

# **PLANNING & IMPLEMENTATION OF EFFECTIVE COLLABORATION WITHIN CONSTRUCTION**

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## **REQUIREMENTS CAPTURE REPORT**

### **- Needs for the PIECC Project**

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## Summary

*This document is the accumulation of work carried out in workpackage 2: Requirements Capture Survey of the PIECC project. The document summarises the needs of the industry for effective collaboration from interviews and questionnaires conducted by the authors.*

*The information is collated together, analysed and presented using the PIECC Project methodology. The document describes the key aspects of what industry deems the most important issues to consider in developing a protocol for the planning and implementation of effective collaboration in the construction sector. The document concludes with a summary of the key challenges faced in the future developments of the PIECC project.*

### Document Revision Sheet

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## **Abbreviations**

<b>PIECC</b>	Planning and Implementation of Effective Collaboration within Construction
<b>SSM</b>	Soft Systems Methodology
<b>UML</b>	Unified Modelling Language

## 1. Introduction

Requirements analysis centres on getting all users to identify needs, problems and expected benefits. The main deliverables are a statement of the functional requirement (sometimes referred to as the user specification or the requirements specification), and at least the outline of an acceptance test plan which will stand as the main reference point during the later stage of acceptance testing.

Historically, the process of requirements analysis has been ill defined, and fraught with difficulty and misunderstanding. Nowadays, it is subjected to the discipline of structured methods and is becoming better understood. It is very important to the success of the project, and must be seen as the area of greatest investment of time and effort.

In order to achieve the objectives of the PIECC project the following strategies and research methods were suggested as first thoughts:

1. Use of published sources – through an extensive literature review to establish current 'state-of-the-art' practice on collaborative working, both in the construction and other industries.
2. Field studies – these will be conducted to establish current practice for collaborative working within collaborating organisations. These field studies will include questionnaires, semi-structured interviews and detailed case studies within the collaborating organisations to identify the requirements for collaborative working and the key issues to be considered at organisational, project and users levels.
3. Using a 'develop-test-refine' strategy (action research) – to perfect the methodology for effective collaboration. This is appropriate since this project is concerned both with developing real-life solutions and furthering the goals of 'science'. Thus, the initial methodology will be developed, tested and refined to ensure that it is comprehensive and cost-effective.

This suggested methodology to determine the factors for effective collaboration will consider the organisational culture; project; process and users' requirements for the implementation of collaborative tools and techniques.

This means that both 'soft' (i.e. organisational and cultural) and 'hard' (i.e. technological) concepts and tools, will be adapted and combined to achieve the objectives of the PIECC project. This approach was proposed because lessons learnt from past research initiatives suggest that the combined approach of 'soft' and 'hard' is the most sensible approach to be adopted.

### 1.1 Summary of Methodology

The PIECC project aims to gather information from a number of unstructured and semi-structured interviews in each of the participating industrial organisations. We

aim to interview people from the policy making, implementation and use levels of collaboration tools and methods from each organisation.

The collection of data will be recorded and analysed using Checkland's (1981) SSM techniques. These results will be verified with the participating organisations. The analysis will provide the project with the needs and requirements for the development of policy, methods and tools to enable effective collaboration in the construction sector.

A graphical representation of the methodology is provided in Figure 1.

