

Major problems in renovation projects in Finland

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Abstract

Construction is a very complex process. It involves a multidisciplinary approach. There has been concern that construction projects are running behind schedule and many have failed resulting in a loss of money. It is important for construction industries to have a proper management structure that can co-ordinate the various sections of the project. The authors have been asked by the industry to identify the causes of the problems. Four renovation projects were chosen for our studies. There were successes and failures with these four projects. Data gathered consist of observations and interviews carried out with the four participants of these projects. The collected data were analysed to identify problems. In this paper, we describe our findings and point out the reasons why projects failed and what we believe could help to resolve some of the problems.

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1. Introduction

The processes involved in the construction industry are complex. For a project to be completed successfully, several different types of skills are needed. Architects, quantity surveyors, designers, contractors, sub-contractors, suppliers and engineers may use different means to convey the same information. However, all these different people must work together to get the work done successfully. Very often, these different people may work together for months or years. This is often a one-off project.

For projects to be completed on time and meet budgets, the different people involved in the projects require different knowledge and skills. There is a wealth of knowledge involved in a construction project.

The construction industry is facing many of the same problems as the software industry. The problems are that projects often run late and over budget. This often results in failure. Construction projects are among the most complicated of human enterprises. There is a high level

of skills and knowledge required to translate a client's version or list of requirements into plans and specifications and then into a real building that functions well for the people who will live or work there.

Besides the technical skills required in construction projects, it is also important to have people skills in order to coordinate the diverse efforts of the many people involved. There are inevitable problems encountered in the course of a construction project, such as unexpected additional work, defective work, delay, structural failure, cost overrun and accidents. Other problems include [1]:

- Inaccurate project financial rewards and reports.
- Overcharges and costly practices.
- Excessive requirements and scope management issues.
- Excessive charge order costs.
- Project funding not aligned with project plans.
- Government compliance issues.
- Inconsistent facilities-management processes.
- Non-user-friendly and inefficient project management systems.
- Occupant requirements unfulfilled.
- Claims and disputes.
- Uninsured property and casualty losses.

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This comes as no surprise because the construction projects involve interdisciplinary aspects consisting of Communication Sciences, Public Administration, Construction Engineering, Information sciences and Industrial Economics. People involved in the construction business have seen projects where costs have exceeded the budget, where the timetable has been drawn out causing disadvantages for the project and where the end results proved to be useless. The costs of these projects must be paid as capital expenditures or rents. Construction projects in Finland are no different from elsewhere. It can be said that one percent of these costs in the real estate business in Finland is of this kind. This means costs of more than 0.3 billion euros per year. Because of this, we have been asked by the construction industry in Finland to identify the problems and propose ways to resolve them.

In order to do this, we carried out studies on four renovation projects. Each of these projects had successes and failures. We analysed the loss of money incurred for one project. Extra costs, constituting 22% of the total costs, were divided into three groups. The first and smallest group consisted of normal extra work related to renovation projects. These were 2.7%. The second-largest group consisted of unexpected costs, which means the work that should have been done, but was not detected until during the project. These costs are related to the quality of project management. The third group of extra costs, 3.4%, included totally needless costs that indicate a complete lack of project management. This often involved the pulling down of finished buildings. When converting into monetary terms, it means a loss of 74,000 euros in this case. This is only one small example of the problems. Why did these projects fail? In subsequent sections of this paper we will identify the problems and attempt to give the reasons for them. Having identified the causes, we propose recommendations that can be used to solve these problems. We conclude with suggestions for further work.

2. Method

The research is qualitative aiming at illustrating the problems in construction projects. The paper is based on literature review and four case studies in public construction projects in Finland, in three towns. The number of inhabitants in these towns varies between 23,000 and 185,000. The four construction projects we have been studying were:

- Renovation of a school that had mould problems, total area 7000 m² and budget 4,000,000 euros. The project was started in 1997 and ended in 2002. The project exceeded its budget by 22% and several things had to be excluded from the initial plan. A total of 21 persons were interviewed.
- Renovation and partly new construction of a school that had mould problems, total area 3000 m² and budget 27,000,000 euros. The project was started on 1998 and

ended 2005. The project did not exceed its budget but the deadline half a year late and several things were left out of the project. A total of 16 persons were interviewed.

