

THE IMPROVEMENT OF TEAMWORKING THROUGH THE EXPLOITATION OF IT: LESSONS FROM THE CONSTRUCTION, MANUFACTURING AND FINANCE SECTORS

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Based on an EPSRC sponsored research project that focuses on the utilisation and exploitation of IT for teamworking in construction, manufacturing and the financial sectors, the research aims to assess the degree to which IT is or is not exploited for teamworking, and what lessons the construction industry can learn from other industrial sectors. The construction industry is aware of its position regarding IT and teamworking, and is willing to accept that research needs to be done and recommendations taken on board, but there is a real fear that IT is being introduced too fast and is becoming overused and overwhelming. The notion that IT can aid or encourage teamworking is confusing to some. Attention will be given, in this paper, to how this research can be put to use; how will the research be received; and what issues will it throw up for further debate and research? It is vital that companies are aware of the most frequently used technologies for teamworking. The industry must pay attention to cultural and structural variables, when introducing and attempting to exploit IT for teamworking. Vast amounts of money are being spent on hardware and software, but little is being done to ensure that this new IT orientation fits in with the actual culture of the organisation. This leads to the major recommendation of the research – that directed training on IT for teamworking is vital if the uptake and full exploitation of IT is to be achieved. Finally, the paper recommends that there is ample scope for further studies to be conducted in this area.

Keywords: culture, education and training, teamwork, information technology.

INTRODUCTION

Although the construction industry is historically seen as being relatively slow in its recognition and uptake of IT as a major communications tool, things are definitely starting to move forward. The construction industry is starting to become more aware and acquainted with the potential offered by what are referred to as ‘Information Communication Technologies’ (ICTs). Unfortunately, it also seems to be the case that the IT may be there, ready and available, but that it is not being exploited as fully and completely as it could be (Egbu, *et al.* 2001a, 2001 b).

IT, in its different and constantly emerging forms, enables us to undertake activities and achieve outcomes that were not possible before. IT encompasses so much more than just computers. It not only affects the work task but it often has a profound effect

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on the entire organisation, its processes and its people. Within the organisational context, IT is becoming increasingly geared towards the enhancement of communication (Egbu, 2000). It is commonplace for today's business organisation to encompass a wide variety of IT 'tools'. Network systems (Internet and Intranet), e-mail, voice mail, video and audio systems, video- and tele-conferencing, and GroupWare are widely available for use in conjunction with word-processors, database, presentation and spreadsheet packages, telephones, and fax machines. Theoretically, it can be argued that this entire package of IT tools will make for a highly integrated and cross-functional organisation, one in which a 'dynamic network of inter-relationships' will enable effective communication to take place. Amongst all this, however, it is important that we are able to articulate and document the real impact IT contributes to effective teamworking. This is more so when teamworking is increasingly seen as vital for business success and organisational effectiveness (Drew and Coulson-Thomas (1997). For construction, in particular, it becomes increasingly vital as we move into more collaborative forms of working such as partnering, joint ventures, alliancing, PFI projects and Prime Contracting.

A thorough review of the general IT literature and the literature of IT in construction reveals a vast amount of research undertaken into the role of IT within today's organisation. This is certainly becoming apparent within the construction academic community. However, it remains the case (with a few exceptions) that much of this work is directed towards issues such as the technical aspects and capabilities of IT, its benefits and weaknesses with regard to organisational effectiveness. There seems to be little consideration given to the 'human factors' associated with IT exploitation - the important and very real issues of teamworking, culture, and motivation of the workforce to embrace IT for teamworking through different approaches, including training and education. There is also the issue of many writers and commentators talking up the potentials of IT and, perhaps, not reflecting enough on those areas, where IT use may not be effective or appropriate. Some of these issues are discussed in this paper.

OBJECTIVES

The Exploitation of IT in design and Construction teams research project (Exploit) had four main objectives:

- To identify the potential of IT to contribute to close integration (including effective communication and collaboration) between clients, design and project team members at all stages during the briefing, design and construction cycle;
- To identify the opportunities for, and barriers to, IT supported interdisciplinary working (identifying where the non-use, or inappropriate use of available IT tools forms a barrier to effective team working). There may be instances when IT is not appropriate;
- To establish the impact of organisational culture and sub-cultures (team culture and dynamics) on the adoption and exploitation of IT tools in construction, manufacturing and the financial sector;
- To explore the varying motivational factors that encourage the utilisation and exploitation of IT tools in the financial industry, manufacturing industry, design and in construction with a view to ascertaining what the construction industry can learn from other industrial settings.

