

Explaining Successful Information Management In Small Business Necessity, sufficiency and two-level complexity.

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ABSTRACT

This development paper describes research into successful information management in small business conducted as part of the DBA programme at Durham Business School. It brings together research in information management, small business, qualitative comparative analysis (QCA) methods and critical realist theory to build on the theoretical work outlined in a paper delivered at ISBE 2005 (Parker 2005).

The project is explicitly based upon critical realist theory, and uses qualitative comparative analysis (QCA) methods to identify complex causal mechanisms that neither variable-orientated nor single case methods can achieve. Instead, combinations of events in a small sample of cases have been systematically compared using Tosmana QCA software supported by document research and interviews.

Fieldwork has been completed, coded and analysed using QCA software. The result is a two-level model that highlights major causal conditions and suggests how these are related both within and between these levels.

This model suggests that basic-level information management categories are a *conjunction of necessary causes* all of which are individually necessary and jointly sufficient when producing a successful outcome (one route to success). In contrast, the relationship for unsuccessful cases is one of *equifinality* suggesting any one category is sufficient to produce the outcome (many routes to failure).

The research contributes to both knowledge and practice. The former is achieved by providing an example of QCA methods for other researchers in the small business sector to consider; the latter by explaining the conditions which combine to cause successful information management in small businesses.

Keywords: Small Business, Information Management, Qualitative Comparative Analysis.

INTRODUCTION

Small businesses form a vital part of the UK economy and one of the key determinants of their ability to compete is their effective use of information (DTI 1998). This research aims to help address this problem by explaining successful (and unsuccessful) information management in small business. By identifying the combinations of complex causal conditions that operate in the heterogeneous small business sector it will provide limited generalization and start to identify 'what works for whom in which circumstances'. More specifically:

Explaining ...

Previous attempts to explain successful information management in small business have been mixed. At one extreme are the positivist, quantitative papers that seek similarities across large numbers of surveyed respondents (e.g. Thong and Yap 1996). At the other are the interpretivist, qualitative papers that look in depth at one or very few individual examples (e.g. Walsham 1993). Both have flaws.

In the 'large n' variable-orientated approach, cases are aggregated into variables and their distribution analysed. Examination of patterns of variation among variables is used as a basis for making general statements about relations between aspects of cases (Ragin 1987). This conventional impulse to prove causation by gathering data on regularities or repeated events is misguided (Sayer 2000). What caused something to happen has nothing to do with the number of times we have observed it happening but by identifying the causal mechanisms at work and under what conditions they are activated.

While the case-orientated approach avoids many of the simplifying assumptions of the variable-orientated approach, it cannot be used to address similarities and differences among many cases due to time and complexity issues. Whilst case studies highlight this complexity, diversity and uniqueness and provide a powerful basis for interpreting cases, it is very difficult to use this approach to explain more than a few cases at a time. Furthermore, the interpretivist concept-laden approach often limits generalizability.

The aim of the research is to *explain* successful information management in small business by identifying the causal mechanisms likely to be involved, understanding how they work, and discovering if they have been activated and under what circumstances. The methodology chosen to provide this explanation is critical realism, using a broad retroductive research strategy to reveal underlying causal powers, structures and mechanisms that are possibly responsible for empirical effects (Sanghera 2004).

... Successful ...

Success is difficult to define, especially in a very diverse small business sector. The literature argues that prescriptive 'textbook' definitions of success (e.g. profit maximisation, sales growth, etc.) cannot be liberally applied to a small business community dominated by (frequently irrational) sole traders and owner managers (Bridge, O'Neill et al. 2003). The research instead uses the behavioural theories of Simon and others (Baumol 1959; Marris 1964; Simon 1965; Williamson 1967) to justify *satisficing* objectives as opposed to maximising or optimising ones i.e. deciding what constitutes a satisfactory outcome and then looking for ways to achieve it.

In the research to-date, the definition of a successful or unsuccessful project will lie with the respondents themselves. It is not for the researcher to 'play God' and decide this for them. Such a grounded definition is the only one realistically possible given the heterogeneity of the population being examined as recommended by Blackburn and McLure (1998) and others.

... Information Management ...

The field of 'managing information in business' as an academic discipline it is large and fragmented, and frequently analysed as a dualism between 'hard' and 'soft' schools of thought. A recurring theme throughout this project is the desire to find 'a third way' between dualist

extremes that without falling into simplistic relativism. The following terms were therefore rejected:

'Hard' School. Information Technology (IT) and Information and Communications Technology (ICT) are both favoured by the DTI and Business Links and have contributed to the relative failure of their efforts to encourage small business to improve the way they manage their information assets. The emphasis is heavily on the technology and tools required (focussing attention on cost) rather than the information generated (focussing attention on value).

'Soft' School. The term Management Information Systems (MIS) implies focus on the management of systems rather than the information they generate. This and its strategic variants e.g. Strategic Management Information Systems are also well-used terms which are normally applied to larger, more formally run businesses than the small business sector we will be examining.

Table 1. Comparison of 'Hard' and 'Soft' information management schools

'Hard' School	'Soft' School
Hard Science	Social Science
First Order (Factual) Questions	Second Order (Conceptual) Questions
Positivist	Interpretivist
Technology, Systems Focussed	People, Management Focussed
Practitioners	Academics
Generalizable	Specific
Technological Determinism	Social Determinism
Naturalist	Humanist

Source: (Mingers and Willcocks 2004)

The term chosen throughout this project will be simply *information management*. This term focuses on information, not the technology or systems processing it, nor the management of these systems or the people who operate them.

