



## Get in touch with us and contribute

For comments, ideas, articles, events, photographs, news in general, research experience, achievements, workshops, funny stories, serious stories....

....anything basically that you would like to share with other members, through this newsletter please contact the editor, Dr Viam Ahmed.

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### Committee Members

The committee of ARCOM is elected each year at the Annual General Meeting, which is held during the Annual Conference.

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Welcome to the March edition of the ARCOM newsletter.

Firstly, I would like to welcome Professor D. Greenwood for taking over as the new chair for ARCOM and many thanks to Akin Akintoye for his contribution to ARCOM during his tenure as Chair.

The ARCOM 18th Annual conference was a great success and we hope that our new ARCOM conference 2003 will be a great achievement too. Please read the article on page 3 regarding hosting of the new workshops. We would appreciate your input with venues, themes and chairpersons.

We are including the wide range of interesting findings taken from the new book (published by ARCOM) - "A network of construction creativity clubs", for your perusal.

Congratulations to David Oloke, Fiona Borthwick, Hong Xiao for recently achieving their PhD's. Abstracts of their thesis are on pages 5 and 6.

As we all know, research is a major part of our work. We are grateful to Will Hughes who shares his thoughts and tips on this subject on pages 7/8. It is proposed that this feature will be an ongoing column that will continue in the next issues.

We are also sharing some of the successful events that are running within our research community, such as the "nd modelling workshop" that was held in Manchester earlier this year.

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## ARCOM welcomes its New Chair



**David Greenwood** became the new Chair for ARCOM in September 2002. He is Associate Dean (Research & Consultancy) in the School of the Built Environment at Northumbria University.

He worked for nearly ten years for a major contractor in a commercial role that involved tendering and planning for large building projects and the subsequent management of their commercial and physical progress.

For the last 20 years he has been a full-time academic at Northumbria University where he teaches and researches in the field of construction management and contract administration. During this time he has maintained a close contact with the industry through consultancy and training work in related fields.

Some of this work has been overseas, principally in the Far East and in France, where he is Professeur Invité at the Université d'Artois, France. He is on the management board of the Sustainable Cities Research Institute in Newcastle.

His primary research interests are the com-

mercial relations between contracting organisations, including the way construction contracts are drafted.

In 1992/3 he undertook a study of procurement and contract conditions in the specialist engineering sector which was referred to in the first of Sir Michael Latham's reports and was influential in subsequent contractual reform.

He completed his PhD at Reading University on the topic of power and trust relations between construction organisations. He has supervised students at MPhil and PhD level in a number of related subject areas. Many of his publications relate to the issues of project scheduling, the analysis of claims and the contractual context in which they are conducted. Recent research contracts include collaborating in a study of the costs of different construction procurement methods (for EPSRC), a study of partnering involving local authority schools projects (for DTI), and the implementation of a performance measurement system for local authorities (PII FastTrack).

## ARCOM 2002 Annual Conference

ARCOM's 18<sup>th</sup> Annual Conference was hosted this year by Northumbria University and took place on the 2<sup>nd</sup> - 4<sup>th</sup> September at St. James' Park Football Ground, Newcastle.

The call for papers attracted well over 130 abstracts, most of which resulted in full papers that were peer reviewed by at least 2 referees.

The process led to 82 papers being finally accepted. A good proportion of these came from new researchers, including those who are actively engaged in PhD study.

We also welcomed old and new friends from outside the UK. We were happy to receive

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## ARCOM 2003 Annual Conference

A note for your diaries, the next ARCOM conference will be in Brighton on the 3<sup>rd</sup> to the 5<sup>th</sup> of September, 2003.

Abstracts are invited to be submitted by 13<sup>th</sup> January, 2003 and full papers, by 7<sup>th</sup> April. We look forward to seeing you at Brighton.



(Continued from page 1)

You are most welcome to share any research experiences with us. I have done that on page 10 with my "trusty" glass of water.