- Hospital for senior citizens, renovation of a nursing home, total area 7000 m² and budget 5,700,000 euros. The project was started in 1996 and is still going on. Budget overruns were about 10%. A total of 24 people were interviewed.
- University project, 24,000 m² and alteration of an old factory into a university and partly new construction. The project was started 1997 and was finished in 2004. There was major problems in defining the state of the building and due to this the budget was exceeded. The construction company faced serious difficulties as it was running the project. A total of 16 persons were interviewed.

Theme interviews and observations were used as means to collect information. Documents from drawings and memos were also used. The problems identified and suggestions for improvements were joint decisions made by the authors and participants. The interviewees were the owner representatives, architect and also the other designers in some projects, two representatives of contractors and also site workers in the university project. The theme questions were:

1. What are the phases of the project? How do you participate in each phase?
2. How do you participate in this process?
 - What kind of forms of participation did there exist?
 - How were the design meetings organised?
 - How were the site meetings organised?
 - What kind of other meetings did you have?
3. Who are the main information brokers in each phase?
 - Who is the most important person who delivers information?
4. What kind of successes and challenges have you experienced?
 - What kind of information reaches you best?
 - What kind of information does not reach you?
 - With whom is it easiest to exchange knowledge?
 - What kind of challenges is the greatest?
5. Information and knowledge in a construction project
 - Channels of information (meetings, phones, emails, drawings)
 - Why do you use the information channels you utilise?
 - What kind of IT tools do you use or not use?
 - Do you have problems with IT tools?
 - How should IT tools be improved so that you would start to utilise them?
6. Other:
 - How has construction changed during time?
 - How has the flow of information changed?
 - What kind of problem is typical today?

3. Problems identified

From our analysis and studies, we have identified several common problems in all projects.

- *Lack of decision-making process:* Parties do not know who is responsible and who takes care of what—especially the role of the end user. That has caused problems in decision making. Some roles are well defined like the main designer or the Construction Company. The project documents are written in a precise way. There is a problem when it comes to cooperation between professionals since they come from different organisations and there is little trust between the parties. Many felt it is better to keep quiet about their real problems in order to protect their organisations. Another discovery we made during our observations was that there was no planning or discussion taking place with respect to important decisions that have to be made. Someone from the meeting would suggest solutions to the problems identified; every one would accept the suggested solutions as the decision to be taken.

On many occasions the decisions chosen would appear to be unsound. However, no one would challenge them. It was only after the solution was found to be unworkable that it had to be abandoned. By then many resources and time would have been wasted on it. The reason why a decision cannot be made depends on the process of decision making itself. The difficulty in making decisions is generally attributed to obtaining the information on which the decision is based, being certain that the data used to determine the decision were correct, that it was in the correct order of importance. Not all the needed data were available at the time.

- *Lack of time for planning:* Shortening time to complete tasks or marketing a product has been one of the most critical factors to the success of a business in many industries. As a result, companies have sought methods that can ensure a faster product development. Most industries focus on product cycle time reduction through concurrent development. Construction projects are not an exception. There has been increasing pressure from clients to fast-track construction projects. However, when a project is fast-tracked without proper planning, it can lead to failure or delay of the project. Since construction has a physical manifestation, a construction rework is normally perceived to have a larger impact than change. As a result, construction projects tend to avoid rework on problematic tasks by changing the scope of the work, especially under time constraints. There was not enough time and other resources used in the planning stage. A considerable amount of time was used in the planning stage to change the plans and cut down the costs to keep the project within the budget. However, many of these shelved plans had to be reinstated during the implementation phase.

- *Difficulty in updating regulations:* To protect public safety and welfare, legislators and various government agencies periodically issue regulations that influence the construction process, the operation of constructional facilities and their disposal. In the construction industry, there are regulations on how things should be built and authorities are controlling how things are done. The construction professionals need to know several rules—they also have difficulties in remaining up to date about all the new rules. The construction field is also a rather conservative field. New ideas are discussed long before they are used. Even asking what the end user wants is sometimes seen as risky because it may create higher expectations and can increase the costs.

The threat of litigation regarding construction defects makes it important for parties in the construction projects to keep abreast of new regulations and laws and to comply with them. In reality it is very difficult to keep up to date with knowledge of new construction techniques on the part of the architect and engineering professionals in a busy dynamic world.

