Journal of Civil Engineering and Architecture 9 (2015) 534-546
doi: 10.17265/1934-7359/2015.05.005

Accessible Knowledge—Knowledge on Accessibility

Inge Mette Kirkeby

Danish Building Research Institute, Aalborg University, Copenhagen 2450, Denmark

Abstract: Although serious efforts are made internationally and nationally, it is a slow process to make our physical environment accessible. In the actual design process, architects play a major role. But what kinds of knowledge, including research-based knowledge, do practicing architects make use of when designing accessible environments? The answer to the question is crucially important since it affects how knowledge is distributed and how accessibility can be ensured. In order to get first-hand knowledge about the design process and the sources from which they gain knowledge, 11 qualitative interviews were conducted with architects with experience of designing for accessibility. The analysis draws on two theoretical distinctions. The first is research-based knowledge versus knowledge used by architects. The second is context-independent knowledge versus context-dependent knowledge. The practitioners found their primary support in context-dependent knowledge, whereas context-independent knowledge was criticized as being too prescriptive. Further, they tended to ask for assistance from the researcher in person rather than reading research publications. The findings challenge research in two ways—first, to produce context-dependent knowledge to structure the first step of the design process, second, to develop new ways to ensure a knowledge flow between research and practice.

Key words: Accessibility, inclusion, context-dependent knowledge, context-independent knowledge, knowledge flow, phronesis.

1. Introduction

Making our physical environment accessible and inclusive is an on-going process that calls for attention and care. On one hand, legislation and standards are needed, on the other, architects should work with concepts like universal design in their practice.

For architects, designers and planners, it is important to have access to knowledge about users' needs, as well as the interaction between a (disabled) person and materiality.

For researchers, it is crucial to know what kinds of knowledge architects really do use when designing accessible buildings—only then can researchers produce the kind of knowledge that feeds into the design process.

This article addresses the question of knowledge supporting an accessible environment. Empirically, the article is based on 11 qualitative interviews with practicing architects with experience of universal design in order to get first-hand knowledge about the design process and the sources from which they gain knowledge and understanding.

Theoretically, the article draws on two distinctions. The first is inherent in the set-up of this project between research-based knowledge and knowledge used by architects. The other is context-independent knowledge versus context-dependent knowledge. An important kind of context-dependent knowledge is Aristotle's concept of "phronesis"—knowledge which enables the practitioner to make responsible choices. The design process is considered a process where choices are continually made between different, not yet existing and physical solutions, and in the framework of this article, responsible choices are interpreted as accessible.

The UN (United Nations) Convention on the Rights of Persons with Disabilities reaffirms that all persons with all types of disabilities must enjoy all human rights and fundamental freedoms [1]. Denmark ratified the convention in 2009 and since then requirements in the Danish Building Regulations have tightened the requirement on accessibility, especially specifications on measurable details.

Corresponding author: Inge Mette Kirkeby, Ph.D., senior researcher, research fields: architectural heritage, educational buildings and accessibility. E-mail: imk@sbi.aau.dk.

The convention introduced the concept universal design with the intention not to discriminate by design, but on the contrary, to make design to be used by a broader group. A simple example could be a door handle so well designed, so good to grasp and easy to operate that even people with weak rheumatic hands can use it.

Previous research conducted on architects' use of knowledge has documented that practitioners make use of a broad spectrum of kinds of knowledge ranging from rule-based knowledge and facts on one hand and good examples and concepts on the other. It also revealed that research-based knowledge, only to some extent, reaches the practitioners—far from the extent that researchers intended [2-6].

Recent research at SBi (Danish Building Research Institute) has documented loss of accessibility throughout the building process—regardless of the best intentions at the beginning of a building project. It is suggested that this loss is partly due to lack of communication among the different parties in the project [7].

This lack of exchange of knowledge and ideas is a matter of concern for this article and special attention should be paid to the question of research-based knowledge and the exchange of knowledge and ideas between scholars and practitioners.

The research question of the article is what kinds of knowledge, including research-based knowledge, do practicing architects make use of when designing accessible environments?

2. Knowledge and Knowledge Sharing

In his ground-breaking book "The Reflective Practitioner—How Professionals Think in Action", Schön [8] pointed to the need to explore the relation between "kinds of knowledge honored in academia and the kinds of competence valued in professional practice", and this article makes the same distinction with its point of departure. Schön [8] criticizes academia for generally engaging insufficiently in practical competence and professional artistry, holding "'hard' knowledge of science and scholarship" opposite "'soft' knowledge of artistry and unvarnished opinion". But how to produce knowledge that may be used by the competent practitioner? What kind of knowing? Schön [8] asks, and by using the -ing form of the verb, he points to activity and moves a step towards seeing knowledge as embedded in action. He introduced the concepts "reflection in action" and "knowing in action", because there are things we know when we are in a problem-solving situation. It means that this kind of knowledge cannot necessarily be verbalized outside the concrete situation.