Also included are four books that have been recently published and which we feel would be of interest to you. If you have any titles that you would like to share with other members please let us know through our contacts on the back page

I hope that you like the new layout of the newsletter and the variety of topics that we have provided.

If you would like to make any suggestions and contributions for future issues please contact me directly.

Vian Ahmad

## ARCOM 2002 Annual Conference

(Continued from page 1)

delegates from as far afield as Australia, Canada, China, Denmark, Eire, Holland, Hong Kong, India, Portugal, New Zealand, Singapore, South Africa, Turkey and the USA: indeed, this attests to the growing international standing of ARCOM, of which we are very proud.



Delegates at the conference

The two-volume proceedings are a fine record of academic achievement. ARCOM is indebted to the committee members, for all their hard work prior to the conference in refereeing abstracts and papers, and especially to Will Hughes for his unmatched skills in compiling them. For those who were not able to attend the conference, there are still copies available by contacting Dr. Hughes at Reading University.



Delegates at the annual conference

The venue was, even by the grudging admission of the most ardent rival football supporter, a good one. All sessions proceeded smoothly, and in this regard a big thank-you is due to the staff at St. James' as well as to the back-up they were given by staff from Northumbria University, particularly by Ms. Elaine

Scotland and Mr. Guy Brown.

The three days of presentation, debate and discussion were sandwiched, as it were, between two magnificent oral offerings of a very differing nature. First, the keynote speech, by the always-provocative Prof. Stuart Green of Reading University set the scene for the keen debate to follow. Like the true academic should, Stuart left no 'trend' unquestioned; no 'initiative' unexamined, and left us reflecting on how much that currently circulates in construction literature is no more than the 'propaganda of corporatism'. Then, towards the end of the conference, in the relaxed surroundings of the Magpie Restaurant, our after-dinner speaker and active committee member Professor Dave Langford, *raconteur* and master of the *mot just*, served us an offering spiced with his inimitable wit and

presented with all his usual elegance. Immediately following the dinner, the Paul Townsend memorial prize for best paper was presented to Alan Wild for his paper 'The management college that never was'.

At the Annual General Meeting, which was held, as usual, after the proceedings of the second day of conference, the outgoing Chair, Professor Akin Akintoye, spoke of the significant achievements that ARCOM had made in recent years, such as:

- ⇒ the ARCOM forum,
- ⇒ the ARCOM Abstracts and Indices service (now available on internet),
- ⇒ and the Doctoral Research Workshops, to name but a few.

Akin received a warm vote of thanks and formally handed over the chair to Dave Greenwood. Also ratified by the AGM was the appointment of Dr. Farzad Khosrowshahi as Vice-Chair.

David Greenwood



## Book corner



**Capturing Client Requirements in Construction Projects** by John M. Kamara, Chimay J. Anumba and Nosa F. Evbuomwan.

This book describes an innovative and structured approach for capturing client requirements on construction projects. The new approach, encapsulated in a Client Requirements Processing Model (CRPM) and associated prototype software, ClientPro, facilitates better understanding and implementation of clients' requirements, more effective collaborative working and design creativity. It also minimizes uncertainties and downstream problems because of the early consideration of issues affecting the lifecycle of a facility, and provides the basis for effective requirements management throughout the facility lifecycle.

Blackwell Publishing is pleased to announce the publication of the following three books:



**Public Private Partnerships** edited by Akintola Akintoye, Matthais Beck and Cliff Hardcastle

This edited book will familiarise both researchers and construction professionals working with public private partnerships (PPP) with the issues involved in their planning, implementation and day-to-day management and it offers a number of frameworks for managing the risks associated with PPP.

For more information go to <http://www.thatconstructionsite.com/index.asp?page=book&ref=063206465X>



**Construction Process Improvement** by Brian Atkin, Jan Borgbrant and Per-Erik Josephson  
This book analyses the way forward for improving the construction process, in particular the links between research and development and industrial competitiveness. The implementation of new methods and thinking in companies is examined and important advice for senior managers and researchers is offered.

