Chapter 16
Ontology and the Scottish Building Regulations

John Lee

16.1 Context

In this section, we discuss the notion of ontology in relation to the Scottish Building Regulations. There is no formal ontology associated with these regulations, and the interest here is partly in investigating why. This is therefore less a case-study than the study of a non-case, but we hope that it will point to some useful issues about the potential role of ontologies in cases like this, and in related contexts. The fact that the regulations are part of a legal framework seems to be important, and highlights issues about when and why it is considered important for definitions to exist and be clear, and the importance of attention to the needs and practices of the communities using the terminology. Questions that arise include which terms are defined, how terms are used that are not defined, and how in practice concepts are used and worked with.

16.2 Purpose and Aims of the Ontology

The Scottish Building Regulations provide a legislative framework within which standards can be applied to the industry involved in the design and construction of buildings. Many aspects of buildings are addressed within this framework. It is natural to suppose that the conceptual structure involved would benefit from being made as explicit as possible, so that the application of standards in individual cases can be clearly determined. In the ideal case, perhaps, it would be possible to develop intelligent systems that would automatically determine, for a given design, whether

J. Lee (✉)
Graduate School of Arts, Culture and Environment, University of Edinburgh, Alison House, 12 Nicolson Square, Edinburgh EH8 9DF, Scotland, UK
e-mail: J.Lee@ed.ac.uk

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it complies with the standards (as is done in Singapore with the CORENET system[1]). The primary purpose of an ontology in this area would thus be to exhibit and formalise this conceptual structure. Secondary purposes might include roles in education, further development of standards, etc.

16.3 Scope

An ontology as envisaged here would have scope over the complete range of building types covered by the regulations, both domestic and non-domestic. It would apply within Scotland, specifically; but one supposes that a very similar system could be used in many other countries within Europe and perhaps more widely. The time frame could be fairly long, but there would have to be sufficient flexibility to encompass innovations in building design and construction, materials, methods, purposes, etc.

16.4 Stakeholders

Legislators, design and construction professionals, and local authority verifiers (see discussion below) would be the principal stakeholders, and the principal effective roles in this context. Others, including property owners and ultimately the general public, would have important interests.

16.5 Methods of Development and Content of the Ontology

We discuss these issues together. Since there is no ontology in this area, the challenge is to investigate why this is and whether there would be a role for one. The content and methods would therefore be interdetermining. We are also not really able to address ontology construction approaches, and especially tools, in any useful way. We therefore lay out the context of the problem, with some focus on those aspects that can be thought of as conceptual structuring, and the nature of the practices involved in the use of the regulations.

The Building (Scotland) Act (2003), a piece of legislation enacted in the Scottish Parliament, completely overhauled the system of building regulation in Scotland. It removed a system that had been in place for several decades and introduced "functional" standards that prescribe how buildings should perform, or what general

[1] http://www.corenet.gov.sg/ Accessed on 19 October 2010.

features they should have, rather than in detail about how these should be achieved as "prescriptive" standards. This change was introduced partly to provide greater freedom for the industry, but partly in response to a need for European harmonisation of standards. The regulations imply a responsibility, placed on all concerned, to establish that particular construction practices achieve the specified objectives. The Act creates the Scottish Building Regulations, or, more accurately, the *Building (Scotland) Regulations 2004*, as a statutory means of controlling the safety and habitability of buildings in Scotland. These are in themselves quite a brief document, being a little less than 10,000 words.[2] However, they are supported by Technical Handbooks, one covering Domestic and the other non-Domestic buildings, each extending to over 700 pages.[3] The purpose of these handbooks is to interpret the regulations and provide guidance on how to comply with them. The handbooks themselves have no legal status, and alternative means of compliance can be used if found to be reliable, but in practice the handbooks are treated as an extension of the regulations themselves. There is also a Procedural Handbook describing many procedures relating to implementing the regulations.[4]

As noted, the new regulations are expressed in terms of functional standards. These standards are statements of functions the completed building must fulfill or allow. For example, Section 3.9, Private wastewater treatment systems - infiltration systems:

> Every private wastewater treatment system serving a building must be designed and constructed in such a way that the disposal of the wastewater to ground is safe and is not a threat to the health of the people in and around the building.

Any means of achieving this objective is in principle acceptable, as long as it also respects the other regulations. A consequence of this approach is that the regulations have relatively little to say in detail about the parts or other aspects of buildings themselves, and hence do not contain a rich terminology for these purposes. However, there is a curiously arbitrary quality to the terminology that is used.

At the start of the regulations document, a section headed "Interpretation" provides definitions of the following 16 key terms:

"agriculture"
"boundary"
"building site"
"different occupation"
"domestic building"
"dwelling"
"flat"
"high rise domestic building"
"house"

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[2] http://www.opsi.gov.uk/legislation/scotland/ssi2004/20040406.htm Accessed on 19 October 2010.

