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Tackling the knowledge needs of maintenance and operation staff in mouldy housing

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SUM MARY

Interdisciplinary collaboration is key when it comes to solving and preventing mould problems in housing. Many forms of collaboration is necessary, not just between operating staff, inhabitants, management and tradespersons, but also knowing and working with the building structure in question and its' heating and ventilation systems may be a challenge. This paper proposes a study of the practices and knowledge needs of operation staff in housing in order to develop a digital tool to communicate relevant knowledge and strategies for preventing and alleviating mould problems. It is also discussed how a digital tool could help operating staff gather, share and systematise knowledge of local conditions and practices in order to improve operation and maintenance.

KEYWORDS

Housing management. Mould and dampness. Operation and maintenance. Digital information tool.

1 INTRODUCTION

This study springs from the on-going project skimmel.dk (mould.dk) at the Danish Building Research Institute. Skimmel.dk is a communication and counselling platform that started in 2008 and offers an information website and counselling via phone or mail to tenants, operation staff (OS), landlords and housing management in regard to handling and preventing mould problems in housing. Skimmel.dk already provides tools for OS, these include written information about mould and a step by step alleviation guide, printable material for tenants, the possibility to generate a building-specific tenant-guide, access to documents detailing the administrative procedure for social housing, and a list of useful links to other resources. We have some doubts as to whether these tools are sufficiently useful in practice. This study seeks to gather qualitative data to further develop these tools or perhaps redevelop more appropriate tools for disseminating best practice and knowledge about alleviation of mould problems.

This paper discusses the background, methodology and theoretical framework for improving the form and content of mould information material for OS in housing through a study of their practices and knowledge needs. It is reporting initial work and is constructed as a clarification of objectives towards the result: A framework for an empirical study.

Background – the important role of operating staff in mouldy housing

Dampness and mould in the home present a health risk and are an issue affecting many people (WHO, 2009). For homeowners the responsibility is their own, but in rented housing the re-

sponsibility is shared between the tenant and the building owner. The Danish urban regeneration law (UIBM, 2016a) states that all residential buildings must: Protect sufficiently against dampness, cold, heat and noise; Allow for reasonable access to air renewal; Have the possibility of sufficient heating and Have a satisfactory indoor climate. In the renting law (UIBM, 2016b) it is stated that the building owner must handle exterior maintenance while the tenant is responsible for proper use and internal maintenance. When there are problems with mould and dampness the question of responsibility becomes difficult. The cause is rarely simple and is often a mixture of how the building is constructed, the level of maintenance, building damage and patterns of use (Valbjørn & Eriksen, 2001; Warscheid, 2011). This makes mould problems an enormous challenge for the OS in rented housing, but also put them in a very central position.

Besides the question of responsibility and the complex technical and practical challenges of identifying the cause of a mould infestation and the necessary alleviation procedure (Bonderup et al., 2016; Warscheid, 2011), the staff must navigate large amounts of non-concurrent information from scientists, building professionals, media and public. Furthermore the staff must balance conflicting interests and handle communication with residents, tradespersons and management within codes of practice set out by both housing associations and different public authorities.

A focus on the economy of scale and efficiency improvement in housing organisations is leading to changes in management all over Europe (Blomé, 2010; Priemus et al., 1999). This is also noticeable in the trending research topics relating to facilities management and housing like performance optimisation and cost efficiency, IT solutions and innovation, sustainability and management strategy[1]. Local caretakers in Danish housing are in many cases being replaced by centralised maintenance organisations. There is a risk that the caretakers' specific knowledge of individual buildings and systems is lost during this centralisation. While centralised organisations have the ability to assign specialised personnel to handle cases of mould infestation, they often lack the day to day knowledge of residents and building weaknesses which is important in general (Blomé, 2010; Nielsen et al., 2012) and particularly valuable when attempting to prevent widescale mould infestations.

This leads to two "simple" objectives in a complicated context, the main objective being: *How do we help OS in rented housing handle cases of mould growth?*
This comprises supplying them with the necessary information at the right time, in a useful form, and helping them create an overview of the situation and a plan of action. The secondary objective relates to the on-going centralisation of operation and maintenance of rented housing: *How do we help OS collect and utilise local knowledge of buildings and systems?*

Although the objectives might be simple, outlining the practical background for the study in the previous paragraphs touches on many different fields; health, legal responsibilities, microbiology, building physics housing maintenance, technical alleviation procedures and issues of information, communication and collaboration on both interpersonal, interdisciplinary and organisational levels. One could say that the problem of mouldy housing is a wicked problem, as described by Rittel (1973) in relation to problems of social policy. The "wickedness" arises when a multitude of factors, practical, social, communicational etc., interfere, but perhaps an interdisciplinary approach can aid in solving the problem.