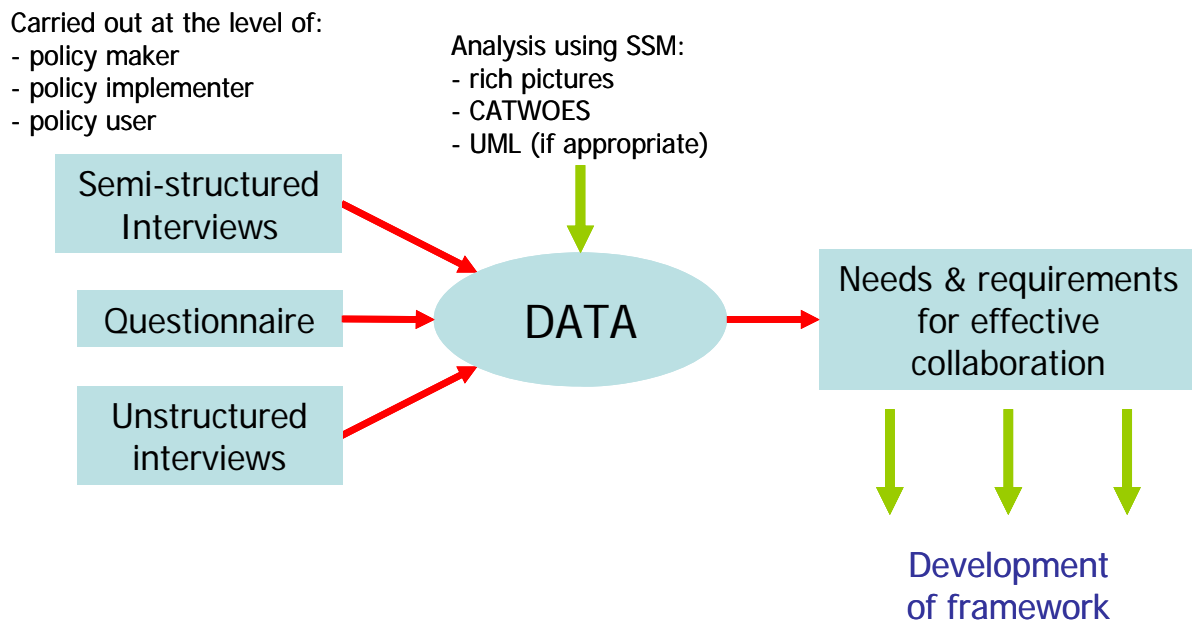


Figure 1: The PIECC projects' requirements capture methodology

## 2. Requirements for Effective Collaboration

To enable an organisation (or organisational unit) to 'effectively collaborate' there must be a harmonisation of three key strategic areas: business, people, and technology.

Usually collaboration enables participants to build up capacity to complete a set of tasks that one sole organisation would find difficult to achieve. The collaboration eliminates fragmentation, duplication and distrust. This is achieved by intelligently using available resources wisely, sharing the multiple project risk factors across multiple domains, and enhancing staff and organisational motivation. This can only be achieved 'effectively' by bringing together and aligning the three strategic areas of business, people and technology (see Figure 2).



Figure 2: Key areas for effective collaboration

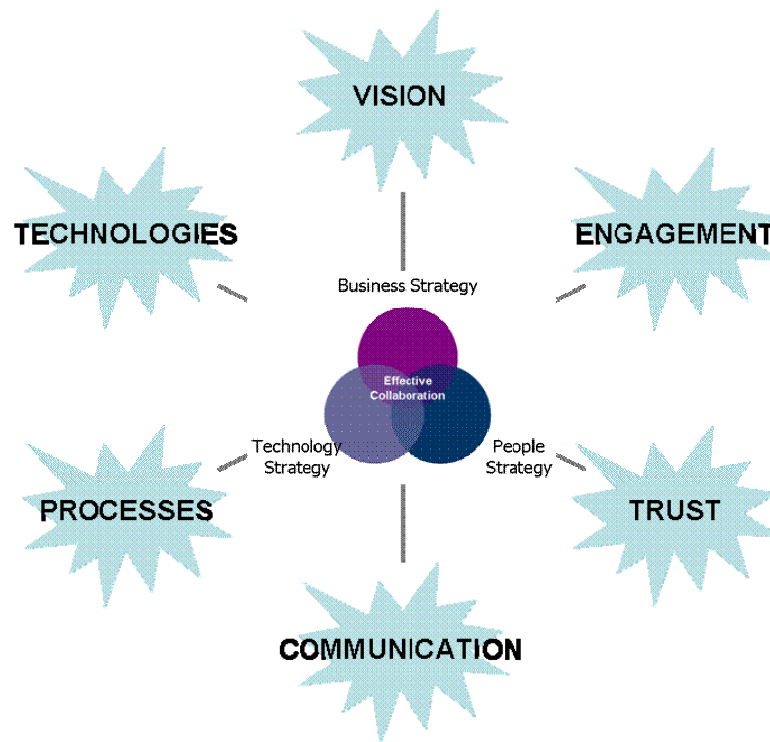
## 2.1 Key areas for collaboration

There are many factors that are likely to influence the success or failure of working collaboratively, many of which have already been discussed in this document. It is important to realise that no two collaborations will progress in exactly the same way or within the same time frame. Each collaboration must find a way to proceed that is consistent with its unique circumstances and composition.