... In Small Business

Whilst there is a temptation to use the standard DTI definition of an independent business employing less than 50 employees, a more practical approach was taken by Curran, Blackburn and Woods (1995) when researching small enterprises in the service sector. They argue that the heterogeneous nature of small businesses means that a single definition such as size is inappropriate, and that 'smallness' is a multi-dimensional concept linked with legal independence, type of activity, organization and economic activities. In this research, for example, a retail chain with 100 employees (mainly shop-floor) has similar information management intensity to a show organiser with 10 employees. A grounded definition is therefore used and the conditions used to define this are discussed later.

RESEARCH METHODS

Literature Review

A review of small business information management literature was conducted (Swartz and Boaden 1997; Smith 1999; Thong 1999; Southern and Tilley 2000; Dans 2001; Shiels, McIvor et al. 2003; Whaley 2003; Kyobe 2004). The main purpose was to identify possible conditions which might cause successful or unsuccessful information management in small business which contributed to the synthesis of the seven categories listed below. Space (and focus) prohibits a review of this literature in this paper.

Fieldwork Phase One: Organization as Case

Fieldwork effectively started in October 2005 with the construction of a questionnaire which was sent to twenty-one prospective respondents. At this stage 'the case' was an organisation with which the researcher was familiar and, based on his knowledge of them, was graded as either successful or unsuccessful users of information management. The fifty questions were based on

topics identified in the literature review and were divided into two main areas: a) objective organisational information and b) subjective opinions on information management. Of the twenty-one despatched, eleven were received back (52% response) all of which were valid and used in subsequent analysis.

A smaller sample of seven respondents were then interviewed with the returned questionnaires used as the basis for semi-structured interviews. Interviews were conducted at the respondent's offices during November 2005. They were digitally recorded then manually analysed to identify conditions, themes and categories of possible interest.

In addition to identifying several new conditions (e.g. family ownership) the most important finding from this exercise was that the original definition of a case – the organisation – was inappropriate. Many organisations had clearly experienced examples of both successful *and* unsuccessful information management at different times and the definition of a case had to be revised to an information management instance (described as IT project to respondents).

Fieldwork Phase Two: Information Management Instance as Case

A second questionnaire was prepared, with questions this time relating to individual information management instances. This second set of questions was based on the conditions identified from the phase one interviews and asked respondents to identify what they believed to be the causes of successful and unsuccessful IT projects using a five-step Likert scale.

The questionnaires were sent to the initial seven phase-one respondents and a further eight cases. Fourteen responses were received of which twelve were deemed valid. All new respondents were interviewed face-to-face or by telephone and where necessary, phase-one respondents were contacted to qualify their answers further.

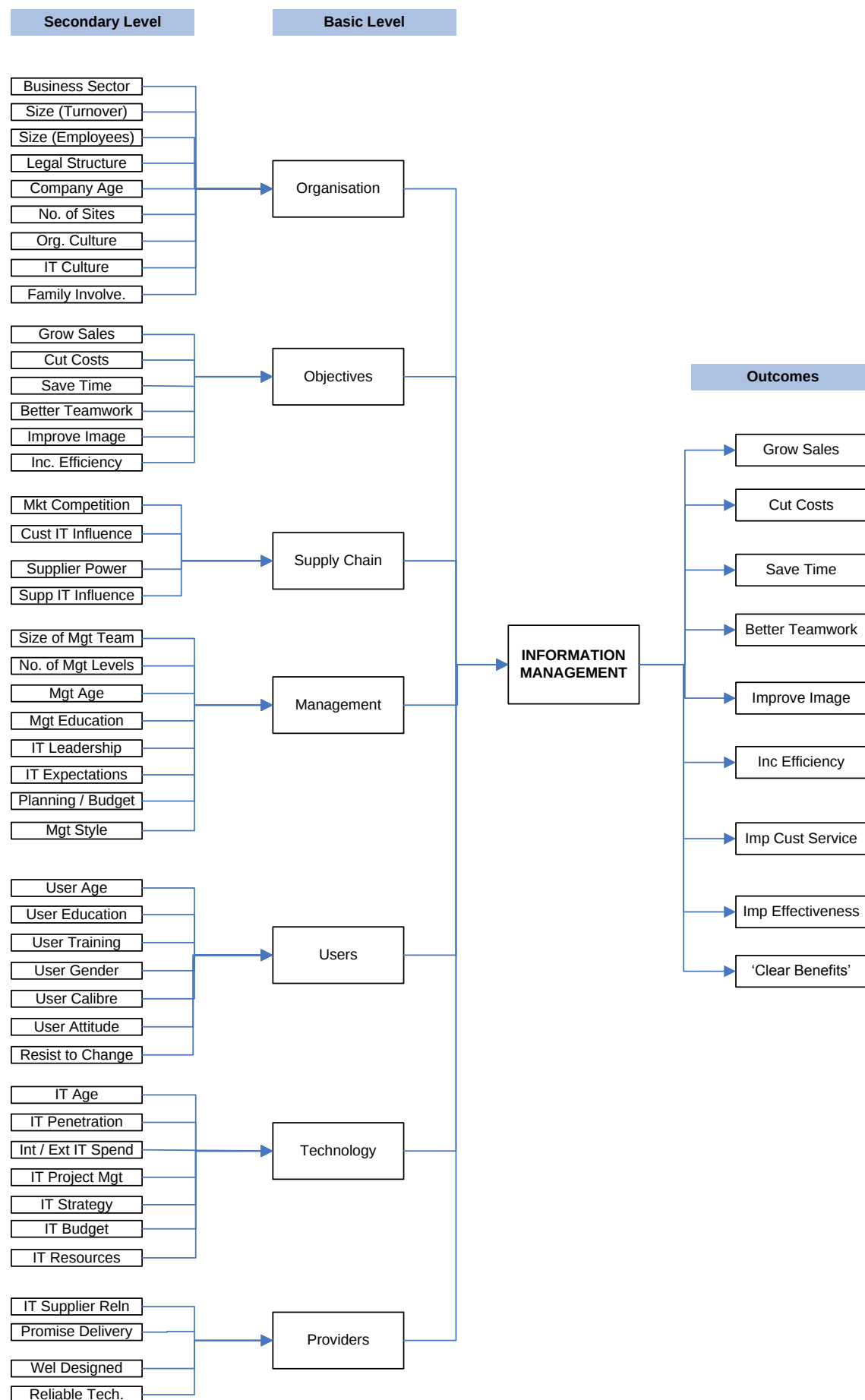
At the end of this exercise, the researcher had quantitative (nominal and ordinal) data for twenty four cases of information management instance (half successful, half unsuccessful) relating to eighty possible conditions (or variables) across twelve organisations. The task of systematically analysing even this small number of cases is not straightforward, and qualitative comparative analysis (QCA) techniques was chosen to manage this complexity. But even with algorithms to manipulate Boolean algebra on powerful personal computers QCA cannot cope with the possible combinations of eighty conditions with up to five variables in each condition. Even if it could, the inevitability of contradictory outcomes and lengthy, meaningless prime implicants means the exercise would be pointless. The first priority therefore was to reduce and re-group the number of conditions and this was done in two steps:

First, by removing 'case=company' conditions (phase 1) that were either duplicated by superior 'case=instance' (phase 2) conditions or made redundant through the change in case focus. An example of the former is 'growth an objective' which was made redundant by 'growth in sales'. An example of the latter is 'monthly management accounts' which was positive across all organizations and project outcomes.

Second, by re-grouping the remaining conditions into seven logical groups as suggested by literature and supported by interviews. These groups are:

1. Organisation (key descriptors such size, age, type, etc. at organizational level)
2. Objectives (business goals at organization level)
3. Management (both at company and instance level)
4. Users (mainly from IT instance)
5. Resources ('hard and 'soft' IT system aspects of IT instances)
6. Providers (people aspects of IT instances)
7. Market (external influence from customers and suppliers)

These actions reduced the number of conditions to forty-three (see figure 1). This is still far too many conditions to logically analyse so the categories were analysed individually using qualitative comparative analysis and then two-level theory applied at both individual levels and between levels.

Figure 1 – Initial Information Management Model

Qualitative Comparative Analysis

Qualitative comparative analysis uses Boolean algebra in a truth table to help understand causal complexity. In Ragin's original work (1987), he uses 'crisp' sets of data i.e. a dichotomous set where an object is either in or out of a set and can therefore be expressed as a binary variable with two values '1' or '0'. Recent advances have enabled multiple value and fuzzy set approaches to overcome this potential restriction and the first decision that had to be taken was which QCA technique to use: Fuzzy Set QCA (fsQCA) or Multi-Value QCA (MV-QCA). The former uses fuzzy set theory to produce probabilistic results; the latter uses new algorithms to process multichotomous data whilst retaining the veristic Boolean integrity. The pros and cons of each method are outlined in a useful paper by Lonqvist (Cronqvist and Herrmann 2005) and the ability to retain rich detail in a relatively small number of cases and the preference for the researcher to use QCA to subtly complement alternative methods means that the MV-QCA approach was chosen.

The software created to perform these calculations is called 'Tosmana' (Tools for Small N Analysis) (Cronqvist 2005). Whilst Likert scores translate directly into QCA values nominal data such as employee numbers can be conveniently grouped into sets by using a 'Threshold Setter' to choose and evaluate appropriate ordinal thresholds. The table data was analysed for each of the seven categories. An immediate problem was the duplication of phase-one company data which was the same for both successful and unsuccessful cases. Company variables identical for two cases and Tosmana were included to see if any of these conditions combined with other conditions creates a pattern explaining success or non-success over multiple cases. Company conditions (alone or in combination with other conditions) occasionally create prime implicants but these are never in the most parsimonious solutions as these they contradict with the other case of the same company with the opposite outcome.

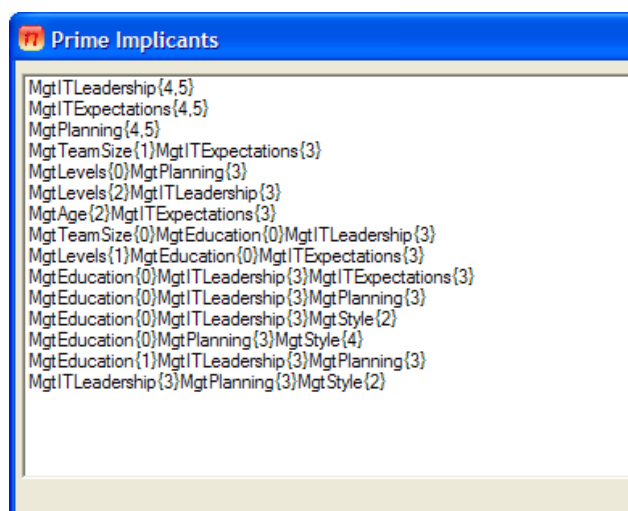
RESEARCH FINDINGS

The two main Tosmana outputs of interest are a) the list of all prime implicants and b) the most parsimonious solution. Examples of both (from Management category) are shown in figures 2 and 3. MV-QCA was run for all seven categories for both successful and unsuccessful outcomes and examples are summarised below using:

- (1) to signify the expressions for a successful outcome
- (0) to signify the expressions for an unsuccessful outcome

Comments and quotations from the interviews are used to support these findings.

Figure 2 – Typical Prime Implicant Listing



Source: Tosmana (Cronqvist 2005)

Organisation

This might seem an odd place to start, but the definition of the case in this model is a *small business* information management instance so ensuring we have the correct organisations on which to apply it is vital. This is difficult as the definition of a small business often needs to be grounded to be relevant and the conditions listed try to convey this.

