge gained through continuous presence in a company or industry. External design consultants, on the other hand, are often hired for their fresh perspectives and ideas [10], [11]. While designers that work across different industries are recognized for their contribution to horizontal cross-industry learning [12], [13] in-house designers integrate knowledge between disciplines within the company and vertically across the supply chain [11], [14]. A company's choice of in-house design, external design or a mix of the two is therefore essentially but not exclusively connected to the need for familiarity, i.e. contextual knowledge, versus external perspectives and fresh ideas that build on context independent or transferrable knowledge. By studying the use, contribution, and relative importance of in-house and external design practitioners in different industries, it is possible to understand what constitutes the context specific knowledge of these industries and to reflect upon what industry characteristics influence the need for context specific design knowledge.

3 AN ACTIVITY THEORY APPROACH TO THE STUDY OF CONTEXTUAL DESIGN KNOWLEDGE

Originally outlined by Russian psychologists, cultural historical activity theory is now used across a wide range of disciplines as a means to understand human action in its material and social context [15]. In activity theory, any activity is oriented towards an object and is mediated by historically and culturally formed tools and signs and by social properties such as community, division of labour and rules. The importance given in activity theory to artefacts, signs and tools on the one hand and historically situated work communities on the other, makes it a useful framework for the study of situational aspects that require contextual design knowledge. Kuutti positioned design practice in an activity system where the object of design is both the artefact in its current and emerging essence, and the artefact – tool of the user in his or her current and emerging use [16], as shown in Figure 1.

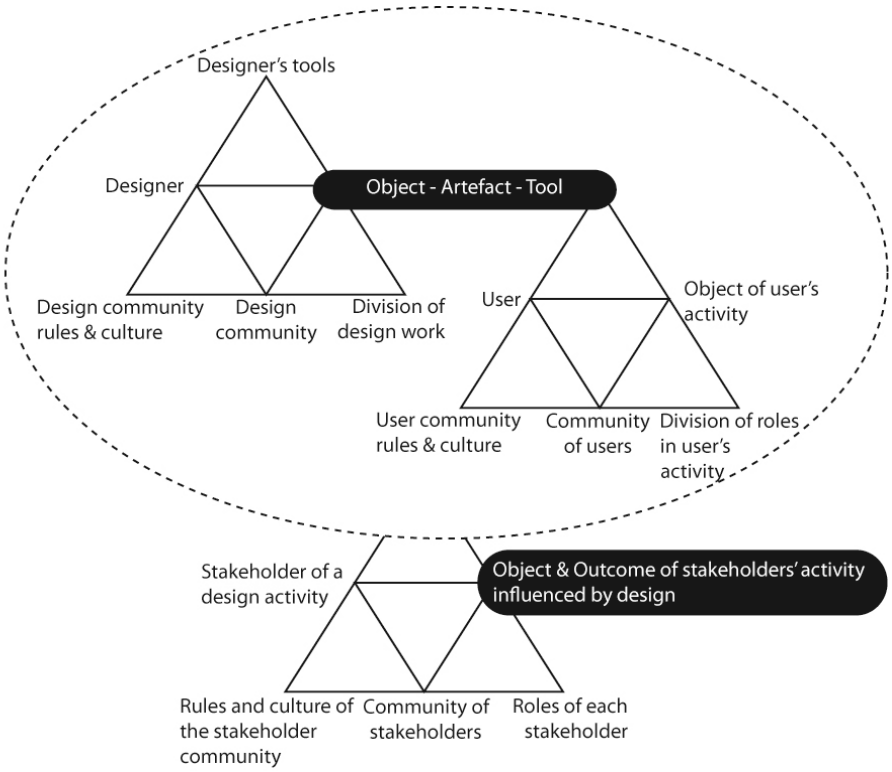

Figure 1. Kuutti's model of design activity [18]

The design activity itself is considered to be the mediating tool of any stakeholder of the design process. The knowledge needed in a design activity is gained in interaction with the material and social world, between design and use [17]. By practising design in a community, a designer internalizes its historically determined means of culture, which mediate and shape further design activities in that community. The mediating tools and signs in a design situation are thereby shaped by the designer's previous experiences, and the culture and history of his or her community, but also by the history and culture of stakeholder communities.

