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CASE Success at Bank of Queensland

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Executive Summary
The more recent history of Computer Aided Software Engineering (CASE) has been one of stagnation, with a high percentage of organisations abandoning their use of CASE within two years of acquisition. Yet the theoretical benefits of CASE are strong, and some organisations are achieving benefit from the introduction and use of CASE. What are the factors that result in some organisations succeeding while others fail?

This paper seeks to establish a basis for explaining how CASE success can be achieved. Bank of Queensland is studied as an example of an organisation which is using CASE successfully. Previous claims about CASE success factors are examined in light of data gathered at Bank of Queensland. It is shown that CASE success is not well explained by the factors most commonly cited. Instead, a subtle and complex interaction of factors is revealed.

Reference is made to theory established from research into information systems implementation and research on innovation adoption. On the basis of this theory and analysis of data from Bank of Queensland, a model is proposed as a framework for understanding CASE success.

The model which emerges from this study has implications for systems development research in introducing the concept of Task-Technology-Fit (TTF) as an important indicator of CASE success. TTF offers an alternative to previous approaches in considering interaction among the CASE package, the development tasks chosen for CASE support, and the attitudes and skills of the developers. The model is a starting point for further empirical study. For the Information Systems Manager considering CASE adoption, the proposed model offers new assistance towards achieving CASE success. The TTF factor ought to be used for guidance in the selection of a CASE package to meet the specific needs of an organisation. The model also highlights for the IS Manager the potential impact on CASE use of a range of organisational factors, all of which need to be incorporated into plans for CASE adoption.

Introduction
There seems a real risk that the CASE bandwagon will halt. In the face of claims that most CASE packages purchased are no longer in use (C.R.C. 1991 cited in Urwiler et al 1995), the erstwhile enthusiasm among developers has declined (Whybrow 1989, Rader et al 1995). What Swanson and Ramiller (1994) call "the organizing vision" of the CASE concept among the practitioner community has dimmed, and the rate of CASE adoption has declined. Yet there appear to be organisations that are deriving substantial net benefit from CASE use. In order to better understand the success or failure of organisations implementing CASE, a range of factors have been cited as possible determinants of success in CASE adoption and use. However, examination (Wynekoop and Conger 1991) indicates that there has been little rigorous empirical study of these factors. Nor is there a strong theoretical basis underlying the claims. This case study explores CASE success with a view to generating a soundly based general model to explain CASE success factors.

Background To The Case Study
Bank of Queensland (henceforth BoQ) is one of two regional banks with head office in Brisbane. Although it is small compared with the major Australian banks with which it competes, BoQ provides a full range of retail and commercial banking. There are just in excess of 100 BoQ branch outlets

distributed throughout coastal Queensland and south-eastern Queensland. As with all modern banks, effective deployment of IT has a very important and strategic role as reflected in strong statements about IT in the bank's annual reports.

In pursuit of new directions in banking, and appreciating the increasing importance of their computer systems, in early 1995 BoQ decided to completely redevelop its computer based banking information system. The redevelopment is a major task expected to take almost four years, and requiring a considerable increase in the number of information systems staff. After some prior experience with the Upper CASE tool, Excelerator, BoQ Information Systems management determined to use another Upper CASE package, Systems Engineer, on the redevelopment project. In September, 1994, they acquired four copies of Systems Engineer, adding a fifth in mid-1995, with plans to add further copies during the development project.

The Research Method

The study takes as its starting point the literature on CASE success. Each of the factors claimed as a contributor to CASE success is analysed in terms of consistency amongst claimants, and in relation to findings from related areas such as innovation research and implementation research. From this analysis, two propositions are put forward for field testing. These propositions relate to two blocks of factors: a) those factors deemed by preliminary analysis to be plausible determinants of CASE success and b) those considered unlikely to be determinants of CASE success. These propositions are then used as a basis for a protocol to guide the evidence collection. From a subsequent analysis of data from the BoQ case study, informed by the CASE literature and literature from related fields, a model is developed to represent the interrelationship of factor groups contributing to CASE success.

Case Success Literature

A survey of the CASE literature reveals a range of factors identified as contributing to CASE success. In this section, identification of the claimed success factors is accompanied by an analysis of each factor in terms of the weight of argument provided by proponents, consistency among proponent views, and consistency with established theory from related disciplines. Specifically, the factors are considered in light of findings on system implementation and innovation adoption. It is reasoned that CASE introduction can be regarded as a special instance of system implementation and, since implementation has been extensively studied, cognisance should be taken of the findings. Similarly, there is evidence that CASE adoption involves organisational changes comparable with those associated with the introduction of significant innovations.

