Organisation Profiling and the Adoption of ICT: e-Commerce in the UK Construction Industry

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Abstract: This paper outlines the application of a model of business that has been developed from an amalgam of sources covering a wide range of research literature concerned with the relationship between electronic communication and the business. This model outlines what is termed an "organisational profile" profile and allows the analysis of the business with respect to its ability to perform in four distinct quadrants: management, processes, organisational culture and human resources. It is then applied to the adoption of ICT in the business and the supply chain using a case study of the UK construction industry. The results are analysed to show which elements of the model are important for success. The model shows that to be successful in the adoption of ICT a business must have threshold scores in each of these quadrants that show its make-up or "organisational profile" (OP). It is this OP that is the most interesting point of the research. It has been found that certain OPs are more likely to succeed in this adoption than others and that the likelihood of success can be shown by the movement of the business in the four quadrants: thus the model can provide a rough prediction of the future success in various activities - such as adoption of ICT but can also be extended to other activities because of the widespread nature of the model developed. It is also planned to apply the model to different problems in the same domain in the near future so that further insights can be gained from the model and its application.

Keywords: e-commerce, ICT adoption, construction industry, business modelling, organisational profile

1. Introduction

Previous work has seen the development of a model (Jackson and Sloane 2003, 2007) based on a number of sources (Gallier 1991, Wolvelaere et al 1991, Williams 1993, Emmelhainz 1993, Garcia-Sierra, Moreton, and Sloane 1994, Regan 1995, Lummus and Duclos 1995, Angeles, Nath, and Hendon 1999, Fearon and Philip 1999, Pawar and Driva 2000). This has incorporated a wide range of different research into the final tool – The "target" model of ICT (information and communication technology) adoption. This "target" model is based in four different areas of an organisation: process, management, human resources, and organisational culture. The various sectors of the model give an overall view of the organisational ability to benefit from the adoption and implementation of ICT – an organisational profile. This model has now been applied to a range of businesses in the UK construction industry and the results are presented in this paper.

2. The supply chain

ICT developments and new methods of electronic trade are constantly being introduced into the commercial arena. Electronic trading methods have been available for many years, Electronic Data Interchange (EDI) being the most widely accepted form particularly in the construction industry. It provides a governed formal structure for trading business documents. EDI has helped the development and expansion of partnerships between organisations to varying degrees. It has provided the media for developing electronic business communities and supply chains (E-Chains). It is a technology that has enabled change, development, and for operating cost to be reduced. It is a competitive market tool that the expanding use of the Internet can fuel, increasing the use of electronic trading methods.

In business, communication is central to operations and the formation of E-Chains. EDI permits the sharing of information throughout a supply chain by the seamless exchange of documents. For the effective utilisation of EDI, the integrated IT system requires a detailed analysis from both a breadth and depth perspective. This permits the effective co-maturation and development of the existing business with new technology. Research shows extensive business integration of IT developments, especially at the architecture stage, can provide substantial benefits in small and large companies alike.

To fully exploit opportunities bought on by, adopting electronic trading methods and developing business practices, a business analysis and constant monitoring of the individual organisation and the supply chain is required. This research supports a general shift towards inter-organisational relationships rather than stand-alone analysis to yield maximum business growth. Within this framework the individual business needs to be analysed to see how it fits in the supply chain and how it is fitted to adopt the technology.

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The model presented here is a necessary tool to analyse the individual organisation which will then feed into the supply chain model to give a more complete picture.

3. Model outline

It has been shown that there is a positive relationship between the higher levels of EDI implementation and achieving more significant benefits. The literature suggests (Jackson and Sloane 2003, Jackson and Sloane 2007) that both depth and breadth be considered when analysing an organisation for implementing a new technology. There have been four key elements repeatedly mentioned throughout the literature as vital for any successful adoption, they are; process, management, human resources, and organisational culture. The target model (Figure 1) examines an organisation as a single entity taking into consideration the elements mentioned and the degree of adaptability.

