# MODELLING THE INTERACTIONS AMONG FACTORS THAT INFLUENCE SUCCESSFUL COMPUTERISATION OF SMALL BUSINESSES

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## ABSTRACT

Identification of factors that contribute to computer-based information systems success is of crucial importance to the small business sector. Central to this process is the task of building conceptual models of interacting variables that contribute to success. The present study used structural equation modeling to test a model that embraced four broad groups of variables, including background characteristics of the organization, background characteristics of the Chief Executive Officer, decision making processes, and a cluster of variables relating to the performance of the system itself. The outcome variable was user satisfaction. A self-report instrument called the Implementation Survey for Computer Based Information Systems (IS-CBIS) was used to collect data from 171 regional small businesses located on the East Coast of Australia. Results showed that, although the performance of the system was the immediate determinant of satisfaction, the background variables had both direct and indirect (mediated) effects on user satisfaction. These findings emphasise the importance of going beyond the immediate surrounds of a computing environment if one wishes to explain the factors that influence CBIS success in small businesses.

## INTRODUCTION

Many small businesses are improving their competitiveness through deployment of information systems and information technologies. Information systems are now essential for small business innovation (Redoli, Mompo, Garcia-Diez, & Lopez-Coranado, 2008). Properly handled, the investment will improve the competitiveness of the company. Badly handled, the investment will handicap the company and perhaps even lead to its closure. It is therefore not surprising to see an increasing amount of research devoted to identifying the factors that lead to successful computerisation. Despite these efforts, a search of the literature indicates that there are still gaps in

the knowledge relating to success factors in small businesses, especially regional small businesses (Patullock, 2005; Schubert, Fisher, & Leimenstoll, 2007). Small businesses typically lack the expertise and financial power of larger businesses, both of which are major impediments when it comes to adopting information systems. Regional small businesses face additional concerns and experience different pressures to their metropolitan counterparts, especially in relation to backup support and servicing. The main aim of the present study was to identify and model the network of factors contributing to successful implementation of computer-based information systems (CBIS) in small wholesale and manufacturing businesses in a regional area of Australia.

A second gap in the literature concerns the fact that many studies have concentrated on a small part of the CBIS success chain, focussing on the decision to adopt a CBIS, the operational characteristics of already-purchased systems that contribute to satisfaction, or the measurement of satisfaction itself. Technology adoption and implementation is a multistage process. The focus of the present study was the stages following the decision to adopt CBIS through to the point where the businesses were able to rate their satisfaction with the CBIS they had adopted. The key constructs investigated were the characteristics of the Chief Executive Officer (CEO), organisational characteristics, the decision criteria used in the acquisition and implementation of CBIS, and the operating characteristics of the system installed (e.g., whether it produced the required information). The study used survey methodology in conjunction with structural equation modelling (SEM) to test implementation success models. We begin by stating our definition of small business and then review the literature on CBIS success.

The term "small business" is not the only one used to describe this section of the economy. The term "small and medium enterprise" (SME) is also widely used. Throughout this paper, we will refer to small business but, for convenience, use SME where appropriate in our review of the literature. In Australia, the widely accepted definition of small business is still that offered by the Australian Bureau of Statistics (ABS, 1995). This definition categorises manufacturing small businesses as those with fewer than 100 employees and all other categories of small businesses as those with fewer than 20 employees. The ABS (2006) estimated there were over one million small businesses operating in Australia in 2004. These small businesses employed over 34% of the non-agricultural, private sector workforce, inclusive of owners. Studies from neighbouring countries emphasise the importance of small businesses to their economies and the increasing adoption of CBIS in their small business sectors (e.g., Kartiwi, 2006; Locke, 2001). Clearly, the sector is a very important part of the Australasian economy (Patullock, 2005).

Despite the positive nature of these growth statistics, rapid advances in information technologies and benefits obtainable through efficient and effective use of these technologies is often not realised in the small business sector. A decade ago, small businesses lacked technical expertise in information systems and related technologies (Chau, 1994; Burgess, Belcher, Paull, & Singh, 1997) and it seems that the situation has not changed in the intervening years with more recent studies reporting that small businesses rarely position themselves close to the cutting edge of technology and generally don't have the time, resources, or expertise to develop appropriate plans to incorporate technologies into their business operations (Morgan, Colebourne, & Thomas, 2006; Lawson, Alcock, Cooper, & Burgess, 2003). This problem is not confined to CBIS adoption, but to any situation where small businesses take on new systems or technologies (Chong, 2007). Consequently, most small businesses use information systems technologies for operational support rather than for strategic purposes (Harindranath, Dyerson, & Barnes, 2007). Alongside these observations, a growing body of literature is adding to our knowledge of what factors will help businesses to adapt successfully to computerised work environments. In the paragraphs that follow, we review these key factors.

