Analysis of survey on the use of modelling in projects

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Introduction

A survey of the use of modelling was carried out as part of the Innovation Base Community Engagement activity to gauge the current use of and interest in modelling in the higher education development community.

The survey was carried out using the SurveyMonkey[1] survey tool. The survey was advertised on the following JISCmail lists:

- E-FRAMEWORK
- ENTERPRISE-ARCHITECTURES
- JISC-INNOVATION
- JISC-REPOSITORIES
- ALT-MEMBERS

The request to complete the survey was also sent to the JISC Institutional Innovation projects by the support team.

Respondents were self-selecting, so that the data cannot be considered to be a representative sample of the community. In all 47[2] valid responses were recorded when the survey was closed. There is no data available to determine why the response rate was disappointingly low, but possible reasons include:

- Timing – the survey was launched on 8 December, which may be getting close to the Christmas break, and re-offered in mid-January
- Little interest in modelling in the community,
- General unwillingness to undertake surveys,
- Inappropriate selection of places to advertise the list.

However, 45 responses is sufficient to undertake some analysis.

All the questions in the survey were optional, in order not to put people off answering the remainder of the survey if they did not have a response they wished to make against any question; however most people answered most of the questions. The number of respondents is shown against each question.

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1 http://www.surveymonkey.com/Default.aspx

2 An additional two "responses" were recorded with no valid data, and have been excluded from the analysis.

Analysis

As will be noted in detail against some of the questions there are some issues with the quality of the data derived from this survey. We noted in the introduction that the respondents were self-selecting and therefore not a random sample of people undertaking projects in the community. There is a clear bias towards those who are doing modelling, given that we have evidence of the very low level of the use of modelling from other sources.

There may also be some problems with the quality of the data. For instance, only half the respondents reported users as a significant stakeholder in their work. There are several reasons why this may be so:

- Many of the projects do not have users, or at least users who are significant stakeholders (conceivable, but unlikely – for instance a project to improve a network might see the users as beneficiaries rather than active stakeholders).
- Respondents do not consider users to be stakeholder. This is quite possible as some people take stakeholders to mean some form of governance responsibility for the project and do not include users in the term (there are users and stakeholders).
- Projects have not done a stakeholder analysis and therefore the information is incomplete. Unlikely, as even a rudimentary analysis would include users.
- Presented with a blank slot people pick the first things that come into their head without too much thought. Again, quite likely, which would suggest that the tick box data may be more accurate than the blank box data.

However even with these concerns about the quality of the data there are some interesting points that can be seen from the data.

The respondents

The first part of the survey was about who was responding to the survey..

Project involvement

40 respondents listed the projects that they were responding on behalf of, this amounted to over approximately projects, with a range of zero to eight projects per respondent, and a wide range of project types from those intimately concerned with modelling (Enterprise Architecture / Service Oriented Architecture) to resource development projects with little or no modelling components in the project.

Roles of participants

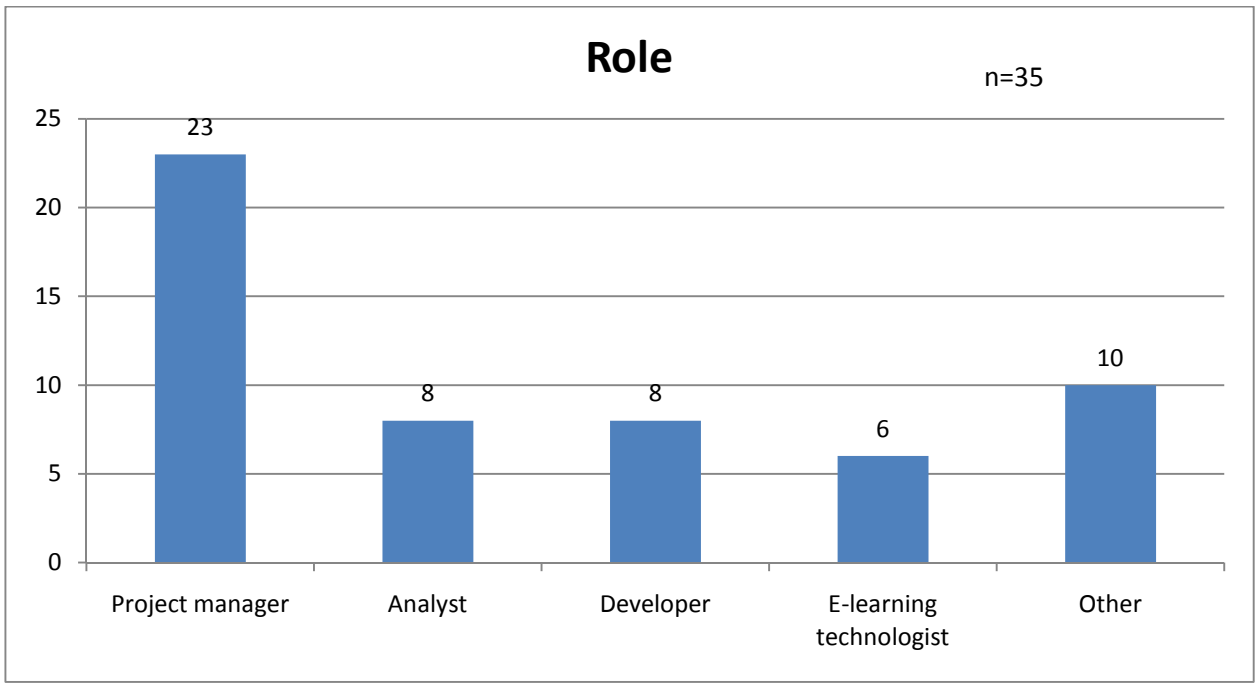

Figure 1: Roles of respondents

34 people responded giving their roles, with nearly a third having more than role and nearly a third being project managers. Only 8 of the respondents were analysts, which together with one enterprise architect suggests that a relatively small proportion (less than 20%) would have modelling is a core part of their role. As we were particularly interested in the use of modelling by learning technologists the low response rate (six) by learning technologists was especially disappointing, and is too small for us to be able to draw any conclusions about the use of modelling by that group.

Area of activity

We asked people to say what areas (domains) they were working in, using the same list as that given in the e-Framework, but allowing people to assign their own as well. There is a fairly even spread between the various domains. The other domains offered were:

- Identity and Access Management
- Modelling tool supplier
- conceptual modelling for interoperability specification

The first of these could possibly be classified under Information and communications technology, whilst the others are not higher education domains.

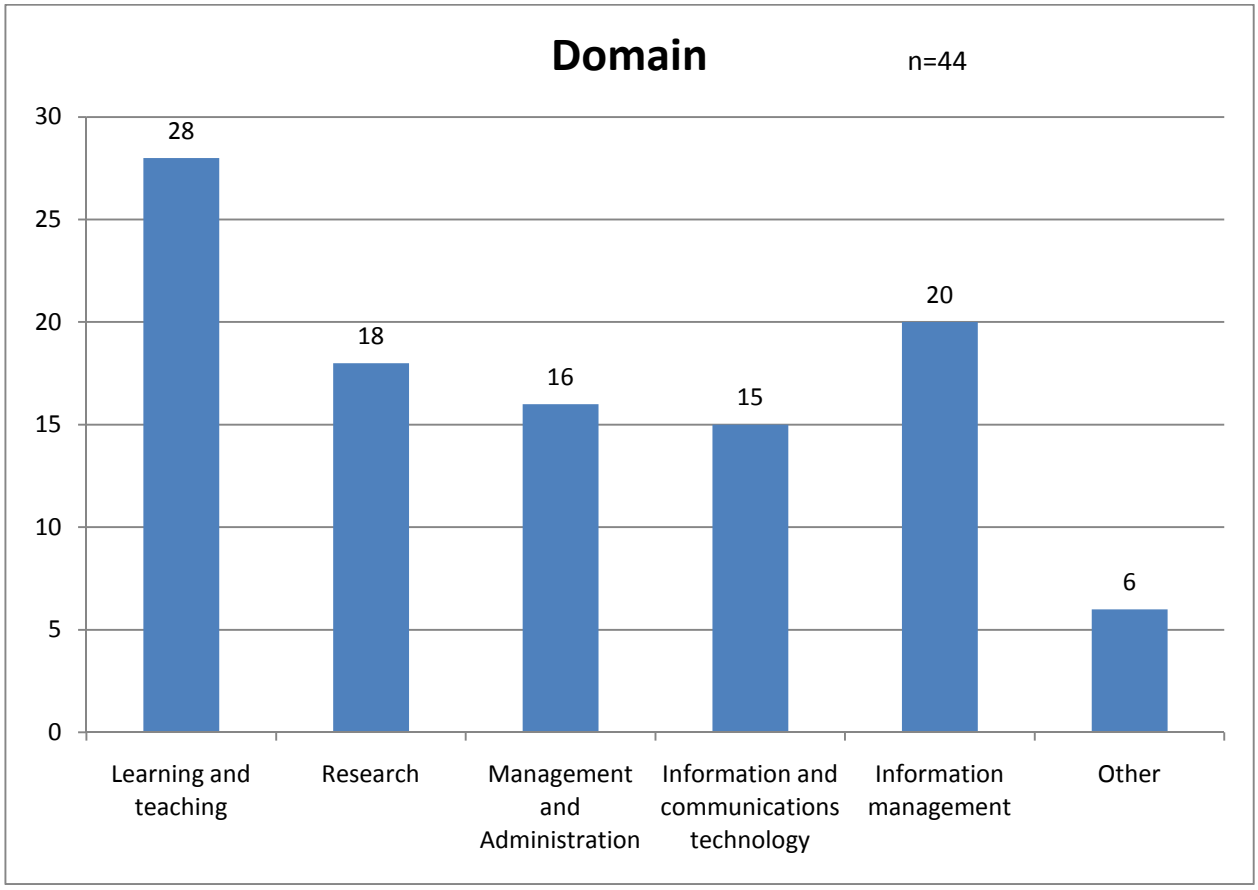

Figure 2: Domains respondents are working in

The full set of domains covered by respondents is shown below. Where an item was cited more than once the total number of citations is given in parentheses:

Learning and Teaching

- Admissions (2)
- Adult learning
- Agent-assisted collaborative learning
- Assessment (2)
- Bespoke training
- Blended learning
- Course and program management (2)
- Courses information management
- Curriculum design
- Curriculum development
- E-learning (3)
- E-learning development
- Enrolment
- E-Portfolios (5)
- Induction
- Instructional design
- Learner mobility
- Learning design
- Monitoring student behaviour
- Registration (2)
- Skills and competences (2)
- Student experience
- Student intervention
- Student retention
- Teaching (2)
- VLE / LMS (8)
- Work-based learning (2)

Research

- Research (2)
- Research activity data

Management and administration

- Added value.
- Administration
- Admissions (2)
- Campus management
- Capabilities
- Course management
- CPD Course Administration
- Efficiencies
- Enrolment
- Enterprise Resource Planning
- Governance
- Institutional change (2)
- New models for higher education
- Procurement
- Quality enhancement
- Registration (2)
- Subject/course management (2)

Information and communications technology

- Federated Access Management
- Identity Management
- Interoperability
- Online data bases
- Role-based access
- Shibboleth
- Web development

Information management

- Application profiles
- Authority Control
- Bibliographic Referencing Systems (2)
- Content sharing
- Courses information management
- Data mining
- Data sharing
- Data warehouse
- Digital preservation
- Digital preservation
- Digitisation
- Dublin Core
- Dublin Core Application Profiles
- E-literature
- (institutional) repositories (6)
- Knowledge management
- Libraries (2)
- Metadata
- Metadata schemas
- Names
- Ontology
- Open access / Open content (2)
- Portal
- Registries
- Semantic web (2)

Business and community engagement

- Bespoke training
- Business and community engagement (3)
- Employer engagement (2)
- Relationship management (2)
- Schools liaison
- Work-based learning (2)

Other

- Concept mapping
- Conceptual modelling
- Educational system mapping
- Enterprise Architecture (2)
- Mind mapping
- Modelling cognitive mapping
- Policy
- SCORM
- Service Oriented Architecture (2)
- Standards development
- Support
- Synthesis
- Taxonomy

Note the large range of topics that people are working on, with only repositories, e-portfolios and virtual learning environments having five or more people working in them. In part, this reflects the way that people think about the domain that they are working in. The finer grained the area that is given the fewer people are likely to be working in it, but the more accurately that it may be defined. For instance, e-learning encompasses all the other things included in the learning and teaching domain, and blended learning may well be the same as e-learning (in that most people do not use e-learning to mean exclusively technology based learning).

It should be noted that the definition of domains does create significant taxonomic problems. Firstly there is "splitting" versus "clumping". Some people prefer to divide things up as much as possible into the smallest separately defined concepts, while others prefer to group things together if possible. Neither is in any sense "correct". However it does cause problems in attempting to categorise information. Secondly, people use different terms to describe the same (or very similar) concepts (teaching; teaching and learning; learning and teaching; learning are all used to cover the same territory without much distinction (though distinctions can be made between teaching and learning)). This can be dealt with through the use of synonyms, but they do all have to be mapped onto each other (should pedagogy, andragogy and mathetics be mapped to each other as synonyms?). Thirdly, people cannot agree how terms should be organised – even looking at the list above you can see that some of the terms have been repeated under different headings (for instance I have classified *work based learning* under both "teaching and learning" and business and community engagement and *Admissions* under both "teaching and learning" and "Management and administration"). There is therefore clearly a tension between allowing users to classify for themselves and other people being able to find it later using potentially different terms.

Knowledge of the domain

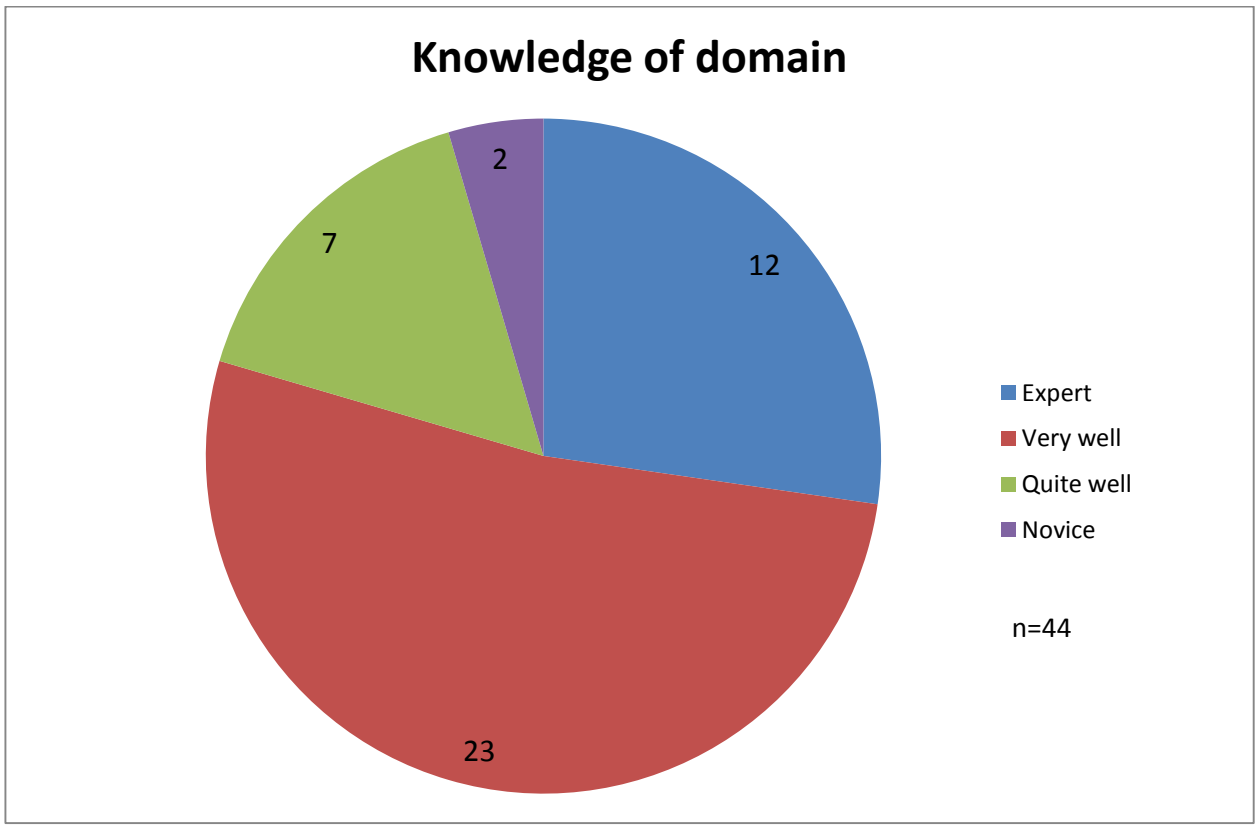

Figure 3: Level of knowledge of respondents

The majority of the respondents were domain experts in the area that they were working on, with almost none of them being novices. This in part reflects the type of people who replied to the survey; which was mostly project managers. A significant number of these are from relatively small JISC projects where the bidder is both a domain expert and the project manager. For many JISC, and other small projects in the sector, Unless projects are very large and a professional project manager has been brought in one would expect the project manager to have significant knowledge of the area they are working in. Whereas analysts and developers might be expected to move from domain to domain as required and therefore have less expertise in the domain they are currently working on – as their expertise lies in analysis and development. However, both the novices in this survey were project managers, and those that knew the domain "quite well" were spread evenly across project manager, developer and analyst.

Stakeholder involvement

Part of the reason for modelling is that it is an effective way to share information with stakeholders – to gather requirements, share ideas and solutions and to develop a common language and set of metaphors for discussions.