For more details go to <http://www.thatconstructionsite.com/index.asp?page=book&ref=0632064625>



**Standard Letters for Building Contractors**, 3rd Edition, by David Chappell

This book provides a set of over 270 standard letters for use with the standard forms of building contract and sub-contract. The new edition takes account of extensive changes to the forms since the first edition was published in 1994, including the Housing Grants Act and case law. It also includes a free CD of all the letters.

For further details go to <http://www.thatconstructionsite.com/index.asp?page=book&ref=0632055561>

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## nD Modelling Platform Grant at Salford

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is funded by the EPSRC (Engineering and Physical Sciences Research Council) in the tune of £0.5 million for four years under a Platform Grant. The unique nature of this grant encourages blue-sky innovative research, international collaboration and supports future funding opportunities.

The objective of the project includes developing a business process and IT vision for how integrated environments will allow future nD enabled construction to be undertaken.

The research team at Salford is currently developing this vision – identifying how nD modelling can improve and shape the design and construction process, and the barriers and opportunities for change. This directive will be fortified by industrial input at the forthcoming national workshop that will be held on the 9th October 2002 in Milton Keynes, UK.

We hope that you can contribute your exper-

tise in this area at the international workshop, which will be held at Mottram Hall on the 30th January to the 1st February 2003. A subsequent international workshop is also planned for 2005 and details will be sent to you in due course.

We aim to gain knowledge of similar research initiatives you are undertaking during the international workshop. Therefore, there is the opportunity for you to make a 20 minute presentation at the event within the context of the project (i.e. 3D + time, 3D + cost, 3D + accessibility, decision-making etc). This will not only help to inform the vision, but also enable us to explore potential collaboration opportunities by combining our research efforts to apply for future research funding.

A major report will be produced and widely disseminated following the output of the work, and your contribution to the future vision of nD-enabled construction will be recognised.

## Laugh (and Learn) from a trusty glass of water



My first conference paper. In fact, my first paper ever. It bounced back and forth, at least 1½ million times between me and my supervisor.

At the time, it felt as though it was the toughest thing I had ever done. It took me a month trying to put it right, but I managed to finish it eventually.

The paper looked immaculate. When it did get accepted in the conference, I celebrated my achievement by having a take away and allowing myself to eat it in front of the TV!!

As the days rolled over, I had to attend the conference to present the paper. I bought a new outfit, practised my presentation over and over again, read the map and got my directions right!!!!

The clock was ticking and my name was called to present. My heart was about to jump out of my body and bounce on the floor. Seventy people were staring at me, waiting for me to talk!!

I managed to introduce myself and gave a short introduction....but soon after .. I choked.

The words just wouldn't come out of my mouth. There was no water. I suddenly saw a can of coke on one of the desks in front of me. I swiftly reached for it and started drinking without looking who it belonged to. I survived, but was incredibly embarrassed.

These days, I don't depart from my glass of water when I am giving a presentation. Writing papers is not so painful anymore. Although no one remembers what happened, I will never forget my first paper and my trusty glass of water.



## An invitation to host an ARCOM research workshop

Following the success of our previous workshops, we would like to invite ARCOM members to propose new workshop themes for 2003/4. Those that have attended and participated in these workshops in the past will testify to the benefits that they can provide construction management researchers. ARCOM runs two types of workshop:

### Doctoral workshops

Doctoral workshops provide an opportunity for PhD students to present papers and receive feedback on the methodological issues raised by their work.

The usual format is for five or six researchers at various stages of their PhD's to present an outline of their work for about 20 minutes each, with 10 to 15 minutes of discussion for each speaker.

**Regional research workshops**  
These are to support academics and senior researchers in areas such as how to write research proposals, research methods, how to attract research funding, how to manage research projects etc. The usual format is for two or three keynote speakers to be invited to speak at the events with plenty of time allowed for open discussion.