- *Users do not know what they need:* Each project in the construction industry is unique. Users have different needs that must be made known to the designers. However, in reality, users seldom know what they need, making it difficult for designers to specify what users need. In addition, the timespan from the first need specification to realisation of the project is often very long, 5–10 years, in public construction projects. The success of the project depends on getting the users' needs identified. If users have no idea of what they need, it is very difficult to plan in advance what to do in the project.
- *Lack of trust:* Trust is vital in a construction project, as many people from different organisations work together. The ability to rely on people to do what they say they are going to do impacts everybody and the way they work. Trust is about reducing risks and uncertainty through better communication [2]. There is generally a lack of trust present in construction projects. It is very difficult for members of the project to obtain information from another person. It would appear that no one seems to be willing to share information and pass it on. Some members of the project have actually failed to understand the language used in the construction activities. Many of them found it difficult to accept a viewpoint different from their own, making it impossible to discuss alternative solutions.
- *Lack of risk assessment:* Projects frequently start without proper planning or risk assessment being taken into consideration. It is taken for granted that projects have been well planned and it is known in advance how much the deadline may overrun or cost increase or exceptional events that may occur. Because of the complexities involved in a construction project, there are always risks involved. Construction projects possess more risks than other industries. The risk factors in construction

projects include: labour disputes, poor financial controls, bad weather, faulty design, cost overruns, quality problems and even natural disasters [1].

- *Failure to learn from successful projects:* It is generally acknowledged that much of the knowledge of construction companies resides in the minds of the individuals working within the domain. Although a project has been completed successfully, it is rare that the intent behind the decisions is recorded or documented. This is hardly surprising, given that it requires complex processes to track and record the thousands of ad hoc messages, memos, conversations and phone calls that comprise much of the information.

Another problem is that data are not managed as it is created. Instead it is only captured and archived at the end of the construction. The people who have the knowledge about the project have most probably left by this time, making it impossible to retain the required knowledge.

It would be good to have some way of finding what worked and what failed. However, there is no record of any past case studies or lessons learned that the designer or the participants can refer to in their work.

- *Resistance to use of IT:* Recently new technologies have been used to support construction projects. Computer aids have improved the capabilities of generating quality designs as well as reducing the time to produce alternative designs. The most dramatic new technology in the construction industry is that of the Internet and Corporate Intranet. The Internet has been used as a means of faster collaboration among professionals on a project, to communicate for bids and results, to procure necessary goods and services. This should ideally result in more effective collaboration, communication and procurement. Although construction quality and cost can be improved with the adoption of new technologies which have been proven to be efficient from both the viewpoints of performance and economy, many of the participants in the project were very suspicious of the use of technology to support the project. Some even refused to use emails.
- *Lack of change management:* Change affects all forms of human activity and construction projects are no exception. Change happens all the time in construction. Many projects are conceived, designed and planned many months or years before they are constructed. No one can predict what would happen in the months and years ahead, no matter how well the project is originally thought out. When change is required in construction projects, it involves many different people: architects, engineers, surveyors, contractors, sub-contractors and suppliers and so on. Changes must be properly managed in construction projects; otherwise, missed dates and claims for damages will inevitably follow. Change is a risk. It is important that the risk of change is borne by those best able to manage that risk. There are inevitable changes that may be made in a project. In all cases, we found that there was no facility

for participants to handle changes. Although changes needed to be made, the information is seldom passed on to those who should have it. This creates resentment among people because they do not know what is happening. Even though they receive the information about the changes, often they are not told why changes were made or necessary.

4. Proposed improvements

As can be seen, there are various issues that affect the construction projects making them fail to reach their targets. Are there ways of alleviating these problems? We will attempt to recommend solutions to address some of the above-mentioned problems. Each of these will be briefly reviewed.

4.1. Building trust

The construction industry has a bad reputation. Poor relationships between the client, main contractor and sub-contractors lead to problems that affect cost, quality and time, as well as damaging relationships between all parties involved.

