

Characteristics of Single-Item Measures in Likert Scale Format

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Abstract: The use of single-item measures has been encouraged by several authors asserting that single-item measures are appropriate and can substitute multiple-item measures in many cases. This study focuses on the characteristics of single-item measures in Likert scale format. There are two motives behind it: first, the Likert scale has been called problematic and its usage discouraged by the very proponents of single-item measures; and second, the reverse wording of Likert items has led to many problems with multiple-item measures. Because the Likert scale is one of the most used scales in marketing and management, and more researchers may decide to use single-item measures in Likert scale format, it becomes necessary to answer the question if it is usable or not. This research scrutinizes the characteristics of the Likert scale in a positive-negative continuum: from positive to negative with different levels of intensities. Based on collected sample data for three popular computer brands, the main conclusion is that only positively worded Likert items with a fairly high level of intensity should be used as single-item measures. The supporting empirical evidence includes: (1) positively and negatively worded items are not true opposites, (2) items with reversed scores inflate means, (3) items with neutral intensity have unique conceptual meaning, (4) dependent variables are predicted best by independent variables with similar intensity and (5) negatively worded items contain a method factor that limits their ability to capture the measured concept. The results also suggest that the effect of the method factor is expressed more when respondents are not familiar with the object of the measured concept. The findings in this study provide guidelines for the practical use of measures in Likert format. Scales in other formats should undergo similar scrutiny.

Keywords: single-item measures, Likert scale, negatively-worded items, reversed items, C-OAR-SE

1. Introduction

The dominant paradigm of multiple-item scale development in marketing, as advanced by Churchill Jr. (1979), has been challenged by several authors (Drolet and Morrison 2001; Rossiter 2002; Bergkvist and Rossiter 2007). The main argument is that multiple-item measures are not always necessary and can be substituted by single-item measures in many cases. The C-OAR-SE procedure suggested by Rossiter (2002) has become the focal point of the recent debate. C-OAR-SE is a comprehensive methodology for the development of multiple- and single-item measures claiming to surmount some of the current pitfalls in scale development in marketing. The focus in C-OAR-SE is content validity. Rossiter (2005; 2008) claims that this is the only validity needed in scale development, and the typical item purification through statistical procedures is unnecessary because it can change the meaning of the measured concepts. Therefore, according to Rossiter (2005; 2008), if a scale has a precise definition, there is no need to examine other types of validities. An important practical assertion advanced by C-OAR-SE is that most concepts (e.g., purchase intentions) are concrete and understood unequivocally by raters and there is no need to use multiple-item scales to measure them; a single-item measure is sufficient.

Although the C-OAR-SE procedure is a solid argument in defense of single-item measures, it opens the door for a possible misconception. Specifically, Rossiter (2002; 2008) argues that the only appropriate scale for single-item measures is the semantic-differential scale. The Likert scale was called problematic and its use was discouraged because of the lack of a neutral point. According to Rossiter (2008, p.383), the Likert scale “produces hopelessly fuzzy scores.” The danger with this assertion is that it annihilates a whole category of scales from the marketing research. It seems that the new attempt to relax scale development was restricted again. Furthermore, Rossiter does not provide comprehensive empirical or theoretical justification for his recommendation, except the lack of “psychological zero” and conceptual meaning.

Addressing some of the raised concerns, the purpose of this study is to clarify the use of single-item measures in Likert scale format. The Likert scale is one of the most popular scales in marketing and its status is unlikely to change. Therefore, as more researchers may decide to use it as a single-item measure, it becomes necessary to examine the characteristics of the Likert scale more closely. The intention of this study is *not* to avow the superiority of the Likert scale to any other scales, but to

describe its behavior and provide practical recommendations. The research question this study answers is: Are single-item measures in Likert format usable?

2. Review of positive-negative asymmetry

Nunnally (1978) suggested that positively-worded items in Likert scales can be transformed into negatively-worded items and their scores can be reversed symmetrically afterwards. This practice continues even today, although it has been known that negatively-worded items introduce problems in multiple-item scales. Negatively-worded items often form a separate factor, independent of the main factor, and change the dimensionality of the construct (Herche and Engelland 1996; Mook et al. 1991; Tomas and Oliver 1999). Factors based on negatively-worded items have strong method effects and exhibit longitudinal invariance (Motl and DiStefano 2002; Horan et al. 2003). Negatively-worded items tend to lower the reliability of multi-item scales as measured by Cronbach's alpha by as much as 20% (Schriesheim et al. 1991; Barnette 2000), and confound measures in cross-cultural research, hampering measurement invariance (Wong et al. 2003). All of the above contribute to the positive-negative asymmetry, which is reviewed in the following section.