Whilst some of the conditions are clearly factual (e.g. sector or turnover) others are far more subjective. Whilst organisation culture primarily relates to lifestyle vs. growth objectives many other 'small business mentality' issues arose during the interviews including:

Why do you and other directors sit in different parts of the office? "So we can keep an eye on the staff." Partner, Insurance Broker (showing lack of trust).

"Someone like me gets pulled in so many different directions, because there is only me here in charge. So you move from one crisis to the next ... constantly fire-fighting." Chief Accountant, Print Company (showing scarce resources).

"I'm concerned about COST – it's potentially very expensive. Also perhaps losing a bit of control - letting go of the reins. If we do it (develop new software application) development will be by me." Managing Director, Engineering Company A (showing fear of loss of control).

"When the old system was coming to the end, Dad just walked in and said 'we're getting this one' because it was free." Partner, Insurance Broker (showing family influence).

"A lot of people go 'Shit ... IT... it's going to be expensive, or I haven't got the time or it's going to be too much aggro when it doesn't work" Managing Director, Design Company (showing negative IT attitude).

The nine conditions in this category come primarily from phase one company survey i.e. sector, turnover, number of employees, incorporation, age, sites, number of sites and culture (growth or life-style) and IT culture. The one condition that was added from phase two was whether the organisation was family owned or managed as this appeared important in several interviews.

Because the conditions are the same for both successful and unsuccessful outcomes, it is impossible to minimise these further within the organisation category. It is worth noting though that some company conditions are included in prime implicants during reduction, but not the most parsimonious reduction.

Objectives

These too are phase-one organisation conditions that were not directly queried further during the second phase. It was clear however that the some organisations had specific ideas about what they wanted their IT to do for them:

"The main advantage is internal efficiency. VAT Returns will come out at press of a button. Previously they would take a whole afternoon." Managing Director, Retail Chain.

"We believe we can be a lot more efficient We think we can do more work with the same number of fee earners. Monitoring of what we do with what we are paid to do." Partner, Surveyors.

What was interesting is whether information management projects which start with clear (if not measurable) objectives can then measure success better against these later. This is fine in theory, but the reality is that most small businesses have little time or inclination to systematically measure return on investment:

"I always find it difficult to quantify 'This is going to save us this amount of money.' We don't sit down and work out 'This is going to save us this amount of money' because it is very difficult to do" IT Manager, Manufacturing Company.

"You're so bloody busy doing the day to day stuff making ends meet and trying to grow you don't have the time to sit down and analyse it – only to find out what you don't want to know!" Managing Director, Design Company.

Some however quickly see benefits:

"To be honest, since we moved here and improved the systems we've done away with two staff. I've just saved myself £16,000 in wages." Partner, Insurance Broker.

"We no longer have people spending hours per day sorting out paper documents, hole punching, filing, etc. Then spend thousands of pounds storing them and never looking at them." IT Manager, Finance Company.

Conditions for the relevant phase one objectives (growth, efficiency and effectiveness) are also the same for both outcomes and therefore of limited use for QCA purposes. Some light is however shed on this issue when outcome conditions are analysed later, where it is suggested that improvements in efficiency are the most likely result of successful IT instances.

Management

Management is a mixture of phase one and phase two conditions. It is interesting to see that common organisation conditions combined with variable project conditions in some of the parsimonious expressions. Minimising the tables for management conditions produced:

- (1) Realistic expectations exceeded OR well planned projects

Both these conditions suggest that careful consideration in advance of what an IT instance can do for an organisation contribute greatly to a significant outcome. Whilst respondents seem to appreciate that good project planning is important, few managed to practice it:

"We're not an organisation who keeps abreast of developments. We don't spend the time sitting down and identifying what IT can do for us. Perhaps we should!" Chief Exec, Show Organiser 2.

"Should have spent a lot more time with us beforehand finding out what we wanted first. We might not then be in this god-awful mess we're in now!" Finance Director, Hotel & Restaurant.

It was interesting therefore to see that poor project planning did not feature as a prime reason for unsuccessful projects. Both expressions for unsuccessful outcomes did however include unrealistic initial expectations not being met.

- (0) Unrealistic expectations not met OR a small mgt team with few IT expectations
- (0) Unrealistic expectations not met OR an older mgt team with few IT expectations

A typical example from interviews was:

"I thought it would be more than just traffic lights. Imagine a pin ball machine, things happening, spinning round, etc!" IT Manager, Finance Company (describing a digital dashboard solution).

It is important to realise this is not an outcome condition i.e. post-IT project, but the explicit acknowledgement by respondents that the 'bar was set too high' prior to the project actually commencing. Interestingly, those with neutral opinions (expectations = 3) suggest failing

projects may be explained by smaller or older management teams. The reasons for this are unclear.

The overwhelming finding from the QCA exercise was that good planning and having realistic expectations (subsequently exceeded) are the two conditions which combine to provide successful - or pragmatic - management. It was interesting to see that the much quoted 'Chief Executive Influence' found in studies of larger organisations was only apparent in one case:

"We've spent more money (on IT) in first year (since old MD left) than in previous three. We've used it differently too. Where the old MD used to like faxes going out, he used to like paper memos, I turned round and said I want you to do it all with Email." Managing Director, Engineering Company B.

Users

Other than user education, all user conditions are phase two and relate to IT instances. Age, education, gender, calibre and resistance to change were all cited as causes and calculated to be prime implicants, but user training or user attitude have the most coverage.

(1) Good user training OR a positive user attitude

Interviews confirmed that most organisations realised the importance of training (but given resource constraints identified elsewhere were often unable to deliver it):

"Training is very important. We spend a lot of time and effort on training and development." Managing Director, Engineering Company B.

"In the past the partners hadn't learned the system. We did this time so we could cope if the staff dropped us in it." Partner, Insurance Broker.

Positive user attitude was less obvious in the interviews.

"They are ready to embrace change and are highly motivated to do that for the benefit of their clientele." Chief Exec, Charity.