We would like members to propose venues, themes and chairpersons for workshops which would attract students and academics to attend. We would expect the host institution to provide a room and audio-visual equipment, but ARCOM will pay for lunch!! If you have an idea for a theme, venue and chairperson, then please contact:

**Andy Dainty**

ARCOM Doctoral Research Workshop Convenor

Dept of Civil and Building Engineering

Loughborough University

Email:

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## Construction Creativity Clubs

ARCOM published its first book shortly after the last conference. It emerged from the ARCOM project which was entitled A Network of Construction Creativity Clubs. This was a one year project funded by the Engineering and Physical Sciences Research Council (EPSRC).

The book, entitled "**The Construction Creativity Casebook**" was written by Dave Langford and Branka Dimitrijevic and published by Thomas Telford. Dave is on the ARCOM Committee and Branka was the national Co-ordinator for the network.

The book is based upon data collected at a number of innovation meetings. The book showcases 42 innovations and was based upon a standard template to analyse the data. This template probed the challenges which prompted the innovation, how solutions were

derived and the beneficiaries from the innovation.

An overview is provided where all of the innovations recorded are analysed by the business activity of the innovators, size by turnover and number of employees, how the innovation was funded and the genesis of the innovation. The findings from the project were:

- Presenters at the NCCC events were from industry (61%), academia (31%), professional organisations (3%) and government initiatives (5%).
- The highest number of presentations was about environmental impact management (8 presentations), procurement (7), and contracting and partnering (7).
- Among those who provided the information on financial turnover, 11% had a

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## Construction Creativity Clubs

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- turnover of less than £150,000; 3% between £150,000 and £500,000; 11% between £500,000 and £1m, 36% over 1 M. Further 28% belong to the public sector, and 11% withheld this information.
- Regarding the number of employees, 22% of organisations did not provide this information, 43% have less than 250 employees, 6% less than 1000, and 29% more than 1000 employees.
- Different types of partnering in developing innovations feature in 17 of the 35 companies who provided this information.
- Lead companies provided 100% of funding in 17 companies, while 18 of them obtained funding from additional sources.
- The needs of client were the most important origin and driver of innovation. Thus, the innovators perceive that the clients will be the main beneficiaries of innovation.
- Among the companies who provided the information, 68% declared that their innovations are not subject to patent.
- While 75% of companies encountered a range of difficulties in the conception, development and implementation of their innovations, 26% did not have any difficulties.
- With regard to the dissemination of innovations, 57% of companies have a dissemination structure in place. The main reason for not having a dissemination structure was identified as 'the innovation being specific to the business' (23%).
- The largest percentage of innovators (27%) consider their innovations to be transferable to a wider construction industry, clients (21%), other sectors (19%), subcontractors (15%), and other groups (5%).

The network and research achievements of the NCCC, despite the complexity of co-ordination of activities across 4 Regional CCCs, over a comparatively short time frame of 12 months, can be put down to a range of critical success factors, which include:

- A well-developed proposal, corresponding project plan, and methodology for collection of information on innovations.
- The enthusiasm and hard work of the National and Regional network co-ordinators.
- The willing support of 'host and club' Universities within each Regional CCC, and the benefits generated from being able to plug into their industry networks.
- The availability of support from other organisations such as the UK Network of Centres for the Built Environment.
- Participation in a number of events by National Construction Initiatives such as the Construction Best Practice Programme and the Movement for Innovation.
- The willingness of industry to present and showcase their innovations, and the interest shown by event attendees.
- The availability of the EPSRC grant funding, which took away the commercial pressure to generate income to support activities. This allowed the Regional CCCs to focus on the implementation of the NCCCs aims and objectives, at the outset.

The downside to this success is that the NCCCs EPSRC grant funding came to an end, with it proving to be almost an impossible task to secure the minimum £50,000 per annum required to keep the concept going as a UK wide network.

There are lessons here for funding bodies and industry, because such initiatives have immense and accessible value in providing learning environments and methods for knowledge exchange. The problem is that somebody has to be willing to foot the bill to sustain this value, through grant funding or sponsorship. This is particularly the case given the levying of sizeable user fees (e.g. hundreds of pounds), on the NCCC's smaller business participants, would serve to exclude them from similar networks in the future.