Proposition 1 Factors - Likely Determinants of CASE Success

Parkinson (1991) and Isoda et al (1995) cite *the existence of a strategy for CASE introduction* as essential for success. In each instance, there is an implication of CASE adoption being complex and requiring careful planning and formal articulation of the plan.

Extensive training is touched on as a requirement for CASE success by most writers on CASE. Jones (1992) observes that "the most notable factor that separated successful from unsuccessful CASE usage was the adequacy of the training received" (p41). He suggests that CASE success may require between $0.50 and $2 for every $1 spent on CASE software. The lower figure in Jones's range has been taken as a cut-off point for determining 'extensive training'.

Howard & Rai (1993), Sorensen (1993), Stone (1993), Isoda et al (1995) identify *commitment from senior management* as a significant factor for CASE success. A characteristic of Upper CASE is that the early phases of system development (planning, analysis, and design), may take longer than without CASE (Stone 1993). Hence, there is a need for support from senior management to condone the slow early pace that accompanies the CASE-driven change in development culture.

Mc Clure (1989) claims that a major reason for CASE failure is that selection of a CASE package is undertaken by organisations prior to their *deciding on a development methodology* that meets their needs. Since every CASE package supports only certain methods and techniques, the need to decide on a methodology or methodologies for the medium-term seems a reasonable prerequisite to adopting a particular CASE package. This is a view endorsed by Crozier et al (1989).

Implementation studies have suggested (e.g. Robey 1979) the importance of *involving end users* in IS implementation although others have cast doubt on the conclusiveness and consistency of supporting evidence (e.g. Ives and Olson 1984). In any event, modern development methodologies invariably place heavy emphasis on involving end users as a requirement for successful implementation. This general principle has been argued (Parkinson 1991) to be equally true for CASE implementation, where Parkinson regards the end users as the organisation members who use the systems developed with CASE assistance.

An organisational policy on job role rotation is cited by Orlikowski (1993) and Howard and Rai (1993) as contributing to CASE success. Howard and Rai support this factor on the basis of a survey backed up by reference to information systems implementation theory which associates the broadened perspective of the organisation gained through job rotation, with greater success in IS implementation. Orlikowski observed that in one organisation which provided for staff to spend three to five years in IS before moving into the general business area, staff did not see the advent of CASE as a threat to their existing skill base, so the potential for CASE success was enhanced.

Proposition 2 Factors - Unlikely Determinants of CASE Success

The literature reveals several other factors claimed to be associated with CASE success which do not stand up well to analysis in light of other CASE writings and findings from implementation and innovation research. It was proposed prior to commencement of the BoQ study that there would be no causal link between these factors and CASE success. Factors posited not to be related to CASE success include: (1) organisational intentions in adopting CASE (2) experience of development staff (3) use of external consultants on projects (4) job security of developers. Each of these factors is discussed in the following:

Orlikowski (1993) argues that CASE research has given inadequate attention to organisational aspects including varying *organisational intentions in adopting CASE*. The varying intentions will reflect desire to achieve one or more of the several claimed potential benefits of CASE (McClure 1989, Parkinson 1991, Stone 1993). It is posited here that an outcome of successful CASE adoption can be achieved regardless of the organisational intention. This allows for the fact that benefit may be achieved which is at odds with that expected. It also accepts that success may be achieved through fulfilment of any one of the potential benefits or any combination of them.

Isoda et al (1995) propose 'developer maturity' as a factor determining CASE success. They argue from their data that experienced developers can put CASE into an overall perspective of system development. Of similar thrust is the factor of appropriate expectations as proposed by Stone (1993). The IS developer who has previously seen innovations hailed as breakthroughs in system development and has seen the subsequent reality of much more modest gains, is much less likely to have inflated expectations of CASE. The counter argument is put by Orlikowski (1993) who suggests that lesser experience means lesser loss in relinquishing old methods. This is supported by other studies which indicate lesser receptiveness to new ideas with increasing age (Jarvenpaa & Ives 1991). Given these counteracting arguments on developer experience, it seems reasonable to propose that *experience of development staff* is not a general determinant of CASE success.

