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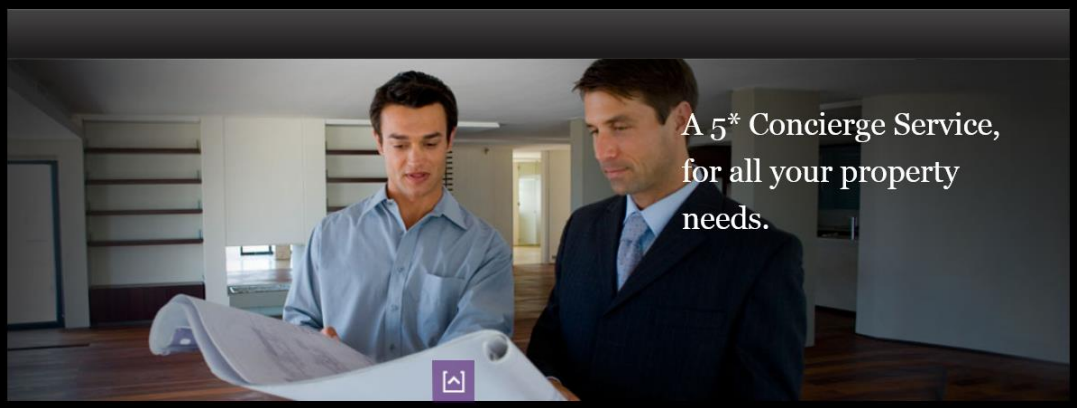
Property Specialists

Sales | Lettings | Design | Build

Information Management
Construction & Property



As At
06 October 2013

Author
D Winsper

EXECUTIVE SUMMARY

"Information systems are the means by which organisations and people, utilising information technologies, gather, process, store, use and disseminate information"
Smithson 1997

Falling from the unifying statement above '*Data'* is transformed into *'Meta-Knowledge'*, via Information Systems and effective / efficient Information Management, but is not solely reliant on Information Technology, which should be viewed as an enabling tool, but is also conditional on a successful Knowledge Management System and its inherent Knowledge Workers, thus performing a '*Socio-Technical'* function.

The construction industry, although disjointed in 'Design' and 'Build' context, in addition to the 'Contractor' – 'Sub-Contractor' relationship, does have the capacity to improve its Information Systems, as can be identified by various academic papers;

- RICS COBRA, 'Process Re-Engineering in the Construction Industry – Buzzword or Reality', Nelson 1999.
- 'Construct IT – Bridging The Gap', Anderson Consulting 1995.
- 'Building IT 2005', ConstructIT Forum 1996.
- Bridging The Gap 'A Process For Change – The development of a generic design & construction process protocol for the UK construction industry.
- Cooper et al 1998.
- Crowley, 1998.

In comparing the manufacturing and construction industries relevant IM and IS, in conjunction with these various academic papers, overarched by governmental reports from Latham 93/94 & Egan 98, similarities exist in process, irrespective of product. Enabled by IT, IM / IS through KW's and effective KMS can enable interoperability on an international scale, within the sector and if championed by large corporates within the whole, effective IS will percolate down to the SME's

Barriers though, do exist in this industry due to the fragmented nature of the sector, which is compounded by the vast islands of information, held within the construction sphere, on different formatted or obsolete software or indeed in the tacit knowledge of the Knowledge Worker, whom is reluctant to change on an individual basis.

This new raft of data has driven legislation (Data Protection Act 1998, Freedom Of Information Act 2000), which has placed an additional burden on the SME's within construction and has the potential to lead to costly litigation, if not designed in, for any future IS.

IS frameworks are ever evolving, as can be seen with Building Integrated Modelling (BIM), a 3D / 4D Approach to the design and build process and with the appetite for more data comes storage solutions in the guise of 'Clouds' (Extranets), which have the potential to standardise file process and may lead to industry standardisation, something which is lacking compared to the manufacturing industry.

Inevitably differences between industries are slight and not product driven, but process orientated.