**References**  
Langford, D., Dimitrijevic, B (2002). Construction Creativity Casebook. Thomas Telford, London.  
[www.ce.strath.ac.uk/nccc](http://www.ce.strath.ac.uk/nccc)



## nD Modelling Platform Grant at Salford

The University of Salford is currently leading a research programme, entitled '3D to nD modelling'. This project aims to enable and equip the design and construction industry with a tool that allows users to create, share, contemplate and apply knowledge from multiple perspectives of user requirements.



This research differs from other 4D modelling tools as its objective is to develop infrastructure, methodologies and technologies that will facilitate the integration of time, cost, buildability, accessibility, sustainability, maintainability, acoustics, lighting and thermal requirements.

The tool will allow construction professionals to perform true what-if analysis at a very early stage of a project, based on the manipulation and impact of changes to the aforementioned parameters, so that informed decisions can be made.

The project is funded for four years under by the EPSRC (Engineering and Physical Sciences Research Council) at £0.5 million per

year under a Platform Grant.

The three day nD Modelling international workshop held at the Mottram Hall, Manchester in January 2003, was a great success. It brought together more than fifty experts from industry and academia, to

share their expertise and research experiences in nD modelling. A subsequent international workshop is also planned for 2005. Congratulations to Salford on their great achievement.

The University of Salford is currently leading a research programme, entitled '3D to nD modelling,' that will leverage 3-dimensional computer modelling to integrate scheduling, costing, accessibility, crime, sustainability, maintainability, acoustics and energy simulation into a holistic building model, thus, to an almost infinite number of dimensions.

The project aims to aid the decision-making process by enabling true what-if analysis - It

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Members of the nD Modelling Network, posing for a photograph at the international workshop held on 30th January - 1st February 2003 in the Mottram Hall, Manchester.

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## Research Tips: Part 1 - Writing a literature review

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It is a good idea to use words, boxes and arrows to sort out your own view of these relationships, but do not reproduce these in the thesis. Such diagrams convey little to anyone else. So, structure the chapter according to your diagram, then dispose of the diagram.

One very important matter that is frequently done badly in the majority of published papers is name-dropping instead of useful citation. You will often see authors place a citation after a particular idea, so that they can denote where the idea came from. We all do it. But we tend to be sloppy about it. If we merely provide the citation, the reader has no idea what led the cited author to make the claim that we are attributing to him or her, nor any idea about the context in which the cited author stated it. Most pieces of writing contain observations made in passing, as well as major research findings. So a few words or a sentence about what the cited author did that led to this marvellous fact being quoted makes the argument a lot more persuasive.

For example, "Lorrimer (1934) stated that scaffolding tends to be merely thrown up unless scaffold erectors are closely supervised" is nowhere near as persuasive as "Lorrimer (1934), in a review of site diaries and accidents on 162 building sites monitored in 1931-2, recorded poor supervision as a major factor in 27 out of 35 fatalities".

The former approach requires the reader to go and find your source material, or to be left with the sense that this is not particularly convincing. The worst thing to do is to merely scatter citations through the text at the end of sentences. These tell your reader nothing about your understanding of past research or the relative strengths and weaknesses of different approaches to the problem.

In choosing what to review, use authoritative sources. Your work is only as good as these sources, so base it on good papers from refereed journals, not magazine articles. Peer reviewed material is better simply because the strength of the science is more likely to have been checked by someone who knows about the field. This includes sources that have been vetted by editors, referees, or funders. If you feel that there has been nothing written on your topic, then you are probably defining it too narrowly. Remember, it would be a strange piece of research if you were investigating a totally new field previously unknown to science. One way out of such a block is to think of topics that provide useful metaphors. Are there other industrial sectors in which this particular issue has been a problem? What is the general class of problem of which yours is a specific example? How would your question look if you applied a similar approach to a different academic discipline? By making these connections, you are more likely to come up with something that is more generalizable, a common aim in research.