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[1] Google scholar search "facilities management"+housing in the period 2000-2017 – first 100 search results, filtered for geography (only results relating to Europe/North America/Australia) and for thematic focus (only results focused on housing or facilities management)

2 MATERIALS/METHODS

It seems relevant to apply an interdisciplinary method to an interdisciplinary problem. Although interdisciplinarity might be a difficult endeavour, it is also considered a fruitful way of researching real-life problems as seen in Kleins (2012) definition of interdisciplinarity as: "[…]a synthesis of ideas, data and information, methods, tools, concepts, and/or theories from two or more disciplines aimed at answering a complex question, solving a complex problem, or producing new knowledge or a product." The concept of transdisciplinarity takes it a step further, being "[…]the integration of one or more academic disciplines with *extra-academic perspectives* on a common (and usually a *real-world*, as opposed to a merely academic), problem."(Holbrook, 2013) In order to respond to the interdisciplinarity of the field of inquiry, the paper will begin by discerning different levels of interdisciplinarity in the broader social, vocational and academic context of mouldy housing. Interdisciplinarity can be considered a process of translation"[…]the integration of two or more disciplinary languages with the aim of generating a common understanding." (Holbrook, 2013) A starting point can be locating which "languages" are spoken in the context of mouldy housing and which "languages" the study uses in the inquiry – contextual interdisciplinarity and interdisciplinary methodology.

Contextual interdisciplinarity

A simplified view of the context for this study is mouldy housing, but mould is not a simple problem and housing is not a simple area – as Warscheid states: "The problem of indoor mold growth is multidisciplinary by definition" (2011). Housing as understood in this paper relates to the letting of residential properties, either by private building owners or by social housing organisations. In Denmark almost 50% of homes are rented, it amounts to 528.000 dwellings in social housing, 531.000 in private rented housing, and 169.200 sublets (Knudsen & Nielsen, 2015). The housing context consists of many stakeholders; tenants, building-owners and operating staff being the primary, but especially in social housing also housing associations, tenants associations, policy makers, municipal authorities and state legislators play important roles. Conflicts often arise when e.g. OS, who have to follow guidelines and stay within budgets, try to communicate with tenants worried by issues related to their own health.

Since the subject of the study is the important role of OS in mouldy housing and how to create better tools for them, an awareness of the disciplines involved in their daily work and practices is important. The job mixes two already transdisciplinary disciplines: Housing management and facilities management. OS in Danish housing do not necessarily have a specialised education; many come from various vocational fields. If the staff have a specific vocational education it is as Property Service Technicians, which comprises the following subjects:
  – Building maintenance
  – Landscape gardening
  – Waste management, environment and safety
  – Heating, ventilation and indoor climate
  – Use and maintenance of tools and machines
  – Tenant service, resident democracy, conflict management and practical guidance
  – Planning, casework and administration
  – Procurement of supplies and services

Interdisciplinarity as methodology

Methodology is the way one choses the tools for conducting research. When conducting qualitative research the researcher is a tool herself, my personal interdisciplinarity within architecture, digital communication and indoor climate affects the methods I choose.

Since knowledge is a central theme of the study it should also be pointed out that several epistemologies come into play. When believing that scientific knowledge about mould exists and must be communicated to the operating staff in a way in which they can use it in practice, scientific empirical knowledge meets the notion of a posteriori and situated knowledge, while a view of interdisciplinarity as translations between members of different disciplines infers social constructionist views of knowledge as a communicative process.

3 RESULTS AND DISCUSSION

Discussing the results is discussing the three steps of the proposed method of investigation:
- A thorough context mapping - text and document analysis and qualitative interviews
- A practice-based field study - participant observation and qualitative interviews
- A user-centred tool design process - interaction design and prototyping

These steps are not seen as separate, but as described by Gherardi (2012) as a spiral case study, where each step can feed forward into the following or feed back into the previous steps in an iterative fashion.