The minimal expression for an unsuccessful outcome was unequivocal i.e. responsibility for unsuccessful projects lies primarily with poor training.

(0) Poor user training

There may be a link here with lack of resources (which was often cited) during interviews and this needs to be explored further. The overall tone was overwhelmingly one of 'we know it's important but ...'

"You can spend a good proportion of your time fire-fighting, dealing with your current work. Like Outlook – we're only scratching the surface. It's difficult to free someone up when you're busy. It's always a problem to find the time to go training, then again when they come back and have other work to do." Chief Exec, Show Organiser 2.

"At present, both (software products) are incredibly unsuccessful, and the biggest reason for both of those is that no-one understands how to use them and that comes down to training." Project Manager, Recruitment Agency.

User attitude was of lower profile but still important.

"If we're honest what holds us up now is operator driven, not system driven." Due to number of staff or calibre? "Probably a bit of both really." Chief Exec, Show Organiser 2.

"If the staff had the nous to work the system properly we'd avoid a lot of our problems." Finance Director, Hotel & Restaurant.

Although not registering in the minimised prime implicants, both age and gender contributed to negative attitude and resistance to change too:

"A lot of the reps are quite old and anti-computers and would be dead against it (changing from manual order books). They'd like to do it the way they've always done." Chief Accountant, Print Company.

Two older guys don't want the training or want to be seen training. Two guys are young and keen. The girls – no problem! They just look at you and say thanks very much! I've always noticed this difference (in gender attitude)." Manager, Recruitment Agency.

Technology

The technology category includes both 'hard' and 'soft' elements of information technology e.g. IT equipment and IT strategy. Minimised combinations of possible causes here include:

- (1) Good project management OR clear IT strategy in place
- (1) Good project management OR sufficient time / resources
- (1) Clear IT strategy in place OR adequate money or budget
- (1) Adequate money / budget OR sufficient time / resources

Whilst this clearly suggests that four conditions (project management, strategy, money and time) are all important, the combinations do not prove very enlightening. This can partly be explained by looking at the truth table which shows that every case is unique - a problem in multichotomous Boolean reduction where the number of possible combinations is significantly higher than dichotomous.

None of the 'hard' technology aspects (e.g. equipment age or penetration) gained much coverage in QCA and it was four 'softer' aspects that, in various combinations, proved most prevalent in our survey. Both good IT project management and clear IT strategy in place resonate with the good planning identified in the management category. The most stressed conditions in the interviews were however the availability of adequate money and time and these both came out in the secondary-level analysis.

"It went right because we took time out of a busy schedule here to sit down and actually say what we want out of the system." Managing Director, Retail Chain.

The unsuccessful outcomes resonate with the positive analysis by highlighting similar conditions but in different combinations.

- (0) Weak project management OR no IT strategy OR inadequate money / budget
- (0) Weak project management OR no IT strategy OR insufficient time/ resources
- (0) No IT strategy or inadequate money / budget OR insufficient time/ resources

The overwhelming tone again was 'we know what to do if only we had time / money'. Time was especially important in service organisations where it was very closely associated with money :

"I tell you what, the single biggest thing for us of whether we have success or failure of any IT thing is whether we ourselves have the time to put into it to get the thing started." Partner, Surveyors.

"As far as having an action plan for IT .. it just doesn't exist. Nobody has the resources or the time to think about it or plan." Chief Accountant, Print Company.

Providers

The role of the companies which provide IT products and services to small business is seldom mentioned in the literature. This is surprising as SMBs rarely have their own internal dedicated IT resources and rely heavily on external advice and support to successfully manage their information.

Figure 3 – Typical Truth Table and Minimised Expressions

Company	Mgt Levels	Mgt Age	Mgt Educn	Mgt IT Leadership	Mgt IT Expectations	Mgt Planning	Mgt Style	Outcome
Manf (1)	1	3	0	3	5	5	4	1
Manf (0)	1	3	0	3	1	1	4	0
Show A (1)	1	3	3	3	5	4	2	1
Show A (0)	1	3	3	3	1	2	2	0
Finance (1)	1	2	0	3	3	5	4	1
Finance (0)	1	2	0	3	2	2	4	0
Ins Broker (1)	1	3	0	3	5	3	2	1
Ins Broker (0)	1	3	0	1	1	3	2	0
Surveyor (1)	1	3	3	3	5	4	4	1
Surveyor (0)	1	3	3	3	3	3	4	0
Charity (1)	1	4	3	4	4	5	4	1
Charity (0)	1	4	3	3	3	2	4	0
Recruitment (1)	2	3	1	3	5	3	4	1
Recruitment (0)	2	3	1	1	3	3	4	0
Engineering A (1)	0	3	0	5	5	3	4	1
Engineering A (0)	0	3	0	1	3	1	4	0
Engineering B (1),Retail (1)	1	3	1	5	5	5	4	1
Engineering B (0)	1	3	1	3	3	1	4	0
Retail (0)	1	3	1	2	2	1	4	0
Hotel (1)	2	2	1	5	5	4	4	1
Hotel (0)	2	2	1	2	1	1	4	0
Show B (1)	1	3	2	5	5	5	4	1
Show B (0)	1	3	2	3	3	3	4	0

Results: (all)

MgtITExpectations{4,5} +	MgtPlanning{4,5}
(Manf (1)+Show A (1)+Ins Broker (1)+Surveyor (1)+Charity (1)+Recruitment (1)+Engineering A (1)+Engineering B (1),Retail (1)+Hotel (1)+Show B (1))	(Manf (1)+Show A (1)+Finance (1)+Surveyor (1)+Charity (1)+Engineering B (1),Retail (1)+Hotel (1)+Show B (1))

Source: Tosmana (Cronqvist 2005)

Four conditions were examined and here was again symmetry in responses over both successful and unsuccessful outcomes. It was the ability for IT providers to design new systems well and then deliver their promises which proved most important in both outcomes.