The notion of knowledge used-in-action was followed up by Lawson [9-11], who has contributed to our insight into design and design processes, and he defines architectural research as "original investigation undertaken in order to gain knowledge and understanding". By adding "understanding" to "knowledge", he creates an opening for softer and more subjective kinds of knowledge than traditional research often does. Others of Lawson's contemporaries have enriched the discussion of architectural knowledge with concepts such as "designerly ways of knowing" [12] or "episodic knowledge" [13]. According to Lawson, traditional research is often descriptive, while design is prescriptive, since design is not primarily a question of the world is or was but of how it could be.

In this article, understanding is seen as the kind of knowledge that distinguishes itself from facts and rule-based knowledge by being far more subjective. It is considered as important for the architect, because to produce architecture requires the ability to imagine a yet non-existing building and to imagine how it would feel to be in it. This requires knowledge which can be used for looking ahead. Action knowledge which enables the architect to make responsible choices.

Aristotle terms this kind of knowledge "phronesis" and he holds it to be the most important of the three kinds of knowledge: episteme, techne and phronesis

[14, 15].

While episteme is knowledge invariable in time and space and based on analytical rationality (know why), techne is knowledge linked to production of art and craft (know how), phronesis is practical knowledge with practical ethics centrally placed [14].

Flyvbjerg [14] points out a very interesting difference between episteme and phronesis that episteme is context-independent and phronesis is context-dependent, e.g., experience-based or shown in the good example. This distinction between context-dependent and context-independent forms part of the analysis model is presented in Fig. 1.

Flyvbjerg advocates "phronetic social science" where research is conducted by means of case studies not aimed at rules or generalizations or other context-independent knowledge. Instead, it creates knowledge that is transferable to other situations [5, 13]. This transfer requires ability from the user to judge where and when it may be applied. Latour [16], who also addresses the question of movement of knowledge, compares it with the way a metaphor can transfer meaning from one situation to another, and he reminds us that the etymological meaning of metaphor is actually transported [16].

It should be noted that different kinds of knowledge are not to be seen as totally separated and that phronesis according to Aristotle listens to experience as well as to theory [17].

The kinds of knowledge that architects make use of relate to some important characteristics of the design process. Design works with "loosely structured problems", where the framing and the solving of the design problem are developed in parallel. The knowledge that designers actually do have cannot be clarified at the beginning of the project, but it may be recognized when it appears at the right moment in the process. Kristian Kreiner emphasizes that, in each case, the architect needs to find an approach, an "Archimedean point" which, at the moment, it is chosen, will guide the task solving. In this situation, Kreiner says, thought-provoking knowledge comes in more useful than knowledge pointing to specific solutions [9].

The question of how new knowledge may feed into practice leads to theories on learning, and since previous interviews stated that new knowledge is often found, exchanged or constructed within working situations, it seemed interesting to study the concept of situated learning.

Lave and Wenger's social learning theory links learning closely with participation in communities of practice. The core in this social practice theory is that understanding and experience are in constant interaction and they reject the notion of the learning person as a passive recipient of information [18].

Prior to this project on accessibility, research was conducted on architects' use of knowledge in general [2, 3, 6]. Part of this work included interviews with Bent Flyvbjerg [7] and Kristian Kreiner [4].

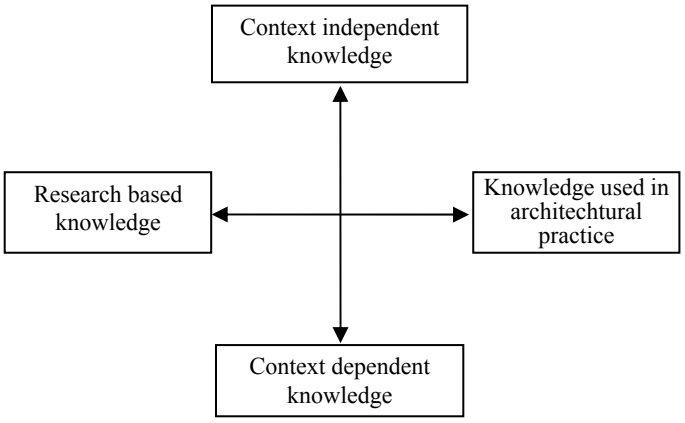

Fig. 1 An arena of understanding of the kinds of knowledge in the making of architecture.

3. Method and Definitions

3.1 Method

Eleven interviews were conducted with practicing Danish architects[1]. A gross list with possible interview persons was composed by asking colleagues inside as well as outside SBi to draw on different networks to increase the representativeness. To ensure that they knew the different aspects of designing, accessible architects with experience in this field were selected. In the final choice, priority was given to geographical spread and variation of working experience. The respondents were mainly building architects educated at one of the two Danish schools of architecture. Four were landscape architects.