Urwiler et al (1995) and Orlikowski (1993) both cite *use of external consultants to work with internal staff on initial CASE projects* as requirements of success. While access to the expertise of consultants' on-the -job would seem to be useful, this same expertise can be accessed from a committed champion inside the organisation. For this reason, use of external consultants is not posited to be an important predictor of CASE success.

The literature reveals conflicting views with regard to the impact of *job security* on CASE success. Orlikowski (1993) describes developer job security as a facilitator of CASE success. Others (e.g. Howard & Rai 1993) have suggested that environmental uncertainty, which may include fear of job loss, encourages developers to embrace CASE technology as a skill to improve employment prospects. Given arguments for job security as both a positive and a negative influence on CASE success, it is justifiable initially to examine the notion that it is not a determining factor at all.

The Case Success Construct: Measuring Success

In summarising measures most frequently used to indicate MIS implementation success, Ives and Olson (1984) record the following: system quality; perceived quality/ satisfaction; system usage; changes in behaviour/ attitudes. Lyttinen (1988) concludes that user satisfaction and system usage are the most common surrogate measures of information systems success. In the BoQ case, two aspects of "system usage" are adopted as indicators of CASE success. The two indicators are: persistence of use of the CASE package, and extent of use. Extent of use equates to Rogers' (1983) idea of the degree of diffusion. A third indicator used in this study is "developer satisfaction" which corresponds to "perceived quality/ satisfaction" in the Ives and Olson list and Lyttinen's "user satisfaction". These measures were used in a crude, preliminary categorisation of successful Systems Engineer users in Queensland and were subsequently used in assessing BoQ's degree of success in CASE use.

Table 1 Measures for CASE Success Variables

Variable	Operational Measure
Persistence of use	Evidence of continued use of the CASE package at least 1 year after introduction
Degree of diffusion	% of 'eligible' developers using CASE
Developer satisfaction	Expressed satisfaction with CASE adoption (7-point scale)

The Case Success Factors: Antecedents Of Success

Yin (1994) argues for the desirability of specifying a measure or measures for each of the variables identifiable in the initial proposition/s to be examined. Tables 2 and 3 list a priori measures for each of the variables represented in the initial case study propositions.

Table 2 Measures for Variables in Proposition 1

Variable	Operational Measure
Strategy for CASE introduction	Evidence of a plan outlining at least: Planned phases of introduction, personnel responsibilities.
Extensive training of development staff	Dollars spent on training in CASE, 'extensive' implying at least $0.50 for every $1 spent on the software
Senior management commitment	Presence of a senior manager on a steering committee for CASE introduction, and/or assessment by IS management of commitment by senior managers (7-point scale)
Prior development methodology plan	Evidence of a statement of the development methodologies to be used after the introduction of CASE
Job role rotation	Evidence of a policy in the organisation to rotate development staff through job positions
End user involvement	Evidence of end user participation on a steering committee for CASE introduction, and/or evidence of consultation with end users on the CASE introduction

Table 3 Measures for Variables in Proposition 2

Variable	Operational Measure
Objective in introducing CASE	One or more of: Faster system development; Improved system quality; Reduction in later maintenance time; Improved system documentation; Consistent development methods; Other (specify).
Experience of application development staff	Years employed in IS
Employment of external consultants	Evidence of IS personnel from outside the organisation working with internal IS staff on early projects using CASE
Job security	Assessment by developers of the chance of their being displaced from their jobs within a year (7-point scale)

Data From The BoQ Case Study

Overview

Facts about CASE use at BoQ were gathered via semi-structured interviews and documentation review. The data collection process was focused on gathering data pertinent to the a priori propositions on CASE success. Analysis concentrated on matching the data collected against the components of the theory embodied in the two initial propositions. Where evidence was encountered which was at odds with what had been initially posited, reference was made to related research to assist in building a new explanatory model.

Staffing

Project development is undertaken using teams from the Project Development Section. Each team comprises a systems analyst as leader, plus programmer/ analysts and programmers, with team numbers commonly changing during a project. System maintenance is carried out by personnel from the Systems and Programming Section although there is a policy for rotating staff between maintenance and development. The General Manager of Information Systems reports to the Deputy Chief Executive Officer.