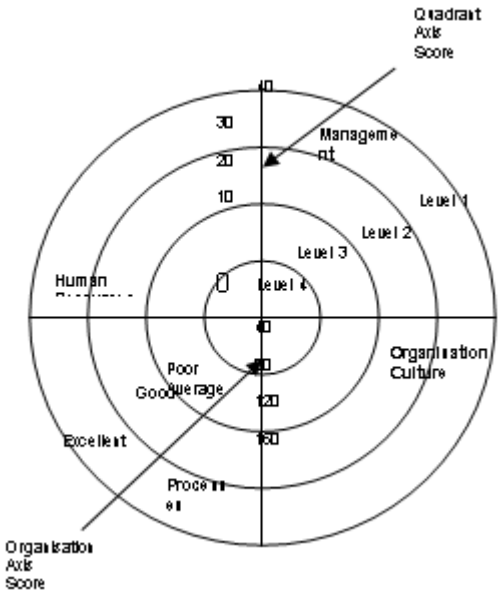

Figure 1: The target model

4. Results and analysis

This section shows the results of the development and application of the model. The results gathered are displayed and analysed based on organisational quadrant division. The analysis identifies the two lowest and highest resultant marks from each quadrant, an overall average quadrant score, and quadrant range score. The results are also analysed in holistic terms, thus providing an organisational score or ability to adopt new ICT developments into existing business framework.

The significance of the highest and lowest scoring statement is not obvious. The most simplistic view would be that the results show that the low statement has a lesser impact on the adoption of new technology compared to the converse returned by the high scoring statement. However another view could suggest that the low statement in itself is of lesser importance and the high statement result being of higher importance. The analysis is constructed on the premises that the highest and lowest recorded figures represent the most and least significant statements respectively based in each quadrant.

4.1 Quadrant results: Organisational culture

The data gathered from the organisational culture questions was averaged and applied to a bar chart to display the results by question (Figure 2)

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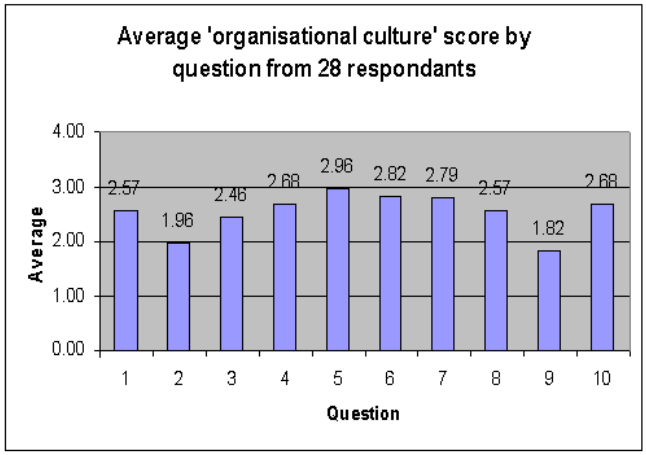

Figure 2 Quadrant results – organisation culture

The two lowest average marks were obtained by:

- Q9 (Value1.82) Best practice of our trading partners has influenced our organisational development path.
- Q2 (Value 1.96) Colleagues are willing to 'point the finger' concerning other's over known issues.

The two highest average marks were obtained by:

- Q5 (Value 2.96) People choose to work with others rather than in isolation.
- Q6 (Value 2.82) People become allies when development is proposed.

By examining and analysing the 'organisational culture' results it would suggest that best practise utilised by the respondents trading partners has had a low impact on the adoption and implementation of new technology in their own organisation; statement (9). This result combined with the well above average result from statement (7); 'Previously the organisation has coped well with change' and statement (10); 'Our organisational culture has positively influenced our performance and corporate strategy', suggests that although many organisations indicate they embrace organisational cultural change few are influenced directly by their current trading partners.

The highest score was gained by statement (5); 'People choose to work with others rather than in isolation'. The result indicated that most employees would rather form and work from with in a team to achieve a common goal than work on their own.