Stakeholders

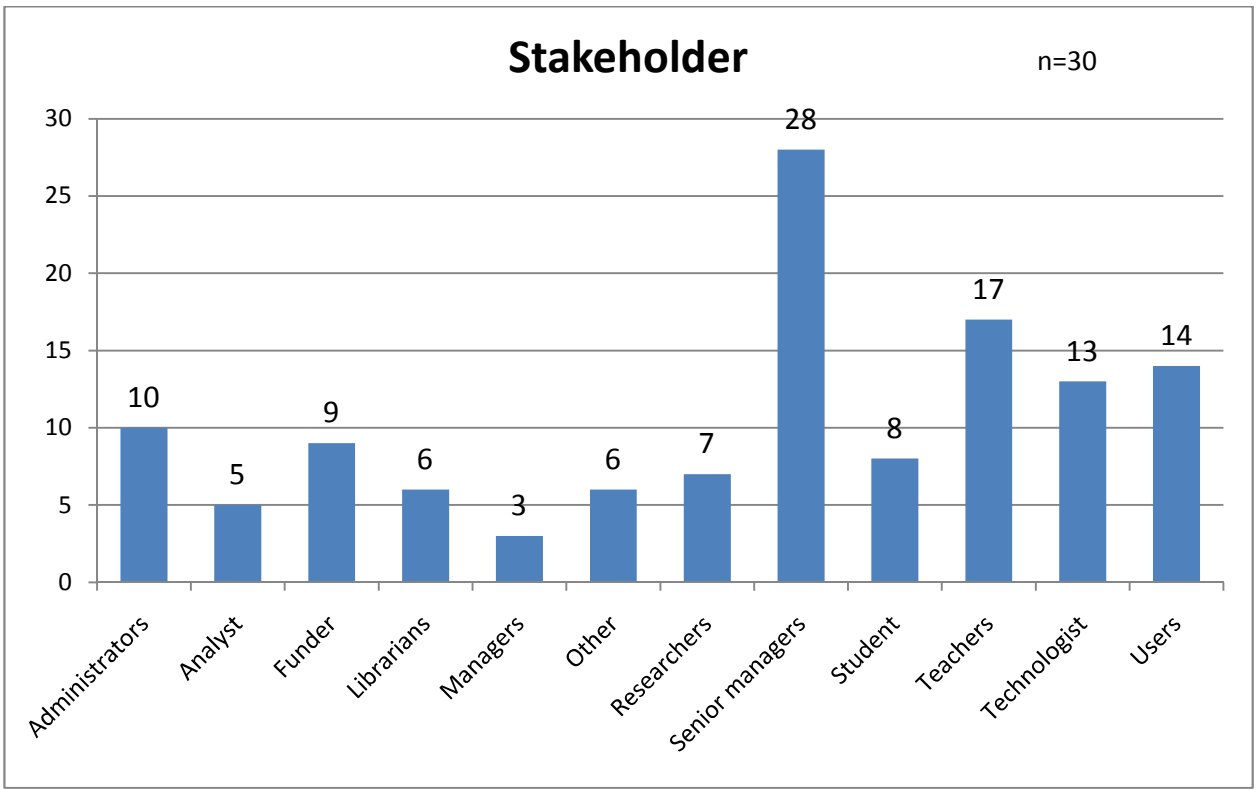

Figure 4: Key stakeholders

We asked projects to name up to five of the main stakeholder groups that they were working with, and these have been grouped under the headings show in the chart below. There is a fairly even spread amongst the various different types of stakeholder, with senior managers, perhaps surprisingly, the most common group, with 28 out of the 30 responses including senior managers as one of the stakeholders, though this is mostly in the form of governance (see table below).

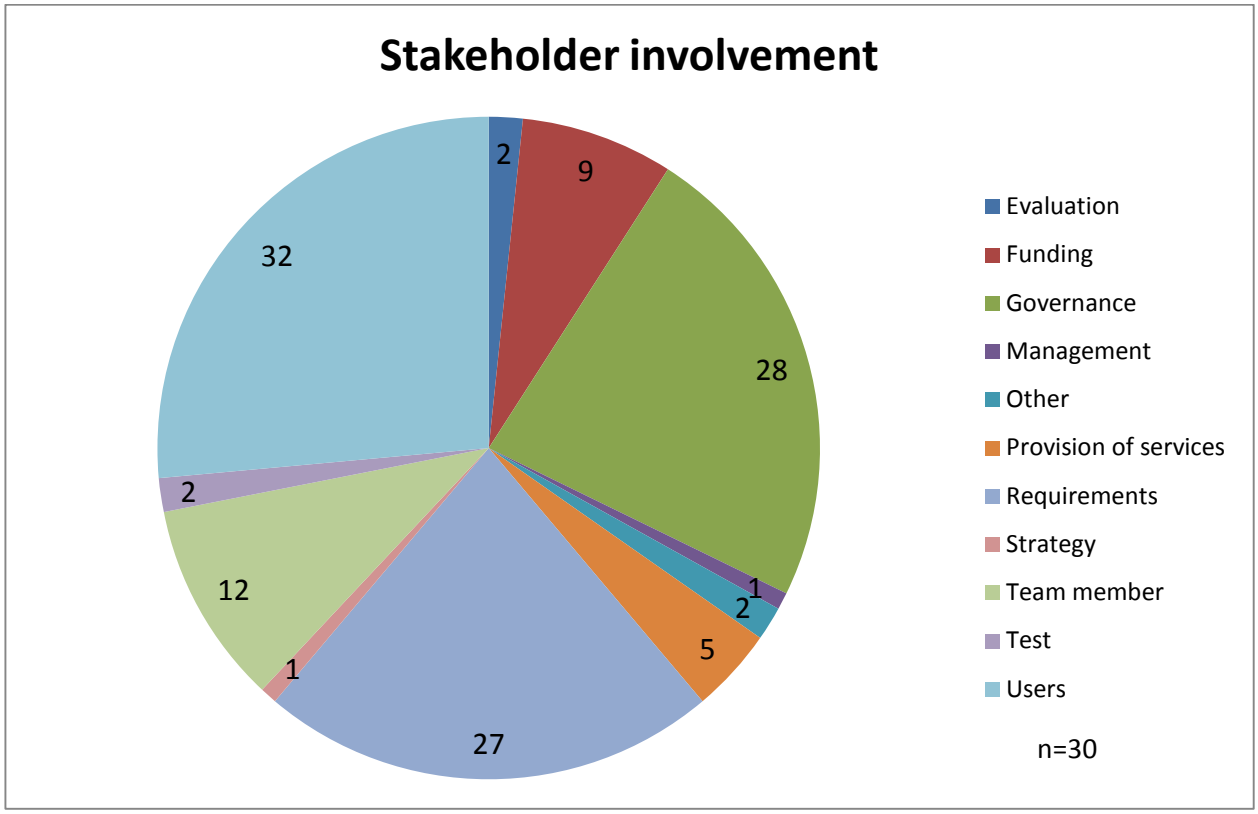

Figure 5: involvement of stakeholders in project

Respondents were also asked what the involvement of each of the stakeholder groups was, and the three most important areas were governance, requirements gathering and as users, with funders and team members being the only other common forms of stakeholder involvement in the projects brought out in this survey.

Perhaps it is more interesting to look at the way in which the various stakes are distributed across the different stakeholder groups. From this three things stand out. Firstly, as already mentioned, senior managers are primarily involved in the governance of projects with this accounting for 23 of the 28 stakeholders concerned with governance, or 23 of the 27 roles played by senior managers. Secondly, requirements and users are drawn from all the groups of stakeholders in approximately equal (but low) numbers, with the exception of administrators and teachers who are more commonly represented. Thirdly, librarians figure more as providers of requirements than as users (suggesting that they are being used as a surrogate for the users) and that students and administrators are users who are not always being consulted in requirements gathering. However, it would be dangerous to draw to many conclusions from this data as people tend to fill in surveys and questionnaires quickly and more reflection might be expected to change the relative weightings of some of the stakeholders and their involvement in the projects.

Stakeholder	Evaluation	Funding	Governance	Management	Other	Provision of services	Requirements	Strategy	Team member	Test	Users	**Grand Total**
Administrators				1			1				8	**10**
Analyst									5			**5**
Funder		8					1					**9**
Librarians			1				4				1	**6**
Managers			1				1				1	**3**
Other					1		2				1	**4**
Researchers							2		1		4	**7**
Senior managers		1	23				2				1	**27**
Student							2				5	**7**
Teachers	1						7	1	1	1	6	**17**
Technologist	1				1	4	1		5		1	**13**
Users			3			1	4			1	4	**13**
Total	**2**	**9**	**28**	**1**	**2**	**5**	**27**	**1**	**12**	**2**	**32**	**121**

Table 1: Involvement of stakeholders in projects

To some extent the spread of stakeholders (especially for requirements and as users) is a reflection of the spread of projects represented by the respondents.

Interactions with stakeholders

One of the areas that we are particularly interested in is how project staff gather and present information with stakeholders, and in particular to what extent models of one sort or another are used for that purpose. As can be seen, documents, presentations and demonstrations are the most common methods of presenting information to stakeholders, with models not far behind and other forms of presentation not widely used.