According to [3], trust is a major factor leading to the success or failure of construction projects. The National Audit Office highlighted the importance of trust in their report, “Modernising Construction” [4]. These initiatives will only bring about improvements if there is substantial commitment across the whole industry to bring about change built on mutual trust between client departments and construction firms, and a common appreciation of the respective priorities. Both integrity-based and benevolence-based trust are important. Integrity-based trust is the perception that another party is honest and reliable. It is about having a relationship, not just doing business. It is generally acknowledged that people build trust by working together on projects. Owing to the temporary and short-term-based nature of construction projects, it is difficult for people to build successful relationships. When there is a trusting relationship among team members, individuals can be flexible and may respond to changes of information. This is important in construction projects because information may be incomplete at the time of the contract and changes are inevitable as the project progresses.

Trust is built in a project when teams can move away from a ‘blame culture’ to a problem-solving culture. Building trust begins with creating a shared sense of commitment across the group. For each member of the group to have a shared sense of commitment there requires a sense of community (SOC) within the group is required. That is, a feeling that members belong to the group and matter to one another, and a shared faith that members’ needs will be met through their commitment to be together [5]. According to [6], where SOC is stronger, participation in sharing will be greater.

Organisations should be aware that their reputations as trustworthy companies are an asset. According to [2] it gives an individual who works for them a head start in project teams. It also means that other organisations are likely to form long-term relationships with them.

4.1.1. Benefits of trust in construction

There are many benefits when there is trust in organisations, especially in construction. [2] suggested the following benefits when there is trust in construction organisations:

- Uncertainty of outcome is reduced. Because the construction industry faces more uncertainty than other industries, trust is important to deal with uncertainties. As there are always changes in information, or new information being discovered that can have an impact on the way work is carried out, it is vital that team members produce information that is clear and accurate and other members can rely on. This helps to reduce uncertainty. When people have worked together for a while and have solved problems, they begin to trust each other. If problems arise, they know that they can rely on each other to handle them properly.
- Risks are reduced when people worked well together on projects. Where there is uncertainty, there is risk. Risks are also reduced when outcomes can be effectively ascertained. Cost is reduced when there is an understanding of risk. This means that there is a financial benefit when there is a trusting approach.
- A more flexible approach exists. Because there is honesty and trust among team members, it aids problem solving in projects.
- There is saving of time and money. The main benefit of having trusting relationships is that it produces profit, that is, it saves time and money in carrying out construction projects. It is important for people in construction projects to engage in trusting relationships because it can help the organisations to reduce the uncertainty, improve risk management and increase flexibility. A trusting behaviour removes costs brought about by poor communications and adversarial approaches to problem. The results of these problems could end in expensive litigation.

4.1.2. How to build trust among team members in construction projects

- *Be honest in communication:* Communication is vital to building relationships in trust. It is important that people be open, willing to share important information with the rest of the team, as well as being honest, giving information that will reflect the real situation. If an individual makes a decision, it should be ensured that he/she stands by it. It is important that people give information when it is needed. Clear communication is required in construction projects to enable people to be more effective in putting across their requirements for one another in order to have better delivery.

If there are unusual circumstances cropping up, it is essential to make people aware of the problems in order to minimise the impact. A successful and trusting project team has fair and free access to enable communication between all the parties, where people can communicate without fear of their messages becoming distorted [2]. It is very important to maintain communication between the different parties and team members. Communication is essential when dealing with conflicts. Conflicts can be used to build or destroy trust. Communication provides a means of finding a solution to the problem.

- *Be reliable:* It should be ensured that the individual who makes the promises keeps them. This may be very small things, like agreeing to meet someone somewhere—it is important to turn up on time. This helps to build relationships. Construction projects need this kind of trust because in complex projects there are many specialist trades. Not everyone has the expertise to understand what is being done, so there is a need to rely on that person's experience.
 - *Integrity of organisation:* The role of the organisation's reputation is important. People have often said that they trust individuals more than the organisations. Organisations should have integrity, especially in construction. Construction is generally considered a small world where people often work with the same people on many different projects over many years, which is how organisations build reputations. This has an impact on whether people trust them enough to work with them on projects. It is important for companies to maintain their reputations, because they are an important asset in construction.
- Besides inter-organisational trust, there should be intra-organisational trust too. According to [2], effective teams are built when people have the authority to make decisions and the information that they are passing between one another is honest and accurate. Organisations must trust their own people in order to build relationships with other organisations.
- *Experience is important:* People build relationships by working together. Repeated fulfilment of communications through actions and outcome create trust. There will be trust if people consistently prove that they are reliable. Having experience of working with people who are trustworthy can build trust in teams.
 - *Problem solving:* It is important for project teams to solve problems together. Problem solving to mutual satisfaction is easier when project teams trust each other [2]. Solving problems at the point of the problems is an important factor in building trust.
 - *Shared goals:* It is vital in construction for everyone in the projects to have shared goals. This means that everyone can be seen to be fulfilling a joint task, rather than viewing their own role as separate from the rest of the project team. There should also be mutual understanding between members of the team.