The interviews were qualitative, semi-structured interviews that followed a brief interview guide, where the answers given were followed up by new questions. If the architects criticized existing legislation and standards, they were asked to elaborate, since SBi participates in the elaboration of guidelines and therefore it is useful for SBi to know the opinion of practitioners.

Each interview lasted about an hour and the records were transcribed by an assistant. Quotations in the article were translated and shortened by the author and were approved by the interview persons. Still, the quotations were rather comprehensive in order to give the architects a voice and to create a picture of the reality in which projects were developed that is close to practice.

[1]The following architects were interviewed. In one interview two architects participated, thus in total, 12 were interviewed: Povl Barfod, Architect/Bplus Architects, Copenhagen; Ernst Hansen, Architect/Billund-Hansen Architects, Fredericia; Peter Laust Hønnecke Landscape Architect/Sweco, Copenhagen; Nina Jensen, Landscape Architect/Schønherr, Copenhagen; Katrine Daugaard Jørgensen, Architect/Rubow Architects, Copenhagen; Hans Kragh, Landscape Architect/Kragh and Berglund, Copenhagen; Ulrik Kuggas, Landscape Architect/Schønherr, Copenhagen; Søren Leth, Architect/Sleth Architects, Aarhus; Rie Ollendorff, Architect/Rie Ollendorff Architects; Per Ravn, Architect/CUBO Architects, Aarhus; Katrina Wiberg, Architect/Møller & Grønborg, Aarhus; David Zahle, Architect/B.I.G., Copenhagen.

The architects were asked to characterize the profile of their working process. Then they were asked to give some examples of the kinds of knowledge that they made use of—emphasizing that "knowledge" was to be understood in its widest sense covering hard-core as well as "softer" kinds of knowledge. In this way, the respondents took an active part in defining the concept of knowledge. They were also asked to mention some sources of knowledge. Finally, questions addressed research-based knowledge and when research-based knowledge might be considered useful/not useful for them.

It might be objected against using interview as a method to gain knowledge about the knowledge that practitioners use and that respondents far from always do and say what they think they do, but picture themselves as they think they ought to do. As a consequence of this consideration, observation studies might have been chosen as method, e.g., Yaneva's [19] valuable study of architectural practice in "the making of a building: a pragmatic approach to architecture".

However, the interview method was chosen to gain first-hand insight into which experience the practitioners themselves emphasize as important in their work based on a desire to gain insight in their reflections and considerations in relation to the design process.

3.2 Definitions

3.2.1 Knowledge

Some might prefer to reserve the term "knowledge" strictly to exact, factual knowledge as known from the natural sciences. However, this article understands the word knowledge in a broad sense, and more intuitive and experience-based kinds of knowledge are included.

This interest in knowledge and its production must not be seen as an attempt to make the design process "scientific". On the contrary, the project was conducted with the intention to gain insight into the kinds of knowledge that architects use, and thus enable coming research projects to be tailored to meet the practitioners'

need and support more accessible solutions.

In discussions on knowledge, it is common to distinguish between explicit and tacit knowledge. Tacit knowledge is obtained through experience and embedded in practice and can be exchanged without words in cooperation and in master-apprenticeship relations. Tacit knowledge can only be explained to a certain degree and it is questionable whether one ought to attempt it. Rather it should be accepted as a constituting part of professional practice and in no way be considered inferior to explicit knowledge. But seen from a researcher's point of view, the study of tacit knowledge is of limited importance since research-based knowledge by definition belongs to the sphere of explicit knowledge. Focus in the article is put on explicit knowledge.

3.2.2 Accessibility

The UN Convention on the Rights of Persons with Disabilities [1] defines accessibility:

"To enable persons with disabilities to live independently and participate fully in all aspects of life, states parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to, inter alia:

(a) buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces;

(b) information, communications and other services, including electronic services and emergency services."

3.2.3 Universal Design

The convention [1] further defines universal design:

"'Universal design' means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. 'Universal design' shall not exclude assistive devices for particular groups of persons with disabilities where this is needed."

4. Interviews

In the interviews, the architects were asked to explain how they tackle design projects with emphasis on accessibility, what kinds of knowledge they draw upon and how they obtain new knowledge.

4.1 "What Makes This Project Unique?"

First of all, architects develop an understanding of a new task. Especially, they look for characteristics of the specific project. With accessibility as the pivot, it is important to familiarize yourself with how it is to be a user with a disability. Maybe it does not change a project radically, it is said, but it may lead to some changes which enables a wider group of users included.

To gain this crucial understanding, the architect needs the client to discuss with. To "drain the client", one respondent said.

Of course, if a project is an entry in a competition, it is not possible to have such a dialogue right at the beginning, but then you can qualify the project on accessibility together with the user in the following steps.

The background for the project, the location, the actual site and the programme are also studied to find the core characteristics which can be the architects' leverage to a solution. Many and disparate requirements for each project are not necessarily seen as a disadvantage. An architect explained that it was part of his method to look for paradoxes and uniqueness in each specific task, whereby he stressed the importance of knowledge:

David Zahle: "We often look for the paradoxes and the specific challenges in each project. We try to get to the heart of the given assignment by finding out: what makes this project unique?