## BACKGROUND (DISTAL) FACTORS CONTRIBUTING TO CBIS SUCCESS

When examining the factors that contribute to CBIS success, some researchers (e.g., DeLone & McLean, 1992, 2003, 2004) have focused on the characteristics of the IS system itself, such as the relevance of the information provided. We call these proximal factors to distinguish them from the more distal factors identified by other researchers, such as the broad economic landscape in which the business operates (e.g., Thong & Yap, 1995). A distal factor is therefore one that is likely to have an indirect effect on CBIS success. The present study covered both proximal and distal factors in an attempt to gain a better understanding of the various influences on successful CBIS implementation. The terms proximal and distal can have another meaning in this context. As Redoli et al. (2008) pointed out, technology is usually adopted in stages and an SME can be at different stages of implementation for different parts of a CBIS system. The first stage is the decision to adopt a CBIS. In their meta-analysis of the literature dealing with SME e-Business, Parker and Castleman (2007) pointed out that a high proportion of the literature on this topic deals with factors influencing the adoption decision itself. Although our focus is on implementation, it is likely that factors that led to adoption will continue to influence implementation, but perhaps with decreasing strength over time. Some of the rationale for our implementation success model will therefore draw upon the CBIS adoption literature. Our three distal factors, CEO Characteristics, Organisation Characteristics, and Decision Processes, span both adoption and implementation phases. We begin our review of CBIS success factors by looking at these three factors.

Thong and Yap (1995) found that small businesses that adopt IT are more likely to have CEOs who possess a positive attitude towards adoption of IT, who are innovative, and who are knowledgeable about IT. Burgess et al. (1997) found that 56% of the respondents in their study of small businesses in Australia considered a progressive owner to be a success factor in the implementation of CBIS. They also found that in small companies the owner is generally the manager and the sponsor of the IT projects. Aside from this empirical evidence, one would expect that in a small business environment, the owner or CEO will determine the characteristics and organisational culture of the business. We therefore included the variable in our modelling, focussing particularly on the CEO's knowledge of CBIS and the CEO's innovativeness.

The next set of factors relate to the characteristics of the organisation. Businesses that have technical expertise should be in a better position to capitalise on IT innovations. Recent research recognises that for small businesses, this technical expertise is likely to come from external advisors, in which case availability and quality of external advice becomes a key factor in CBIS success (Goode, 2002; Morgan et al., 2006). We labelled this construct Organisation CBIS Technical Capacity, and included it as part of the network of factors influencing CBIS success. Recognising that technical expertise could come from outside or inside the business, we phrased the questions in our survey so that respondents indicated the capacity of the business to deal with each of the technical issues identified in the items. We also included the source of the capacity in the question stem.

A second organisational factor likely to impact on CBIS success concerns the growth outlook of the business. A CBIS is more likely to be rated positively by a business that is expanding and able to capitalise on the opportunities offered by computerisation. In a similar vein, successful small businesses must be innovative to enhance or maintain their competitive advantage over rivals (Redoli et al., 2008). Compared with countries such as Sweden and Germany which follow a "coordinated" business philosophy, Australian small businesses operate in a highly "competitive" environment, supported by government policies directed at entrepreneurship (Parker, 2002). In regional areas, in particular, competition for scarce resources is likely to be a major factor in

business success (Chong, 2007; MacGregor & Bunker, 1996). Thus, many businesses fail simply because they cannot keep up with their rivals. However, competitiveness is not an inherently good or bad quality. It can be a major asset in some industries (e.g., service) and a liability in others (e.g., technical innovation). Its inclusion in our CBIS success model as a third characteristic of organisations was therefore somewhat exploratory.

The last of the distal factors concerns the decision-making processes and/or decision criteria used by small businesses to make decisions relating to CBIS. Working in an Australian context, MacGregor and Bunker (1996) identified four main reasons why small businesses acquire CBIS. They are to increase productivity, to streamline work procedures, to improve customer service, and to achieve better record keeping. More recently, Bunker, MacGregor, Carlsson, and Magnusson (2002) added organisational competitiveness to this list. These reasons could be classified as a mixture of strategic and operational aims. There are other types of decision-making processes that should also be taken into consideration, such as the criteria used to make the choice between different IT solutions (e.g., vendor support), and whether or not formal decision aids, such as cost-benefit analysis, were used. Although the focus of the present study is not on the decision to adopt CBIS, it is apparent from MacGregor and Bunker's research that this initial decision can also embrace decisions about the characteristics of the system to be adopted, and that these characteristics have an influence on CBIS success. We therefore included a range of decision making measures in the present study and positioned them in our model as potential mediators between CEO characteristics and the more proximal factors, such as system characteristics and user satisfaction, which are the subject of the next section of this review.

## PROXIMAL FACTORS CONTRIBUTING TO CBIS SUCCESS

DeLone and MacLean (1992) classified all measures of CBIS success under the six major categories of system quality, information quality, information use, user satisfaction, individual impact, and organisation impact. The DeLone and McLean model has subsequently been updated and expanded (see DeLone & McLean, 2003, 2004). The expanded model retained system quality and information quality as key input variables but added service quality as a third major influence on the outcome constructs of intention to use, actual use, and user satisfaction.

Seddon and Kiew (1996) employed a slightly different set of factors when modelling the network of constructs surrounding CBIS usefulness and satisfaction. They introduced the constructs of system importance and task importance to their conceptual model on the basis that systems that perform more tasks that are important are perceived as more useful, irrespective of the quality of the actual system. In their model, the immediate predictors of user satisfaction were usefulness, information quality, system quality, and importance of the system. Usefulness also acted as a mediator variable through which the other three variables exerted an indirect influence on user satisfaction. This model, minus the system importance variable, was nested within the conceptual model to be tested in the present study.