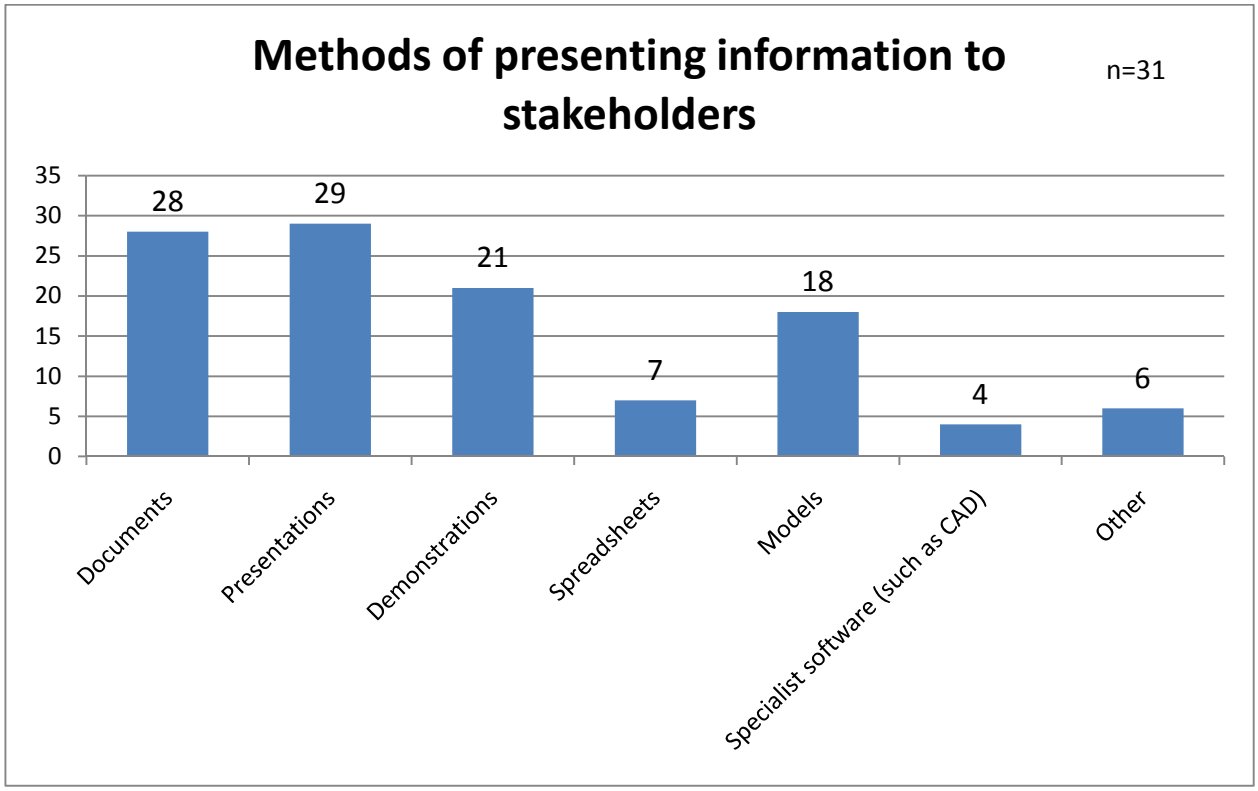

Figure 6: Methods of presenting information to stakeholders

However, when it comes to gathering information from users there is a very different picture, with documents, presentations and meetings predominating and models barely used at all. This large difference is interesting and raises some interesting questions as to how models are being used in projects. While we might not expect that stakeholders would be producing models using modelling tools we might have expected them to, for instance, annotate models that they have been shown in order to express their requirements. It is possible that these have been expressed in the survey as using meetings. However, in that case one might expect models to be treated in the same way in presenting information to stakeholders.

This is an area where more work is needed in order to understand how models are being used in projects. This could include looking at the types of models being produced, where in project life-cycles they are being produced, who they are being produced for and what they are actually being used for.

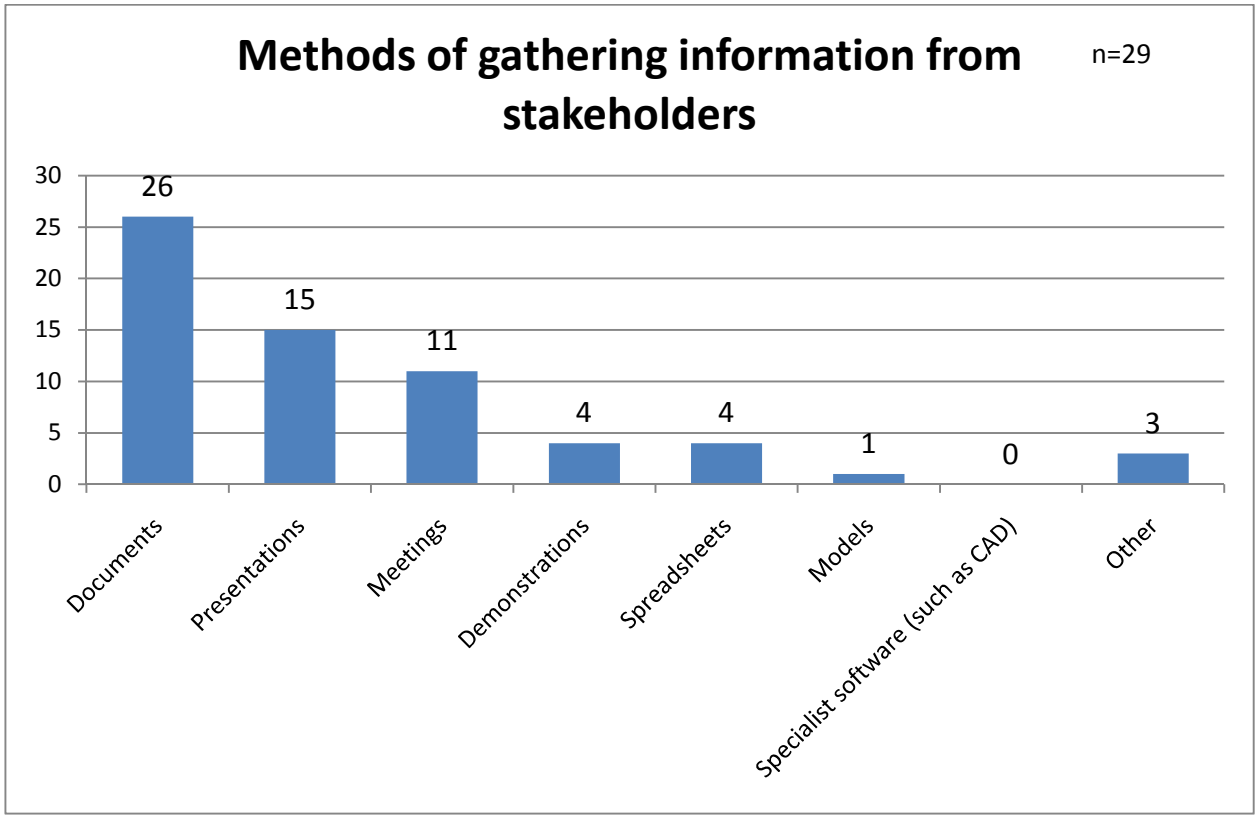

Figure 7: Methods of gathering information from stakeholders

Methods of organising input from stakeholders

Next we asked about the methods used to organise the information that has been gathered. This was a free text response, and the responses have been grouped under the following headings. As can be seen, a significant number of respondents use more than one method for organising their responses, but there is not a common pattern amongst the respondents. However, what is striking is the lack of correspondence between the methods used for presenting and gathering information with those used for organising the information gathered from stakeholders. In particular, only six of the respondents use documents to organise their input, and only two use models to organise their input despite 18 using models to present information. This disconnect between the use of models to present information and to organise information is surprising, and perhaps worrying. If modelling is not being used to capture and organise the information from users then what is it being used for?

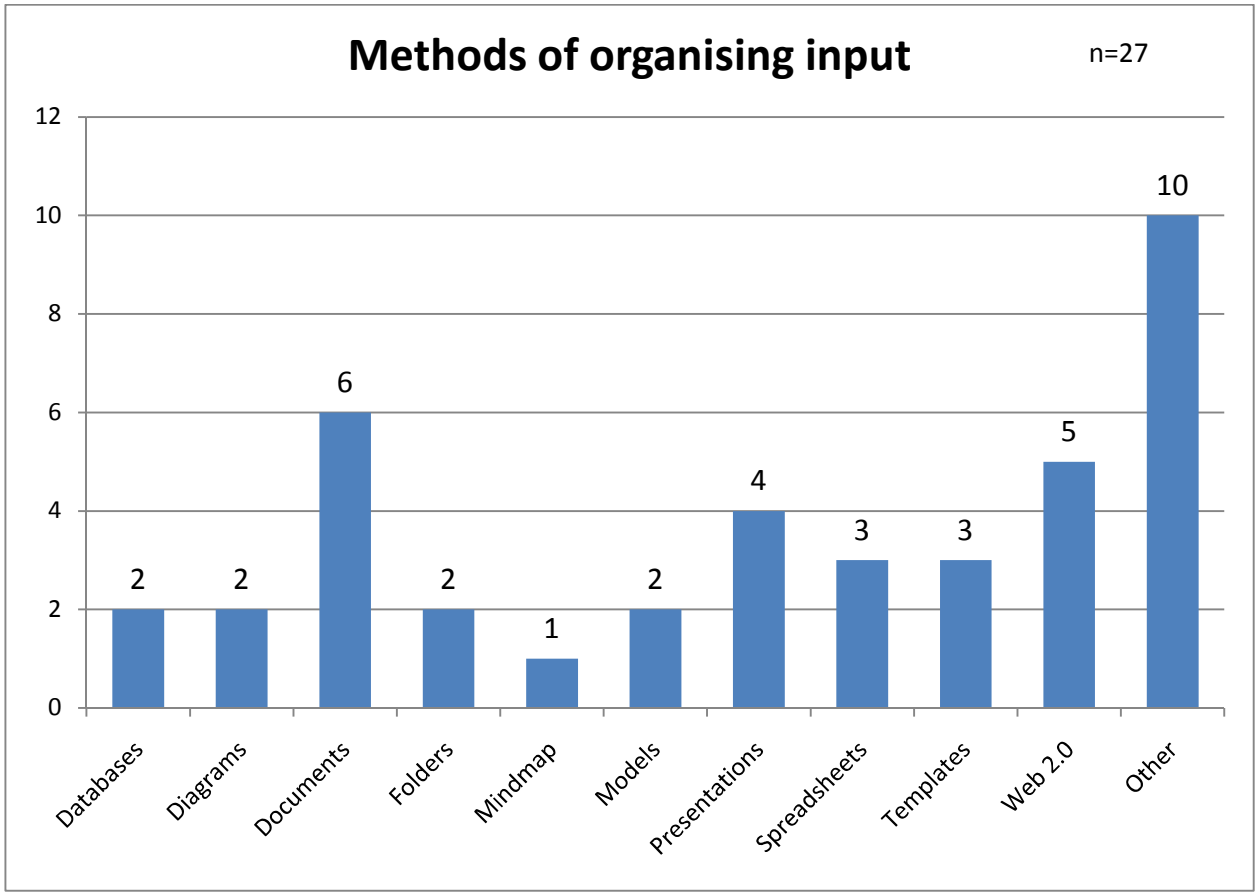

Figure 8: Methods of organising input from stakeholders

When it comes to exploring ideas with other people we asked people to select from paper sketches, online sketches, concept maps, mind maps and other. Maps (combing concept and mind maps) vie with paper sketches as the most popular methods for exploring ideas, though a couple of respondents mentioned that they use models. It is interesting to note the much greater use of relatively informal methods such as mind maps compared with the use of models with their greater semantic content.