For this paper, however, it is intended that only selected results from both the interviews and questionnaires, which addresses some of the research objectives will be documented and discussed.

METHOD

The ExploIT project used a combination of methodologies. Firstly, a case study approach was employed in an attempt to capture subjectively meaningful concepts, thoughts and statements. Ethnographic techniques were applied to interviews with 34 targeted individuals at different levels within six organisations from construction, manufacturing and Finance. The data generated through this methodology was supported by information obtained from structured interviews, e-mail questionnaires, site visits and organisational documents. In an attempt to augment the case study data, postal questionnaires were sent out to randomly selected companies representing small medium and large firms within the construction, design, manufacturing and finance industries. The questionnaire was designed with the project objectives in mind and was endorsed by the six industrial partners who kindly agreed to display their company logos on the front cover. A total of 121 usable postal questionnaires were received. The breakdown is presented in Table 1. A workshop was also held, involving people from industry and academia to discuss some of the issues of the research project as well as preliminary findings from the study.

Table 1: Usable questionnaires by industry type

Industry Type	Number of Respondents	%
Construction	86	71
Finance	21	17
Manufacturing	14	12
TOTAL	121	100

IT AND TEAMWORKING IN PRACTICE

With the massive influx of IT into today's society, it is easy to imagine that those working within successful construction and design companies would be well versed with its capabilities. It is certainly the case that the directors of the ExploIT companies are aware of the ever-increasing part IT has to play in the business and day-to-day functioning of their organisations, and, as a result of this awareness, strategies have been formulated to make the most of that IT. Difficulties arise, however, when it becomes clear that those actually working within those companies do not share the same enthusiasm for the use and exploitation of IT. The ExploIT project defines IT as those electronic technologies, which enable effective and efficient communications to take place. It potentially enables us to deal more effectively with information and knowledge acquisition, data storage and processing, communication processes and teamworking, and the dissemination of relevant information. The range of tools available include word-processors, databases, presentation and spreadsheet packages, telephones, fax machines, network systems (internet and intranet), e-mail, voice mail, video and audio systems, video- and teleconferencing, and GroupWare. However, it was somewhat surprising to discover that 97% of those interviewed for ExploIT regarded IT as comprising little more than the computer, its hardware and its software. It is obvious that those actually working within the case study companies have a very limited view of what IT actually is, and, as a result, are very unsure about the role it has to play in their companies' strategies. IT is largely regarded as a tool useful for speeding up and simplifying work tasks,

whilst increasing productivity and improving efficiency. This 'tool' is clearly invaluable in that it is viewed as vital if employees are to complete the high volume of work they are expected to undertake. What is less clear, however, is the role that IT has to play in teamworking.

Ninety-seven percent of those interviewed within the ExploIT case study organisations, recognised the presence and activity of teamworking within their immediate working environments and within their organisations as a whole. 67% of these feel happy to work in teams, with a further 6% recognising that teamworking is vital if work goals and objectives are to be achieved. Clearly, teamworking is a highly valued means of working for the vast majority of employees across all 3 industrial sectors - construction, financial and manufacturing. For teamworking to be truly effective, however, it is regarded as being of the utmost importance that the working environment is tailored as closely as possible to this method of working. Close physical proximity and informal lines of inter-personal communication are regarded as obvious prerequisites to a healthy and successful teamworking environment. For the vast majority of those interviewed, particularly across construction and manufacturing, teamworking can only be truly effective and positive if it is embarked upon on an inter-personal, physical basis. It is difficult for these individuals to understand or visualise how IT could be of any real use to the activity of teamworking. Indeed, of those interviewees who see teamworking as being present within their working environment, every single one of them questions the value of IT in this sense.

It is clear that the concepts of 'IT' and 'teamworking' are difficult for the majority of employees to reconcile. Indeed, 94% of those interviewed for ExploIT admitted that they did not fully understand how the two could in any way be linked. To the majority of those interviewed, IT is 'the computer'. It is a 'hard' technology, utilised to complete work tasks in the most efficient manner. Teamworking, on the other hand, is regarded as an activity rooted in social and verbal interaction. Interviewees can all see how useful IT is in terms of activities such as information sharing, but most fail to understand how it can have any real benefits for teamworking, as teamworking rests on the principal that it relies on interpersonal communication, not electronic communication. It is clear that teamworking is primarily regarded as being about 'people'; "IT does not aid teamworking, rather, teamworking is aided by good verbal communication and physical proximity".