- (1) IT supplier delivering promises
- (1) Well designed new systems

Interviews supported these findings.

"It went right because of the actual assistance we got from (list of IT providers)"
Managing Director, Retail Chain.

"We work through small, independent, local firms. Having the backup from the partners who were quite happy to work together - not the 'it's not my problem' problem. We had this in our previous system." Managing Director, Retail Chain.

Unsuccessful outcomes mirrored the above.

- (0) IT supplier failing to deliver promises
- (0) Poorly designed new systems

"There is a simple, single one (example of undelivered promises) that sticks out like a sore thumb. It's the provision of management information. We still very much lack management information." Did the supplier let you down? "Yes. The concept was great but we were sold something that couldn't be delivered. There wasn't a piece of software out there that could do it." IT Manager, Finance Company.

"It didn't help when the person who wrote it buggered off to Greece for three weeks shortly after we bought it. They've been very naughty really, they've three or four people there who we were led to believe could help but when you ring them up and he's not there they always have to get back to you. It's very frustrating." Finance Director, Restaurant & Hotel.

Market

The Market category includes competition levels and support or pressure from customers or suppliers. It is interesting category as with three company case conditions and only one IT instance condition there are a number of logical contradictions in the analysis. Excluding these contradictory cases (full discussion prohibited by space) yields:

- (1) Support from customers
- (0) Resistance from customers OR (resistance from customers AND low competition)
- (0) Resistance from customers OR (resistance from customers AND low pressure from customers to adopt)

These fragmented results suggest little commonality between respondent organisations and this confirms the lack of importance attributed to this category suggested both by the interviews and literature review. The solitary mention of market pressure on IT was ...

"Customers wanted the ability to buy tickets over the internet and it (web site) has exceeded our expectations." Finance Manager, Show Organiser A.

... which suggests that whilst small businesses undoubtedly work in competitive markets, they are unable or unwilling to explicitly invest in IT to help them compete.

Outcomes

Although not strictly part of the research brief, the second phase of the survey also prompted respondents to identify why IT instances (cases) were successful by asking them to rate any benefits delivered. Examining the truth table suggests little consensus (i.e. multiple cases with identical combinations) and the list of prime implicants included all nine conditions, but minimisation revealed that two conditions contributed most:

- (1) Clear benefits
- (1) Improvements in efficiency
- (0) No clear benefits
- (0) No improvements in efficiency

The 'clear benefits' question is perhaps vague but was deliberately asked as, from the researcher's experience, the failure to anticipate and therefore often appreciate IT benefits is one of the main reasons for perceived IT project failure. These findings tend to support this theory. Of the other benefits, it was improvements in efficiency which cover most set space and suggests SMEs are still using IT for internal uses rather than gaining external competitive advantage.

TWO-LEVEL THEORY

The above analysis provides the basis to identify a number of possible causal conditions which explain successful and unsuccessful information management in small business. The task now is to try to build these into a more cohesive and comprehensible model. The method chosen to understand this complexity is two-level theory which can use QCA to test for necessity and sufficiency (Goertz and Mahoney 2005).

Two-level theories 'offer explanations of outcomes by conceptualising causal variables at two levels or analysis that are systematically related to each other' (p496). The first or basic level represents the core of the theory and focuses on the central causal conditions and main outcome under investigation. The second level focuses on causal conditions at a less central level of aggregation which 'are also causes of the main outcome under investigation but their effects cannot be understood independently of their relationship with the causal factors at the basic level'. (p498).

Like much qualitative and comparative work, two-level theory uses variables (or conditions) and the way they are related to build theory and there are two most common forms of these structures. The first is a set of causal factors that are *individually necessary and jointly sufficient* for a outcome. Goertz & Mahoney call this structure *a conjuncture of necessary causes* to reflect the fact that a combination of necessary causes is sufficient to produce an outcome and can be specified using logical AND. The second is a set of causal factors that are *individually sufficient but not necessary* for an outcome. This structure is called as *equifinality* meaning that various conditions are sufficient and therefore there are multiple paths to the same outcome (Ragin 1987) which can be specified as logical OR.

Table 2: Relationships from the Secondary Level to the Basic Level

Relationship	AND (*)	OR (+)	Symbol	Temporal Priority
Substitutability	No	Yes	➔	No
Ontological	Yes	Yes	=====	No
Causal	Yes	Yes	➔	Yes
Conjunction of necessary causes	No	Yes	➔➔➔	Yes
Noncausal conjunction of necessary causes	Yes	No	➔.....	No

➔ means a causal relationship; ===== means an ontological relationship;➔ means a substitutable relationship

Boldface characters are used for basic-level variables. Normal characters are used for secondary-level variables.

Source: (Goertz and Mahoney 2005 p507).

In two-level theory, we not only have to consider how structures at each level but also how second-level conditions relate to basic-level conditions and Goertz & Mahoney stress the need to grasp the structure of the relationship between basic and secondary levels before the theory as a whole can be evaluated. They propose three possible theoretical relationships using the idea of necessary and sufficient conditions to understand each:

1. **Ontological Relationship.** Where conditions in the secondary-level define or constitute causal variables at the basic-level i.e. they are not indicators, but literally constitute basic-level phenomena. Traditionally this relationship has been defined by secondary-level conditions that are *necessary and sufficient* for the existence of basic-level condition (p499).
2. **Substitutable Relationship.** Where conditions at the secondary-level are different ways by which it is possible to arrive at basic-level states i.e. alternative means of achieving

the same ends. A substitutable relationship refers to a set of secondary-level conditions that are *individually sufficient but not necessary* for the presence of a given basic-level condition.