Positivity and negativity are not symmetrical: negative information weights more than positive information (Anderson 1965; Rodin 1978), and positive and negative affective states have low correlation (Diener and Emmons 1984; Watson et al. 1988). Cacioppo and Berntson (1994) advanced the concept of bivariate evaluative space, where positivity and negativity are distinct entities that can coexist independently. Cacioppo et al. (1999) summarized that the underlying cognitive processes are bivariate (i.e., positivity and negativity are different concepts), but the limiting physical conditions make them appear as bipolar (i.e., positivity and negativity are true opposites).

The biases associated with the processing of positive information were called the *positivity bias* (Markus and Zajonc 1985), and the biases associated with the processing of negative information were called the *negativity bias* (Kanouse and Hanson Jr. 1987). The *positivity bias* is a cognitive process referring to humans' readiness to generate positive content (Peeters and Czapinski 1990). One aspect of the bias is its linguistic expression. There are more positive than negative words in vocabularies, people ascribe more positive descriptions to a target, and it is common to have unfavorable terms defined as opposites of favorable terms (Adams-Webber 1997; Benjafield 1985; Matlin and Stang 1978; van Dijk et al. 2003). The *positivity bias* is an *a priori* hypothesis about reality; people approach or search for events expecting to find positivity (Peeters 1971; Markus and Zajonc 1985). This internal drive is called the unconditional optimism (Czapinski 1985). A unique aspect of the positivity bias is that it has a strong *subjective* component, which if reduced, eliminates the bias (Aderman 1969).

The *negativity bias* can be summarized in four ways: (1) negative evaluations are stronger than equivalent positive evaluations, (2) negative intensity increases faster than positive intensity when approaching corresponding events, (3) the combination of positive and negative stimuli results in a more negative result than their algebraic sum, and (4) negative events lead to more complex cognitive processes (Rozin and Royzman 2001).

Some unique findings in positive-negative asymmetry are worth mentioning. Positive events are with higher frequency, but less urgent (Rozin and Royzman 2001). The processing of information under negative mood is more systematic and accurate than under positive mood. Negative events provoke more causal attribution than positive events (Bohner et al. 1988). Processing positive information is more *subjective*, while processing negative information is more *objective*, analytical, and complex (Peeters and Czapinski 1990).

Considering the positive-negative asymmetry, it is obvious that the Likert and semantic-differential scales are different representations of the measured concepts. The Likert scale captures the presence or absence of a concept, and it does not necessarily assume that every concept has a corresponding opposite. On the other hand, the semantic-differential scale assumes that a concept always is restricted by two symmetrical opposite characteristics.

3. Theoretical advancement

The basic premise I step on distinguishes between the positivity bias under positive wording and the negativity bias under negative wording in Likert scales. I take a gradual approach and examine the properties of the Likert scale in a positive-negative continuum: from positive to negative with different

levels of intensities. Intensity herein refers to the extremeness of the argument with which a respondent needs to agree/disagree.

Positive and negative affective states can coexist and do not form a single dimension (Schimmack 2005). It is possible to elicit mixed feelings by positive and negative stimuli (Schimmack and Colcombe 2007). This asymmetry applies to many concepts, including liking and disliking (Herr and Page 2004), attitudes in general (Cacioppo and Berntson 1994), and others. Replicating previous studies, the following hypothesis is advanced:

H1: Positively and negatively worded items are not true opposites.

Neutrality, psychological zero, is a key attribute of semantic-differential scales, but it does not have the same significance in Likert scales. Because it is technically possible to have a Likert scale with a neutral wording, this category is examined as well. According to Edwards (1946), neutral items are non-differentiating because neutrality may be interpreted by raters as: ambiguity, ambivalence, irrelevance, or indifference. In addition, the logic dictates that a neutral Likert item should not be correlated with any other item. The existence of a non-zero correlation with an item, even in the slightest direction, suggests that a 'neutral' item is not really neutral.

H2: Items with neutral wording have a distinct conceptual meaning compared to items with non-neutral wording.