In each project, a lot of the consideration will

address knowledge you already have as an architect or within your organization. But the special solution for a particular project often derives from knowledge you learned or developed through the process. You are challenged to go somewhere you have not been before."

During the design process, a long chain of choices are to be made and choices during the first sketches have consequences for possibilities later in the process. The many considerations to be met and combined in the final result, all have to be considered right from the beginning, including requirements to accessibility.

"Accessibility comes in from Day One", Ernst Hansen stated, "because the first disposition contains functional as well as ethical values". He gave a sloping building plot/terrain as an example:

"At the beginning, you make a number of decisions. Maybe not whether there is to be a ramp or a step, but whether the building complex is to be stepped down the slope in different levels? Should it instead be one plateau? Is it possible to make one plateau? Accessibility counts from Day One and I find that it has become a habit to think accessibility right from the beginning."

At the end of this quotation, the architect said that considering accessibility had become a habit. It was put forward several times during the interviews that this consideration became integrated in the process. It was definitely not seen as the only parameter, but gradually it had become part of the design work and it seemed to remain on the agenda. For instance, Per Ravn explained that he would no longer suggest a spiral staircase, since it would exclude a number of users. "If you use it, you'll exclude some elderly/disabled people." And, he continued, "will you have that on your conscience?".

He was backed up by Katrina Wiberg who said that accessibility had become part of the design process so that she no longer thought of it as a special consideration but as a question of inclusion and equality.

For the practitioners, concepts and principles seemed to be of greater operational value than specific rules and recommendations. It was rather enlightening that a practitioner explained how he participated in a seminar on accessibility and had learned more from a philosopher lecturing on the concept of equality than a number of lectures providing specific details.

Equality was seen as a new design parameter:

Per Ravn: "To work so focused on 'equality' is something new. When we designed 'The House of Disabled People's Organizations', it was key item. Equality was primary design parameter. So each time you suggest a solution, a counter, a corridor, a lift or a light intake, you ask: does it work for equality? Is it good for all people?".

The architects use concepts like equality and inclusion to define a foothold from which they could structure their design process. Further, the answers made explicit that what originally was a requirements stipulated by law, gradually becomes part of the routines of the office and an ethical yardstick for what was considered as acceptable.

4.2 "Thinking before Look-Up-Knowledge"

The interviewed architects were strongly aware of the different levels of knowledge, and it was of major relevance to find the level which suited all stages in the process. They distinguished between understanding, experience and references at one hand, and facts and rules on the other. It was of special interest that the respondents gave priority to "soft" kinds of knowledge at the beginning of the process to structure thinking and make choices, while specific rules, measurements and recommendations came in later when the project was further detailed.

The above heading was coined by Per Ravn who explained about how The House of Disabled Peoples' Organizations came into being:

"In the initial steps, we actually did set the building regulations aside to think best solution in terms of accessibility. Checklists and regulations came in later in the process. The next step was to find the right

measures. But we did not start there. The main point was that, to make a house super accessible, thinking equality is needed from the first lines drawn."

Characteristics of the location had to be considered thoroughly. The context was of great impact on the final solutions. "Just as buildings are different, the outdoor areas are never alike", the landscape architect Peter Laust said. The solution must always be adjusted to the specific place and he mentioned the importance of leading water away from a building as a big issue when planning outdoor areas. The Danish Building Regulations requires level-free access, i.e., horizontal, and at the same time, water must be led away, which is contradictory, and he added, "Then you have to 'bend' what horizontal means".

This quotation pinpoints the problem of making general rules to fit situations which are in principle different and unique.

David Zahle suggested that we should look for the intentions behind the rules—what we wanted to achieve with the rules. Then we could find some general intentions: people should be treated in an equal way, be able to get into a building and be able to find their way easily. Strict rules would not meet the variety in the different design projects and their individual characteristics, and then the design solutions would not do so either. But in the underlying intentions, Zahle said, there would be a higher degree of flexibility which allowed architects to adjust solutions to the specific situations and programme. If you had to comply with 100 rules, you would become very focused on details and not on the whole. Instead, we might get a few general principles or dogma like in the dogma film.

The landscape architects Nina Jensen and Ulrik Kuggas were also skeptical about standardizations of solutions deriving from many rules, and they made six dogmas when renovating a town centre with a rich heritage. "The dogmas are carrying values and intentions for accessibility demands that the project is based upon. They are to define the goals we aim at—keeping in mind that each situation asks for specific solutions." Dogma One reads: "Real accessibility: the solutions have to be so simple and beautiful that they can be used by all without unnecessary details showing that it is a special solution for disabled people" [20].

It should be emphasized that it was not a complete rejection of rules which was put forward. Rules do add to accessibility and may also serve as guidelines. But like an architect said, "it is useful to get sizes and measurement of different things and critical distances between things as well, but not to get a fully designed room prescribed". Instead, they asked for more open guidelines.