4 CASE SAMPLING AND DATA COLLECTION

The regionally agglomerated industries of shipbuilding and furniture design of the Norwegian region of Sunnmøre, and the Italian production system of sports and leisure shoes in Montebelluna, offer contexts of different character for the three cases: first they produce objects aimed at different uses with accordingly distinct main customer values, second they present different kinds of product and organizational complexity, and third they have different traditions of industrial design.

The geographic concentration of the three industries that were chosen for the study offered the opportunity to perform qualitative in-depth interviews with a range of design practitioners engaged in the design activities of different sized organizations of each industry. The initial intent to interview in-house and external designers of each industry was expanded to include a third category of designers identified in the initial mapping of design practice in the industries. This category includes design consultants who work exclusively within one industry. They will be referred to as in-industry designers, and are probably a phenomenon of regionally agglomerated industries. In order to gain a rich understanding of the cases, additional interviews were performed with stakeholders of the design process, such as engineers, company owners, R&D managers, and marketing and HR personnel.

The interviews, which were taped, transcribed and coded, included narratives of local design processes and topics such as the overall structure of the industry, the interactions between designers and others, attitudes towards industrial design and innovation, and the influence of regional culture and history on everyday design practices. In addition to the interviews, a review of the literature enriched the qualitative interview outcomes. By interpreting the data from an activity theory perspective, the contextual knowledge used in the design activities of each industry could be related to both product type and organizational, cultural and social contexts.

5 THE INDUSTRIES

The shipbuilding industry of Sunnmøre has its roots in the production of industrialized all-year fishing boats that started in the 1860s [18]. Despite the fact that most ships can be considered vast human-machine interfaces, the ship industry in question has a limited tradition for design: its main customer values build on technological innovation and quantifiable product performance. Because of the limited scale of design in the industry in-house design is not used at all. The isolated examples of industrial design contributions are confined to just a few companies, and almost exclusively performed by in-industry designers. The complex product is produced in a highly disintegrated manner, while the most important contextual knowledge mentioned in the interviews is of a social, cultural and political nature. Further, designers are expected to be aware of and respect the laws that regulate the industry as well as the strategic nuances that exist between ship designers, yards, and owners. Design is still in the process of defining its proper role within the industry, and its main contributions to the object of design typically build on context independent and transferrable user centred principles.

Although the furniture industry of Sunnmøre manifested a natural consideration for form and ergonomics from its earliest years at the beginning of the 20th century, its initial focus was to produce affordable furniture [18]. After the Second World-War craft and decoration moved towards what can be considered the more modern furniture and industrial design that is now widespread in the industry. Most furniture manufacturers of Sunnmøre use design as a means to differentiate and as a core competitive value in an effort to avoid price competition. The dominating furniture producer of the local industry, who has gained its position from a strong focus on the modularization of parts and production, is the only company that has an in-house design department. Here design practice relies on a deep knowledge of the rules established by production. Beyond this, most design activities in the industry are performed by in-industry designers and external design consultants. The latter are hired occasionally by furniture producers, especially when a prestigious product is to be produced and sold in the name of the designer. The in-industry designers of this industry are appreciated for their deep