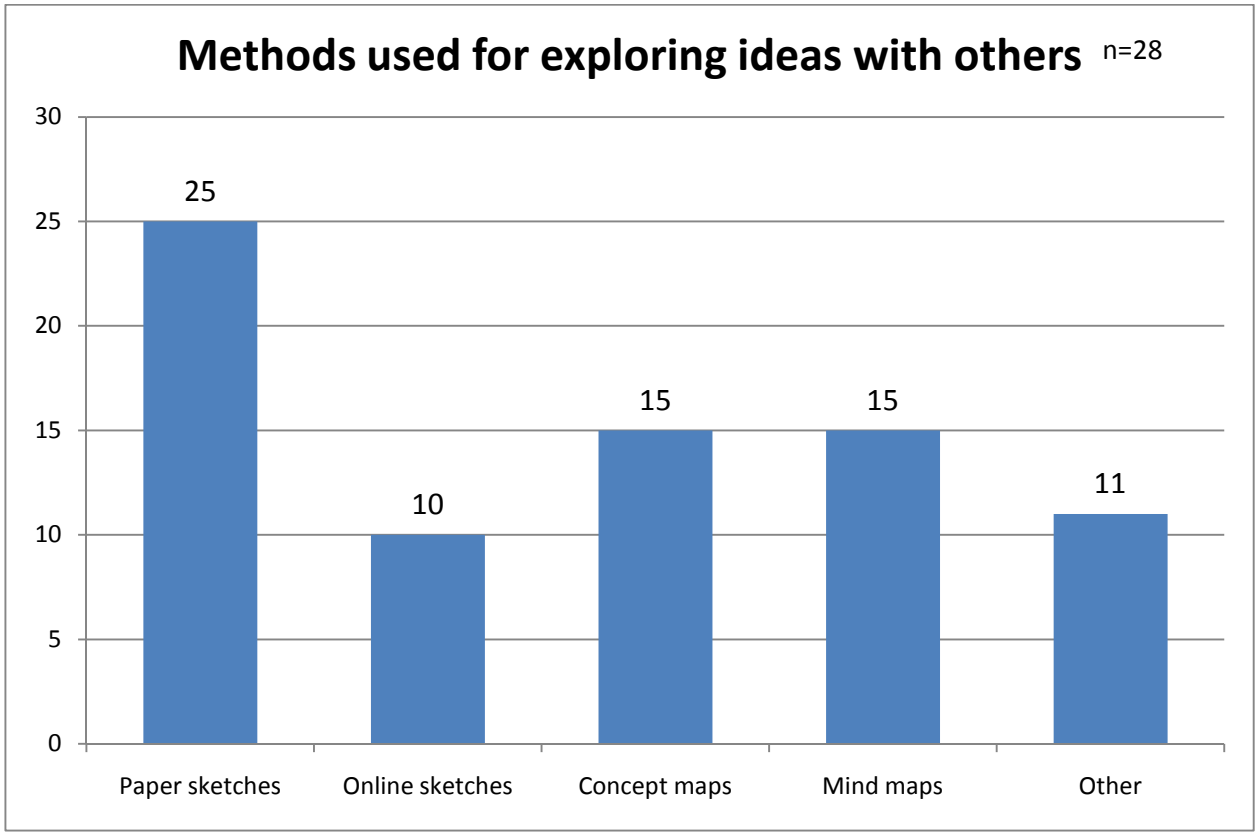

Figure 9: Methods used for exploring ideas with others

We also asked what diagramming tools people used, if they did use tools, and as can be seen a variety of tools are used, with the more informal tools such as PowerPoint and Visio being widely used and just over a third using modelling tools. It is also interesting to note that 28 of the 31 respondents said that they produce different diagrams for different audiences.

Producing different views of the same model is something where modelling tools can, of course, save much effort as they are designed to be able to produce multiple view, whereas with Powerpoint and Visio it is necessary to draw the different views as the tool has no understanding of the semantics of the model. This might be a fruitful area to look at why people are using the tools that they are using and what the benefits of alternatives might be. Are they currently using the optimal toolset for their needs? And if not what needs to change for them to do so? Is it a lack of awareness of the alternatives? A lack of available training in the tools and methods? Or something else?

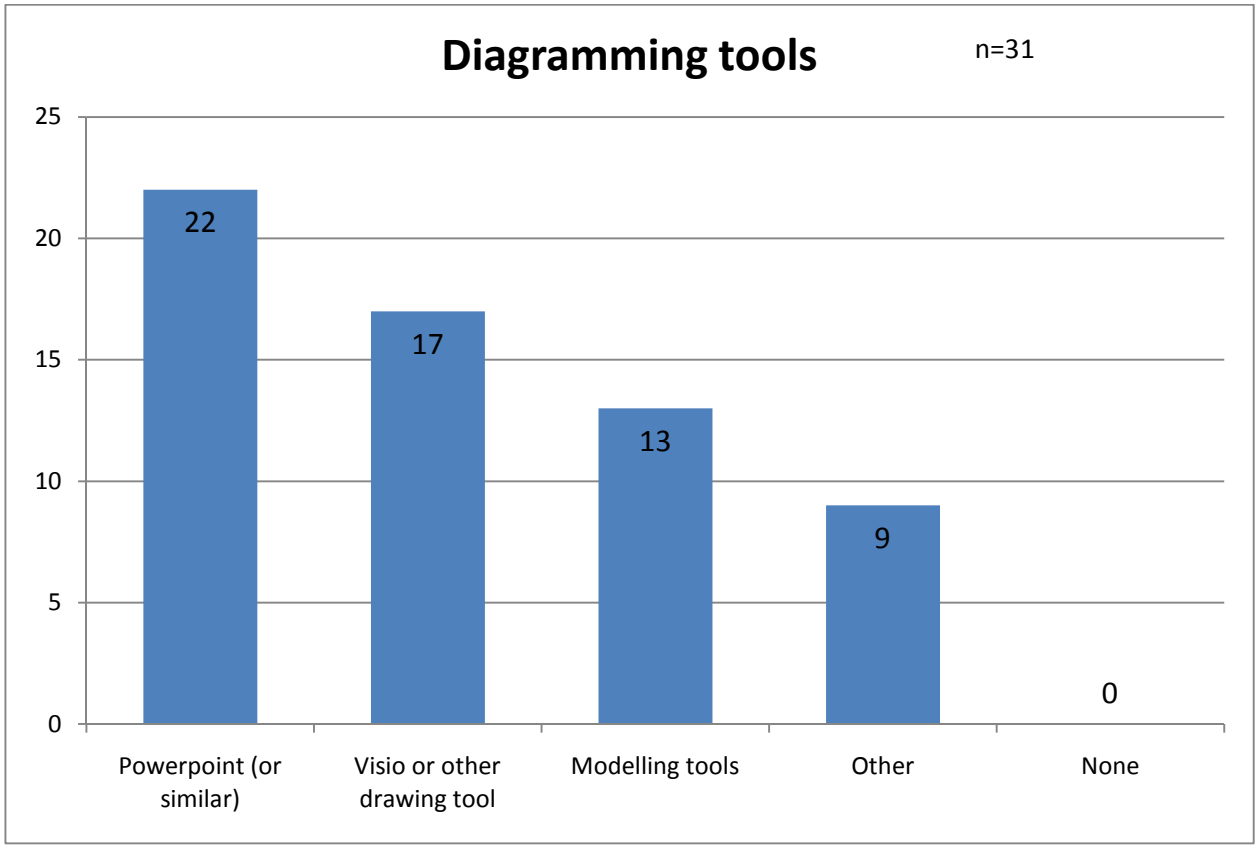

Figure 10: Diagramming tools used

Glossaries and definitions

In our experience it is not uncommon for different stakeholders to use similar or identical terms to mean potentially different things. We have therefore found it useful in our work to produce a glossary or set of definitions **for the project**. Even some of the most widely used terms may be used in very different ways. For instance, in a recent study of the induction process at one university it become clear that different people had radically different understanding of the term induction itself. For some it meant what happens during induction week, while for others it started as soon as someone applies to be a student, or accepts a place. For some it also covered much of the work in the first semester (or year) while students are being inducted into academic practices. Similar problems can be encountered with almost any term that is being used, hence the desirability of having a shared set of definitions for use in a project. Of course, having a shared set of definitions is not, by itself, enough. It will only be useful if people use it (or at least make clear where they are not using it), at least for the purposes of the project.