The architects gained knowledge from many places and sources. Not least do-it-yourself-courses were considered useful, because they provide you with a basic understanding of how it is to be disabled. Direct contact to researchers and other experts was highly valued, too, but research publications to a lesser degree.

The way of working decided which kinds of knowledge were found relevant for the design process, and thinking, and considerations on equality and inclusion came in before building legislation, was consulted. The practitioners criticized when rules predetermined the final result. Because, as was stressed again and again, the architectural design solution must take its point of departure in the specific situations.

4.3 "You Look for Inspiration in All Your Work, All Things You Do, and All People You Talk with"

But where does new knowledge come from? What strategies, what sources? As the heading (David Zahle) suggests, it might come from many different sources. In a few sentences, he covered a wide range of sources of knowledge:

"We use guidelines and sets of rules first, then specialists and SBi to get further. Our cooperation with experts on accessibility starts early, so that the specialist gets to follow the project and the intentions

behind the driving parameters of the concept. The expert is able to communicate directly with the disabled people's organizations. You look for inspiration in all your work, all things you do, and all people you talk with."

Next to rules and recommendations, the practitioners valued cooperation with specialists in the field, because they got a specialist with in-depth knowledge of accessibility and the thinking behind and who could also help in communication with the disabled people's organizations.

Further, they stressed the importance of keeping an open mind and seeking inspiration in everything they encountered, even from novels—a fact which is underpinned by previous interviews [6].

But when asked, the practitioners seldom mentioned research publications—scholars' usual means of communication. Practitioners did give a few examples—one had read a report on the multi-sensible room and was very enthusiastic about it—said it had changed her mind-set. But it was one of very few examples. Other respondents referred to courses and seminars as giving valuable knowledge and understanding. The do-it-self courses were greatly appreciated, where different disabilities could be experienced by means of (partly) blinded glasses, by using wheelchairs or walking with heavy loads attached to the legs in order to feel how it is to have difficulties with walking.

Last but not least, they referred to the importance of references. It might be things seen on excursions but it might also be references mentioned by colleagues:

Peter Laust: "There are references—national as well international. Then there are excursions. As a landscape architect or building architect, you are always looking around. It makes the main part of the inspiration you get, and then there is sparring with colleagues. It can be a technical problem, then we talk with colleagues—what is the best solution and we use each other's references. Maybe we find the references on the internet. Many references cannot be applied as they are because of the regulations but still then can give inspiration and support creative thinking."

References that they had seen or heard about from colleagues or references in magazines and books were not copied as such but were used as a source of inspiration. Wiberg had seen a museum by Jean Nouvel. She found inspiration in some walls covered with leather and said: "Some small maps were indicated with small nails—nobody can resist the temptations to touch them", and she added that this design, in her opinion was a beautiful example of universal design because it could be experiences by blind as well as seeing people. Another example was a handrail—some parts would not work, she said, but it did not matter, "because then you could make it in a way that it would work". Thus, inspiration was a starting point for a design process—not something to be copied blindly.

5. Analysis

5.1 Problem and Solution Are Defined in Parallel

The empirical results showed that architects started a design task from "within" and not by stating the outside limitations, e.g., from legislation.

First, the architects established a thorough understanding of the design problem. The architects created their understanding of the design task by identifying with the user, by studying the context and by focusing on what made one task different from other projects.

This approach is closely linked to a fundamental notion of architecture that each single task is unique and thus can only be solved optimally if consideration is given to the characteristics that distinguish it from other buildings.

According to Kristian Kreiner, the definition of the problem is the most important task for an architect, but it characterizes the profession that problem and solution are defined in parallel, not the problem first and then the solution. This means that the knowledge which actually exists among the actors cannot be presented in the very beginning but can be defined in

retrospective. It is not known beforehand but it may be recognized when it shows up:

"The criteria somehow already exist but they show in the concrete. You may recognize quality, but it is very, very difficult to put into words, what is needed. Such things make it difficult to study knowledge. It is more easy if you can isolate knowledge: 'Here is an element of knowledge, here is a competence which can be translated into practice such and such'. In architecture, practice and knowledge are much more integrated into each other. It makes it fun to study it but it makes it difficult to isolate what is the component of knowledge and how one eventually could define it" [4].

The respondents emphasized the value of concepts like equality, inclusion and universal design to guide them through the design process, especially in the beginning. "Thinking comes before looking-up-knowledge", one of them said, and this suggested that reflection and abstractions were not a detour. On the contrary, they were driving forces in generating a solution in the situation. But this needs to be explained.

If we consider the design process as a long chain of choices, the architect needs a kind of guidance to be able to make the choices. The interviews revealed that they made use of concepts like inclusion or universal design as design parameter. Or equality, each time they considered a new part of the building, he asked himself: "Is this an equal solution—will it be good for all?". But where does the judgment come from? Kreiner explains that we need a foothold, a point outside the design problem itself, an "Archimedean point", to establish a perspective of the problem [4].