4.2 Quadrant results: Management

The data gathered from the management questions was averaged and applied to a bar chart to display the results by question (Figure 3)

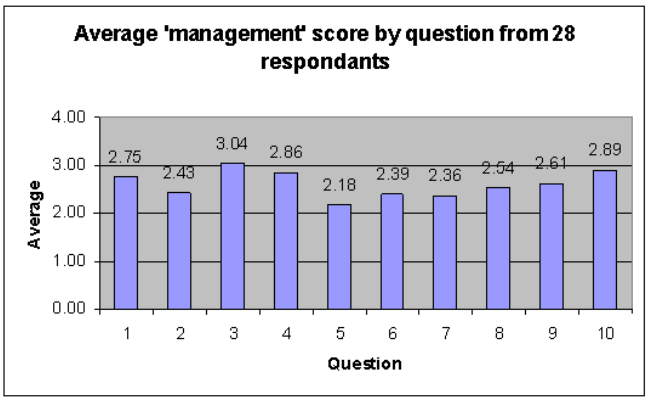

Figure 3: Quadrant results – management

The two lowest average marks were obtained by:

- Q5 (Value 2.18) Management provide adequate positive and negative stroking.
- Q7 (Value 2.36) Management stimulate an interest in work.

The two highest average marks were obtained by:

- Q3 (Value 3.04) Management determines resources and structure required for new adoptions.
- Q10 (Value 2.89) Management effectively resolves conflicts and differences (including resistance to change)

By examining and analysing the 'management' results it would suggest that the management and/or management style employed by the organisations tested provides a low level of positive stroking (statement 5: management provide adequate positive and negative stroking) and stimulating an interest in current business related work operations (statement 7: management stimulate an interest in work), thus resulting in a negative interest in the adoption of new ICT into an existing business framework. It is clear from the highest scoring result that management can clearly identify what is requirement for new ICT adoption (statement 3: management determines resources and structure for new adoptions). The second highest scoring result (statement 10: management effectively resolves conflicts and differences) suggests that any new adoption is managed carefully helping lower any resistance to change, a positive sign stance for any organisation to adopt.

4.3 Quadrant results: Processes

The data gathered from the process questions was averaged and applied to a bar chart to display the results by question (Figure 4)

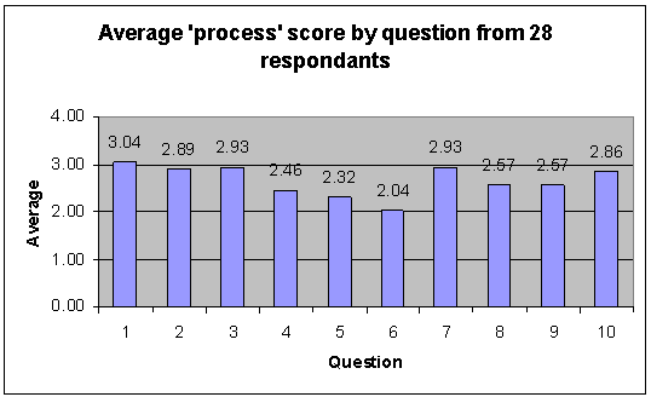

Figure 4: Quadrant results – processes

The two lowest average marks were obtained by:

- Q6 (Value 2.04) The organisation has a budget set for new technology adoption.
- Q5 (Value 2.32) Business process re-engineering is common.

The two highest average marks were obtained by:

- Q1 (Value 3.04) The benefits of new technology adoption is greater than the associated cost (cost – benefit analysis).
- Q3 & Q7 (Value 2.93) New technology adoption will add significant value to the business and improve productivity & New technology adoption makes commercial sense.

By examining and analysing the 'processes' results it would suggest that adopting ICT into an organisation is relatively low on the agenda. The two lowest results (statement 6: the organisation has a budget set for new technology adoption) and (statement 5: business process re-engineering is common) would suggest that the technology infrastructure is only adapted, changed, upgraded, or added too, on rare occasions, also it would seem unlikely that any new adoption would radically change current working practices. Conversely the highest scoring average results indicate that organisations observe the benefit of adopting new technology into current working practices and that the benefit outweighs that of the cost (Statement 1: the benefits of new technology adoption is greater than the associated cost). Further, any new ICT adoption would be seen to add value to the current business and makes commercial sense (Statements 3 and 7 respectively: new technology adoption will add significant value to the business and improve productivity, and new technology adoption makes commercial sense)