Given the importance of shared terms it is therefore perhaps surprising that nearly a quarter do not have a set of shared terms that they use as part of their project.

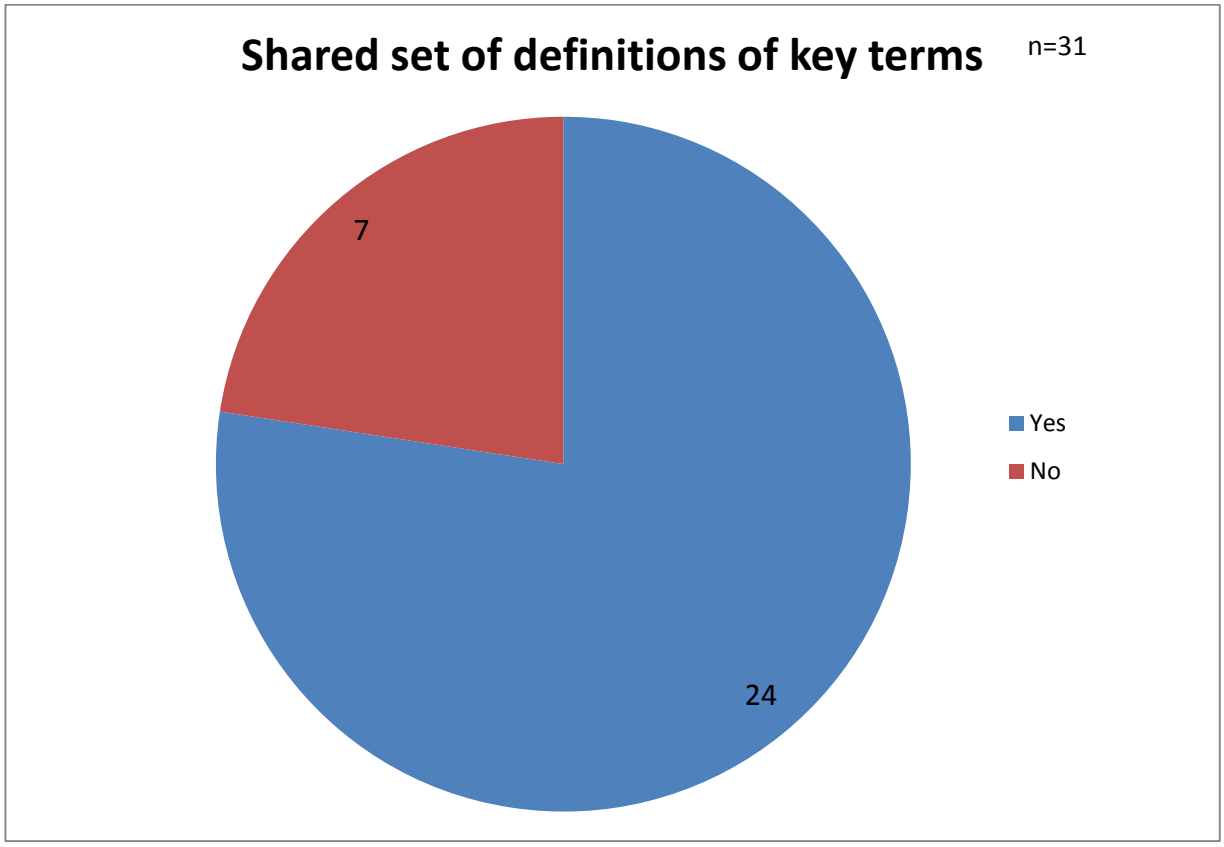

Figure 11: Frequency of use of shared set of definitions of key terms

Given the previous comments it is clear that terms need to be, as far as possible, those that are used by the community itself, thus it is, perhaps, not surprising that the majority of projects that produce sets of definitions primarily define their own. This does highlight one of the difficulties of sharing models between projects. If the same term may mean different things in different projects and different terms may be used for the same concept then it is difficult to create a shared understanding and to re-use models without going through each item in detail and checking what it means in each system. In this case it may be easier and quicker to start afresh rather than understand someone else's terminology and then translate it. It also suggests that it is extremely important to publish and glossaries alongside the models to aid understanding of the model.

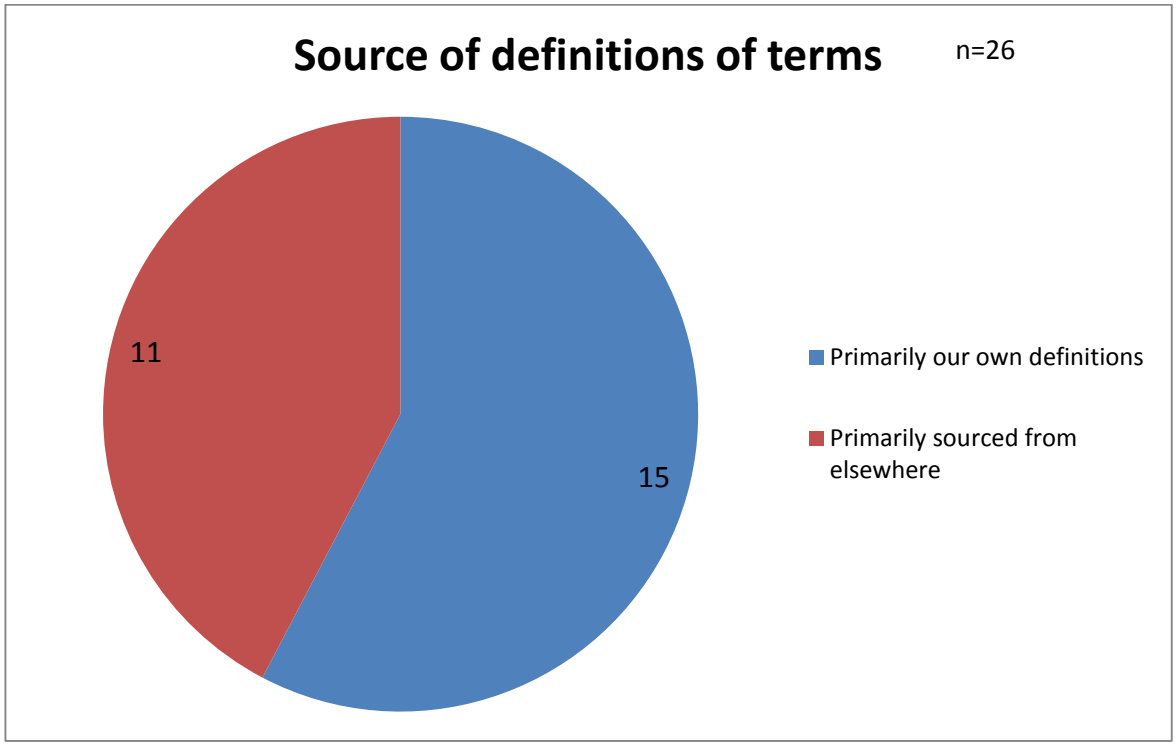

Figure 12: Frequency of re-use of definitions from elsewhere

For those that had used definitions from elsewhere a wide variety of different sources have been used, some to define the terms themselves (JISC themes and topics, Wikipedia) and some to define the structure into which those terms fit (Dublin Core, TOGAF).

Listed sources include:

- JISC themes and topics
- Dublin Core Metadata terms
- the data service (www.thedataservice.org)
- standards (British standards) and some TOGAF and IAF terminology
- publication from Elith et al, Guisan and Zimmerman
- Functional Requirements for Bibliographic Records (FRBR)
- Functional Requirement for Authority Data (FRAD)
- No specific glossary: just common usage of terms which are already understood by the community
- Not so much glossaries as using industry-accepted terminology
- e-Framework service genres; JISC Standards Catalogue
- Wikipedia; JISC; Google search.

Modelling expertise

Having looked at what respondents are doing in terms of producing models and sharing information with stakeholders it is time to turn to their expertise in modelling.

Analysis and design methods

Apart from Entity modelling none of the analysis and design methods are widely used, with most methods only have a couple of people who are either good at them or experts, and only five people who are expert in a method (two in entity modelling, one in RUP and one in agile methods and one in soft systems methodology). The others who reported themselves in experts in others stated:

- Various proprietary models based on recognised standards

- None
- Niche Models, Statistical Prediction Models
- I may have used some of the methods above, but not been formally introduced to them
- Systems failures

Figure 13 shows includes those who reported that they have no expertise in a particular technique, while Figure 14 excludes that group, and clearly shows that there is considerably more expertise in entity modelling than in all the other methods combined.