- *Reciprocal behaviour is important*: When someone does a good turn for another person, it is important to return the favour. This helps to build trust among team members.
- *Commitment*: Commitment is essential if the project is to succeed. Team members should be committed to the project. There are different ways that can be used to encourage commitment by members of the team. These include compliance, identification and internalisation [7]. When behaviour is a result of incentives, rewards or punishments, the members may not necessarily appreciate or understand the value of the desired behaviour. Although compliance may enable people to carry out the tasks, there is little confidence to build trust among members. Commitment by identification is behaviour that results from the need for acceptance among peers and managers, based on such recognition. This may help in some way towards the building of trust, but some people may not want to be recognised or respected. Internalisation of values, rather than focus on extrinsic rewards or social references, is the best way to promote commitment. In this case, the people are genuinely interested in making sure the project is successful because it benefits everyone. Internalisation Commitment is referential and self-generated; it can lead to a better trusting relationship between team members.

4.2. Knowledge management

Although addressing the risk factor is a daunting task, we believe that it is important to control the risk. There must be a plan or strategy in place to deal with risks in projects. When risks are allocated to different parties, it is important to understand the implications and spell them out clearly. Risk management can be addressed by incorporating it as part of the knowledge management system.

All construction projects must incorporate change management. Change management is an orderly and transparent way of getting at the facts about changes as soon as possible. Solutions should be found such that the party who carries the risk of change may manage the risk more effectively without disadvantaging the other party. Whenever possible, change must be managed to mutual benefit. Construction changes typically refer to work processes, or methods that deviate from the original construction plan or specification. They usually result from work quality, work conditions or scope change. In order to respond to the increasing pressure from clients to deliver on time and within the budget, the construction companies have been investing in the use of information technology (IT) to support business processes and project management. The use of knowledge management can help organise the complexities involved in the design and construction process.

Knowledge is now perceived by most organisations in the construction industry as a vital organisational resource and source of competitiveness. Knowledge is fast overtaking capital and labour as the key economic resource in advanced economies [8]. These intangible assets are widely acknowledged as vital elements in improving competitiveness. Therefore KM has emerged as a major driving force of organisational change and wealth creation [9].

There is a common myth that KM and IT are conceptually interchangeable [10]. Although IT is useful for KM, KM is much more than IT. There are organisations that employ IT without KM [10].

It is increasingly being acknowledged that KM can bring about the much needed innovation and improved business performance in the construction industry [11]. Knowledge is defined as a dynamic human process of justifying personal belief towards the truth [12]. It can also be defined as 'know-why', 'know-how' and 'know-who', or an intangible economic resource from which future resources will be derived [13]. Knowledge is built from data, which are first processed into information (i.e. relevant associations and patterns). Information becomes knowledge when it enters the system and when it is validated (collectively or individually) as a valid, relevant and useful piece of knowledge to implement in the system [14]. Besides the meaning of knowledge is the identification of the kind of knowledge that is to be managed. There are various kinds of classifications of knowledge: formal (explicit) and tacit (expertise) knowledge; foreground and background knowledge; knowledge of business environment; or knowledge for control activities [14].

4.2.1. IT support for knowledge management

IT is perceived by many as crucial for the successful implementation of a KM system. However, good knowledge management does not result from the implementation of information systems alone [15]. Despite this, the role of IT as a key enabler for KM remains undiminished [16]. According to [17], information systems for knowledge management are classified into four main categories.