[3] http://www.sbsa.gov.uk/tech_handbooks/tbooks2009.htm Accessed on 19 October 2010.

[4] http://www.scotland.gov.uk/Resource/Doc/217736/0105327.pdf Accessed on 19 October 2010.

"maisonette"
"residential building"
"residential care building"
"sanitary facility"
"sheltered housing complex"
"site"
"storey"

No other terms are explicitly defined, although a few passages might be said to have the effect of a definition, e.g. regulation 6 on "Limited life buildings", which says:

> For the purposes of paragraph 3 of Schedule 1 of the Act (which enables special provision to be made for buildings intended to have a limited life) a period of five years is hereby specified.

It is not at all clear why or how just these 16 terms are selected. Other terms are of course used, for instance in the section relating to communication in the event of an outbreak of fire (Schedule 5, section 2.11), where we find the following limitation:

This standard applies only to a building which (a) is a dwelling; (b) is a residential building; or (c) is an enclosed shopping centre.

In this case, the term "shopping centre" (enclosed or not) is nowhere defined, and nor is the term "enclosed". One might think that the terms in (c) call for definition as much as those in (a) or (b), but it seems the legislators felt otherwise.

In the Technical Handbooks, an appendix (identical in both) provides a relatively much more extensive set of definitions, numbering 118 including those already found in the regulations and also defining many terms that are used, but not defined, in the regulations. However, many terms are of course still not contained in this list. Enclosed shopping centres are discussed almost exclusively in connection with fire risk. There is a specific annex (2.C) that deals with them, noting that "The recommendations contained in this annex … are unique to enclosed shopping centres with malls on 1 or 2 *storeys*": the italics indicate that "storey" is defined in the appendix (and, in this case, the regulations themselves), but no further definition of the other terms is offered. Nor is there a definition of the term "mall", which is widely used in the document in relation to these kinds of buildings.

A lawyer, informally queried on how one can determine whether a given building is an enclosed shopping centre, suggested that it would simply be up to the courts to decide. In practice, no doubt, this means that people will "play safe" – not necessarily a bad thing, but not helpful in terms of discovering the details of the conceptual system or ontology underlying the regulations.

These observations indicate that the ontology is in fact very implicit, and remains embedded in practices and understandings among the relevant professional and other communities involved in construction. The regulations create a framework for managing certain aspects of the activity of these communities, but do not seek to determine details of how this will apply in particular cases. Such determination requires practitioners, and if necessary the courts, to interrogate the specifics of a

case and interpret the regulations to fit it. This will quite possibly entail the further definition of some of the concepts involved. However, this will happen on a case-by-case basis, and be constrained to the question whether a specific building meets a functional requirement by whatever means it may seek to do so. To understand this properly, we need to note the system whereby the regulations operate. Normally, a building requires a "warrant", showing that it is compliant with the regulations, which is issued by a "verifier", usually part of the local authority. A long process of negotiation may surround the issuing of the warrant, during which the designers/constructors and the verifier discuss whether and how the regulations are met by various aspects of the building. Eventually a warrant is issued or withheld. In the latter case, there can be appeal to the courts; however, there has been no such appeal in relation to these regulations, which suggests that the negotiation process is rather effective.

There is no attempt to generalise the outcomes of these processes. One might suppose that a very similar process may have to be carried out many times for quite similar cases. The system seems to be designed to embrace this consequence and resist further development of contentious cases.

These cases are in any event not common. There are no court cases involving the Building (Scotland) Act 2003 and/or associated legislation, other than a fatal accident inquiry in February 2008 relating to the death of a construction worker working on a farm building. The system allows in principle applications to be made for relaxation of the regulations, as noted by the Procedural Handbook, in "cases where a requirement is clearly, in whole or in part, unreasonable for a particular building" (p.34). However, as of 2008 no applications for relaxations had been received by the Scottish Government. We conjecture that this is because the generality of the regulations is such as to make relaxation all but impossible: who could suggest e.g. that wastewater should in some case be allowed to be a threat to health? The Scottish Government's Building Standards Division also offers a service to provide a "view", on behalf of Scottish Ministers, "[w]here the owner or the verifier considers there is doubt about the extent to which a building or design meets the building standards."[5] Such views are not frequently sought – only 32 have been recorded from 2005 (when the regulations were implemented) up to September 1, 2010, and these are normally expressed in somewhat specific terms. For instance, it is agreed in one view that "safe, unassisted and convenient means of access" is acceptably provided by stairs in a given working environment,[6] and it is asserted in another that similar sanitary provision is expected in a conversion as in newbuild.[7] Although the latter in particular seems generalisable, these views remain strictly "project specific".