There are 6 key areas that are deemed critical for effective collaboration in construction:

- **Vision** – all members of the collaboration agree on the collaborations aims and objectives;
- (Stakeholder) **Engagement** – collaboration leaders need to ensure that all key participants are consulted as to the practices to be employed during the collaboration;
- **Trust** – time and resources are needed to enable all participants to build trusting relationships;
- **Communication** – a common means of communication is decided by all key participants in the collaboration;
- **Processes** – both business and project, that describe to all key participants how the collaboration is to work on a day-to-day basis;
- **Technologies** – an agreement on those to be used to ensure the collaboration is easily implemented and maintained.





*Figure 3: Areas to be addressed in the strategies to enable effective collaboration*

All 6 areas need to be addressed in the three strategic areas described to have 'effective collaboration' in the organisation / project context. However, the strategies may be different depending on the context of the proposed collaboration. Differences exist in effective collaboration at the project and organisational level.

One of the aims of the requirements capture exercise was to determine the importance of each of these areas for a strategy for effective collaboration. A set of questions were devised to determine which, if any, of the strategies depicted in Figure 2 were of most importance to effective collaborative working. Other questions were devised to determine the importance of the 6 key areas (depicted in Figure 3) to working collaboratively. The results of these are discussed in section 2.2 and section 2.3 respectively.

## 2.2 Results from questionnaires

The PIECC project sent out (via partners, contacts and the project website) the developed questionnaire. For the first iteration of the needs and requirements document the PIECC project has thus far received responses from 16 people in 7 different organisations their views on collaborative working.

The aim of this section is to bring together information from these questionnaires and provide a summary of information found in some of the key questions asked within the questionnaire. One of the key questions asked was:

4.1 Please rank the following three areas in order of importance to effective collaboration

	Essential	Very important	Important	Not important
Business Processes & Procedures	[.....]	[.....]	[.....]	[.....]
Technology	[.....]	[.....]	[.....]	[.....]
People	[.....]	[.....]	[.....]	[.....]

The results of this question are depicted in Figure 4. Each of the options in *Question 4.1* was given a score. *Essential* was given 3, *Very important* 2, *Important* 1, *Not important* 0. This enabled the %s shown in Figure 4 to be worked out.

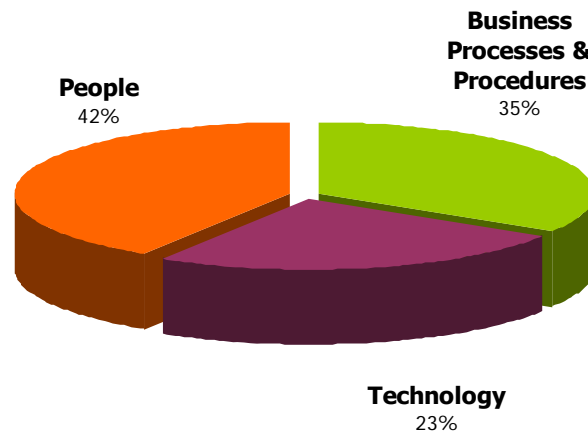


Figure 4: The importance of the 3 key strategies for effective collaboration

The results show that respondents believe that '*people*' are the most important aspect of a successful collaboration. This is followed by '*business processes & procedures*' and '*technology*' aspects respectively. This means that the focus of any developments of the PIECC project should concentrate on the people and process aspects of collaborative working. However, no study of collaborative working can exclude the technology. It is the intention of the PIECC project to highlight tools and techniques that allow technology to be used in collaborative working, and show how these technologies may be used in a supporting role of the processes and people aspects.

Another question to be asked was designed to determine the importance of the 6 key areas shown in Figure 3. The question was:

4.2 Research has shown that there are 6 critical success areas to ensure effective collaboration. Please rank the importance of these – (1 is highest, 6 the least, you may only use each number once).