- Those for creating knowledge (knowledge work systems). These support the activities of highly skilled knowledge workers and professionals as they create new knowledge and try to integrate it into firms. Examples are CAD, Virtual Reality and Investment Workstations.
- Those for distributing knowledge (office automation systems). These include helping disseminate and co-ordinate the flow of information. Among these are word processing, desktop publishing, imaging and web publishing, electronic calendars and desktop databases.
- Those for sharing knowledge (group collaboration systems). These support the creation and sharing of knowledge among people working in groups. Examples are groupware and intranets.
- Those for capturing and codifying knowledge (artificial intelligence systems). These provide organisations and

managers with codified knowledge that can be re-used by others in the organisation. Examples are expert systems, neural nets, fuzzy logic, genetic algorithms and intelligent agents.

Although IT is important to KM in construction organisations, the construction industry as a whole has been slow to recognise the benefits of IT as a major communication tool [18]. Transferring knowledge and information in construction organisations is difficult. This is because much of the construction work is project-based, that is short term and task oriented, making it impossible to promote a culture where continuous learning is viable. Specialist knowledge is often lost from one project to the other, impeding an organisation's ability to develop knowledge and generate new ideas. IT can be used to assist the transfer of knowledge and information between project teams, enabling the development of new knowledge for innovation.

It is our belief that a KM system is needed to and the construction industry in delivering their projects efficiently in the face of tight budgets. We propose an open application sharing (OAS) platform. This OAS knowledge management system (OASKMS) can be used to establish and support an on-line, community-based, collaborative environment facilitating the sharing, rework and creation of knowledge and solutions among peers. Key features of this would be:

- A web-based portal allowing access to hosted knowledge and solutions.
- An open forum for partners to contribute and show-case their solutions and capabilities.
- A mechanism for searching, rating and cataloguing the best discussion and solutions.

We have started work to develop the OASKMS for the Vaasa city construction department. The work for this will be discussed in a forthcoming paper.

4.3. *Lean construction*

Besides the above recommendations, we also believe that there should be lean construction. It is generally accepted that lean manufacturing had a revolutionary effect on many industries, particularly automotive assembly companies. We believe that to improve efficiency and prevent failure of construction projects, a lean construction is needed. A lean construction would involve:

- Reduced defects and waste, helping to improve quality and value, etc.
- Making sure that workers are responsible for satisfying customer needs.
- Continuing to improve processes for the entire workforce.

Lean construction can be understood as a new paradigm for project management. Lean construction had three initial sources of inspiration, the impact of which has been

bolstered by dissatisfaction with the practical accomplishments of project management. [19] challenged the industry to apply the principles behind the revolution in manufacturing, and quickly initiated an effort to establish production management on a sound theoretical foundation. The third source took the form of an anomaly discovered by Ballard [20]; namely, that normally only about 50% of the tasks on weekly work plans are completed by the end of the plan week. This proved to be an uncomfortable fact for a philosophy of project management that relied on detailed, centralised planning and the assumption that what **SHOULD** be done could be transformed into **DID** through contract structures and contractual enforcement [21].

5. Conclusion

The Finnish construction industry is facing major problems when it comes to completing projects. This is especially the case for public construction projects. Many valuable resources have been wasted because of failed projects. Our studies have revealed the following common problems as the cause of the failure:

- Lack of decision-making process;
- Lack of time for planning;
- Difficulty in updating construction regulations;
- Users do not know what they need;
- Lack of trust;
- Lack of risk assessment;
- Resistance to use of IT; and
- Lack of change management.

From our research and interviews, we have proposed several recommendations to help alleviate some of the problems identified. We believe that trust is an important issue that needs to be addressed in order to help the different stakeholders work as a team with mutual benefits. Besides trust, issues such as lack of risk management and change management can be improved by the use of a knowledge management system. We are currently developing this system. It is our belief that a knowledge management system offers several benefits for managing the complexities of construction projects. KM systems have the capability to aid the much-needed innovation and improved business performance in the construction industry. Typical construction organisations do not encourage the culture of sharing knowledge. In order to encourage the sharing of knowledge among stakeholders, it is vital that there is trust among team members.

Integrity-based trust is also important. It plays a crucial role in motivating group working and knowledge sharing. One is not likely to be motivated to share one's knowledge with another if one perceives them to be dishonest or unreliable. Building trust begins with each member of the group having an SOC. Where SOC is stronger, participation in sharing will be greater.

Guidelines can be established that can be used to help team members to build trust. The authors have developed some guidelines for this. Currently the authors are working on the development of a knowledge management system for construction. The first priority is to have a system where the end users can use it to identify their needs. This work will be discussed in the next paper.

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