The above discourse provides food for thought for both the academic community and the construction industry as a whole. The last decade has seen much written in the area of concurrent engineering, advocating teamwork at the heart of it and IT playing a vital part. Could it be that it is only very few construction organisations that are actually practising concurrent engineering, as we know it? Perhaps the lack of awareness and full appreciation of the inter-play between teamworking and IT, coming out from our study, in some part, explains why the industry has not embraced the fullness of concurrent engineering, especially where IT is concerned?

Perhaps the main area where IT is regarded as having some potential to aid teamworking is e-mail. Indeed, 85% of interviewees felt that this may be the case. E-mail is regarded as useful in that it allows separated groups to share information and files. Nevertheless, 65% of these still maintain that, although e-mail does enable some degree of global teamworking, it can never replace interpersonal teamworking. It is generally agreed that 'teamworking' undertaken via e-mail does not reap such good

results as that done in person. In a way, that also explains why a telephone call sometimes follows the e-mail sent, allowing the sender to explain much further the content of the-mail. By doing this, some aspect of tacit knowledge could be passed on.

INSTANCES WHERE IT IS NOT APPROPRIATE AND COULD INHIBIT EFFECTIVE TEAMWORKING

The study sought to investigate if there were instances where IT is not appropriate, and could potentially be seen to be negative to effective teamworking. To this effect, the following question was asked:

“Are there instances where the use of Information Technology is not appropriate, and potentially inhibits effective teamworking, in the kind of work you do – Yes or No?”

Table 2: Responses as to whether there were areas where IT was not appropriate

	Construction	Manufacturing	Finance	Total (%)
YES	30	8	11	49 (42%)
No	43	16	10	69 (58%)
	73	24	21	118 (100%)

Although the majority (58%) of respondents to the questionnaire indicated that there were no areas of their work where IT was not appropriate, Table 2, above, reveals that a sizeable number of respondents (over 40%) noted that there were instances where the use of IT were not appropriate and had the potential to inhibit effective teamworking in the kind of work they did. A possible deduction from this result is that IT is not fully used or exploited by all organisations in construction, manufacturing and the finance sectors. An inference from this result could also be that there is room for further exploitation of IT for teamworking. Taking this a step further, one might contend that IT is only an enabling tool, which cannot replace other project and organisational work activities which is associated with effective teamworking. There is therefore a need to establish the optimum use and involvement of IT in project and organisational processes.

The respondents were also encouraged to note the areas of their work where IT was not appropriate for teamworking. The following details the majority views of the respondents:

- *More difficult to explain, negotiate, persuade some people in your team by e-mail than by face to face discussion.*
- *It is valuable to talk, face to face, with colleagues, rather than become lazy and rely too heavily on e-mail.*
- *Debating solutions and issues. Prefer to do this face to face.*
- *When system is not user friendly, unreliable, slow, poor integration within packages, poor integration within office systems*
- *Viewing property for property development opportunities*
- *By removing a personal touch. May reduce interpersonal participation*
- *Training and ‘corporate buy-in’. Slow management of change*
- *Attention to detail, management of change and dealing with people problems*
- *Dependency on e-mail/e-mail watching reduces effective/goal management*

- *At construction level, labour force can be 'scared' of IT*
- *Site meetings on-site; all parties together and discuss project*
- *Selective e-mailing (i.e. exclusion of people) – use e-mail when talk would be far better.*
- *Industry and organisational structures have ensured that manual systems have remained in place*
- *When brevity in a message is perceived as 'cold' and warmth of face to face contact is lost*
- *Performance, or disciplinary issues, promotion*
- *Development of team morale and motivation is heavily dependent on direct contact between individuals.*
- *Face to face meetings in social marketing*
- *Much negotiation with site and subcontractors need to be carried out person to person. IT can present barriers to problem solving by the perceived formality of its use, and its 'removal of personalities'*
- *Sharing of classified information on person and personnel issues, where it is more effective to talk*
- *There can be some feelings of 'alienation' when conversation is mainly via e-mail and not verbal*
- *Production line team work activity and communication is done through contact not IT*
- *I would not use IT for interviews*
- *Face to face contact with teams, particularly at the start of a project*
- *It cannot replace informal 'water cooler' meeting, when important background information is gained.*