Context mapping

This paper can be seen as the beginning of a context mapping, discovering the different "languages" spoken in the context and how they interrelate. The figure shows a preliminary mapping and indicates many areas, fields or disciplines to examine. Some areas contain an abundance of relevant documents or previous research and are therefore clear-cut for literature review and document analysis while other areas are transdisciplinary and less text-based and could be better examined with qualitative interviews with stakeholders. After the context mapping, the study will zoom in on the daily work of operating staff, to examine how knowledge is acquired and if and where knowledge is missing. A special focus will be on where messages from other fields or disciplines in the context lack a useful translation.
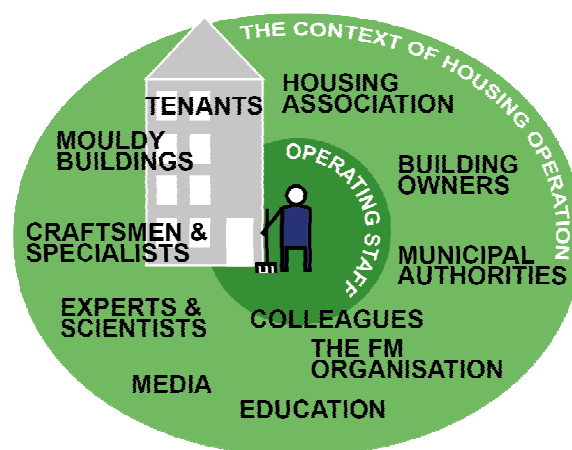
A practice-based field study

The practice-based method sets out a number of ways of observing how knowledge is disseminated and how things are learned in order to be used in practice. Describing the practice-based approach Gherardi (2012) gives her overview of the fields where it is found relevant: "Practice was indicated as a promising approach in anthropology[…], in science and technology studies[…], in education studies[…], in organizational learning and knowledge management[…] and in studies of technological design[…]" This correlates very well with the subject of this study: Looking at how OS gather knowledge through information technology or other channels and how they prefer to work when creating an overview in these complex mould cases. A practice-based method also allows for the examination of how learning occurs in a community of practice, where learning-by-doing and situated learning are prominent as opposed to traditional "school bench learning" (Wenger et al., 2015). The practise-based approach can also be used to examine what is called "the knowing-doing gap" (Pfeffer & Sutton, 1999) or how it often is difficult to turn knowledge into action and especially to turn scientific knowledge into action in practice (Rynes et al., 2001). More than actually being a method in its own right, the practice-based approach is a way of conducting qualitative studies with a

certain lens. In this study the practice-lens will be used in participant observation (Brannan & Oultram, 2012) to gain insights in the work of OS as a prerequisite developing a relevant knowledge, communication and local-information gathering tool.

Tool development and user-centred design
Choosing an interdisciplinary approach for an interdisciplinary problem might help to avoid the situation famously described by the psychologist Maslow: "I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail."[2] In a similar analogy user-centred design helps you avoid making a hammer if the actual problem is not a nail. Within user-centred design developing a new tool requires actual knowledge of how the intended users of the tool work, think and act, in other words "users know best" (Saffer, 2010). This leaves many aspects of the tool yet to be discovered, but as a foundation for tool-development some prerequisite conditions and ways of seeing, and asking can be set up. Since this tool has to integrate as seamlessly as possible into the everyday work of OS, and since our initial examination indicates that the tool has three purposes: Supply OS with actionable knowledge. Help OS get an overview in mould cases. Collect relevant local knowledge for later use. In table 1. are some of the potential questions to ask within each of these purposes:

Table 1. Questions to ask

Purpose	Questions
Supply knowledge	How is information or knowledge usually acquired by OS? How do you learn to become OS? In which situations does the need for knowledge happen? Are they aware of a lack of knowledge at all?
Generate overview	What is the role of OS in a case of mouldy housing? Which tools do they use for handling mould cases? Where do conflicts arise?
Collect local information	What kind of data will it be relevant to collect? How can it be used and interpreted? How is it collected, inputted, stored and retrieved?

Since our objectives are focused on supplying and collecting information, the study proposes the creation of a digital information tool. Information technology offers many possibilities for tool making, but since the needs of the users must be examined beforehand, it is too early to decide on specifics. It could be an app, a website, a database, a video, a decision tree, E-learning, workshops, big data or something altogether different.

State-of-the-art tools for housing operation management
A recent trend in housing is "smart metering": Using sensors in internet-of-things applications and digital communication tools as ways of monitoring and nudging tenants to behave more energy efficient or obtain a better indoor climate (Glad, 2012; Kierkegaard et al., 2015; Knudsen & Nielsen, 2015; Wilke & Andersen, 2014). These tools focus mainly on the residents and less on usability for the OS, who must maintain and troubleshoot these systems. This study might result in tools or strategies for also optimising "smart metering" frameworks with a focus on the important and complex role of OS in housing.

4 CONCLUSIONS
This paper proposes that an interdisciplinary practise-based study of OS could supply us with valuable insights into the complex problem of mouldy housing. A general focus interdisciplinarity as a way of translation could also be relevant in other areas where engineers and other academic or vocational fields must collaborate on real-life problems.

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[2] https://en.wikipedia.org/wiki/Law_of_the_instrument

5 ACKNOWLEDGEMENT

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