A shared vision	[.....]
Engagement of stakeholders	[.....]
Building trusting relationships	[.....]
Good communication	[.....]
Clearly defined processes	[.....]
Well integrated technologies	[.....]

The users were asked to rank the success areas between 1 and 6, 1 being the most important down to 6 being the least. In order for a ranking to be made easily the results were scored from 6 for the most important down to 1. This is shown in Table 1 for clarification.

Importance score from questionnaire		Score for ranking purposes
<b>1</b>	~	<b>6</b>
<b>2</b>	~	<b>5</b>
<b>3</b>	~	<b>4</b>
<b>4</b>	~	<b>3</b>
<b>5</b>	~	<b>2</b>
<b>6</b>	~	<b>1</b>

Table 1: Clarification of scoring system for success areas question

The results for question 4.2 are shown in Figure 5.

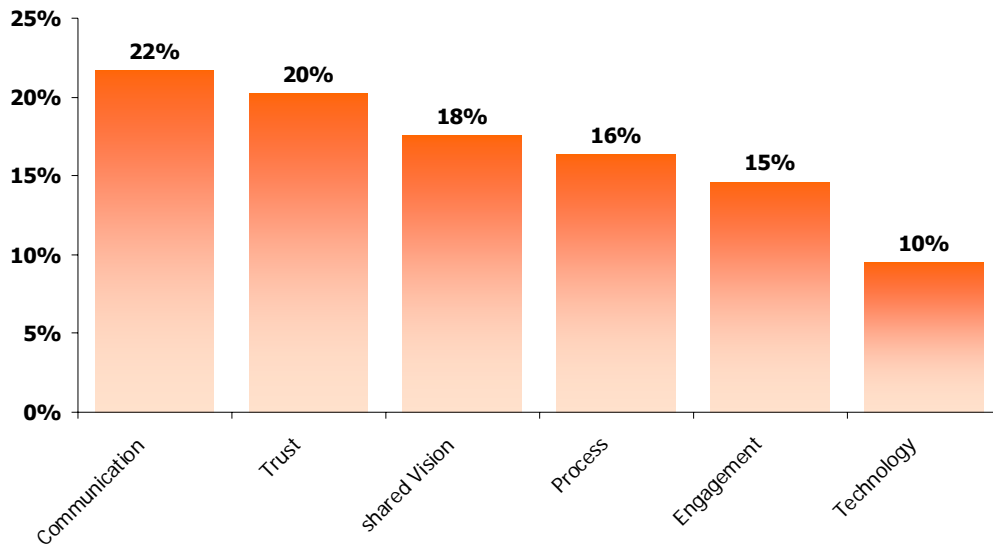


Figure 5: Graphical representation of the results to Question 4.2 of the PIECC questionnaire

### 2.2.1 Other results

Of the participants who have completed the questionnaire 81% of them have been part of a team who have been responsible for the planning and implementation of collaborative environments / projects. In this 81%, 77% of environments / projects had protocols available that described processes to aid in the planning and implementation of the project / environment, with 66% of participants finding such protocols useful. When asked "...do you think that such a protocol would aid the collaboration planning and implementation process..." 66% of respondents said they would, 7% said that they would not, and 27% did not know.

When asked what were essential contents of such a protocol, Figure 6 summarises the results in order of importance. Figure 6 tells us that all the aspects listed are important to the development of a methodology that enables the effective planning and implementation of collaborative working in the construction sector. However, there are a number of aspects (communication procedures; interoperability standards; building trust; a common vision and priorities; and engaging key stakeholders) are the aspects that really make a significant contribution to the success of planning and implementing effective collaboration. It is the intention of the PIECC project to provide a framework that brings together these aspects listed in Figure 6 in the next stages of the project.