THE EXTENT TO WHICH THE BENEFITS OF IT FOR TEAMWORKING ARE EXPLICITLY MEASURED

Given the fact that IT might be useful in Teamworking, the study sought to ascertain whether organisations do measure the benefits of IT for teamworking. It could be argued that the measurement of the contribution of IT for teamworking should enable organisation to gauge if IT is really offering value for teamworking and to take actions for improvements if, and where, needed.

For those involved in taking organisational strategic IT decisions in terms of IT purchase, use and exploitation, knowing the extent to which IT is beneficial to key organisational activities (such as teamworking) could be seen to be useful.

In Table 3, it can be seen that only 22% of the respondents to the questionnaire noted that the benefits of IT for teamworking is either sometimes or always explicitly measured. A great majority (70%) noted that they rarely or never measured the benefits of IT for teamworking. This result has important implications with regard to the amount of money organisations spend on IT and how they value the benefits of the investment made.

At a dis-aggregate level, the study showed that 71% (52) of construction respondents, 54% (13) of manufacturing respondents and 77%(17) of respondents from the finance sector noted that IT benefits for teamworking are rarely or never measured.

Table 3: Measurement of IT Benefit for Teamworking

	Construction	Manufacturing	Finance	Total
Always	5	1	0	6 (5%)
Sometimes	9	7	4	20 (17%)
Rarely	24	7	12	43 (37%)
Never	28	6	5	39 (33%)
Don't Know	5	3	1	9 (8%)
TOTAL	71	24	22	117 (100%)

TRAINING AND EDUCATION DIRECTED TOWARDS IT FOR TEAMWORKING

The study also attempted to investigate the extent to which there is training and education provisions directed towards the use and/or exploitation of IT for teamworking. The argument, here, being that if individuals are to effectively use and exploit IT, then they need to be trained/educated in the use of that IT.

Table 4: Education and Training on IT for Teamworking

	Construction	Manufacturing	Finance	Total (%)
YES	30	6	7	43 (36%)
No	43	18	14	75 (64%)
	73	24	21	118 (100%)

An inspection of Table 4 reveals that over 60% of respondents to the questionnaire noted that they have not been involved in any training/education specifically directed towards IT for teamworking. Education and training is vital if the issue of IT use and exploitation is to actually lead to performance improvements and competitiveness.

IT USAGE IN THE INDUSTRY – SOME CONCERNS

Looking at the ExploIT companies, it would seem that the employees of the companies are struggling to come to terms with the notion of IT being positively utilised for teamworking. However, it would be wrong to assume that this is as far as the difficulty lies. Indeed, rather than merely failing to understand the link between IT and teamworking, the ExploIT project has discovered that employees at all levels are wary of IT and feel that there is a real danger that teamworking may actually suffer as a result of IT usage. This opinion predominantly manifests itself in a fear that IT is being over-used within the working environment. Employees accept that IT is necessary for the completion of work tasks, but there is a very real concern that if IT continues to infiltrate all aspects of working life, work will become mundane and unenjoyable. Fear of 'automation' is at the forefront of the minds of many of those interviewed for ExploIT. There appear to be no major differences between industrial sectors.

Thirty-eight percent of those interviewed for ExploIT feel that IT is certainly over-used and has a dangerous isolating effect. This endangers effective team-building and is regarded as an extremely negative by-product of the introduction of IT for teamworking. It is clearly easy to 'just sit behind a computer all day', but this leads to the average employee having very little 'real life' contact with people. Similarly, it is

very easy to 'hide' behind IT. E-mail, in particular, is extremely 'useful' in allowing people to avoid inter-personal interactions if they so wish. This is obviously damaging to team morale and to the 'atmosphere' of the working environment. One interviewee summed this up, expressing a concern that "... *we are just machines, churning work out ... We don't need to talk to anybody ... It's a shame ...*". This concern is particularly prevalent amongst those working within ExploIT's construction companies – mainly the designers, and leads to individuals approaching and using IT with an increasing degree of caution. In the main, IT appears to be used as far as it needs to be used to complete tasks. The majority of those interviewed, again mostly within construction, and have some involvement with site works, tend to shy away from the use of IT for activities involving or relating to teamworking. There is a genuine fear that there is a growing trend within construction to introduce and use IT more and more within the average working environment. This can only, it seems, lead to an environment where people don't talk and don't communicate regularly on a verbal, personal basis.