knowledge of production processes as well as brand languages. In many cases their context specific knowledge relates to trends and tendencies.
The sports and leisure shoe manufacturing industry of Montebelluna has its roots in an almost two thousand year old shoe-making tradition that started as a response to the local demand for work boots for foresters [19]. Until the introduction of plastics in the 1960s for ski boot production, the whole concept and production process of sports and leisure shoes was performed by a usually aesthetically and manually skilled shoe pattern maker alone. At this point new and specialized knowledge of plastics and production processes was brought in by industrial designers from other industries. Although industrial design has been used in a relatively limited part of the industrial history of Montebelluna, considerations of form, function, and ergonomics have always been important for the local shoe makers. Design is now a matter of course in the industry which is strongly conditioned by fashion. Design activities are performed by in-house designers of larger ski boot producers, in-industry designers who work for the same companies and for companies that do not have any in-house design department, and a few external design consultants who are hired occasionally, generally when more radical innovations are to be introduced. The industrialized production of plastic ski boots requires specific design knowledge. For trekking boots, and roller blades, the production is less codified and a more craft oriented knowledge is needed. Such knowledge can only be found in the local design community. The interviews gave several examples of failed collaborations between local companies and external designers who did not have this context specific knowledge. One example of the weight of contextual craft knowledge was given by the manager of a design consultancy who, in order to gain familiarity with the craft traditions of shoe making and the trust of clients within the industry, had to hire the knowledgeable son of an old shoe pattern maker as a cultural interpreter.

6 REFLECTIONS FROM AN ACTIVITY THEORY PERSPECTIVE

The existence of in-industry designers with a distinct context specific design expertise, in the often innovative and commercially successful regionally agglomerated industries, indicates that context-specific knowledge lies both within companies and between them on an industrial level. The generic and transferrable knowledge as well as the positive learning effects of external designers is well known. The following discussion will focus on the in-house and in-industry designers as local and context specific design experts. Based on an initial reflection upon the data collected in the three cases, a modification of the activity theory model of design as outlined by Kuutti is proposed, as shown in Figure 2.

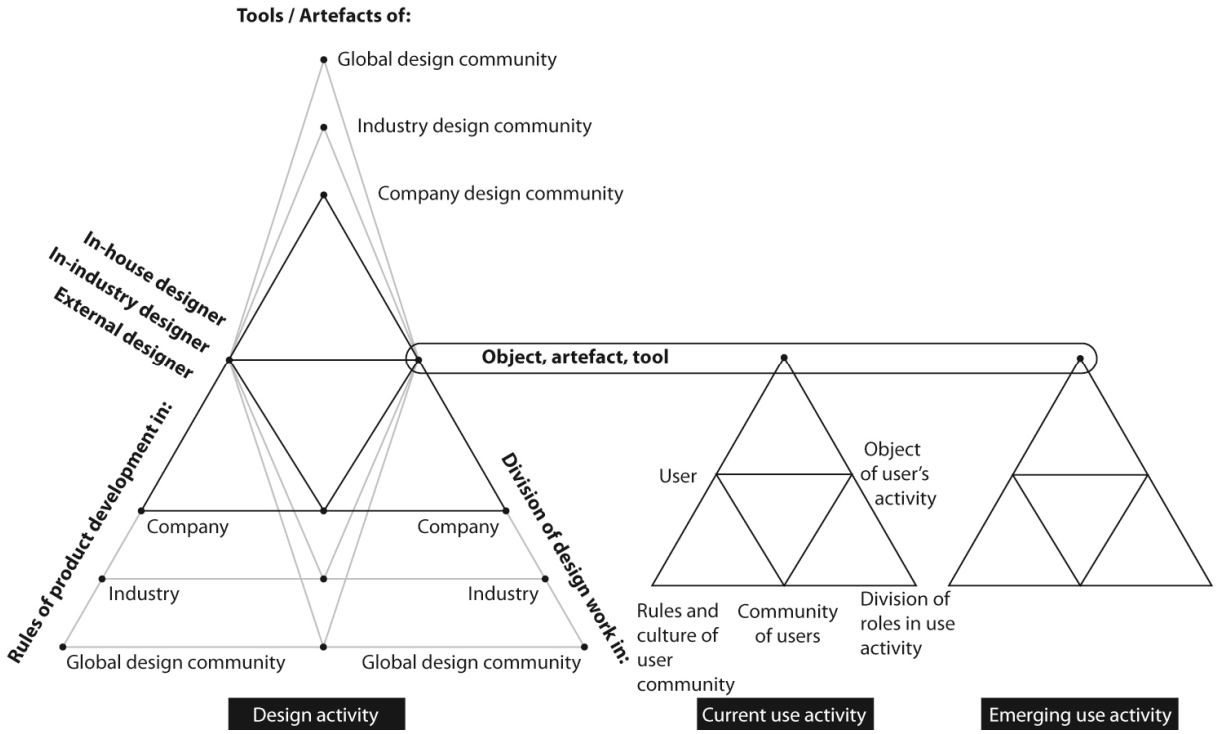

Figure 2. A modified version of Kuutti's activity system of design.