Level of Success

A major reason for selecting BoQ as a study site was its recommendation by LBMS sales staff as a successful user of Systems Engineer. Certainly, it meets the persistence of use test, the package being in continuing use two years after purchase. Its breadth of use in the organisation, the second usage criterion, is relatively great in relation to its initially projected use. All five systems analysts in the Information Systems Department currently use Systems Engineer. Ten of the twelve programmer/analysts are users. The only two non-users of Systems Engineer from this group had only recently been promoted to the position of programmer/analyst. That none of the programmers uses Systems Engineer is an indicator of the functional separation of duties among the IS staff at BoQ and the restriction of its use to the early phases in the system development process.

In the eyes of the information systems staff, the adoption and use of Systems Engineer has been only a limited success. In explaining the basis for a satisfaction rating of 5 (on a 7-point Likert scale where 1 represents 'extremely dissatisfied', 4 represents 'neither satisfied nor dissatisfied', and 7 represents 'extremely satisfied') a representative response was: "The package is useful in the way we apply it but we are really only using a limited range of its features".

Characteristics of CASE Adoption and Use at BoQ

The evaluation which led to BoQ acquiring Systems Engineer was made by the Data Administration Manager, Ms Cutche, and the Manager of Project Development at the time. There were no written criteria for selection of the CASE package but there was an understanding that the package should provide for data modelling and process modelling in conformity with the Structured Analysis and Design methodology established as the standard for the bank. The same selection guidelines used two years earlier in the acquisition of Excelerator were used again in selecting Systems Engineer. The package chosen was required to offer a central repository to allow accessing and sharing of development objects among team members. The move to Systems Engineer was principally motivated by its good multi-user capabilities.

Benefits anticipated from the new package by the Data Administration Manager were several. From prior experience with Excelerator, Ms Cutche expected that Systems Engineer would be a useful drawing tool for developing and revising data models and process models. With introduction of the package and associated development guidelines, it was expected that greater consistency and conformity with development documentation standards could be achieved. This had been a problem prior to the advent of CASE. A further expected benefit was in holding all definitions in the one central repository. Ms Cutche, as Data Administration Manager, felt this to be important in a situation where multiple teams would be working on parts of the redevelopment process, with a danger of duplication and inconsistencies. Ms Cutche also anticipated that Systems Engineer would be beneficial at a later time when the redeveloped banking system required maintenance. Ease of maintaining the data and process models, she felt, would facilitate up-to-date documentation and so, faster, easier modification to the system.

Soon after the purchase of Systems Engineer, prospective users underwent a three day training course conducted by LBMS, the package vendor. The course consisted of a standard hands-on overview of use of the features of Systems Engineer. For most of the BoQ staff, there was a long delay after attending the course before using the package on a real project. At a cost of less than $2000, the training had been inexpensive but it was felt by development staff to be relatively ineffective because it was not focused on the specific features to be used, and because of the lag between training and use of the package.

The introduction of Systems Engineer was not guided by any written plan. Instead, Ms Cutche relied on her prior experience in introducing Excelerator. She was aware that the introduction of a CASE package requires major changes in work methods by new users of the package. Hence, she anticipated resistance from some of the new users of the package and planned, in her words, to "badger, cajole and otherwise motivate" to overcome the resistance.

Senior management of the bank were not significantly involved in the introduction of Systems Engineer. Money was allocated for the purchase of a new CASE package based on the argument from the IS Department that such a package would benefit the software redevelopment project. Accountability was in terms of achievement of satisfactory progress on the redevelopment. Hence, involvement in the introduction and use of Systems Engineer was only likely if project targets were not being met.

End users of the bank's information systems were not consulted regarding the selection and introduction of a CASE package. The view of IS staff was that the form of interaction with end users would be little changed by the introduction of a CASE package and that end users would not be interested in the particular analysis and design tools used by the IS developers.

At BoQ there is a practice of rotating development staff between project development and maintenance, with some lesser movement between these and user support. Apart from broadening technical skills, the intention is to broaden understanding among IS staff of the tasks of their IS colleagues and to expose IS staff to a wide range of the subsystems of the bank.

Rather than relying on external consultants to support staff in early development projects using Systems Engineer, Ms Cutche, the Data Administration Manager, chose to take on the role of advisor and supporter. Since she had developed the CASE Tool Procedures Manual, there were advantages in their author also being the advisor on the early system projects.

Study Proposition 1

Table 4 summarises the factors in Proposition 1 and their presence or absence in the BoQ case. In each instance, presence is assessed in terms of the operational measures stipulated before commencement of the study and as set out in Tables 2 and 3.