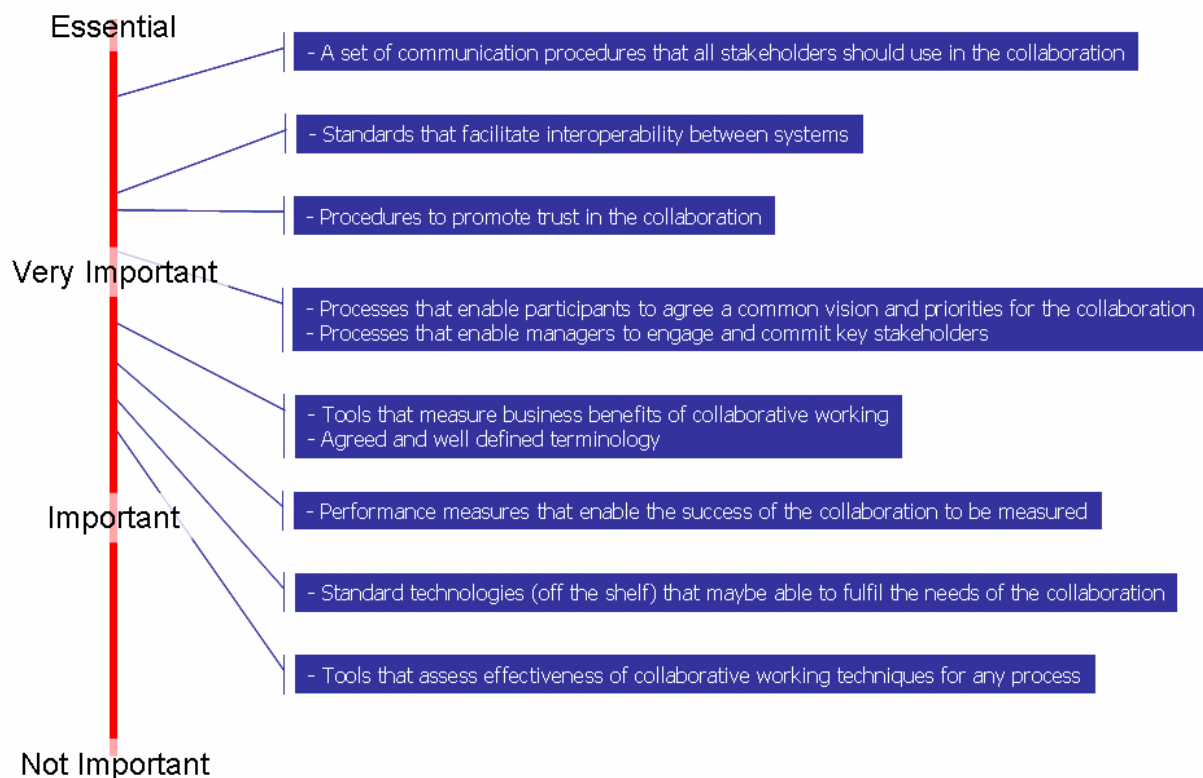


Figure 6: Importance of aspects of a collaborative working protocol

As well as completing the project questionnaire, pertinent questions were also asked in a number of interviews to determine the needs and wants of personnel working in

the construction industry. Much of what was said during these interviews complimented the answers given in the questionnaires. However, there were some issues that were not covered, and are described in section 2.3.

The PIECC project took the opportunity to determine which of the collaboration tools available to the construction industry was being used in projects. Figure 7 summarises these results. We can see that 'Asite' is the most commonly used with 'BIW' and '4projects' the next popular.