Often, an item is worded negatively, and its score is reversed to transform it into a positive item. This is a common practice based on the assumption that positivity and negativity are symmetrical. However, people are more loss averse than gain oriented, and losses "loom" larger than gains (Kahneman and Knetsch 1991; Tversky and Kahneman 1991). Because negative information weights more than positive information, items with negative wording will be disagreed with more than items with positive wording. Therefore, a reversed negative item will have a higher mean than the corresponding positive item, and a reversed positive item will have a higher mean than the corresponding negative item.

H3a: Reversed items have higher means.

People have a natural tendency to prefer to remain in the status quo because the disadvantages of moving away may be larger than the advantages. This is called the status quo bias (Samuelson and Zeckhauser 1988). Similarly, when customers make a choice, they prefer a product with moderate attributes than with extreme attributes (Simonson and Tversky 1992). This implies that respondents would be more uncomfortable with extreme intensity items than with moderate intensity items because extreme statements are further away from the status quo. As a result, there will be a tendency to agree/disagree less with extreme items. Partial support for this contention comes from the negativity bias literature, where the negativity effect is pronounced more when intensity of the negative stimulus is higher (Czapinski 1986; Peeters and Czapinski 1990). Combined with Hypothesis 3a, this means that differences between the means of reversed items increase incrementally as intensity increases.

H3b: The difference between the means of reversed and non-reversed items with the same intensity increases as intensity increases.

The variability produced by a Likert scale can be decomposed into variability due to the main concept and a method factor, which I call a positive-negative method factor (PNMF). PNMF is the result of the cognitive biases due to the positive-negative processing asymmetry. Each Likert item will contain variance due to the measured concept and variance due to PNMF. For example, the differences in satisfaction scores obtained by positively or negatively worded items will be due to the actual differences of satisfaction among participants and the positive-negative biases elicited by the scale based on its wording. The presence of PNMF will attenuate the correlation of any two items if their intensities are different, but will increase the correlation if their intensities are similar. Therefore, PNMF can affect the predictive ability of scales.

H4: All else being equal, a dependent variable will be predicted best by independent variables with similar wording and intensity.

People tend to agree more on the negative (Bosson et al. 2006). "If positive evaluations reflect subjective preferences, which may vary according to the subjects' tastes while negative evaluations are more controlled by objective cues, then subjects may be expected to agree more on negative than on positive evaluations" (Peeters and Czapinski 1990, p.49). That is, more objective processing of items with negatively worded items can lead to increased agreement; therefore, the effect of PNMF will be expressed more uniformly on them.

H5: The effect of the positive-negative method factor is stronger on negatively-worded items than on positively-worded items.

4. Methodology

Data was collected from 153 undergraduate students at a mid-western university. The number of males and females was 76 and 77, respectively. The theoretical framework used to test the hypotheses was the theory of reasoned action (Ajzen and Fishbein 1980). It is a well established theory, which states that attitudes affect purchase intentions, which in turn affect purchase behavior. The collected data includes attitudes, purchase intentions, and simulated behavioral choice for three popular computer brands: Dell, HP, and Gateway. The reason for selecting three brands instead of one brand was to assure that the obtained results are not artifacts of a single brand.

According to C-OAR-SE, when a concept is concrete, it can be measured with a single-item scale. The concreteness criterion means that a concept should not be measured as being manifested or formed by other indirect concepts because all raters understand it unequivocally. Therefore, to be measured, a concrete concept should be included directly in the scale. For example, measuring attitude by a Likert single-item scale can take the form of "My attitude with BrandX is positive." If a concept is not included in the wording of the scale, it would mean that there is a description that conveys a better meaning than the concept itself, which automatically raises the question if there are other suitable or even better descriptions, countering the concreteness argument.

Because the focus of the study was on the use of single-item measures, the participants were asked straight questions about their attitudes and purchase intentions. Attitudes and purchase intentions were measured using Likert scales by asking the same question with five different levels of intensity from positive to negative. One semantic-differential question was included as a control variable for one of the tests. Purchase intention was related to the confidence in the brand of the rater's next computer. The simulated behavioral choice was measured by asking respondents to pick a brand. Four choices were given: the three aforementioned brands and 'Other.' The three brand choices contained the brand logos and a typical desktop image from the corresponding brand so that more brand related cues were evoked. The simulated behavior was coded as a binary variable: one if the brand was selected and zero if it was not selected. All measures are listed in the appendix. The descriptive statistics of the measured variables are presented in Table 1.