4.4 Quadrant results: Human resources

The data gathered from the human resource questions was averaged and applied to a bar chart to display the results by question (Figure 5)

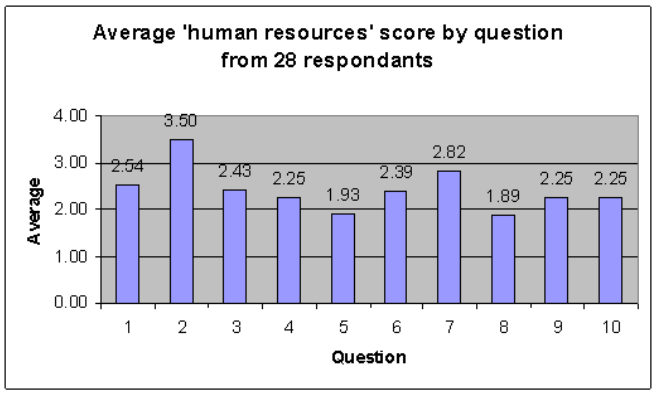

Figure 5: Quadrant results – human resources

The two lowest average marks were obtained by:

- Q8 (Value 1.89) The organisation operates a corporate integrated human resources program.
- Q5 (Value 1.93) The organisation operates an adaptive training program.

The two highest average marks were obtained by:

- Q2 (Value 3.50) People are a vital competitive resource.
- Q7 (Value 2.82) Human resources are committed to the good of the organisation.

By examining and analysing the 'human resource' results it would suggest that the organisations analysed thought that new technology adoptive success did not reply on employing an integrated human resources strategy (Statement 8: the organisation operates a corporate integrated human resources program). Also training or re-training has a low impact on successful new technology adoption (Statement 5: The organisation operates an adaptive training program). The very high, highest average score (statement 2: people are a vital competitive resource) indicates that an organisation values its human resources, possibly more than just as a commercial commodity as suggested by the second highest statement (statement 7: human resources are committed to the good of the organisation)

5. Analysis

The overall average results for each quadrant was the mathematically calculated average of the average score extracted from each quadrant. Table 1 shows the results.

Table 1: Summary of results by quadrant

Quadrant	Highest	Lowest	Average	Range
Organisational Culture	2.96	1.82	2.53	1.14
Management	3.04	2.18	2.60	0.86
Processes	3.04	2.04	2.66	1.00
Human Resources	3.50	1.89	2.43	1.61

5.1 Average scores

An analysis of the average score shows that the element 'processes' scores the highest average mark (2.66) closely followed by 'management' (2.60), 'organisational culture' (2.53), and lastly, 'human resources' (2.43). The difference in average marks could suggest either that the perceived weighting of the 'processes' statements were higher than that with the 'human resources' statements. There may be individual questions that have returned a very high or low result that is affecting the balance of results or, that a higher average score was generally recorded by the respondents as a more significant quadrant associated with the adoption of new technology into an existing business. Using this last statement and applying the results would suggest that 'processes' is the most important of all the quadrants for successful adoption to occur. This would concur with the model review and analysis. Previously of the many models constructed the central focus was the operations or process-develop issues concerning new ICT adoption. This could be seen as inherent in the business of today.

5.2 Range scores

The range result for each quadrant is the mathematical difference between the highest average and lowest average scores achieved this is shown in table 1.

The range analysis identifies the spread or range of recorded results. The table shows that 'human resources' achieved the highest range score (1.61) followed by 'organisational culture' (1.14), 'processes'(1.00), and lastly 'management'(0.86). There are a number of ways of examining the significance of the range result.

- The greater the range result could indicate:
- The more diverse the statements in a quadrant
- The respondent is unsure of the question meaning
- The less evenly weighted the statements are in a quadrant
- The less cohesion there is between the statement and business framework

Conversely; the lesser the range result could suggest:

- The more closely associated the statements in a quadrant
- The respondent has a passion or close relationship for a statement
- The more evenly weighted the statements are contained within a quadrant
- The more cohesion there is between statement and business framework

For this analysis the 'range' result is the diversity of statements asked in a quadrant in the questionnaire. Thus 'human resources' achieved the highest diversity of questions.