Table 4 - Proposition 1 Factor Summary

Factor	Present/ Absent
Strategy for CASE introduction	Weakly present. (Previous guidelines).
Extensive training of application development staff	Absent. (5% of software cost cf. 50% proposed as necessary).
Senior management commitment	Indirectly present. (Support for IT).
Prior development methodology plan	Present. (Structured Analysis).
Job role rotation	Present. (Development to/from maintenance).
End user involvement	Absent. (No consultation).

Study Proposition 2

In Proposition 2, a number of factors were cited which had been proposed as CASE success factors by prior authors but which were refuted by others and/or seem at odds with theory from system implementation or innovation adoption. The proposal is that there is no direct relationship between these factors and CASE success. Table 5 summarises the presence or absence of each of these

factors. Again, the measures determined prior to the study (shown in Tables 2 and 3) are used to assess presence or absence of the factor.

Table 5 - Proposition 2 Factor Summary

Factor	Present/ Absent
Organisational objective in accord with outcome	Present. (Development standards).
Lesser experience of application development staff	Somewhat present. (Analysts generally young but similar attitude across ages).
Employment of external staff on projects	Absent. (Internal mentoring).
Job security	Absent. (Range of beliefs).

Analysis Of The BoQ Case

In the absence of widely tested theory on CASE adoption and use, this case study constitutes an exploratory evaluation of two propositions with a view to establishing a model of CASE adoption and use. A satisfactory model in this context is one which draws on theory from related research areas and is consistent with the observed data at BoQ.

Evaluation of Proposition 1

An assessment of the data gathered indicates that the CASE success observed at BoQ is not adequately explained in terms of the factors making up Proposition 1. The match between the predicted factors and observed characteristics is poor. The subtleties and complexities of reality do not conform to the expectations projected from the literature.

Firstly, while the literature suggests the need for a carefully articulated strategy for CASE introduction, this factor is evident only informally at BoQ. The responsibilities of all staff using Systems Engineer are laid out in a procedures manual but there is no written outline of planned phases of introduction of the package. Nonetheless, it would seem that the adoption process was given direction and focus through Ms Cutche, the Data Administration Manager and initiator of the new CASE acquisition, using guidelines from the previous CASE acquisition.

The approach to analyst training in Systems Engineer at BoQ appears at odds with the requirements laid down in the literature. Formal training outlays at BoQ represent only a little over 5% of the initial cost of the Systems Engineer licences ($1800 training to $34000 software). This contrasts with the assertion that extensive training, to the extent of at least $0.50 on training for every $1 on software, is the most important prerequisite for CASE success. The actualities in the case study show compensating factors in play. Although the developers received only three days of introductory training on Systems Engineer, the Data Administration Manager took on the role of mentor for staff during their on-the-job application of Systems Engineer to system projects.

There is no evidence at BoQ of direct involvement of bank senior management in the adoption of Systems Engineer. Commitment can be detected, however, in a less direct form. It is evident that senior management attach great importance to information systems for the bank. Necessary resources were approved for acquisition and implementation of Systems Engineer with the understanding that it would contribute to the success of the system redevelopment project. Commitment, scrutiny and accountability is related to the project rather than to the tools used. Only in the event of perceived failings in the project would attention shift to the tools used in it.

Clear organisational views on system development methodology are evident at BoQ. The sequence of steps and permitted techniques are documented in a procedures manual and enforced in system walkthroughs. The presence of such a development methodology plan is consistent with expectations from the literature.

Similarly, a policy of rotating staff through different system development positions is predicted from the literature as an associate of CASE success and is found in place at BoQ. It would appear that the broader perspective of the system development lifecycle and the business which derive from job role rotation incline developers to a greater awareness of the benefits of CASE use.

The end user involvement factor of Proposition 1 was manifestly absent at BoQ. End users had not been consulted nor otherwise included in the adoption of Systems Engineer. Given the planned use of Systems Engineer, the deliberate non-involvement of the end users in CASE adoption at BoQ would seem to have posed little risk to the success of Systems Engineer. Development staff were consistent in the view that the nature of interaction with users has changed little with the introduction of Systems Engineer. While the more general assertion of the importance of end user involvement for successful system implementation has been the subject of research debate (Ives and Olson 1984), this case study provides data to suggest that end user involvement be dismissed as a necessary factor in CASE success.