5. Results

Hypothesis 1 was tested by calculating the linear correlations among all attitudes and purchase intentions variables for the three brands (Table 1). The 95% confidence intervals of the correlations of all opposite pairs of items, based on the Fisher's z' score transformation, were considerably above -1.00. For example, the correlation of the most positive and negative attitude items for HP is -.51, which at a sample size of 153, leads to a 95% confidence interval ranging from -.61 to -.38. The average correlation of all pairs with most opposite intensities was -.54, and the average correlation of all opposite pairs with medium intensity was -.40. Correlations of such magnitude, although negative, are not evidence that positively and negatively worded items are true opposites. The averaged correlation of -.54 corresponds to a shared variance (squared correlation) of .29, which is not sufficient to suggest equivalence. These results are interpreted as support for Hypothesis 1.

To identify the unique nature of items with neutral intensity, Hypothesis 2 was tested using exploratory factor analysis with maximum likelihood extraction and direct oblimin rotation. The use of factor analysis on items measuring one concept but with different intensity is appropriate. If such items do not load on a single factor, it could be interpreted as either (1) they do not have much in common and are essentially different, or (2) the effect of other factors is so predominant that it overtakes the main common variance of the measured concept.

Table 1: Descriptive statistics of all variables

Dell	M	SD	A ₅	A ₄	A ₃	A ₂	A ₁	PI ₅	PI ₄	PI ₃	PI ₂	A ₁
A ₅	3.31	1.17	-									
A ₄	3.34	1.03	0.50	-								
A ₃	3.13	1.21	-0.33	-0.04 _{ns}	-							
A ₂	2.26	1.08	-0.59	-0.35	0.21	-						
A ₁	1.77	1.10	-0.52	-0.41	0.14 ^{ns}	0.82	-					
PI ₅	2.54	1.32	0.65	0.26	-0.30	-0.45	-0.37	-				
PI ₄	2.57	1.16	0.54	0.43	-0.17	-0.43	-0.38	0.82	-			
PI ₃	2.99	1.27	0.06 _{ns}	0.19	0.23	-0.22	-0.21	0.14 _{ns}	0.35	-		
PI ₂	2.93	1.31	-0.46	-0.26	0.31	0.59	0.50	-0.67	-0.63	-0.27	-	
PI ₁	2.74	1.53	-0.52	-0.27	0.29	0.62	0.60	-0.74	-0.74	-0.37	0.87	-
A _{SD}	3.54	0.96	0.71	0.35	-0.28	-0.53	-0.45	0.65	0.58	0.16	-0.46	-0.53
HP	M	SD	A ₅	A ₄	A ₃	A ₂	A ₁	PI ₅	PI ₄	PI ₃	PI ₂	A ₁
A ₅	3.34	0.97	-									
A ₄	3.30	0.87	0.59	-								
A ₃	2.89	0.98	-0.25	0.06 _{ns}	-							
A ₂	2.19	0.99	-0.47	-0.30	0.19	-						
A ₁	1.81	1.06	-0.50	-0.42	0.07 _{ns}	0.69	-					
PI ₅	2.65	1.13	0.56	0.39	-0.13 _{ns}	-0.35	-0.36	-				
PI ₄	2.75	1.05	0.52	0.50	-0.07 _{ns}	-0.29	-0.33	0.88	-			
PI ₃	3.15	1.18	0.10	0.26	0.31	-0.06	-0.20	0.26	0.39	-		
PI ₂	2.67	1.16	-0.39	-0.28	0.29 _{ns}	0.51	0.41	-0.49	-0.49	-0.14 _{ns}	-	
PI ₁	2.48	1.38	-0.42	-0.37	0.16 _{ns}	0.54	0.58	-0.58	-0.59	-0.30	0.83	-
A _{SD}	3.46	0.75	0.47	0.43	-0.16 _{ns}	-0.28	-0.31	0.58	0.54	0.18	-0.31	-0.40
Gateway	M	SD	A ₅	A ₄	A ₃	A ₂	A ₁	PI ₅	PI ₄	PI ₃	PI ₂	A ₁
A ₅	2.67	1.00	-									
A ₄	2.79	0.93	0.79	-								
A ₃	3.13	1.20	0.16	0.30	-							
A ₂	2.58	1.11	-0.41	-0.30	-0.11 _{ns}	-						
A ₁	2.40	1.25	-0.43	-0.42	-0.21	0.79						
PI ₅	2.07	1.00	0.67	0.52	0.13 _{ns}	-0.21	-0.19	-				
PI ₄	2.21	0.95	0.56	0.57	0.25	-0.13 _{ns}	-0.14 _{ns}	0.89	-			
PI ₃	2.99	1.29	0.22	0.33	0.51	-0.03 _{ns}	-0.11 _{ns}	0.41	0.56	-		
PI ₂	3.27	1.23	-0.31	-0.20	-0.07 _{ns}	0.58	0.48	-0.43	-0.38	-0.18	-	
PI ₁	3.17	1.40	-0.42	-0.35	-0.18	0.57	0.60	-0.49	-0.47	-0.31	0.85	-
A _{SD}	2.88	0.80	0.52	0.47	0.13	-0.45	-0.45	0.37	0.34	0.23	-0.37	-0.39