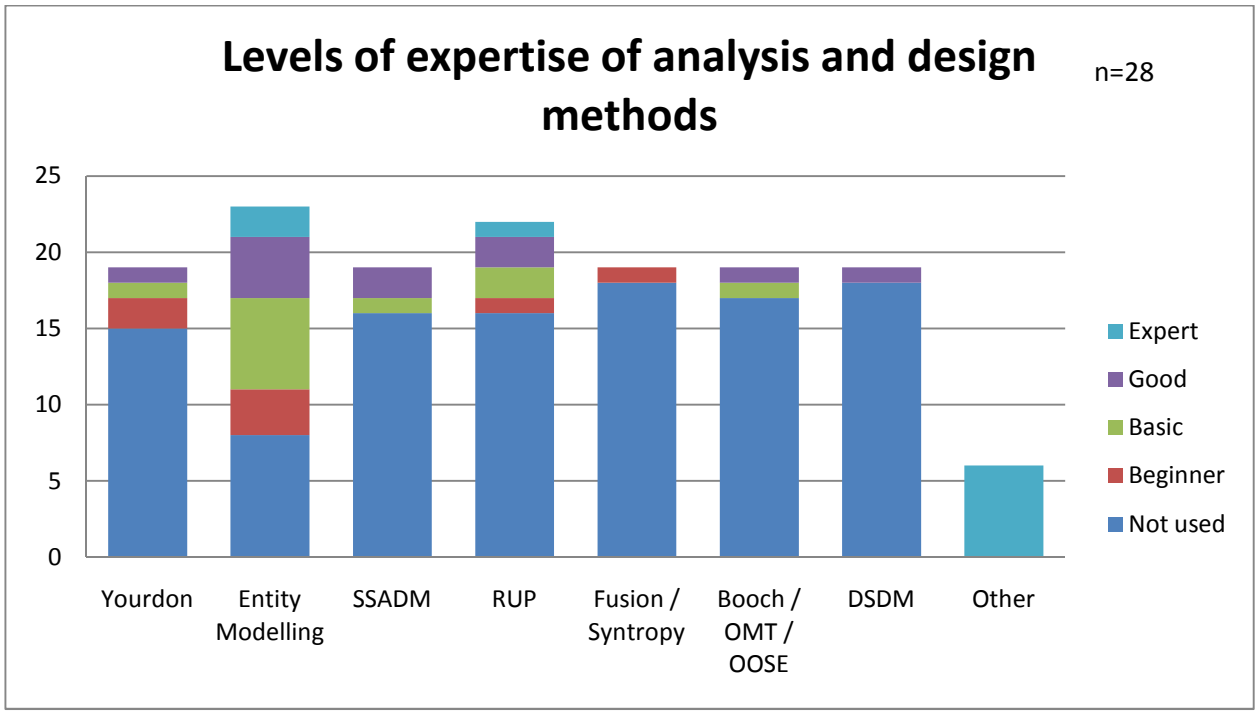

Figure 13: Expertise in modelling techniques

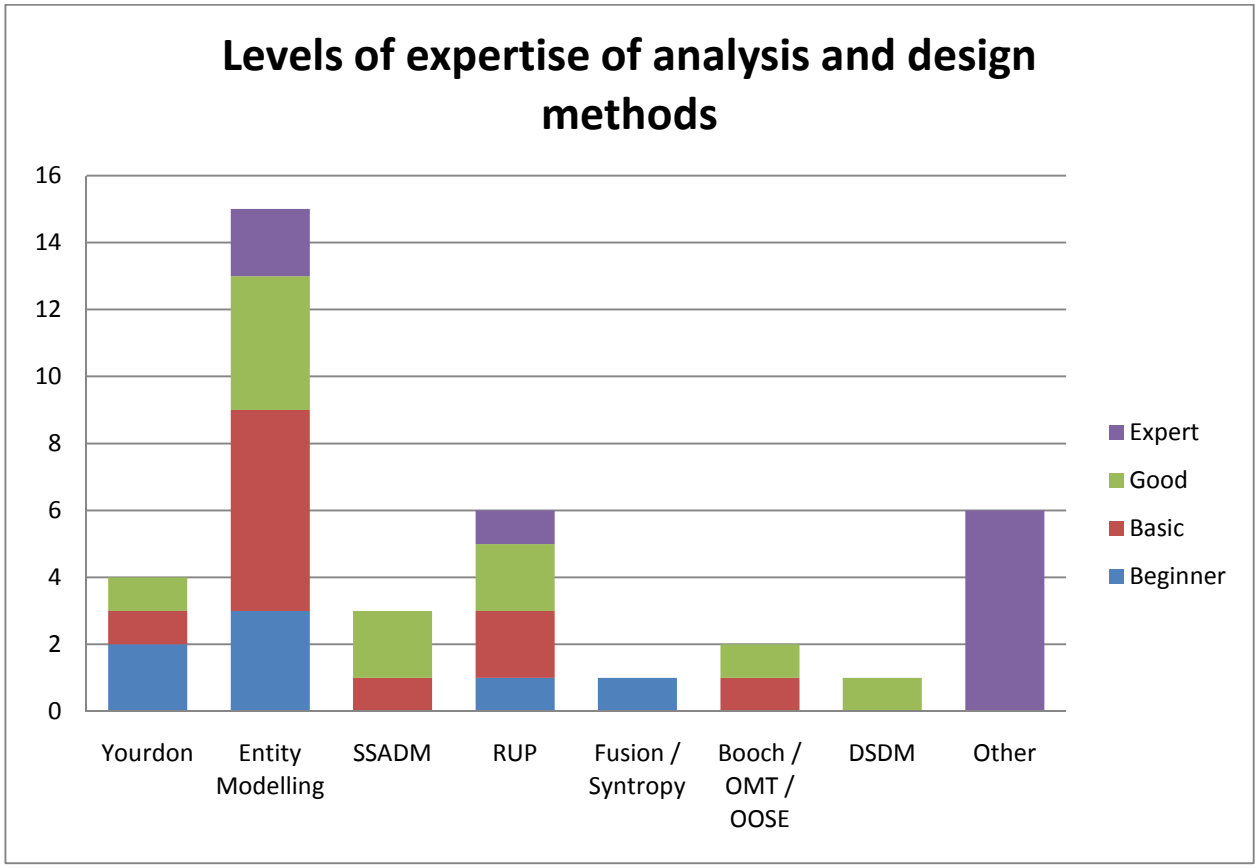

Figure 14: Level of expertise in modelling techniques excluding those not using the technique

Modelling methods

Interestingly, in comparison to the low levels of expertise in analysis and design methods there is a high level of reported expertise in a wide variety of modelling methods, with a clear majority of respondents having at least a good understanding of scenarios, use cases and process modelling, and a majority having at least a basic understanding of each of the techniques.

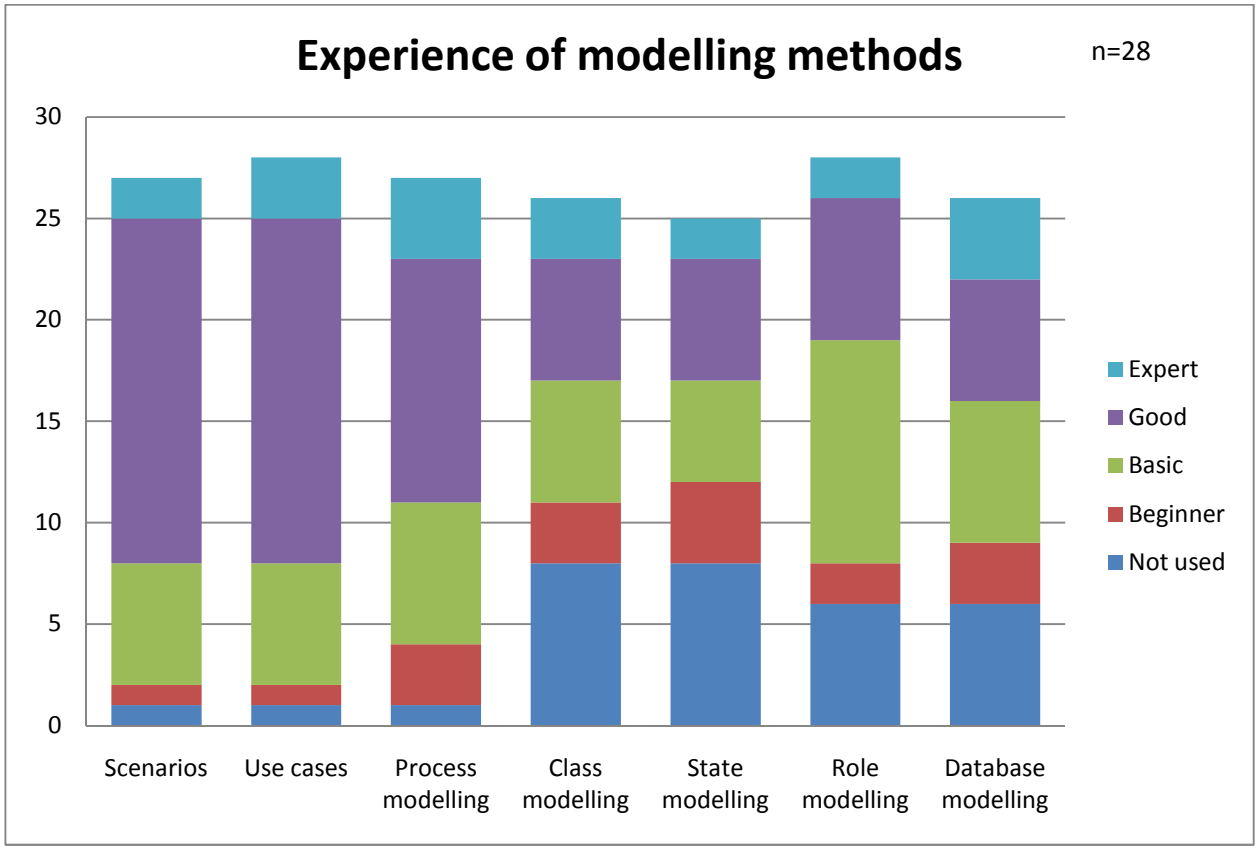

Figure 15: Expertise in modelling methods

Project outputs

Given the high level of modelling expertise amongst the respondents it is perhaps unsurprising that models are the most common output from the respondents. However, it should be noted that this is strong distinction to our analysis of previous JISC projects, where surprisingly few projects produced (as outputs) models of any description whatsoever.