An outstanding feature of the BoQ case is the role of Ms Cutche, the Data Administration Manager, in influencing the outcome of the Systems Engineer adoption. Although the importance of a champion from the organisation is well established in system implementation research, it is not prominent in CASE success literature. The evidence from this case study invites consideration of the presence of an organisational champion as both a primary influence on CASE success and as a compensating influence in the absence of other factors which might be positive influences for CASE success.

Evaluation of Proposition 2

The claimed importance of congruence between organisational intentions and realised outcomes as a determinant of success is unchallenged by evidence from this case. BoQ bought Systems Engineer on the basis of intended changes in the quality of system documentation and for the achievement of data integrity through holding definitions in just one location. This objective was achieved at BoQ.

The view that CASE success is associated with its use by less experienced developers was not strongly supported by the BoQ case. Although the bulk of the development staff are relatively inexperienced (average of about 3 years experience), the older, more experienced developers indicate similar levels of satisfaction with Systems Engineer.

That BoQ has not employed external consultants to work alongside internal staff on early projects has not inhibited success in using the package. The bank's Data Administration Manager although having no prior experience with Systems Engineer, performed many of the same functions as an outside consultant might. Hence, while the use of outside consultants might be commonly beneficial, data from BOQ suggests that similar outcomes may be achieved by use of committed and able internal staff.

There is no strong evidence one way or the other with regard to beliefs in perceived job security as a predictor of CASE success. Within BoQ there is a full range of perceptions by developers of their job security. At one extreme is the view that job security is high because of the importance of the system redevelopment and the relevant knowledge and skills of the developer. At the other, is a belief of very great job insecurity because of the history of regional banks being taken over by competitors. Attitude to Systems Engineer and its success was consistent regardless of varying views on job security. There is no good argument for including this factor in explaining CASE success.

Towards A New Model Of Case Success

Evaluation of the BoQ case provides a basis for looking beyond the factor-based precepts for CASE success. Some of the factors pointed to in the literature do not stand up well to the scrutiny provided through this case. Furthermore, the case points to subtle and complex interactions which may be lost in focusing on discrete factors.

One area of interactions which emerges from the BoQ study is in the interrelationships between the technical capabilities of the CASE package, the tasks the package is used on, and the backgrounds and abilities of the individual developers. The model of Task-Technology-Fit (TTF) as proposed and successfully tested by Goodhue and Thompson (1995) in the context of effective IS implementation, is a useful one to evaluate in relation to success in CASE adoption. Goodhue and Thompson define TTF as "the correspondence between task requirements, individual abilities, and the functionality of the technology" (p.218). Development staff at BoQ, responding to queries regarding their assessment of CASE use, commonly answered in terms of how well suited Systems Engineer is to the tasks they were undertaking with it. Implicit, as well, was an assessment of their ability to work with that package on those tasks. The fact that Goodhue and Thompson have validated the TTF construct is appealing. With data from over 600 individuals, they "found moderately supportive evidence that user evaluations

of TTF are a function of both system characteristics and task characteristics" (p.228). Furthermore, they showed that system utilisation alone was a less satisfactory indicator of IS performance than utilisation and TTF together. In other words, "to predict performance both TTF and utilization must be included" (p.228).