3. Causal Relationship. Where conditions in the secondary-level relate to causal conditions in the basic-level (causes of causes). A causal relationship might be characterised by *either necessity or sufficiency including complex combinations of the two*.

Because two-level theories have not been systematically considered in the literature, the authors provide a system of symbols proposed to represent different relationships (table 2).

Two-Level Model: Secondary-Level Analysis

Armed with this framework, it is possible to revisit and refine our earlier model as below. Note the category titles have now been made less passive to reflect findings and be more meaningful.

Small Business Profile. Conjuncture of necessary causes. The secondary-level displays combinations of conditions which are individually necessary and jointly sufficient to define what makes up a small business. The relationship to the basic-level is ontological as 'this is what small businesses are' and is a useful reminder that these are not causal conditions that small businesses can change quickly or easily.

Measurable Objectives. Equifinality. Any condition appears sufficient to provide an organisation with clear objectives. Relationship between levels is substitutable i.e. any of the secondary-levels could contribute to clear objectives.

Pragmatic Management. Equifinality. Combinations of realistic expectations and good planning are sufficient to produce pragmatic managers. Relationship to basic-level is causal.

Able & Willing Users. Equifinality. A combination of willing users (i.e. with a positive attitude) seem able to overcome inadequate training. Good training helps overcomes negative attitudes. Relationship to basic-level is causal.

Adequate Resources. Equifinality. Combinations of skills, strategy, time and resource conditions are sufficient to produce adequate technical resources at the basic-level. Strategies change to reflect budgets; budgets and resources are restricted but adequate if planned properly. Relationship to basic-level is causal.

Professional Providers. Equifinality. Either condition appears sufficient to define a professional provider. Even if the system is not well designed initially, the provider will correct this to deliver their promise. Relationship to basic-level is causal.

Market Pressure. Conjuncture of necessary causes. Customers are only able to create market pressure in a competitive market. Relationship to basic-level is ontological to reflect 'that's the way the market is' and small business can do nothing to change it (unlike big business).

These categories and the relationships between secondary-level and basic-level are shown in figure 4 (over).