CONTENTS

Prologue 2

Executive Summary 2

Overview 4

Manufacturing Industry

Technical Information 5
Commercial Information 5
Managerial Information 5

Construction Industry / Property Industry

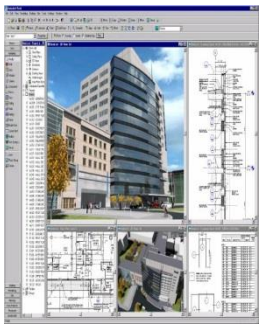
Technical Information 6
Commercial Information 6
Managerial Information 6
Barriers To IS Integration 6

Analysis & Assessment 7

Summary 8

Bibliography 9

Overview



1. Information Systems (IS), which are constantly evolving through the information life cycle, in this technological age, take *'Raw Data'* inputs, through automation or manual entry, in the form of labels, standards or useful facts and gives meaning to that data, through process, thus turning it into information, this information can then be assigned a meaning and evolves into *'Knowledge'*. The cycle is complete when this acquired knowledge is turned into *'Meta Knowledge'* via re-input as data. These Information Systems, in all guises (Bespoke – PACE[1], Off the Shelf – Revit[2]), spanning the managerial chain from strategic through to the operational level (TPS, EIS, MIS, DSS), aid Information Management (IM), globally, across the spectrum of industry, prevents *'Information Overload'* and dependant on the value of *'Raw Data'* and / or '*Knowledge'* inputted to the IS, through its; Reliability, validity, appropriateness, importance, relevance and quality, will give industry confidence and has the potential to lead to savings in the construction industry of some 30%[3], with a more joined up approach to IM, IS and it implementation and evolution as highlighted as *'Best Practice'* in the government reports, that of Latham 1993[4] / 1994[5] and Egan 1998[6] and a view to improved sector integration.

2. A unitary definition for IS, is presented by Smithson 1997[7];

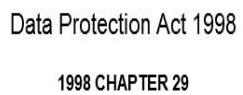
> *"Information systems are the means by which organisations and people, utilising information technologies, gather, process, store, use and disseminate information"*

Falling from this definition it can be realized that data is not the only component part and introduces the aspect of 'Socio – Technical' and the reliance and need for *'Knowledge Workers'* (KW), with explicit or tacit knowledge and effective *'Knowledge Management Systems'* (KMS) to support the IS and also highlights *'Information Technology'* (IT) as a supporting element and not the sole key driver.

3. Drilling down on the construction industry, IS deals with managerial, commercial and most importantly technical data / knowledge via the preferred solution of Building Information Modelling[8] (BIM) which facilitates 3D / 4D problem solving and decision making, but it is noteworthy that there is no industry standard.

4. With these ever evolving IS derives increased legislation, such as the Data Protection Act 1998[9] (DPA) and the Freedom of Information Act 2000[10] (FOI), which places an addition legislative burden on all industries to correctly store data / information, but in addition make it easily accessible to all, within 28 days which leads to inevitable cost implications and all IS should now be developed with this in mind.

5. Whichever industry sector is held as an exemplar, the IS premise holds true, but through evolving life cycle implementation it must always support and not hamper the company business objectives and ultimately the bottom line, that of profit.



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Manufacturing Industry

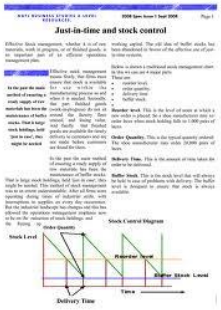
6. The manufacturing industry produce to market a product through a process of New Product Development, with small margins to be sold on mass and hence profitability, via a medium to large scale organisation and thus scalable, which is in direct contrast to the construction industry, with a more disparate environment with design consultancies satellited from and through commercial business objectives, at odds with the build team. The advantages of IS in the large scale manufacturing industry are blatant, in that any mass environment, will have mass data processing needs and will benefit from IS in time management, resource management and the utility of product evaluation.

Technical IS

7. New Product Development, under a common framework, is driven by competitiveness within manufacturing, as acknowledged by Nelson *et al 1999*[11]. Technical IS identifies the real need and allows the streamlining of the operational process and through effective KW and KMS advances the business process and aids profitability, through effective co-ordination and control.

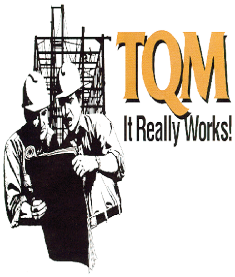
Commercial IS

8. This IS is associated with administration and as such focusses on payments (PAYE)[12] and statuary requirements (VAT etc)[13], hence the production of an audit trail, conforming to the DPA[9]. Whilst initial outlay for effective IS is high, it is mitigated by the size of the company and thus with the requirement of 100% accuracy, is more cost effective, proportional to the number of employees / sub contracted supply chain. Again highlighting *'Economies of Scale'*.