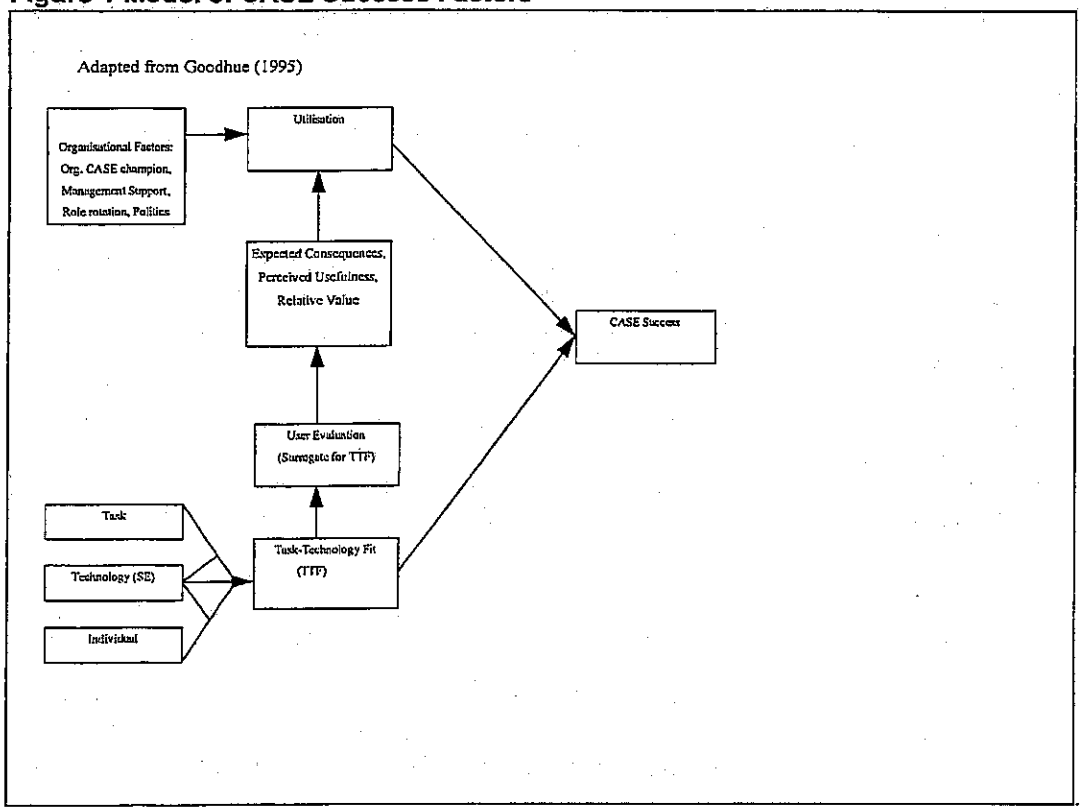
Goodhue (1995) also shows that users can successfully evaluate TTF. This implies that user evaluations of TTF can be appropriately used as a surrogate for TTF.

Goodhue and Thompson (1995, p.228) propose a causal link between TTF and utilisation, although their study results are "more ambiguous". They call on the cumulative evidence of previous research, notably research showing the impact of usefulness (Davis et al 1989) and relative value (Moore and Benbasat 1992) on utilisation. They see perceptions of these concepts being influenced by perception of TTF and, in turn, influencing utilisation. Both concepts (perceived usefulness and relative value) can be seen as having relevance in the BoQ case. The ideas of relative value and perceived usefulness are manifest in many statements from developers. These concepts appear to temper their evaluation of the success of Systems Engineer in their company. A common view is that the package is able to provide useful assistance in the development process. However, the fact that the TTF for their company involves using just a subset of the package's features means that Systems Engineer provides relatively expensive utility.

From the BoQ case, it is apparent that there are organisational factors which influence the tendency to utilise the CASE package. In this instance, the presence of a champion for CASE clearly has impact on utilisation of Systems Engineer. Top management commitment to the objectives supported by Systems Engineer may be an influencing factor. Organisational views on development methodology appeared to facilitate effective adoption of Systems Engineer as does policy on staff rotation for developers. Goodhue (1995, p. 1841) acknowledges research findings that organisational factors influence IS utilisation.

The model in Figure 1 is proposed to explain influences on CASE success. This model (Figure 1) is consistent with observations in the BoQ case. It is in accord with the proposals and findings of Goodhue and Thompson (1995) on TTF and IS performance. It draws on Goodhue's (1995) proposed model for IS performance in situations of discretionary use. The model also draws on theory regarding influences on utilisation. That this theory is well tested in IS implementation success is useful since CASE implementation can be regarded as a variant on IS implementation.

Figure 1 Model of CASE Success Factors



Future Research

The observations of CASE success at BoQ challenge some of the claims on CASE success factors from the literature. An explanatory framework has been developed to more adequately describe influences on CASE success. The proposed Model of CASE Success Factors has the advantage of both serving as an adequate model to support the observed facts at BoQ and also having a base in established theory from IS implementation research. Although the conceptual basis for the model is sound, there is a need to conduct further research to more fully test this model. Such research should (1) examine the validity, reliability and applicability of the model, and (2) improve and refine it.

Although the model accords satisfactorily with the BoQ data and with theory from implementation research, there is scope for misgiving. That observed success at BoQ is moderate rather than strong means that there are present in the data, factors which limit success as well as factors which promote it. Further evidence from further cases will be necessary to confirm that appropriate distinction is made between positive and negative factors. Further evidence is also needed to confirm that the causal relationships established in implementation research and adopted in this CASE success framework hold up in general.