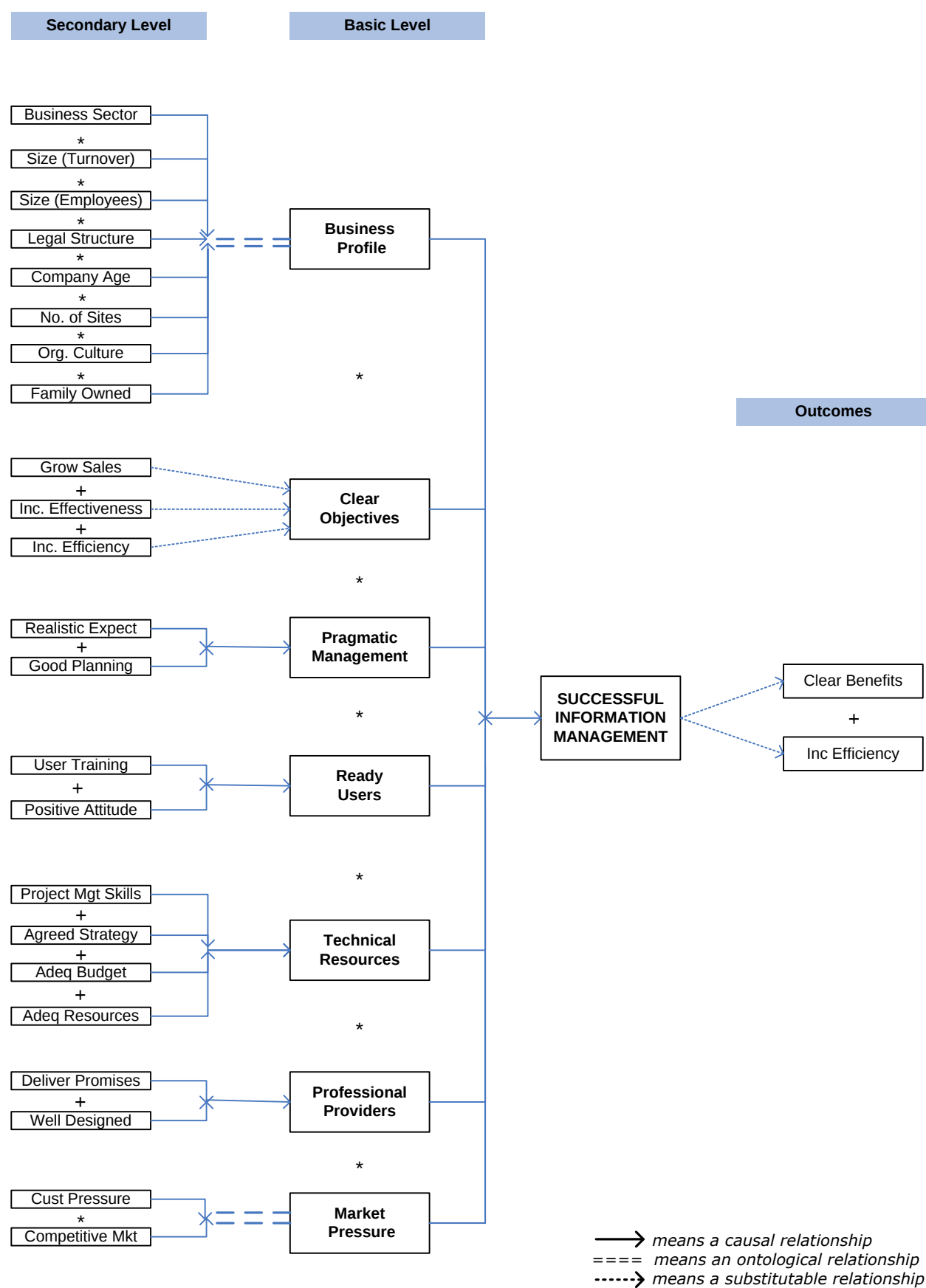
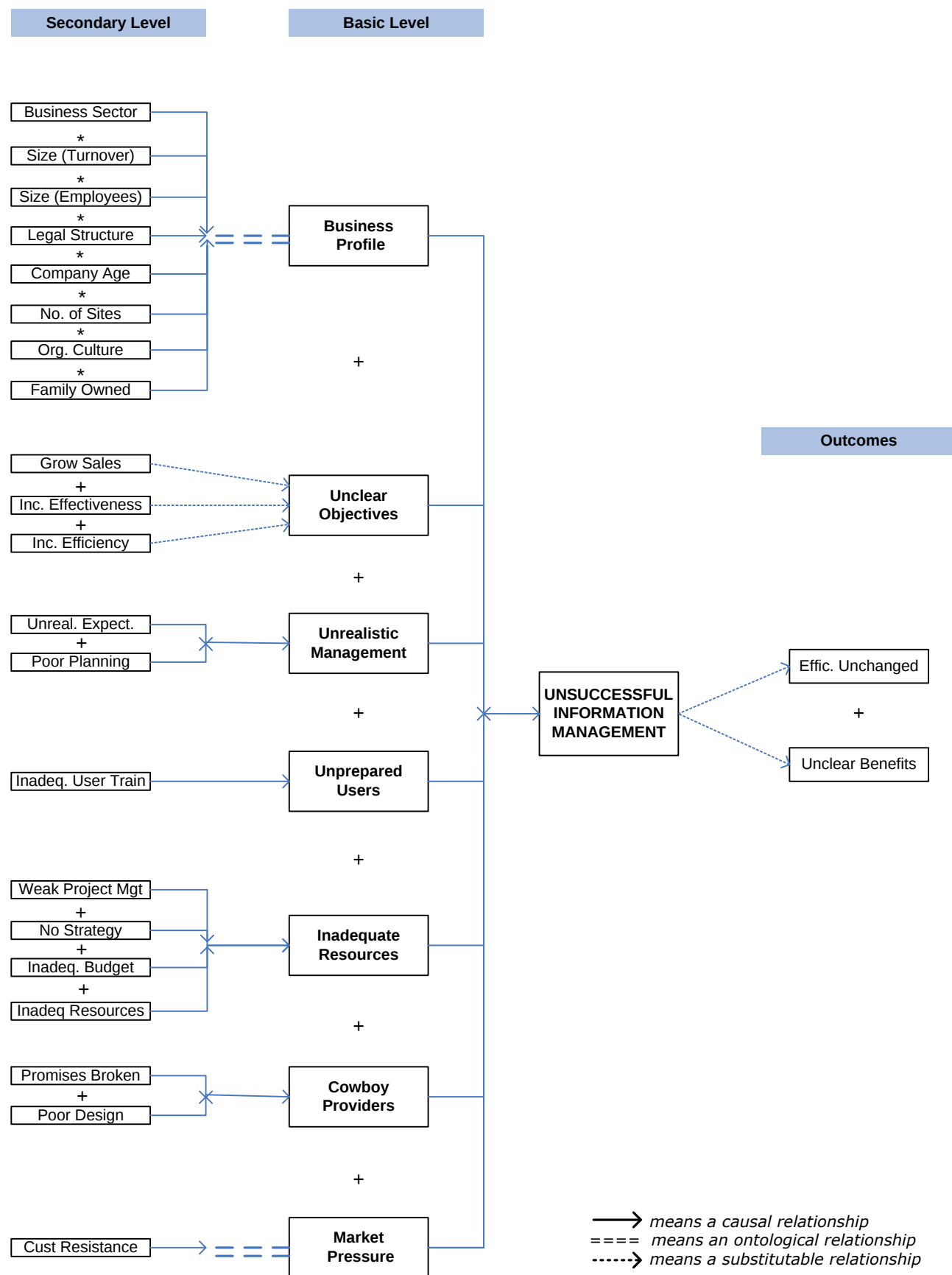
Figure 4 - Two-Level Model for Successful Outcomes

Figure 5 – Two-Level Model for Unsuccessful Outcomes

Two-Level Model: Basic-Level Analysis

So far, the model has concentrated on analysing secondary-level conditions and their likely relationship with basic-level categories. The final stage is to examine the relationship between the basic-level categories. QCA isn't that helpful here. Running the minimisation routines (using the ten key phase-two conditions) produces a parsimonious (successful outcome = professional providers) but this is not felt to accurately reflect the data.

Instead, other qualitative evidence, supporting literature and experience all suggest that successful information management in small business *is a conjuncture of necessary causes* (i.e. joined by logical ANDs) that are individually necessary and jointly sufficient to produce a successful outcome (figure 4).

Space prohibits a detailed review of unsuccessful outcomes but the model is shown as figure 5. The main differences are in the secondary-level conditions and particularly the relationship between basic-level categories which *is one of equifinality* i.e. any category is sufficient to bring about an unsuccessful outcome.

This 'many routes to failure' contrasts sharply with the 'one route to success' and helps explain why information management instances are so prone to problems.

CONCLUSIONS AND FURTHER WORK

This paper provides an interesting venture into the world of small business information management using analytic tools new to the field such as QCA and two-level theory in support of more established survey and interview methods. In doing so, it has brought some structure to an otherwise fragmented field and started to provide information useful to practitioners as ultimately befits a DBA thesis. The final phase of the research is likely to address three final areas:

1. Further refinement of the current two-level model and closer linking to evidence. Especially on the critical area of basic-level logical structures.
2. Re-visiting existing cases or to collect temporal data for possible analysis using Temporal Qualitative Comparative Analysis (TQCA).
3. Once confident with the evidence provided, use retroductive techniques to suggest deeper mechanisms and structures in the real domain.

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