Managerial IS

9. Focussing on *'Resource & Supply Chain Management'* as one vignette that highlights IS advancement within the manufacturing sphere, the development and introduction of Optical Character Recognition (OCR)[14] in the guise of *'Bar Codes'*, thus leading to a *'Universal Product Code'*[15], through to Radio Frequency Identification (RFID), has unquestionably improved the supply chain through a more efficient approach under IS, with the majority of demands being automated. In addition, the '*Universal Product Code'* identifies the need for interoperability across the sector. New working practices have evolved to again 'fine tune' to meet company objectives and profitability, that of Just In Time (JIT)[16] delivery and Total Quality Management (TQM)[17].



10. Whilst the manufacturing industry can be held as an IS / IM exemplar, due to corporate size and product specifics, examples however, similar to the issues encountered within the construction industry, that mirror *'Contractor' – 'Subcontractor'* relationships and how individualism still exists in regards to information flow and management. Baird Textile Holdings Limited v. Marks and Spencer Plc 2000 demonstrates that two different manufacturing companies, passage of information and IM, working towards a supposed joint goal, was poor at best.

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Construction & Property Industry

11. The construction and property industry is fragmented between the *'Design'* and *'Build'* disciplines and additionally complicated by the *'Contractor'* and *'Sub-Contractor'* relationships underpinned by agreements (Partnership v Partnering, Contract Law etc) and overarched by differing corporate goals that are at odds with industry and subsequent government reports, Latham 1993/4[4] & Egan 1998[6].

Hence there is limited interoperability in IS and no overarching recognised industry standard for the cross pollination of data. Couple this with the propagation of small firms (10 – 15 Personnel), all attempting to cement themselves within the industry in austere times and it leads to *'Self'* before *'Sector'*. The Construction Project Information Committee (CPIC)[19], falling from a defunct CPI, has identified these challenges and attempts to provide *'Best Practice'* to the construction industry, with support from relevant professional bodies, but is largely disregarded by practitioners.

Technical IS

12. At the design stage a wealth of technical data exists and software has been developed and evolved over the last 20/30 years, which provides a more holistic approach, namely Building Information Management (BIM)[20], which caters for interoperability, integration, flexibility and is faster and cheaper than individual packages. This does however lead to large data files, creating an unwieldy database and questions ownership and coordination responsibilities. Extranets and *'Cloud'*[21] technology will overcome these aspects with the efflux of time. This technical data is incumbent on KW's and their explicit knowledge to process and aid EIS, however this can be regressive, as KW's can resist change through the burden of additional training and personal development (PD).

Commercial IS

13. This IS parallels the manufacturing sector, but is converse to paragraph 8 above, in that most design / build companies are SME's and thus outlay is high for a limited return.

Managerial IS

14. Continuing the vignette of *'Resource & Supply Chain Management'*. With a more joined up approach to classification and analysis of project information, being critical to success within projects in the Built Environment, through a common approach to categorisations falling from the managerial project information sub-sets. The Royal Institute of Chartered Surveyors (RICS)[22] and ASTM International, under UNIFORMAT II (E06.81 Building Economics)[23], presented a proposed universal standard for cost analysis at the COBRA 2012 symposium, entitled – *'Standard Forms of Elemental Cost Analysis for Civil Engineering'*[24]. This innovative paper attempts to standardise costs of the built elements, rather than the individual material, for example placing a single financial value for a structural wall etc. This paper, when ratified will standardise elemental costs and thus can influence design from a financial perspective, rather than fiscally hampering the project at the design stage.

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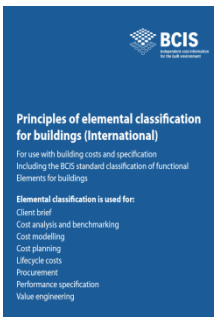
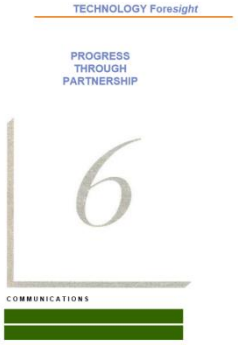
15. The RICS paper proposes that this new elemental process defines the construction entity by function, rather than component parts and will aid classification for buildings to cost planning, cost management, cost analysis and cost benchmarking. The BCIS (RICS) has proposed a draft sub-set data structure, which will become the industry standard. This paper if agreed will then standardize cost information across clients, consultants and contractors and can be utilized by countries that have no local, let alone international standard.