### *Defining the outcome variable*

Different studies have used a variety of measures of CBIS success and although there is continuing debate about the operationalisation of some of the constructs underpinning CBIS success (Burton-Jones & Straub, 2006; Sedera & Tan, 2007; Zumpe & Van der Heijden, 2007), certain core elements are present in most studies; namely information quality, system quality, system use, and user satisfaction. The last of these is particularly important because it has been used extensively as a surrogate measure of CBIS success (Seddon & Kiew, 1996; Thong & Yap, 1995). Seddon and Kiew

(1996) defined user satisfaction as the net feeling of pleasure or displeasure that users experience based upon their individual expectations of the expected benefits of the CBIS (p.22). The extent to which the system meets or fails to meets this expectation is the extent to which the user is more or less satisfied. Following in this tradition, user satisfaction was chosen as the dependent variable for the present study.

### *Conceptual model of factors influencing CBIS success*

The model tested in this study draws upon much of the research described above. The model has both measurement and structural components but, for the sake of clarity, only a broad conceptual overview of the structural model is shown in Figure 1. Starting from the top right-hand side, CEO Characteristics (knowledge and innovativeness) is shown as having a direct effect on organisational characteristics and decision-making criteria, as one would expect in a small business environment where the CEO is closely involved with the business. The model also shows a direct link to User Satisfaction, reflecting the fact that the CEO is likely to be one of the main users of the CBIS. At the top left-hand side, Organisation Characteristics (technical capacity, competitiveness, and capacity for growth) has a direct influence on System Characteristics (software, information quality, usage characteristics) because the needs of the organisation will largely determine the software and hardware choices. Decision Criteria (reasons for purchasing, criteria used to make decision, and decision making tools) is influenced by the characteristics of both the organisation and the CEO and, in turn, has a direct effect on System Characteristics and User Satisfaction. This last link reflects the belief that the processes used to make purchase decisions, sometimes years ago, will continue to affect users' satisfaction.

The model shown in Figure 1 is much broader than proposed by DeLone and McLean (2003) and Seddon and Kiew (1996) in that it explores background variables not featured in their models. Conversely, it presents a simplified view of constructs like user satisfaction, which are treated in more detail in other recent models of CBIS success (e.g., Seen, Rouse, & Beaumont, 2007).

The conceptual model was tested using structural equation modelling (SEM). Version 7.0 of the AMOS package (Arbuckle, 2006) was used for this purpose.

## METHOD

### *Sampling procedure*

The participants came from an initial pool of 598 small businesses randomly selected from the Business Enterprise Register (BER) for the Mid North Coast Region of New South Wales, Australia. This pool was narrowed to 240 when phone contact indicated that 358 of these small businesses, either did not use a CBIS to support their business functions or they were unwilling, or were unable to participate in the survey. Two hundred and forty businesses met the criteria, and received the survey form. Out of the 171 businesses that responded (a response rate of 71.3%), 97 were manufacturers, 64 were wholesalers, and 10 combined both operations. The average age of these businesses was 16 years and almost two-thirds (63%) had fewer than five employees.

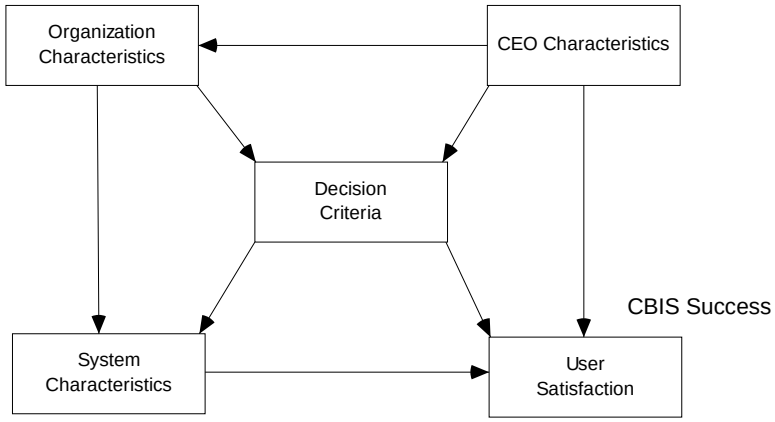


Figure 1: Conceptual overview of factors influencing CBIS success

***Description of the Implementation Survey for CBIS (IS-CBIS)***

To measure constructs relevant to the aims of this study, we developed the Implementation Survey for CBIS (IS-CBIS). The scales and their internal consistency reliability estimates (Cronbach's alpha) derived from the present study are presented below. The first two scales represent CEO characteristics, the next three scales capture the characteristics of the organisation, followed by the four scales capturing the different categories of decision-making criteria, then the well-known CBIS success scales and, finally, the outcome variable for this study, user satisfaction.