Such a point cannot be defined objectively or rationally. At the very moment it is chosen, one takes a position which contains a moment of subjectivity. It offers one perspective on the task and excludes others, and it contains priorities including ethic priorities. Concepts like inclusion and equality give a precise normative angle, which is actually the motivation behind taking them into consideration, and we heard architects say that it clinched with their ethics not to think equality, because they had gradually built up an ethic approach that they could not in decency do otherwise.

An Archimedean point is at the same time abstract and may be idealistic and help to structure a design process. But it does not prescribe specific solutions. This means that the general concepts offer a flexibility which is described in detail in the following.

5.2 Context-Dependent versus Context-Independent Knowledge

Knowledge made use of in the design process covers a wide range from understanding, experience and references to buildings legislation and guidelines. Although they are all held to be important, it is striking that the examples of knowledge that the architects gave to a great extent belonged to the part of the knowledge spectrum which is colloquially called "soft knowledge" and which, to a lesser degree, contains factual knowledge or rule-based knowledge. Here it should be kept in mind that it is easier to verbalize facts and rules than experience and inspiration and therefore quicker "done with" in the interviews. This was also brought up by architects in previous interviews [4].

The importance of different kinds of knowledge has also to be seen in connection with the design process as explained above, and how to qualify choices.

Within a knowledge ideal from the natural sciences, knowledge has to be generally applicable, valid in all situations and in principle context-independent, whereas experience, references and examples are context-dependent. When this distinction between context-independent and context-dependent knowledge is combined with the inherent distinction of the project between research-based knowledge and knowledge used by practicing architects, a frame of understanding is constructed.

If we see the model as a way of mapping the architectural landscape of knowledge, a good part of the knowledge that the architects pointed out as

important is situated in the lower part of the map.

Flyvbjerg [14] points to the fact that episteme can be defined as context-independent, which places facts and rule-based knowledge in the upper part, whereas techne and phronesis are context-dependent, e.g., knowledge embedded in concrete situations and built examples and references.

But being dependent on context has the consequence that it cannot be used blindly. Application requires a qualified and reflective practitioner who is able to judge when a solution fulfils the programme. In this way, architects give high priority to knowledge supporting and qualifying the process, and to a lesser degree, predestine a solution. This may explain why the architects wanted to go behind the rules. Simply because many rules pointed to specific solutions, whereas principles, some architects suggested dogmas, supported the process leading to a solution.

Although architects said rules as such contributed to better accessibility, they were critical of the way they were formulated. One architect said that rules were geared to the average design task—which conflicted with the architects' notion of each design task as being unique, where the optimal solutions would come into being by considering the uniqueness.

Flyvbjerg says that knowledge must be transferable: "That doesn't make it context-independent, but means that it crosses contexts and that people in one context may learn from another" [5].

5.3 Knowledge-Sharing

Insight into the knowledge management of the profession is decisive for creating research-based knowledge that supports practice and contributes to a more accessible environment.

But how do architects acquire new knowledge? How can knowledge be transferred from one person to another?

A special challenge derives from the fact that architects extract knowledge and inspiration from very diverse sources, which can actually, to a lesser degree, be categorized as traditional research-based knowledge but also as being far from the researchers' usual channels of communication.

Architectural making seems to get more fuel from context-dependent knowledge than from facts, rules or rule-based knowledge, and the practitioners often stated how they gained inspiration from things that they saw more or less accidentally. It was explained from the beginning that inspiration would be included in the definition of knowledge. But nevertheless, it seems relevant to give inspiration a closer look—as a kind of knowledge and because of the way in which it may be transferred from one context to another has relation to the design process. Kreiner points to the fact that architects use examples in a way similar to the way that we use metaphors—not in the sense that they copy them but as metaphors.

According to Latour [16], it is a main point for science to make a matter transferable and he states that, in the transfer, a transformation takes place, and he points to the fact that the etymological meaning of metaphor is "displacement, transportation, transfer".

Flyvbjerg uses the word transferable to describe a quality of knowledge which cannot be generalized to cover all new situations but may be applied to some other contexts. When knowledge is displaced in this way, it cannot be applied blindly but a qualified and reflective user is required.

As mentioned above, it might seem a detour not to start with setting out all restrictions given, but obviously the way to the goal leads through concepts, examples and experience and the knowledge often has to be extracted from other contexts before it can be transferred to the present case. According to Flyvbjerg, the rationalistic model holds a strong position in our culture, but it will not lead us above the level of an eternal beginner, he says [5].

One might consider transferable knowledge, thought-provoking knowledge and metaphors as a kind of prefab which can be combined and finished within a new context, and which require reflection in action.