### References

Hughes, W.P. (2001) What makes a good research paper? *ARCOM Newsletter*. 16(3), 1-4. On-line version: <http://www.personal.reading.ac.uk/~kcshuwil/publish/arcom2001.pdf>  
 Latour, B (1987) *Science in action*. Cambridge, Mass.: Harvard University Press.

Editorial comment

Research Tips: Part 2

The next issue of the newsletter will focus on how you can construct your scientific arguments and how you can defend data that you have generated within your work ... and more



## Congratulations to David Oloke PhD

The advantages of plant utilisation in off-highway activities such as construction, mining, forestry, etc can never be over-emphasised. As a result of the enormous demand placed on this valuable resource, documentation has become paramount in their effective utilisation. Such documentation relate to inventories, maintenance records, costs, utilisation and breakdown records, etc. Several efforts have been made in order to institute an efficient plant history information regime. These ranged from traditional paper-based to the ("relatively newer") IT-based methods. However, a literature review and pilot study reveal that these are yet to cope with the dynamism with which historical data are generated. Also, when compared with other similar "advanced industries"

such as aviation shipping, railways and roads; off-highway plant lags behind in the application of web-based 'intelligent' information systems. This research sought to improve off-highway plant information management through the development and application of INTELLIPLANT, a web-based information system. The system evolved as an integration of a web-based Relational Database Management System (RDBMS) and a Model Base Management System (MBMS). The RDBMS was designed from the forms collected during a pilot/ field investigation, while the MBMS emerged from the assemblage of time series models developed from a rigorous analytical procedure. INTELLIPLANT has the capacity to generate over 20 real-

time history reports on-line through its RDBMS structure. In addition, the MBMS models predict plant breakdown time (BDPERC) as a percentage of plant availability time for wheel loaders, backhoe-loaders, hydraulic excavators and off-highway haulers. The models depend on the lagged BDPERC, percentage utilisation (UTILPERC), standby percentage (SBPERC) and fault occurrence percentage (FLTPERC). Model validation results indicated acceptable MAD and RMSE performance statistics for each model. Also, results from the practitioner-led performance evaluation of the system indicated that the development of INTELLIPLANT is a significant contribution to off-highway plant history information management.

**Thesis:**  
 Development of web-based off-highway plant information system.

**David Oloke**  
 University of Wolverhampton



## Congratulations to Fiona Borthwick PhD

The research is based on the European Directive aimed at harmonizing standards for construction products. Harmonized standards remove technical barriers to trade allowing manufacturers to sell their products anywhere in the European Economic Area (EEA) provided the product complies with the standard and has affixed the CE marking. This should lead to greater competition in all EEA markets.

A review of relevant literature covered three distinct areas; developments of the European Union and the Construction Products Directive (CPD), the UK construction industry and materials sector and strategic management concentrating on market barriers and entry strategies. The research combined these areas together by investigating the impact of the CPD on the UK construction product manufacturers specifically considering the strategic decisions of the UK brick industry. As there was little previous empirical research into this area, data was generated through exploratory interviews with manufacturers and bodies involved with the UK implementation of the Directive, through a self-completion postal questionnaire survey with manufacturers from six product groups and by a case study approach used to examine the UK brick industry. The research demonstrated that the Directive is having little impact to date on the strategic decisions of UK construction product manufacturers. Also, there are a disturbing number of producers that were not aware of the Directive and its possible implications. By applying previous research findings to the UK brick industry, conclusions were drawn highlighting the specific nature of this industry and identifying specific characteristics that influence its competitiveness. The Directive and the UK brick industry have never previously been examined in such a manner and areas for further research have been suggested.

The impact of the European Construction Products Directive on UK construction product manufacturers

Fiona Borthwick PhD



## Congratulations to Hong Xiao

Globalisation of world economy requires that any robust benchmarking of contractor performance be conducted on an international level. The Japanese and US construction industries are internationally renowned as world leaders. Notwithstanding this, when at its best, UK construction has been shown to be excellent, and capable of matching any other construction industry in the world. A comparison of contractor performance and practices between the three countries can distinguish their respective strengths and weaknesses and provide an opportunity for contractors to learn from each other and improve their performance.