1. *CEO CBIS Knowledge*. Six items were used to assess the CEO's level of CBIS knowledge on a seven-point scale ranging from Never to Very Often (e.g., I use a computer at work). Alpha = .93. [Source: items adapted from Thong and Yapp, 1995].
2. *CEO CBIS Innovativeness*. Three items were used to assess the level of the CEO's innovativeness and resourcefulness on a seven-point scale ranging from Strongly Disagree to Strongly Agree (e.g., I often risk doing things differently). Alpha = .87. [Source: items adapted from Thong and Yapp, 1995].
3. *Organisation CBIS Technical Capacity*. Eight items were used to assess the technical capacity of the organisation to deal with CBIS issues on a seven-point scale ranging from Very Poor to Excellent (e.g., Designing new information systems to carry out business tasks). Alpha = .94. [Source: items adapted from MacGregor and Bunker, 1996].
4. *Organisation Expansion and Growth*. Five items assessed the opportunity for expansion and growth in the industry. The anchor points of the seven-point scale were Strongly Disagree and Strongly Agree (e.g., There is a lot of scope for the business to grow). Alpha = .85. [Source: items adapted from DeLone and McLean, 1992].
5. Organisation Competitiveness. Three items assessed the competitiveness of the industry in which the company operated. Again, the anchor points of the seven-point scale were Strongly Disagree and Strongly Agree (e.g., The rivalry among companies in this industry is very intense). Alpha = .85. [Source: items adapted from Thong and Yapp, 1995].

6. Operational Reasons. Six items were used to assess the importance of improving operational functions through implementing a CBIS on a seven-point scale ranging from Not Important to Very Important (e.g., Improve availability of information). Alpha = .85. [Source: items adapted from McGregor and Bunker, 1996].
7. Strategic Reasons. A further six items assessed the extent to which the importance of improving strategic functions through implementing a CBIS was a goal of the organisation (e.g., Improve competitive advantage). The same scale seven-point scale was used as for Operational Reasons. Alpha = .87. [Source: items adapted from McGregor and Bunker, 1996].
8. Decision Criteria. This 22-item scale assessed the various sources of information and evaluation criteria used to arrive at the purchase decision (e.g., Confidence in the vendor). The anchor points for the seven-point scale were Not Important and Very Important. Responses to all items were summed so the scale reflects the range of sources consulted and the extent to which they were consulted. Alpha = .89. [Source: items adapted from McGregor and Bunker, 1996].
9. Cost Benefit Techniques. Eight items were used to assess adherence to cost benefit analysis techniques during CBIS acquisition (e.g., Return on investment). The anchor points for the seven-point ratings were No Emphasis and A Lot of Emphasis. Alpha = .91. [Source: this study].
10. Information Quality. Six items assessed the quality of the information provided by the CBIS (e.g., The information I get from the system is clear). Anchor points for the seven-point rating scale ranged from Strongly Disagree to Strongly Agree. Alpha = .91. [Source: items adapted from Seddon and Kiew, 1996].
11. System Usefulness. Five items assessed system usability (e.g., Using the system saves time). The items employed the same scale format as Information Quality. Alpha = .92. [Source: items adapted from Seddon and Kiew, 1996].
12. System Usage Characteristics. Seven items assessed the extent to which the system met expected usage characteristics (e.g., The system is easy to learn). The items employed the same format as the other two CBIS Success scales. Alpha = .85. [Source: items adapted from Seddon and Kiew, 1996].
13. User Satisfaction. Three items with anchor points ranging from Never (1) to Always (7) were used to gauge the overall feeling of satisfaction with the system (e.g., Overall, how often are you satisfied with the system?). Alpha = .80. [Source: items adapted from Seddon and Kiew, 1996].

### *Procedure*

We mailed the surveys to the participating firms, and the completed surveys were returned in a reply-paid envelope. We entered the data into Excel and then imported to SPSS. The survey took approximately 30 minutes to complete.

## RESULTS

### *Descriptive Statistics*

Many of the items used in the IS-CBIS were adapted from scales used to assess CBIS adoption, rather than implementation. It was therefore necessary to assess the factorial structure of the

instrument before forming scales and assessing their psychometric properties. In a two-step process, Principal Axis Factor (PAF) routines from the SPSS package were used to weed out items with low communality. Confirmatory factor analytic routines from the AMOS package were then used to check the fit of the measurement model for individual scales. The factorial validation process resulted in the deletion of a number of items and 13 factors being identified. Scales were formed from the various sets of items defining each of the factors. Because the number of items differed from scale to scale, the means and standard deviations are based on the total score for each scale divided by the number of items in that scale. All items used a seven-point response format, so a mean of 4.0 represents the midpoint of the scale.

The next stage of the validation process involved checking the distributional properties of the scales. Scales that have floor or ceiling effects or too little variance are obviously not very useful for either theoretical or practical purposes. The psychometric properties of the scales are shown in Table 1.

| Scale | No. of Items | *M* | *SD* | $\alpha$ |
|---|---|---|---|---|
| | | | | |
| *CEO Characteristics* | | | | |
| CEO Innovativeness | 3 | 4.63 | 1.29 | .87 |
| CEO CBIS Knowledge | 3 | 4.06 | 1.36 | .93 |
| *Organisation Characteristics* | | | | |
| Competitiveness | 3 | 4.92 | 1.59 | .85 |
| Expansion & Growth | 5 | 5.08 | 1.14 | .85 |
| CBIS Technical Capacity | 8 | 4.04 | 1.36 | .94 |
| *Decision Criteria* | | | | |
| Operational Reasons | 6 | 5.63 | 1.00 | .85 |
| Strategic Reasons | 6 | 4.33 | 1.55 | .87 |
| Decision Criteria | 22 | 3.84 | 1.04 | .89 |
| Cost Benefit Techniques | 8 | 2.03 | 1.41 | .91 |
| *CBIS Success* | | | | |
| Information Quality | 5 | 5.24 | 1.07 | .91 |
| System Usefulness | 5 | 5.01 | 1.37 | .92 |
| System Usage Characteristics | 3 | 4.86 | 1.21 | .85 |
| *User Satisfaction* | | | | |
| User Satisfaction | 3 | 5.47 | 1.00 | .80 |
| | | | | |

Table 1: Descriptive Statistics for All Scales (N = 169)

The summary statistics establish that all scales had satisfactory internal consistency reliability estimates. Although a degree of positive skewness was evident for the Cost Benefit Techniques scale and negative skewness for the Operational Reasons and User Satisfaction scales, in general, a reasonable spread of scores was obtained. This quality is important if the scores are to be used to explore relations among these constructs. Table 2 shows these relations in the form of Pearson Product Moment correlations among all 13 scales.