The practitioners kept eye and mind open to find new knowledge inside and outside the office, and they certainly did not reject the need for knowledge. However, the researcher might find it rather upsetting that their primary approach to obtaining knowledge was neither research reports nor articles. Rather they would invite the researcher to come to their office. In other words, they looked for research-based knowledge, but not published via traditional publications, but the knowledge in person. The meeting between scholar and practitioner face to face allows a dialogue about a specific task and they may join each other in "reflection in action" to find a specific solution to a specific task, thus, researchers step into the south-eastern quarter of the model, while practitioners freely move into the south-western one, and the border line between practice and research is perforated between east and west in the model.

In this cooperation, scholars and practitioners participate in a social community where knowledge is not only shared, but new knowledge and understanding may also come into being which might otherwise have been hard to achieve. However, it gives research a new challenge which is discussed in the last section.

6. Discussions

The study revealed that rules and rule-based knowledge were not considered very productive in the first phases of the design process. Instead, principles, dogmas and concepts seem to support the process and generate new solutions responding to the specific task. Dogmas, it was said, were flexible, whereas rules and legislation determined results beforehand.

The analysis relates this finding to the character of design problems and the need for the architects to find a perspective outside the specific design problem. This foothold cannot be defined objectively or rationally but contains a normative aspect. Here context-dependent knowledge seems to support the process by being transferable to new situations without being descriptive.

Moreover, the interviews showed that although the practitioners made use of different kinds and different sources of knowledge, research-based knowledge was certainly not the one which first sprang to the practitioners' mind when asked.

They would prefer direct communication about a specific task if possible. This dialogue between architect and researcher can be considered a "reflection in action" which is characteristic of architects' and also other practitioners' way of working. However, these findings may challenge academia and research with regard to accessibility

Research is often, certainly concerning accessibility, aimed at context-independent knowledge such as generally applicable knowledge and rules, e.g., in Denmark, the amount of measurable requirements has been increasing. To meet the practitioner, focus should (partly) be moved towards context-dependent knowledge such as understanding, thought-provoking knowledge, transferable knowledge, metaphoric knowledge and references and furthermore to investigate possibilities of reformulating some strict and prescriptive rules into basic principles behind the rules.

And a very interesting challenge emerged from the fact that the practitioners seemed to want to talk to the researcher in person. This way of working also had some negative as well as positive sides. The negative side is that this way of sharing knowledge demands enormous resources for the research world to communicate research-based knowledge directly one to one. Further, it was a problem when knowledge could not stand on its own but was dependent on the presence of the researcher. It makes the knowledge very fragile and it will retire at the same time as the researcher. Whereas traditional ways of storing and communicating research in the form of reports and articles have the advantage that they ensure that results can be transferred in space and time.

The positive side is that a direct meeting between researcher and practitioner is interactive and the dialogue can be spot-on with regard to the specific

design task and new insight may be developed in a kind of community of practice. It should also be noted that it may be an advantage for the research world if research-based knowledge finds its way directly into the design process and the researcher gets valuable feedback directly. The challenge therefore is to investigate how practice and research can develop new forms of knowledge management as a supplement to existing forms of communication.

For instance, we might make workshops and seminars where knowledge-sharing takes place in bigger groups than the usual peer-to-peer training in small groups, workshops where researchers and practitioners meet as equals but with different competencies to share knowledge and to develop new ideas for an accessible and including environment.

7. Conclusions

The first conclusion to be drawn from this study is that when practitioners design for an accessible environment, they put context-dependent knowledge before context-independent knowledge. This particularly applies to the first stage of the project, when a number of overall decisions are to be made. The architects used general principles and concepts to gain a foothold, an Archimedean point, outside the design problem itself to be able to make their judgments between different solutions. The practitioners explained the quality of principles and concepts with their flexibility—they allow solutions which fit each specific site, user and building programme, whereas detailed rules and specifications rather prescribe a limited number of solutions. But later in the design process, rules and specifications come in useful to ensure that each solution fulfills the demands on accessibility and really allows the actual use of a building for a broad group of users including people with a disability.

The second conclusion to be drawn from the study is that the practitioners, to a wide extent, looked for knowledge "in all work, all things you do, and all people you talk with", but to a lesser degree, looked for knowledge published via traditional channels for research-based knowledge, such as articles and reports. If they search for specialized research-based knowledge, they might prefer to invite the researcher in person to come and share his or her knowledge and maybe even join reflection in action.

This means that the knowledge from research to practice runs with a weaker flow than many researchers might have hoped for. In short, knowledge honored in academia and knowledge honored in professional practice overlap only to some extent. Consequently, some research-based knowledge does not feed into practice. That is, if the researcher does not personally carry it to the drawing office, in one way, this is a very positive trend, but on the other hand, a very costly way of distributing knowledge, and even worse. It leaves research results vulnerable and dependent on the person(s) who produced them.