5.3 Summary of quadrant scores

Table 1 shows the results collected and collated from the questionnaire research. The table shows the quadrant results; organisational culture, management, processes, and human resources in a summary format, this includes the compiled results for the highest, lowest, average, and range scores.

The results for 'organisational culture' category suggest that this area of the business is not the most clearly understood, defined, and/or recognised by an organisation. The results show that it is clearly important to some organisations however, to others it is defined as of least importance. This perceived conflict of interest is common as perception and reality will differ between organisations. This is what makes an organisational culture unique.

The results for 'management' and 'processes' categories show that these two quadrants have the two highest 'average' grade positions and the two lowest 'range' positions suggesting that these areas of the business framework are the most clearly recognised and understood by an organisation. It may be suggested from the lesser extreme results that an organisation observes these categories with equal importance.

The results for the 'human resources' category shows an extreme high for the 'highest' and 'range' result. This suggests that this area of the business is the most misunderstood in terms of successful adoption of new technology. It lacks definition in the organisational context. The results indicate that some organisation view its human resources as vital to business success where as others do not. Further more, as discussed when reviewing 'organisational culture', the perceived importance and actual need of human resources is an area of dispute.

5.4 Holistic analysis

An organisation can be divided into a number of quadrants that collectively construct a business framework. However, when a new ICT adoption is to take place the organisational needs to be examined from a holistic view. For this purpose a polar chart has been used. The forty questions (ten from each quadrant) that were used to construct the questionnaire have been charted. This process pieces back together the business to produce a diagrammatical overview of an organisation based on the research conducted.

Figure 6 was constructed from the recorded results of three organisations used in the survey. The plotted points provide a clear picture of the difference between an excellent, average, and poor organisation.

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The 'excellent' organisation scores very high (between 3 & 4) on all questions. This would suggest that the organisation is currently in a very favourable position for successful adoption of new ICT into its existing business framework. The 'average' organisation marks hover in general between the (2 & 3) mark. This indicates current flexibility and capability to achieve moderate success. Full adoptive success is possible but may take a longer period of time to realise or require an extra application of resource. The 'poor' result suggests that successful adoption of a new ICT development is limited, even prone to failure, unless additional resources in most quadrants are applied.

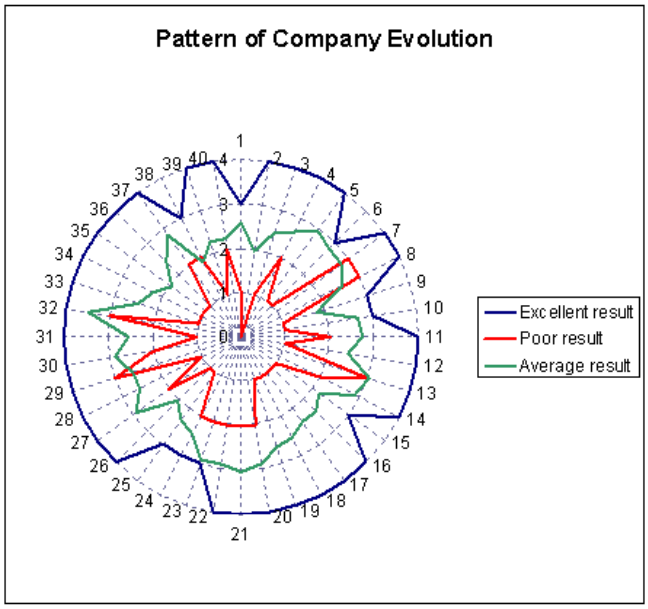

Figure 6: Pattern of company evolution

In general, the graphical representation of the results suggests, by its increasing area, the increasing possibility of a successful new ICT adoption into an existing business framework.

6. Conclusions

This paper provides results and analysis of the application of a newly created model of organisations in the construction industry sector based in the United Kingdom. The data gathered forms the basis for model testing and organisational analysis. It will also be used for further research developments.