The first point to note about the correlations is that they were mostly positive and that there were many significant relationships. The second point to note is that all but one of the variables correlated with User Satisfaction, the main outcome variable in this study. The presence of so many significant

correlations suggests that the study has been successful in capturing constructs that are conceptually distinct from User Satisfaction but potentially useful in predicting this important outcome variable. The next section of the paper describes the testing of the expanded form of the structural model shown in Figure 1.

| Scale | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CEO CHARACTERISTICS | | | | | | | | | | | | |
| 1. CEO Innovativeness | | | | | | | | | | | | |
| 2. CEO CBIS Knowledge | **.41** | | | | | | | | | | | |
| ORG. CHARACTERISTICS | | | | | | | | | | | | |
| 3. Competitiveness | .05 | -.05 | | | | | | | | | | |
| 4. Expansion & Growth | **.40** | **.27** | .05 | | | | | | | | | |
| 5. CBIS Tech. Capacity | **.39** | **.47** | .00 | **.55** | | | | | | | | |
| DECISION CRITERIA | | | | | | | | | | | | |
| 6. Operational Reasons | .15 | .16 | .12 | **.41** | **.31** | | | | | | | |
| 7. Strategic Reasons | .13 | .09 | **.23** | **.43** | **.32** | **.46** | | | | | | |
| 8. Decision Criteria | .19 | **.23** | .06 | **.52** | **.48** | **.44** | **.50** | | | | | |
| 9. Cost Ben. Techniques | .09 | .16 | .06 | **.33** | **.37** | **.25** | **.36** | **.51** | | | | |
| CBIS SUCCESS | | | | | | | | | | | | |
| 10. Information Quality | .07 | .18 | -.05 | **.39** | **.35** | **.29** | .14 | .19 | .09 | | | |
| 11. System Usefulness | **.20** | **.29** | .03 | **.40** | **.41** | **.41** | **.25** | **.29** | **.24** | **.57** | | |
| 12. System Usage Chars | .14 | **.36** | .02 | **.35** | **.43** | .17 | .06 | **.31** | .18 | **.58** | **.54** | |
| USER SATISFACTION | | | | | | | | | | | | |
| 13. User Satisfaction | **.25** | **.34** | .04 | **.56** | **.57** | **.42** | **.29** | **.44** | **.22** | **.74** | **.68** | **.61** |

Table 2: Correlations Among Scales (N = 169)

NB: Correlations in boldface are significant at .01 level (2-tailed).

***Testing the CBIS Implementation Success Model***

For these SEM analyses, we followed Kline's (2005) recommendations in reporting a number of indices reflecting different aspects of model fit. These indices were the sample discrepancy function (CMIN) and the ratio formed with its degrees of freedom (CMIN/DF), the Comparative Fit Index