It is suggested that the model of CASE success factors be applied in a multiple case study investigation. Retention of a case study approach may increase the likelihood of detecting subtle interactions which might otherwise go undetected. As well as selecting sites where CASE success is evident, it is suggested that researchers include in a multiple case study, sites which show lack of success in CASE use. Pattern matching in relation to presence and absence of proposed factors and interrelationships should enable data from the multiple cases to provide a good test for the model and should provide a basis for improving and refining it.

References

C.R.C. Second Annual Report on CASE, CASE Research Corporation, Washington, 1991 .
Crozier, M.; Glass D.; Hughes, J. G.; Johnston, W.; and McChesney, I. " Critical analysis of tools for computer-aided software engineering." Information and Software Technology, v. 31, no. 9, November 1989, pp.486-496.
Davis, F. D.; Bagozzi, R. P.; and Warshaw, P. R. "User Acceptance of Computer Technology: A comparison of Two Theoretical Models." Management Science, v. 35, no. 8, August 1989, pp.982-1003.
Goodhue, D. L. "Understanding User Evaluations of Information Systems." Management Science, Vol. 41, No. 12, December 1995, pp.1827-1844.
Goodhue, D. L.; and Thompson, R. L. "Task-Technology Fit and Individual Performance." MIS Quarterly, June 1995, pp.213-235.
Isoda, S.; Yamamoto, S.; Kuroki, H.; and Oka, A. "Evaluation and Introduction of the Structured Methodology and a CASE Tool." Journal of Systems Software, no. 28, 1995, pp.49-58.
Ives, B.; and Olson, M. H. "User Involvement and MIS Success: A Review of Research." Management Science, V. 30, No. 5, May 1984, pp.586-603.
Jarvenpaa, S. L.; and Ives, B. "Executive Involvement and Participation in the Management of Information Technology." MIS Quarterly, June 1991, pp.204-227.
Jones, T. C. "CASE's Missing Elements." IEEE Spectrum, June 1992, pp.38-41.
Lyytinen, K. "Expectation Failure Concept and Systems Analysts' View of Information System Failures: Result of an Exploratory Study." Information and Management, No.14, 1988, pp.45-56.
McClure, C. CASE Is Software Automation, Prentice-Hall, 1989.
Moore, G. C.; and Benbasat, I. "An Empirical Examination of a Model of the Factors Affecting Utilization of Information Technology by End Users." Working Paper, University of British Columbia, 1992.
Orlikowski, W. J. "CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development." MIS Quarterly, September 1993, pp.309-340.
Parkinson, J. Making CASE Work, NCC Blackwell, 1991.
Rader, J.; Brown, A. W.; and Morris, E. J. "Operational Use of CASE Integration: An Investigation of the State of the Practice." Journal of Systems Software, v. 28, 1995, pp.59-68.
Rai, A.; and Howard, G. S. "An Organizational Context for CASE Innovation." Information Resources Management Journal, Summer 1993, pp.21-34.
Robey, D. "User Attitudes and Management Information System Use." Academy of Management Journal, September 1979, pp.527-538.
Rogers, E. M. Diffusion of Innovations, Free Press of Glencoe, 1983.
Stone, J. Inside ADW and IEF: The Promise and Reality of CASE, McGraw-Hill, 1993.
Swanson, E. B.; and Ramiller, N. C. The Organizing Vision in Information Systems Innovation, University of California, Los Angeles, Working Paper #7-93, February 1994.
Urwiler, R.; Ramparu, N. K.; Wilkes, R. B.; and Frolick, M. N. "Computer-aided software engineering: The determinants of an effective implementation strategy." Information and Management, No. 29, 1995, pp.215-225.
Whybrow, M. "Substantiate the CASE Mirage." Infomatics, June 1989, pp.6-10.
Wynekoop, J. L.; and Conger, S. A. "A Review of Computer Aided Software Engineering Research Methods." in. H.-E. Nissen, H. K. Klein and R. Hirscheim (eds.) Information Systems Research: Contemporary Approaches and Emergent Traditions, Elsevier Science, 1991, pp.301-325.
Yin, R. K. Case Study Research: Design and Methods (2nd ed.), Sage, 1994.

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