"With the increasing globalization of construction, focus on infrastructure renewal and need for standardization to expand the use of new technology, this initiative will accelerate transparency and consistency, and help to improve investment decisions. We should all get behind this and ensure it is adopted."[25]
Simon Taylor FRICS, Immediate Past Chair of the Construction Council






IT AND THE DESIGN AND CONSTRUCTION PROCESS:
A CONCEPTUAL MODEL OF CO-MATURATION

ABSTRACT

Barriers To IS

16. Barriers exist to the successful implementation of efficient and effective IS, due to the fragmented nature of the industry, as highlighted, this is compounded by the vast islands of information, held within the construction industry, on different formatted or obsolete software or indeed in the tacit knowledge of the KW. Thus KW's need to be empowered at the individual level with a view to improved socio technical integration at the corporate level, thus improving efficiency and competition. Overarching this is integration at the project level and industry itself, with various reports highlighting the benefits; *'Construct IT – Bridging The Gap'*, Anderson Consulting 1995[26]. *'Building IT 2005'*, ConstructIT Forum 1996[27]. *'Technology Foresight: Progress Through Partnership 2',* Cabinet Office 1995[28], stating that;

- IT is an enabler, operating on an international level, with direct access to 3D databases, through workstations, in a virtual world.
- IS will continuously redefine and reengineer the design and build process.
- Communications frameworks will exist between project databases, with a strategy to integrate the construction process.

Analysis & Assessment

17. Through a conference paper by Sheath et al 1996 – *Bridging The Gap 'A Process For Change – The development of a generic design & construction process protocol for the UK construction industry'*[29], it can be highlighted that;

- Evolving manufacturing processes should be mirrored by the construction sector, to the benefit of competition.
- There is space for *'realistic and tangible'* improvements to the advantage of construction, however further work is required for these benefits to be achieved.
- Innovative working practices will fall from process, that of; design, build and renewal.
- Highlighted the benefits of Computer Integrated Manufacturing (CIM).

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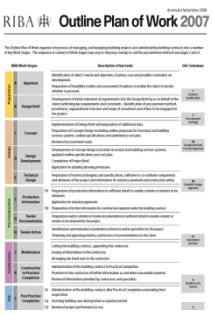
18. Nelson et al 1999, RICS COBRA Research Foundation – *'Process Re-engineering in the Construction Industry – Buzzword or Reality'*[30] identified;

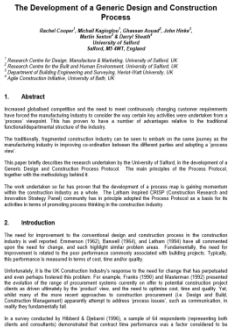
- The relevance of Business Process Re-engineering (BPR) and subsequent opportunities and barriers to the industry.
- Evaluated protocols namely;
  RIBA Plan of Work 2007[31].
  BPF Manual 1983[32].
  Generic Design & Construction Process Protocol (1998)[33] – University of Salford.
- Concluding that, if implemented by large scale construction firms, the process will filter through to SME's.
- Similarities between the two industries exist, that of Initiation, Development, Coordination and product Support.


RIBA Outline Plan of Work 2007


BPF
BRITISH PROPERTY FEDERATION

19. Cooper et al 1998[34], falling from the University of Salford report above, also goes some way to highlight the legislative and litigation issues contained within a more joined up process, highlighting ownership and responsibility delegations.

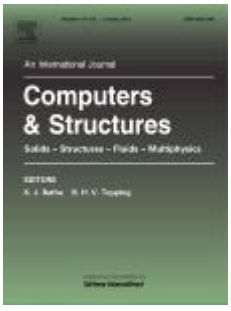
20. Crowley, 1998[35] supports BPR and CIM evolved to Computer Integrated Construction (CIC), but highlights the bespoke nature of the industry with one off projects and the individualistic nature of construction, but concludes that *'construction can and should be viewed as a manufacturing process'*.


The Development of a Generic Design and Construction Process

21. These published papers above suggest that the construction sector can and should mirror the manufacturing industry, with the benefit of integration, interoperability, improved application process and a more effective and efficient communications process.

Summary

22. In comparing the manufacturing and construction industries relevant IM and IS, in conjunction with various academic papers, overarched by governmental reports from Latham 93/94 & Egan 98, similarities exist in process, irrespective of product. Enabled by IT, IM / IS through KW's and effective KMS can enable interoperability on an international scale, within the sector and if championed by large corporates within the whole, effective IS will percolate down to the SME's, overarched by Industry Standards, as highlighted in the construction and resource management field, that of new elemental process, as one vignette. Further, the IS process is ever evolving and through the use of extranets and cloud data storage the concept of a more joined up design and build approach becomes one step closer, for financial and business objective benefits to all.



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