However, comparing international construction is onerous because of the uniqueness of construction products and the complexity of the production process. Each of the existing methods developed for this purpose has its own limitations in terms of comparability and/or representativeness of data.

Having undertaken an international review of contractor performance, the research has:

- ◆ defined 'best practice' for contractors and established criteria to evaluate contractor performance and practice in terms of construction cost, construction time, construction quality and sustainable development;
- ◆ developed a new research approach towards comparing international contractor performance based on a hypothetical construction project which maintains the comparability and representativeness of data;
- ◆ conducted a questionnaire survey among contractors in the three countries to collect information in regards to their performance and practices;
- ◆ identified the significant differences in contractor performance and practices between the three countries and revealed the possible causes for the disparities;
- ◆ developed six best practice performance models by means of multiple regression analysis.

The thesis concluded that there exist significant differences in contractor performance and practice between Japan, the UK and the US. Based on the practices of contractors in the three countries, factors significantly influencing contractor performance are identified and measures for performance improvement are recommended for contractors.

### Thesis:

*A Comparative Study of Contractor performance based on Japanese, UK and US construction practice*

### Hong Xiao

University of  
Wolverhampton



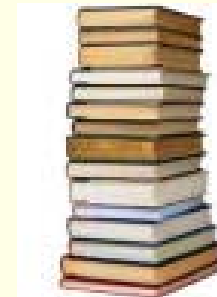
## Research Tips: Part 1 - Writing a literature review

In a research thesis, the purpose of a literature review chapter is to provide the context of your study. It should make clear that you have acquired an expertise in the subject, that you are aware of all the appropriate literature, and that you can use past research and other evidence to put together a logical and structured argument. It is usually quite useful if it concludes with the need for your study and some specific research objectives. The purpose of this article is to provide some advice and guidance about the mechanics of carrying out the literature review.

When you are reviewing research papers, allocate keywords to each paper. You should use your own keywords not the author's. This is because your purpose is to review the literature that forms the context of your study. The author's purpose was to provide indexing terms. Therefore, it is likely that you will want to develop and allocate your own keywords that will help you to develop your own understanding of the field. As you go through each successive research paper, you will need to introduce new keywords, especially at the outset of the study. This is a good thing to do, but you must re-check previous keyword allocations to see if the new keyword applies to papers that you have already looked at, or renders an older one redundant.

As well as allocating keywords to topics, try to also use keywords for describing the methods and data sources used in the research that you are reviewing.

*For example, does the paper that you are reviewing report the results of a survey, a case study, a controlled experiment? Where was the data collection undertaken and when?*



Using the word processor, make an alphabetical list of keywords and under each one, list the author and year of the paper to which they have been allocated. Then, in a separate document where you record the details of the paper, add the keywords, and store this list alphabetically by author's surname. This gives you a double-entry record system which will come in extremely useful when it is time to write up the literature review. Of course, you might choose to use bibliographical software for keeping track of your literature search, and this can be extremely useful, but research is plausible without it. However you do it, keywords should be used with care.

As you acquire the copies of papers that you find, take notes on everything that you read. Always begin with the full bibliographical record, and add your notes as you go. Reproduce the author's abstract as well as your own notes, but ensure that you keep them separate. Include quotable quotes as you go. You might not use them again, but if you do, it can save an enormous amount of time later on if you know exactly where they came from (including page numbers). Make your own critical notes of the paper as well as your own summary of what it is about. Again, this will differ from the author's summary or abstract, as your purposes are different. Use the questions from Hughes (2001) as a guide.

Once you have reviewed most of the papers that you have found, look for connections between the themes. The keywords that you have chosen will provide you with the main headings for your write-up. Those that crop up most frequently will probably form the main sections of the write-up. Draw "mind-maps" to show the links, looking for strong links between key ideas.

*(Continued on page 8)*

**Writing a literature review:**  
advice for  
research students

### Will Hughes

School of Construction  
Management and  
Engineering  
University of Reading