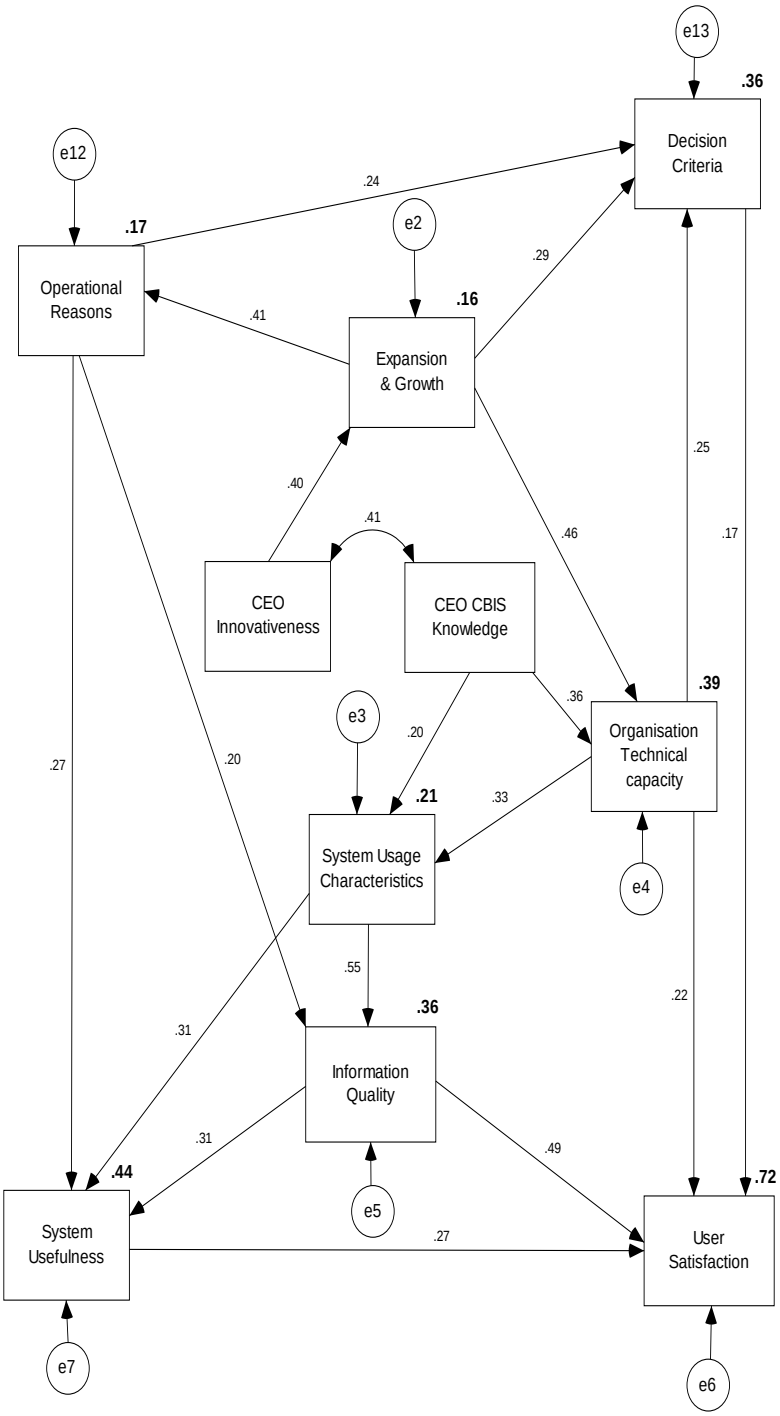


*Figure 2: The CBIS Implementation Success Model (CBIS-ISM)*

(CFI) as an index that describes the overall proportion of explained variance, the Adjusted Goodness of Fit Index (AGFI) as an index that adjusts the proportion of variance based on model complexity, and the Root Mean Square Standard Error of Approximation (RMSEA) as an index based on standardised residuals. To represent good fit, the CMIN should be non-significant ($p > .05$), the CMIN/DF less than 2.00, the CFI and the AGFI greater than .90, and the RMSEA not greater than .05. The sample used for the analyses in the present case was 169 after two cases were eliminated from the original 171 because of missing data. Aggregated scales were used in place of items because of limitations in sample size and the fact that we used a two-step process to establish the psychometric properties of the scales before testing the structural model based on those scales. The final model contained 29 free parameters, meaning that the sample size was consistent with guidelines. Figure 2 shows the full structural model with standardised parameter estimates and $R^2$ values (in boldface).

During the model-testing process, some variables and pathways were deleted. These changes were based on theoretical and statistical grounds (modification indices and correlations). We will deal with these before going on to discuss the final model. The variable Organisational Competitiveness was deleted because it related to just one other variable in the model (Strategic Reasons) and that relationship, although significant, was not particularly strong (see Table 2). Cost Benefit Techniques and Strategic Reasons also failed to contribute to the prediction of any other variables in the model, and were therefore, deleted. Two other non-significant pathways were identified during model testing (CR < +/-1.96). The two pathways were from Organisation Technical Capacity to Information Quality and from Decision Criteria to System Usage Characteristics. Both of these pathways were removed. The final model shown in Figure 2 has the distal variables - CEO Innovativeness, CEO CBIS Knowledge, Organisation Technical Capacity, and Expansion and Growth - positioned in the centre of the model. From there, they influence the CBIS success variables at the bottom of the model and the decision-making processes at the top of the model. This model fitted the data (Chi-Square = 44.03, $p > .01$; CMIN/DF = 1.69; AGFI = 0.90; CFI = 0.97; RMSEA = 0.06). The RMSEA value, although above .05, still falls within the guidelines for reasonable fit (Kline, 2005). Furthermore, all pathways shown in the model are significant. The most salient feature of the model is the high proportion of variance explained in User Satisfaction ($R^2 = 0.72$), the surrogate measure of successful CBIS implementation. Large effect sizes were obtained for all other endogenous variables in the model.

## DISCUSSION

The primary aim of this study was to develop and test a model of the factors influencing CBIS success in a regional small business setting. To achieve this aim, it was first necessary to assemble a questionnaire to collect data on the key variables selected for inclusion in the model. The construction and validation of IS-CBIS therefore became a subsidiary aim, which we discuss first, followed by descriptive statistics of data gathered.

Although survey instruments are in wide use in the CBIS literature, very few of them have been subjected to adequate statistical validation procedures. The IS-CBIS used in the present study covers the period from the decision to adopt CBIS right through to the period where users are able to rate their satisfaction with the system. To achieve this coverage, it contains 13 scales grouped into five major categories. Where appropriate, the IS-CBIS drew upon the literature to

source items and scales, and modified to suit the small business context and the different phases of CBIS implementation.