^{ns} Not Significant at *p-value* < 0.05
M – mean, SD – standard deviation
A – attitude, PI – purchase intention
Index 5 refers to the highest positive intensity, index 1 refers to the highest negative intensity, and index 3 refers to a neutral intensity. Index_{SD} indicates overall attitude measured by a semantic-differential scale.

Table 2: Exploratory factor analysis (structure matrix)

	Factors						
Dell	1	2	3	4	5	6	7
A ₅	.60	-.66	-.01	-.03	-.23	.03	-.13
A ₄	.28	-.52	-.15	-.06	.10	.16	-.15
A ₃	-.31	.16	-.03	.12	.41	.30	-.05
A ₂	-.46	.86	-.03	.26	.04	.22	-.04
A ₁	-.39	.87	-.07	.23	-.02	.15	-.14
PI ₅	.92	-.41	.00	-.10	-.11	-.09	-.20
PI ₄	.86	-.44	-.10	-.10	.20	.01	-.29
PI ₃	.25	-.21	-.20	-.13	.69	-.10	-.13
PI ₂	-.78	.51	-.03	.24	-.09	.49	.06
PI ₁	-.85	.57	-.01	.25	-.16	.38	.08
HP							
A ₅	.02	-.11	-.72	-.15	-.05	-.06	-.07
A ₄	-.10	-.06	-.62	-.11	.19	.05	-.05
A ₃	.00	.18	.17	.12	.31	.21	-.12
A ₂	-.05	.16	.49	.44	.12	.41	-.13
A ₁	-.07	.16	.53	.48	-.07	.28	-.13
PI ₅	.07	.08	-.84	-.19	.12	-.22	-.25
PI ₄	.05	.13	-.84	-.16	.27	-.22	-.28
PI ₃	.14	.07	-.27	-.04	.68	-.13	-.13
PI ₂	-.11	.16	.59	.39	.04	.72	.05
PI ₁	-.10	.12	.69	.49	-.16	.62	.05
Gateway							
A ₅	.12	-.11	-.18	-.46	.06	.15	-.76
A ₄	.03	-.09	-.11	-.41	.25	.25	-.69
A ₃	-.14	-.02	.02	-.18	.62	.12	-.21
A ₂	-.13	.22	.23	.85	.07	.29	.20
A ₁	-.11	.23	.17	.89	-.12	.16	.21
PI ₅	.28	.02	-.20	-.18	.19	-.15	-.92
PI ₄	.24	.08	-.15	-.11	.39	-.14	-.90
PI ₃	.08	-.01	-.11	-.06	.70	-.09	-.44
PI ₂	-.34	.17	.09	.61	-.06	.68	.34
PI ₁	-.35	.11	.16	.69	-.24	.55	.43