It appears, then, that in the context of functional regulations we can have an approach that avoids any level of explicitness such as would be necessary to articulate

[5] http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/about/minview Accessed on 19 October 2010.

[6] http://www.scotland.gov.uk/Resource/Doc/217736/0090253.pdf Accessed on 19 October 2010.

[7] http://www.scotland.gov.uk/Resource/Doc/217736/0090246.pdf Accessed on 19 October 2010.

an ontology, or would benefit from the development of one. If a useful role of ontologies might be to help structure argumentation about points and issues where there is disagreement and contention (cf. Lee and McMeel 2007), even this is sidestepped here by using language so generally that most of the conceptual structure in the discussion has to be contributed case by case. Legal argumentation often seeks to avoid too specific definitions. It is recognised that cases are very different, and the legal system seeks to provide a legislative framework that can cover them all, while exploiting a very flexible system for tailoring its application to the individual specifics. To provide in advance a system of concepts with sufficiently detailed structure to capture variations in understandings of specific issues would be to prejudice the discussions themselves by effectively limiting the range of possible variations.

Especially critical would seem to be the process whereby the verifier issues the warrant on the basis of negotiation. It is during these negotiations that concepts are tried and tested. There is a vagueness or fuzziness about many of the concepts: does this one apply in a given case, or does that one, or is there an overlap? Such questions will be settled in ways that depend on understandings that are, or come to be, shared by the participants, may be different in different cases or contexts, may change over time, etc., and are not themselves anticipated anywhere in the framework. The 16 key terms that we saw defined are simply those that the legislators, more or less arbitrarily, see a need to have clearly agreed at the start, to keep possible disagreement within reasonable bounds, but it is actually not too critical which terms these are, since the process is robust enough to develop the basis for agreement on any other terms that might arise as an issue.

This kind of flexibility is evidently welcomed by the system, because it is what helps to meet the original desideratum that designers and constructors are given more freedom than is allowed by prescriptive regulations. Hence we see that the move towards functional regulations is actually a move away from a position where, in the extreme, one might seek to determine compliance with regulations by reference to some kind of automated system. Prescriptive regulations lend themselves much more obviously to the development of a clear ontology and a system of rules whereby a design can be tested; the functional approach relies, it seems crucially, on a process that would gain little from the codification of precedent and resists automation in almost the same way as does the process of design itself.

16.6 Benefits

If there were to be benefits from introducing an explicit ontology into this framework, they would most likely have to do with the application of information technology. It is therefore interesting to speculate about the potential role of information systems here. Application could be wide, given that European standards are harmonising around the approach. One prospect is perhaps that there could be a kind of “case base” in which histories would be maintained of particular building types and discussions. Verifiers could consult this to accelerate the process of assessing a new

design for compliance. Even this idea, however, is only likely to work for buildings of recognisable types with similar features. Matching a design that is significantly innovative is likely to be impracticable. An aspect, however, of this approach is perhaps evidenced by the Scottish Government in its "Fire and Rescue Framework for Scotland 2005,"[8] which suggests that in fact information technology might help in deriving the benefits of greater flexibility:

> Because of the introduction of [Integrated Risk Management Plans] and the removal of the nationally recommended standards of fire cover and associated guidance, Authorities will in future have more flexibility. Modern, intelligent information systems mean that risks can be assessed more effectively allowing a more appropriate and better-targeted response. (p.16)

Following this line of thought, verifiers, and others, would use intelligent systems, where available and in whatever way happens to be supported, to assess various qualities of a particular design, and then conduct the usual negotiations about whether these meet the standards. The use of a broad range of building performance evaluation tools can thus be actively encouraged, and would take place within a context where the outcomes of using these tools would be subjected to critical appraisal and discussion in the process of negotiation, offering a natural response to the charge that these systems cannot be assumed to be correct or reliable in application to a given design.

In such a scenario, should it become widespread, the role for an ontology will perhaps re-emerge. Standardisation among the tools will mean that lessons from application to one design can usefully be re-used in relation to another. Discussions around these are likely to be similarly enough structured that capturing their rationale becomes a worthwhile exercise. An ontology, as a basis for elaborating this structure, can once again be seen to have a value in supporting the resolution of disagreement, contention and misunderstanding.

16.7 Lessons Learned

The principal lesson learned from this discussion is perhaps the importance of seeing the complexity of practices in a given domain. Where it seems at first sight almost obvious that an ontology would be a valuable development for the application of building standards, we find that in fact there are many deep problems associated with this idea. Ontology development is often undertaken in haste on the assumption that standardisation and automation will be a good thing. Sometimes this may turn out to be literally a waste of time, but in other cases at least it will pay to probe more deeply into why a certain informality is a persistent feature of a domain.

[8] http://www.scotland.gov.uk/Resource/Doc/1100/0017601.pdf (All URLs accessed 19 October 2010).

Reference

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