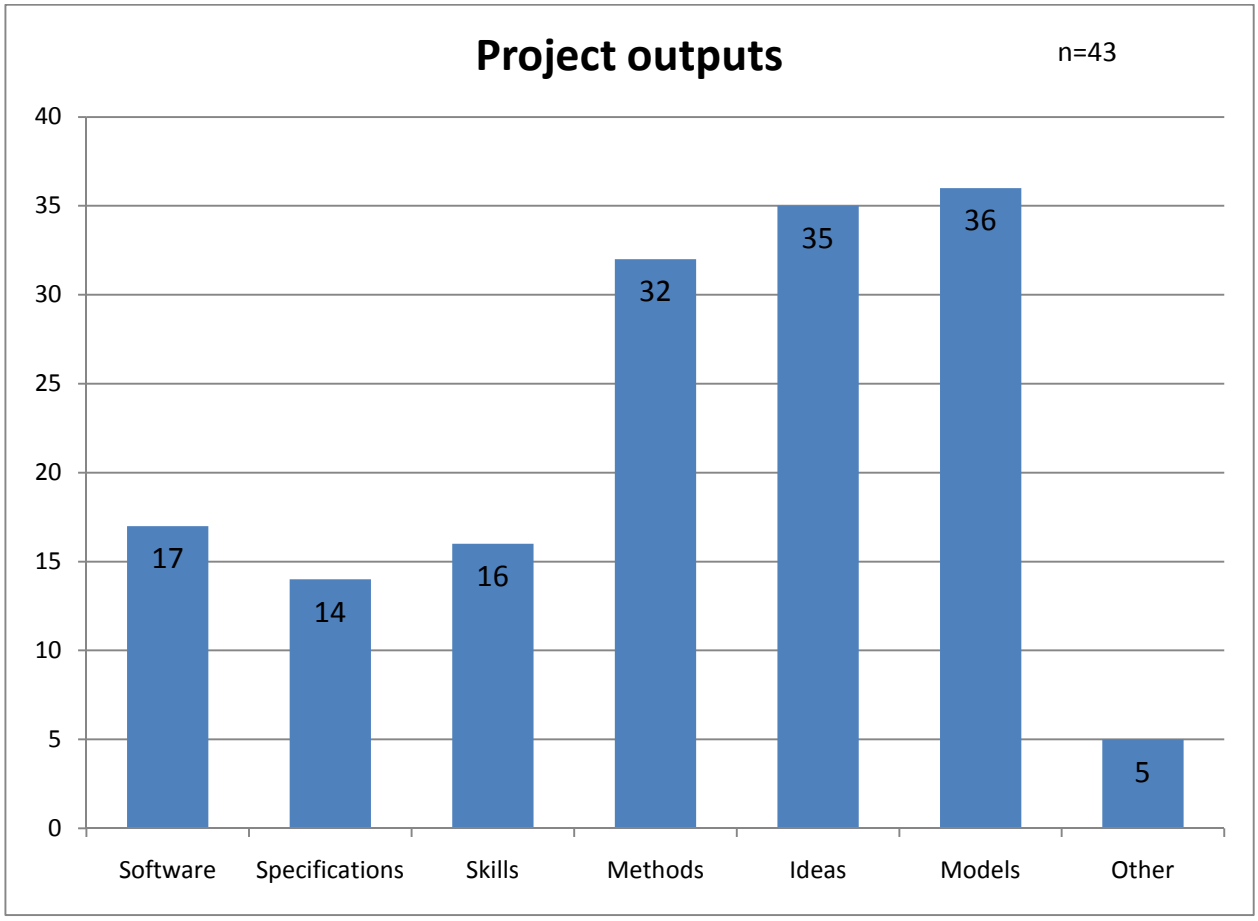

Figure 16: Project output types

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As can be seen a wide variety of different types of model are used varying from the informal (in text documents, diagrams, spreadsheets and presentations) through to more formal ones in UML or Archimate, though there is a dominance of informal models.

The projects that said that they would be using other formats than those listed will be producing outputs using:

- Databases, mind maps, concept maps
- statistical packages
- implemented ontology; FLex prototypes
- Mindmaps, Semantic Models
- GIS maps
- Software
- Online economic model
- Web application
- E-Framework templates and methodology

It is interesting to note the wide range of methods used for sharing models, ranging from the informal (text and diagrams) through methods for structuring models (concept maps) to more formal modelling methods such as Archimate, UML and BPMN.

Further, apart from the use of Web 2.0 technologies to engage with stakeholders (where only one of the respondents mentioned the use of Web 2.0) there is a close correlation between the outputs used and the methods for working with stakeholders.

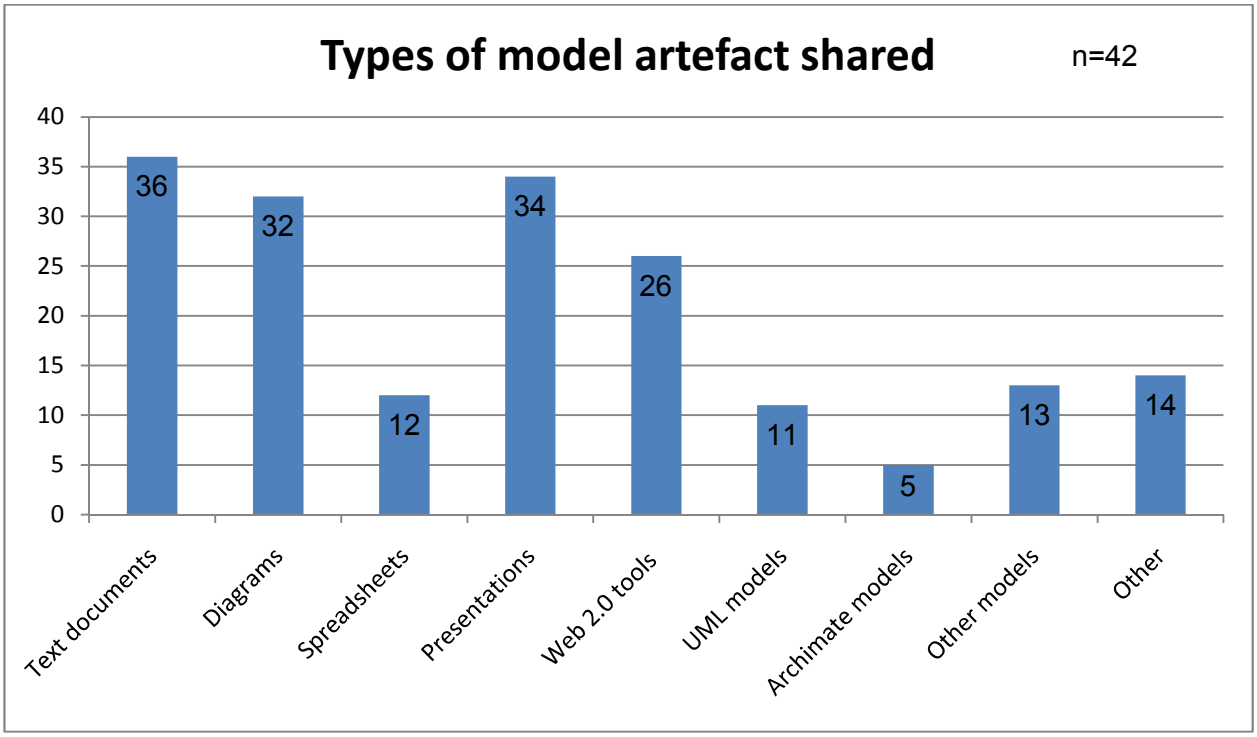

Figure 17: Types of model produced by projects

Conclusions

It is difficult to draw conclusions from the survey for a number of reasons. Firstly, the sample size is quite small, secondly other evidence would suggest that the respondents to the survey are very far from being a representative sample of the population and thirdly there is huge variance in the responses. However, there are still a number of conclusions that can be drawn.

It is clear that there is a reasonable amount of modelling occurring in the community, though there seems to be little pattern in what types of modelling is being undertaken. However, given JISC's sponsorship of the Flexible Service Delivery (FSD) Programme there is likely to be an increase in the use of enterprise architecture modelling (using Archimate).

However, given that there are no clear patterns in the use of modelling it is likely that sharing and re-suing of modelling is likely to be problematic. There is only limited use of UML or Archimate for publishing models at the moment, which leads to several problems for sharing models. Firstly, people are unlikely to find models that cover the domain that they are interested in. We saw earlier the huge range of different domains that this quite small sample of the population are working in, and this represents a tiny fraction of the work that is occurring in the community as a whole. With relatively few people publishing formal models (Archimate, UML, BPMN etc) the chance of finding a model that is relevant is low. Secondly, even if one finds an existing model it may well not be the type of model that the user is interested in (Enterprise Architecture models are of very limited use if what one is looking for is a process model).

Perhaps more worryingly is the low level of expertise in the community. Nearly all the people that responded to the questionnaire are producing models of one sort or another as outputs of their projects, but as Figure 15 shows with the exceptions of use cases and scenarios people have little expertise in the use of modelling. This would suggest that there is a need to develop the modelling capacity across the community.