From an 'organisational culture' prospective the results confirm that trading partners have had little impact on influencing supply chain developments or new ICT adoptions although the results clearly indicate that group/team working is essential to success. The 'management' results suggest that management in general provides a limited amount of feedback to its work force and the structure and resources are determined by management. The 'processes' results indicate that many organisations do not have a budget set for new ICT adoption, however suggest that the benefits of adopting new ICT developments is greater than that of the cost. The 'human resources' sector result identifies the greatest area of conflict and understanding from the organisations surveyed. The results suggest that many organisations do not operate an integrated human resources program however identify that human resources are an organisation's greatest competitive advantage.

The average and range results calculated from each quadrant supplied another dimension to the analysis. The average score is built on the premise: the higher the average score the more important the quadrant and that 'processes' are vital to success.

The study of previous models concurs that 'processes' or operations adoption is usually shown as key to success, many models only looking toward this area of the business framework for new ICT adoption. The 'range' result is the mathematical difference between a quadrants' highest and lowest average mark. The range result can be viewed in a number of ways. However for this thesis it can be described as the diversity of questions asked within a quadrant. 'Human resources' scored the highest range result, 50% greater than all the other quadrants, further investigation is required.

The summary of the quadrant results suggest that 'organisational culture' is not clearly understood or recognised as an impact of new ICT adoption. Management and processes are viewed by most organisations as very important and their impact is widely understood. It is clear from the results that the 'human resource' area of the business is the most misunderstood or simply seen as a non-significant entity in the role of successful new ICT adoption into an existing business framework.

The holistic analysis provides a pictorial overview with three organisations results plotted (excellent, average, poor). The organisations plotted are extracted from the results of the survey. The polar chart provides clear indication of the total area resulting from the plotting exercise. The greater the area results in a more dynamic, and flexible organisation that can accept new ICT developments easily into an existing business framework. Thus, providing:

- A greater rate of success
- A higher level of success (depth of penetration)
- In an ever reducing relative time period

It is clear that research discovers and uncovers more directions and questions to be asked: this research has been no different.

References

Angeles, R. Nath, R. Hendon, D. (1999) "An empirical investigation of the level of electronic data interchange (EDI) implementation and its ability to predict EDI system success measures and EDI implementation factors*", International Journal of Physical Distribution & Logistics Management*, Vol 28, No. 910, pp773-793.

Emmelhainz, M. A. (1993) *EDI: A total management guide*, Van Nostrand Reinhold, New York, NY.

Fearon, C. & Philip, G. (1999) *"An empirical study of the use of EDI in supermarket chains using a new conceptual framework"*, Journal of Information Technology, Vol 14, pp3-21.

Gallier, R. (1991) *"Strategic information systems planning: myths, reality and guidelines for successful implementation",* European Journal of Information Systems, Vol 1, pp55-64.

Garcia-Sierra, A. Moreton, R. Sloane, A. (1994) *"EDI and SMEs: The business case",* Journal of Industrial Affairs, Vol. 3, No. 2, pp99-106.

Jackson, M. & Sloane, A. (2003) *"Modelling Information and Communication Technology in Business: A Review and Analysis"'*, Business Process Management Journal. Vol 9, No. 1, pp81-113.

Jackson, M. & Sloane, A. (2007) *"A Model for analysing the success of adopting new technologies focusing on electronic commerce"*, Business Process Management Journal, Vol 13, No. 1, pp121-138.

Lummus, R. R. and Duclos, L. K. (1995) *"Implementation of EDI systems"*, Journal of Systems Management, Vol. 45, No. 5, pp42-48.

Pawar, K. S. and Driva, H. (2000) *"Electronic trading in the supply chain: A holistic implementation framework"*, Logistics Information Management, Vol.13, No.1, pp21-32.

Regan, J. (1995) Crunch time: How to reengineer your organisation, Century Business Ltd, London. ISBN 0712675450.

Williams, K. C. (1993) *"An empirical study of logistics organisation, electronic linkages, and performance"*, PhD thesis, Texas A&M University.

Wolvelaere, et al. (1991) *"Focusing on Steps for Success*", Extracted from Industry Week edited by Tescher, L., November 4th, Vol 240, No.21, Penton Publishing Inc., London, pp5-16.

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