Table 1 provides the means, standard deviations, and alpha reliabilities for the 13 scales. The scales have good psychometric properties including demonstrated factorial validity, satisfactory means and variances (i.e., absence of floor and ceiling effects and spread of scores), and satisfactory internal consistency reliability estimates. Four of the scales showed evidence of skewness but we believe that in each of these cases, the skewness reflects properties of this regional small business sample rather than weaknesses in the instrument. Positive skewness was most evident for the Cost Benefit Techniques scale. The reality is that these businesses do not place much emphasis on management applications and they do not employ cost benefit techniques as reported by other researchers (e.g., Ekanem, 2005). Negative skewness was evident in the Operational Reasons and User Satisfaction scales. For Operational Reasons, it is well known that small businesses are more likely to make decisions for operational rather than strategic reasons (MacGregor & Bunker, 1996; Patullock, 2005), so the skewness is a feature of the sample, rather than something that has been induced by the items themselves.

The development and validation of the IS-CBIS scales allowed us to test the conceptual model shown in Figure 2. As expected, the major direct contributors to the variance in User Satisfaction were the proximal variables Information Quality and System Usefulness with other significant direct contributions from Organisation Technical Capacity and Decision Criteria. What is also clear from the model is that a number of variables had an indirect effect on User Satisfaction. An indirect effect can occur where a variable is connected to an output variable through a mediating variable. System Usage Characteristics, for example, does not have a direct pathway to User Satisfaction but has potential indirect influences through System Usefulness and Information Quality. AMOS employs a bootstrapping technique to estimate standard error terms for these indirect effects, thus permitting statistical tests of the indirect effects. When these indirect pathways were tested, all of the variables in the model had some degree of influence on User Satisfaction, with the largest indirect contribution coming from System Usage Characteristics.

It is interesting to note the pathways by which these indirect effects operate. There are too many to describe here, but it is informative to trace one or two for didactic purposes. Starting with the CEO, by following one pathway we can see that the innovativeness of the CEO has a direct effect on the growth of the business, which in turn leads to a concern about operational issues, a concern which is eventually reflected in the quality of the information and overall usefulness of the installed CBIS system, and thence to feelings of user satisfaction. This is just one of the indirect pathways connecting CEO Innovativeness to User Satisfaction. The point is that these pathways have been validated statistically and they make sense from a conceptual point of view.

To illustrate this last point more clearly. CEO Innovativeness links with Expansion and Growth but does not have a direct link with Organisation Technical Capacity. On the other hand, CEO CBIS Knowledge does not have a direct link with Expansion and Growth but links with Organisation Technical Capacity. The linkages one would expect are innovativeness affects company growth but not technical capacity (other than indirectly), and CBIS knowledge affects technical capacity and system characteristics but not company growth. These effects occur because the CEO is the major influence in a small business and much more involved in operational activities than counterparts in larger businesses. The CEO's level of understanding of CBIS would be expected to have a major influence on the capacity of the business to deal with CBIS planning and management issues. Similarly, it makes sense that the CEO's perceived level of innovativeness and resourcefulness would be a major factor in the identification and exploitation of opportunities for growth and expansion of the business. The strong relationship between CEO Innovativeness and CEO CBIS

Knowledge ($r$ = 0.41, p < .01) also makes sense as more innovative and resourceful CEOs would be expected to have a better grasp of CBIS.

Looking at organisational characteristics, we can see that Expansion and Growth had a direct effect on Operational Reasons ($b$ = 0.41, p < .01), Decision Criteria ($b$ = 0.29, p < .01), and Organisation Technical Capacity ($b$ = 0.46, p < .01). These pathways are no doubt due to the need for an expanding company to have more computer support for its operations. Thus, small businesses that identify growth and expansion opportunities place more emphasis on planning for CBIS acquisition and implementation, leading indirectly to more user satisfaction. The direct links involving Organisation Technical Capacity are similarly plausible. This variable had a direct effect on User Satisfaction ($b$ = 0.22, p < .01), Decision Criteria ($b$ = 0.25, p < .01), and System Usage Characteristics ($b$ = 0.33, p < .01). A small business that has technical capacity is likely to consult more widely (Decision Criteria), to implement systems that have better usage characteristics, and ultimately to appreciate the CBIS more because the CBIS that was chosen met the needs of the business.

Decision making processes completed the set of distal variables measured in this study. We have already noted the predictors of these variables (organisational characteristics) and observed that these pathways make good conceptual sense. Operational Reasons influenced both Information Quality ($b$ = 0.20, p < .01) and System Usefulness ($b$ = 0.27, p < .01) and thereby had a significant indirect effect ($b$ = 0.22, p < .01) on User Satisfaction. We therefore know that although small businesses may overemphasise operational reasons at the expense of strategic reasons (Harindranath et al., 2007; Patullock, 2005), there is a direct payoff in terms of the how useful the system is perceived to be and how satisfied the users feel. It is interesting to note that the other variable relating to decision processes, and decision Criteria does not influence any variable in the model other than User Satisfaction. We know from the table of correlations (Table 1) that Decision Criteria is related to System Usefulness, but that pathway is not supported in a model that reflects only unique variances. The sole pathway to User Satisfaction indicates that a small business that has undertaken more market research and investigation of CBIS options is likely to be more satisfied with its CBIS.

The final set of variables in the model belongs to the proximal set of indicators of CBIS success. This set of variables has been well-researched (e.g., DeLone & McLean, 1992, 2003, 2004; Seddon & Kiew, 1996) and we found no more than what has already been found. Indeed, there is a remarkable similarity between the parameter estimates reported by Seddon and Kiew and those obtained in the present study for this part of the model. System Usage Characteristics, Information Quality, and System Usefulness are quasi-indicators of CBIS success and, not surprisingly, they account for a large proportion of the variance in User Satisfaction.