Here, the product design activities, which are influenced by and influence the rules, culture and artefacts of not only the product developing company, but the whole industry, and the world, are conceived as layered rather than networked. The in-house, in-industry and external designers refer to different divisions of labour and therefore also to different rules, norms, cultures and motives, as recorded in Table 1. The mix of tools and artefacts that mediate their activities vary accordingly. This has implications for each of their main contributions and expertise. While the design activities of in-house designers are mediated primarily by the symbolic, material, and production heritage and the rules and norms of product design of the company, the work of in-industry designers is mediated by the symbolic, material, and production heritage, and the norms and culture of different actors within the industry. The design activities of external designers on the other hand, are mediated by generic symbols materials and production possibilities and norms and rules of design of the global design discourse.

Table 1. The primary division of labour, and the motifs underlying the object of design

Type of practice	Primary division of labour and kinship	Motif of activity: Contribute to an emerging success of
In-house	Product design department of company	Company
In-industry	Own consultancy, Industry	Own consultancy
External	Own consultancy, Global design community	Own consultancy

Working for many, sometimes competing, companies within the industry, an in-industry designer gains a deep *industry level* context specific knowledge. Irrespective of industry type, the knowledge of who knows who, who works with whom, and who is doing what in an industry has given many in-industry designers the roles of "regional research and development barometer" and "market tendency researcher". They market themselves and propose new projects that embed local knowledge: they integrate knowledge horizontally. Context specific knowledge of product use, users and user communities is held by both in-industry and in-house designers. It is the knowledge of how the user is dealt with *across* the organizations within an industry that makes the difference between the two. A similar distinction can be made regarding strategic design knowledge, where in-house designers and in-industry designers each have a distinct scope of expertise. The former has a deep proficiency in the visual brand language and strategic orientation of their company and vertically across its supply chain, while the latter have a specific sensibility for strategic differences and therefore also inter-organizational compatibilities within the industry, both horizontally and vertically.

The historically, culturally, and often geographically determined rules of an industry community also relate to how to deal with the materials of the situation. These are a result of the constantly evolving symbolic, craft/production, and material heritage of the industry as a whole. The tension between the strong historical heritage of many industrial agglomerations and their accelerating industrial modernization sometimes constitutes a challenge to design practitioners. A good example is provided by the sports and leisure shoe industry of Montebelluna, where context specific knowledge of what is doable and not doable is connected to both typically codified industrial production knowledge and tacit culturally intertwined craft knowledge. In order for designers to navigate and act effectively in the ship building industry, on the other hand, which in many ways is diametrically opposite to the sport and leisure shoe business, essential context specific knowledge relates to the norms, rules and cultures of the industry and those that regulate it legally, and the cultures and customs of the communities of producers, users and buyers. The necessary context specific political knowledge needed to navigate the industry requires an understanding of its organizational structure, which itself is a mirror of the morphological complexity of the product. The short local design history makes design knowledge less path dependent, while the main design contributions still rely extensively on context independent design knowledge. Conversely, in the furniture industry of Sunnmøre, where design practice is well established and competition requires strong brand differentiation, designer contributions build extensively on the design history of the industry, and require contextual knowledge of the different brand languages of competing companies. In this context, economic flexibility and context specific symbolic expertise are offered by in-industry designers.

7 CONCLUDING REMARKS

The initial reflections made in this paper show the usefulness of a modified activity theory model which situates design activity within its industrial context. The variety of context specific design knowledge needed in the different industries that are examined should motivate further studies of what influences its content and relevance. The future challenge for design education is to design educational examples that prepare design students for design situations that require context specific knowledge of politics, strategy, symbolism, as well as the nature of materials and production processes used.

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