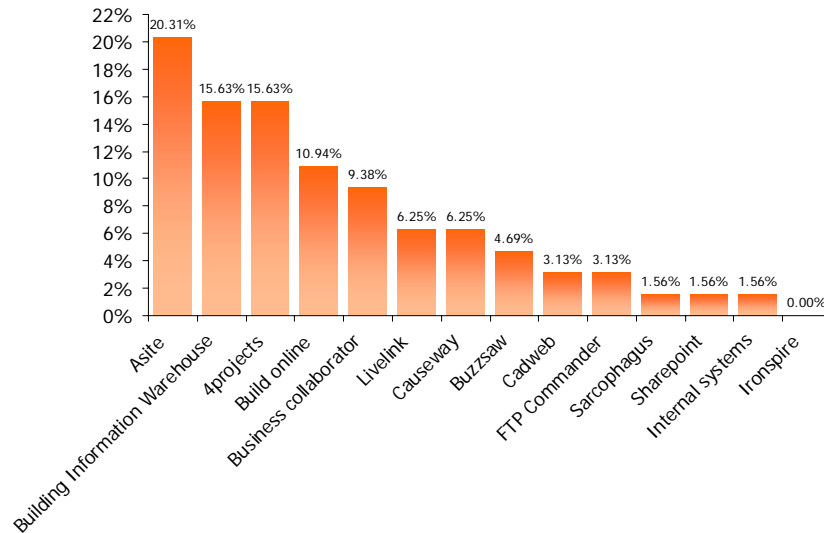


Figure 7: Results of the use of different collaboration software

The questionnaire also asked the respondents what were the key aspects for collaboration software / system. Figure 8 shows the results of this question.

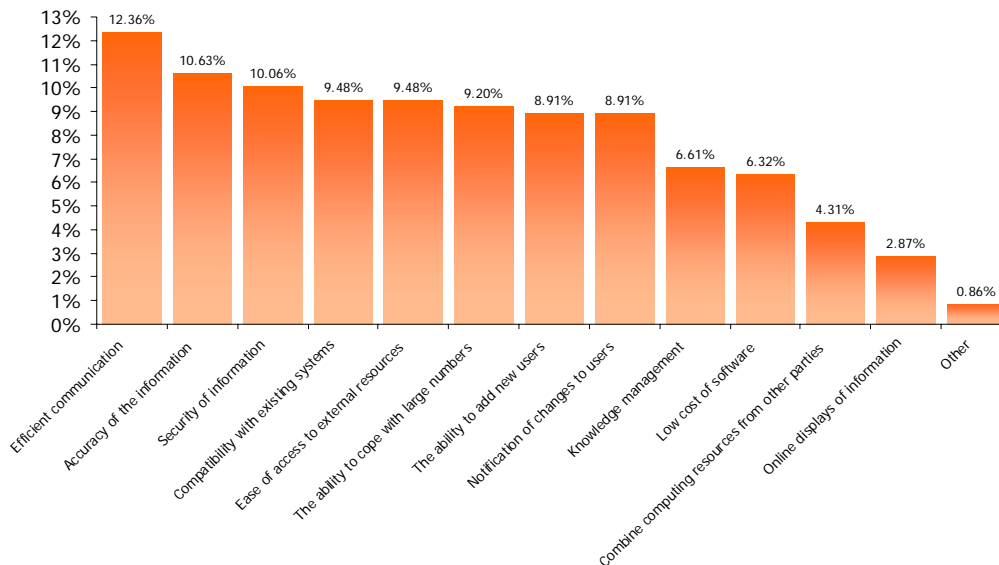


Figure 8: The most important aspects of collaboration software

Although the development of software to enable effective collaboration is way beyond the scope of the PIECC project it is important for the project team (PIECC) to realise what are the important aspects of collaboration software, and build procedures into the framework that can be addressed by collaboration software.

## 2.3 Results from interviews

Many of the different collaboration software that is available have failed to address the familiarity of the tools used by participants in the collaboration. Many lessons can be learnt from the Knowledge Management areas. It is desirable to have some form of "help template" that is available to new users of the tools. Once they are familiar with the tool, then this template disappears and does not bother the user in the future, unless requested by them. Respondents commented on "*...being frustrated with collaboration software...*". Evidence is needed to show those that are frustrated need not be in the future because of new developments in the planning and implementation of collaboration software and systems.

Respondents also voiced concerns about collaboration software adding an extra layer to communication amongst participants in a project. This has often led to a single person being employed to interface between the collaboration software and the design team to prevent time being added to the design phase of a project.

Any framework developed must address the issue of "*conflict resolution*" and the "*blame culture*" of the industry, i.e. it must prevent the "*shutters coming down*" as soon as any problems are identified in the workings of the collaborative environment / project. Information is needed to enable conflicts to be managed, and reduced to a minimum throughout the duration of the collaborative project / environment. The industry needs to work towards a culture of 'identification of the problem – address it – solve it – and then move on' rather than try and appoint blame for the problem and its associated ramifications.