The third conclusion derives from the previous two. Architectural research faces a considerable challenge to produce the kind of knowledge found relevant by the practitioners, and to strengthen the knowledge flow so that new knowledge actually feeds into practice and supports the making of accessible surroundings. At the same time, the fact that the practitioners do open up for meeting the researchers might suggest that the cooperation between researchers and practitioners could be even further developed, maybe organized as a kind of workshops, creating knowledge and new solutions together.

The interviews were not an answer to the question of in which direction this collaboration might go since the problem had not been acknowledged prior to the interviews. Thus, the practitioners were not asked to give their view of the matter, but the weak knowledge flow was revealed during the analysis.

However, earlier experience with "sketching analysis"[2] suggests a possible direction. By applying

[2] http://www.bygst.dk/media/21026/Fremtidens-universitet.pdf?AspxAutoDetectCookieSupport=1.

this method, practitioners and researchers investigate a design problem together, and the practitioners make use of their first-and-foremost working method, sketching, to create a kind of catalogue of design solutions as a guide in other projects without prescribing a specific solution. A new project might deal with different ways of ensuring way-finding for sight-impaired people or step-free access for wheel-chair users.

Finally, dealing with conceptual matters might be considered, where researchers and practitioners discuss items like inclusion and equality in bigger fora than a small design team.

References

[1] UN. 2006. "The UN Convention on the Rights of Persons with Disabilities." UN. Accessed April 25, 2014. http://www.un.org/disabilities/convention/about.shtml.

[2] Kirkeby, I. M. 2009. "Knowledge in the Making." *Architectural Research Quarterly* 13 (3/4): 307-13.

[3] Kirkeby, I. M. 2010. "Indbygget Viden: På Hvilke Former for Viden Bygger Traditionel Dansk Arkitektpraksis? (Built-In Knowledge: On What Kind of Knowledge Does Traditional Architectural Practice Build?)." *Architectura* 32: 140-62. (in Danish)

[4] Kirkeby, I. M. 2010. "Om at Skabe Tankevækkende Viden—Et Interview med Kristian Kreiner (On Creating Thought-Provoking Knowledge)." *Nordic Journal of Architectural Research* 22 (1/2): 169-76. (in Danish)

[5] Kirkeby, I. M. 2011. "Transferable Knowledge—An Interview with Bent Flyvbjerg." *Architectural Research Quarterly* 15 (1): 9-14.

[6] Kirkeby, I. M. 2012. "Om at Skabe Arkitektfaglig Viden (On Creating Architectural Knowledge)." *Nordic Journal of Architectural Research* 24 (2): 169-76. (in Danish)

[7] Frandsen, A. K., Kirkeby, I. M., Ryhl, C., and Pedersen, L. S. 2012. *Bygningsreglementets Tilgængelighedsbestemmerlser Set i Forhold til Byggeprocessen (Provisions on Accessibility in Relation to the Building Process, Danish Building Regulations)*. Copenhagen: Danish Building Research Institute report. (in Danish)

[8] Schön, D. A. 1983. *The Reflective Practitioner: How Professionals Think in Action.* New York: Basic Books.

[9] Lawson, B. R. 2004. *What Designers Know.* Oxford: Architectural Press.

[10] Lawson, B. R. 2006. *How Designers Think.* Oxford: Architectural Press.

[11] Lawson, B. R. 2002. "The Subject that Won't Go Away, but Perhaps We Are Ahead of the Game." *Architectural Research Quarterly* 6 (2): 109.

[12] Cross, N. 1982. "Designerly Ways of Knowing." *Design Studies* 3 (4): 221-7.

[13] Visser, W. 1995. "Use of Episodic Knowledge and Information in Design Problem Solving." *Design Studies* 16 (2): 171-87.

[14] Flyvbjerg, B. 1991. *Rationalitet og Magt. Det Konkretes Videnskab (Rationality and Power)*. Århus: Akademisk Forlag. (in Danish)

[15] Flyvbjerg, B. 2004. "Phronetic Planning Research, Theoretical and Methodological Reflections." *Planning Theory and Practice* 5 (3): 283-306.

[16] Latour, B. 1986. "Visualization and Cognition: Thinking with Eyes and Hands." *Knowledge and Society: Studies in the Sociology and Culture Past and Present* 6: 1-40.

[17] Ruderman, R. S. 1997. "Aristotle and the Recovery of Political Judgment." *The American Political Science Review* 91 (2): 409-20.

[18] Lave, J. 2008. "Situated Learning and Changing Practice." In *Community, Economic Creativity, and Organization,* edited by Amin, A., and Roberts, J. Oxford: Oxford University Press, 283-96.

[19] Yaneva, A. 2009. *The Making of a Building: A Pragmatist Approach to Architecture.* Oxford: Peter Lang.

[20] Skatte, V. 2012. *Tilgængelighed i Historiske Bykerner—Nye Veje til Viborgs Kulturarv (Accessibility in Historical Town Centers—New Access to the Cultural Heritage of the Danish Town of Viborg).* Team Schønherr A/S. (unpublished, in Danish)