The various outcomes reported in this paper are of importance to researchers examining CBIS success in small business**.** Relationships among variables measuring aspects of CEO characteristics, organisation characteristics, decision-making processes and criteria, and CBIS success in small business have been identified and shown to be relevant to user satisfaction. The statistical and theoretical relationships among the variables build upon and support the work of DeLone and McLean (1992, 2003, 2004), Seddon and Kiew (1996), Thong and Yap (1995), MacGregor and Bunker (1996). The model itself is an aggregation of several key outcome variables from the work of each of these researchers plus the constructs dealing with CBIS decision-making processes and decision criteria.

The importance of scales measuring Organisational Characteristics and CEO Characteristics as determinants of CBIS Success in the model provides confirmatory support for the findings of Thong and Yap (1995) who found that both these scales were significant in predicting the adoption of IT in

small business. It also supports recent research on the investing role of CEOs in small businesses (Ekanem, 2005). We can say that they are also important in predicting successful implementation of CBIS in small business.

Overall, the model is a sound statistical and theoretical representation of several factors that lead to the perceived success of CBIS in small business, accounting for 72% of user satisfaction. It shows that decision criteria, information quality, system usefulness, and organisation technical capacity are direct predictors of user satisfaction. It is quite clear how information quality and system usefulness contribute to user satisfaction and the pathway between these variables is supported by the research of Seddon and Kiew (1996). Thong and Yap (1995) hypothesised the relationship between organisation characteristics and the adoption of IT. The current study has identified a relationship between organisation technical capacity and the primary outcome variable user satisfaction. The relationship between decision criteria and user satisfaction also makes sense, as a business that invests more time and effort on CBIS market research would be more likely to be satisfied with their CBIS.

In their recent research expanding their CBIS success model, DeLone and McLean (2003, 2004) added variables to improve the measurement of outcomes. Other researchers have followed their lead (Sedera & Tan, 2007; Zumpe & Van der Heijden, 2007). We have moved in the other direction, accepting user satisfaction as the outcome variable but adding to the set of variables that predict satisfaction. Our findings establish the relevance of additional constructs – namely CEO characteristics, organisational characteristics, and decision-making criteria - to predicting CBIS success.

## LIMITATIONS OF THE STUDY

This study has a number of limitations. First, like many that have preceded it, used a proxy variable – user satisfaction – as the measure of CBIS success. Satisfaction does not ensure success. Second, although there is an implied time sequence in the categories included in the survey – CEO characteristics, organisational characteristics, decision processes, system characteristics, and then user satisfaction –the respondents actually completed the survey at a single point in time. They must therefore, have relied upon their memories to answer questions about the pre-implementation stages. We know from research in psychology that such memories are likely to be flawed and influenced by subsequent experiences, thus creating artificial shared variance between distal and outcome variables. A third limitation is that we have treated the stages of CBIS acquisition and implementation as discrete when in reality firms may be at various stages for different parts of the CBIS system. A particular firm may have acquired a CBIS but not be engaged in e-Commerce, which may have been one of the original reasons for adopting CBIS. These things take time, especially in the small business sector. A fourth limitation applies to our findings and concerns the fact that there may be alternative models that fit the data equally well or better. Our response to this potential criticism is that part of our model, involving what we call the proximal variables, is well replicated (DeLone & McLean, 2003). The newer parts either are, based on research into IT adoption or, in the case of decision processes, sound theoretical considerations. Thus, while alternative models could also fit the data, our model has strong empirical and theoretical foundations, and fits well to the data.

## DIRECTIONS FOR FUTURE RESEARCH

When looking at avenues for further research, the instrument used in the present study contains sections of instruments used in previous studies, most notably Raymond's (1985) User Information Satisfaction (UIS) survey. The UIS has extensively measured CBIS success in small organisations. We included the core components of the UIS in our study, and added constructs relating to the CEO, the organisation, and the decision-making processes that preceded the purchase of the CBIS.

While we have validated the expanded instrument, it could benefit from further developmental work. As we noted above, there is not a lot of room for improvements in the prediction of user satisfaction because current models, including the one reported in this study, are already capturing most of the shared variance (72%) in this outcome variable. However, there is certainly scope for improving the prediction of other variables in the model and for the inclusion of new constructs and improved measurement techniques. Further investigation is also required to examine those constructs that were included in our survey but omitted from the measurement model. This included the competitiveness of the organisation, strategic focus is another, and cost benefit techniques, which were not included in the present study. There is evidence from the literature that these constructs play a role in determining the adoption of CBIS but the conditions under which they help to predict successful CBIS implementation remain unclear.

## CONCLUSION

Small businesses are an important part of the Australian and World economy, and every attempt must be made to improve their prospects of success. The adoption of CBIS by small business is recognised as one of the difficult steps in the growth phase. Because of the disruption and expense often involved in computerisation, we need to learn more about the key factors that help to ensure success. Previous studies have drawn attention to the characteristics of the installed systems and the influence they have on user satisfaction. We have drawn attention to an important set of background factors that will help to ensure that the characteristics of the system are suited to the business. We encourage other researchers to take up the challenge of discovering more about these background-enabling conditions so that more small businesses are able to make a smooth transition to computer based information systems.

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