Another issue raised by some respondents concerned contracts – i.e. traditional contracts have not allowed for collaborative working. There is a need for contracts that are different from traditional construction projects – they take into account long term relationships with clients and other project stakeholders, and should build upon the principles laid down in the Latham report. Initiatives from BE and their 'collaborative contract', the 'New Engineering Contract' and 'PPC 2000/3' are all seeking to address this need. However, take-up and evidence of successful use are still needed before widespread use in the industry is achieved. Other contractual aspects that need addressing include: payment mechanisms – the traditional methods are not appropriate for collaborative working.

It is worthy of note that although many of the respondents described their organisations working towards collaborative and strategic partnerships with their supply chains, there is actually little evidence of this actually being achieved. There are many reasons for this but one that was continually voiced in the interviews was a lack of contract that takes into account the new ways of working that working collaboratively now entails.

One issue that is beyond the scope of this project, but has been raised by a number of the interviewees concerns the "*ease of use of interfaces*". Respondents felt that the intuitiveness of these at this time means that much training is needed before project participants can use them. The actual layout of them also proves difficult with some respondents commenting that "*...there seems to be a lack of thinking by designers...*". Respondents would like to see simpler interfaces designed for project collaboration software.

Any developments made within research projects such as PIECC should be aiming to build upon aspects developed by the AVANTI programme. Nearly all interview participants stressed the importance of the work currently being undertaken by AVANTI and see the PIECC project as adding to this work.

A small number of respondents queried the inclusion of vision and engagement (of stakeholders) as part of a framework for effective collaborative working. Their view was that if people are already sat around 'the table' then the vision and stakeholders are already chosen. Why waste time choosing them? Why not get on with the project with who you have? A recognition that these issues exist and may need addressing, but they are not as significant as the processes and technology to be used in the project, and it is on these that participants should concentrate their efforts.

## 2.4 Summary of needs and requirements

The interviews and questionnaires have enabled a clear set of needs and requirements to be determined for the PIECC project. The captions below summarise the comments and questions provided by the industry (represented through the project partners and other key personnel) for a framework to plan and implement effective collaboration. They provide an overview of what is required to enable effective collaboration to be planned and implemented in a more productive manner in the future.

- *"...a recognisable model for collaborative working does not exist at this time – needs developing to enable a move forward..."*
- *"...processes that enable participants to agree a common vision and priorities for the collaboration – a route map for how the project is going to proceed, and must include suitable time for review of progress against vision and priorities..."*
- *"...standards that facilitate interoperability between different software and systems – we are fed up with learning a new system for every new project!!..."*
- *"...examples of good practice / case study material that shows tangible business benefits of collaborative working..."*

- *"...procedures to promote trust in the collaboration – a key person needs to be in charge, they provide leadership, leading (hopefully) to better performance of the team, to build trust within the team..."*
- *"...a set of communication procedures that all stakeholders should use in the collaboration..."*
- *"...intuitive interface design of software to reduce the requirement for training on new members of a collaborative project / environment..."*
- *"...suitable (and appropriate) help templates / screens for users to familiarise themselves with the software tools. They are removed when a level of competence is reached..."*
- *"...evidence of good practice of collaborative working to be published to alleviate frustration of the industry..."*
- *"...must build upon work being done in other aspects of collaborative working – the AVANTI programme for example..."*
- *"...clarification of professional liability of information generated is needed. Who is responsible for the information generated and its trustworthiness? A right balance between the technology and professional liability is the issue to building trust..."*

### 3. Conclusions

This deliverable has described the methodology for the capture of the needs and requirements from the UK construction industry for the planning and implementation of effective collaboration. Using this methodology the research team sent out the questionnaire to a number of industrial organisations to determine their needs. From these results a number of interviews were arranged to gain more detailed information from key individuals from the industry.

The results from these interviews and questionnaires were then analysed, reported on and summarised in the latter sections of this document. The results show a wide range of needs. Not all of them will be addressed specifically by the PIECC project. However it is the intention of the project to highlight information that may address these needs in the development of the framework on the PIECC project.



## **Acknowledgements**

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## **References**

Checkland, P. (1981) *Systems Thinking, Systems Practice*, Wiley, Chichester