SOME LESSONS LEARNED

It is important that those running construction companies begin to look at the concerns and fears of their workforce as they relate to IT usage and teamworking. Failure to do so can only result in an under-use of IT and, thus, non-exploitation of IT for teamworking. It is important to look towards other industrial sectors in an attempt to learn from them, if possible. This is why the ExploIT project concentrated part of its study on companies representing the manufacturing and finance sectors. It became clear, very quickly, that ExploIT's manufacturing company was facing the same problem as the construction companies, in that its employees were very wary and cynical about the use of IT for teamworking.

The manufacturing company was more aware of this difficulty, however, and took steps to address it through its Investors in People (IIP) initiative. This activity proved to be rather 'hit and miss', though, as perceptions and attitudes towards the programme vary enormously. Many of those interviewed for ExploIT regarded IIP as a 'fad'; a 'gimmick' or a means of making the company 'look good on paper'. As a result, very few employees have confidence in the IIP action points relating to the exploitation of IT for teamworking. This sentiment was exacerbated by the fact that IIP is popularly regarded amongst the workforce as 'a management thing'.

ExploIT's finance company, on the other hand, appears to take on a much more 'community-based' approach to promoting the use of IT for teamworking. It starts out by making use of an IT that is not actually recognised by its workforce as being an IT - television. The company broadcasts a monthly TV programme geared towards embodying and strengthening the team ethos. Employees at all levels and in all sections are informed of major achievements of the company. Those interviewed within ExploIT's finance company all agreed that these broadcasts engender a feeling of 'community' and enable a sense of shared value in what the company does and hopes to achieve. Although the TV broadcast doesn't openly address issues of teamworking, IT or IT for teamworking, it does aim to provoke a sort of team spirit. It is vital that if organisations in any sector are to bring about full exploitation of IT for teamworking, they must first embody a sense of team spirit within their workforce. It certainly appears that ExploIT's finance company is attempting to instil this value within its workforce. As a result, it can be argued that a base is set for future teambuilding and an 'acceptable' introduction of IT for teamworking.

Although those actually working within ExploIT's finance company do not appear to recognise the link between IT and teamworking, senior managers are actively attempting to introduce IT, which can be used to facilitate group work and 'co-working'. Initiatives particularly worthy of note include the company's on-line training programmes and its fully interactive Intranet system. Both make optimal use of IT and are extremely user friendly. They are in no way related to routine work tasks and are physically located away from the usual working environment. Perhaps it is this remoteness from actual work, which made it difficult for interviewees to identify the link between IT and teamworking. It is a start, however, and both systems have had a very favourable reception. Although there is clearly a long way to go yet, it certainly forms a sound base from which to develop similar systems perhaps more closely related to actual work tasks.

Finally, from the workshop conducted as part of the methodology for the study, it was generally agreed that much of the challenges in the use and exploitation of IT for teamworking in construction is at the project-site level. In terms of Information technology for the future to aid teamworking on site, it was felt that the preference would be for a robust, mobile and portable technology. This should also be very easy to use, with little amount of training and education needed for their use and exploitation.

CONCLUSION AND RECOMMENDATION

The paper has considered some important issues regarding the use and exploitation of IT for teamworking. At the moment, IT is too narrowly defined and perceived by construction professionals, with many seeing it as just relating to computer hardware and software. This, in part, explains why many practitioners are not able to see how IT could be useful and exploited for teamworking. It was also shown that there are areas where IT is perceived not to be useful. The issues of understanding organisational culture, motivational constructs and education and training are important if IT for teamworking is to be exploited for the benefits of organisations. There are some lessons to be learned from other industrial sectors. Those at the top of the organisational structure and involve in strategic decisions have a role to play in improving awareness of the wider potential of IT as well as in helping to create the culture that is rife for the exploitation of IT for teamworking. Similarly, the providers of education and training have a role to play too. There is also ample scope for further research addressing the role of organisational sub-cultures, professionalism and motivational constructs on the exploitation of IT for teamworking.

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