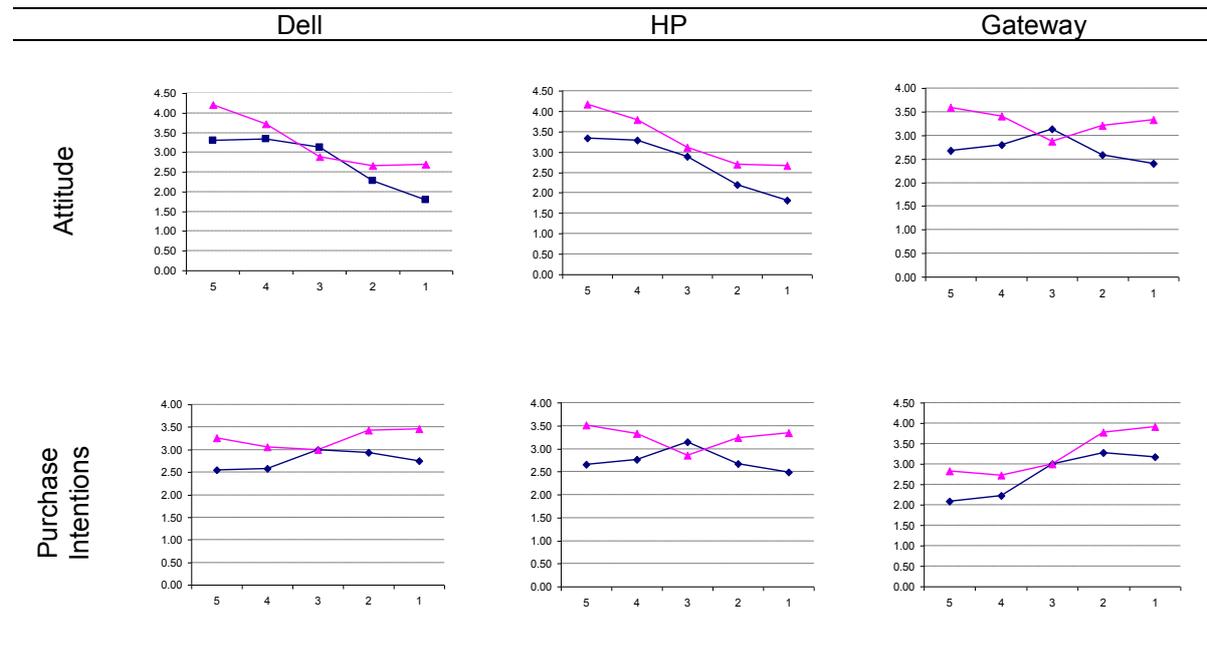
A – attitude, PI – purchase intention

The explained variance is 68%

All attitudes and purchase intentions variables for the three brands were included in the analysis (Table 2). Ideally, all attitudes and purchase intentions items for the three brands should load on distinct factors, and according to Hypothesis 2, the neutral items should not be associated with either of them. The results from the factor analysis revealed that all neutral items loaded on a single distinct factor. The interpretation of the other six is not straightforward, and more attention is devoted to this in the non-hypothesized results section. However, the solid neutral factor that emerged across the three brands is interpreted as support for Hypothesis 2. Hypothesis 3a states that all reverse means are higher than the means of the opposite items. Hypothesis 3b states that the difference between reversed and non-reversed means increases incrementally from the neutral point. The visual inspection of the plotted means of all measures (Figure 1) suggests that the two hypotheses have merit. The results of multiple paired-samples t-tests provided full support (not presented to save page space). First, I tested the significance of the difference between reversed and non-reversed items for each of the five levels of intensity. All differences were significant with the exception of the neutral point. Next, using paired-sample t tests, I tested if the differences of reversed and non-reversed means differed significantly across adjacent intensities. All of them were significant, meaning that the

mean differences between reversed and non-reversed items increase incrementally from the neutral point. Therefore, Hypotheses 3a and 3b are supported.

Figure 1: Comparison of means and reversed-means



■ - Means; ▲ - Reversed means;

Index 5 refers to the highest positive intensity, index 1 refers to the highest negative intensity, and index 3 refers to a neutral intensity.

Preliminary analysis of the correlations between attitudes and purchase intentions for each brand suggested the validity of Hypothesis 4. The highest correlations were at the diagonal, suggesting that the correlations between items with similar intensity were highest (Table 1). The analysis was continued using multiple linear regressions. Consistent with Ajzen and Fishbein (1980), I used attitudes as predictors of purchase intentions. Five regressions were estimated for each brand, corresponding to the five levels of intensity of purchase intentions. Each level of purchase intentions was regressed on all five attitude items with different intensities (i.e., $PI_{ji} = f(A_{j5}, A_{j4}, A_{j3}, A_{j2}, A_{j1})$, where i is intensity index and j denotes brands). As expected, the significant independent variables for each regression tended to be those with intensities similar to the intensity of the dependent variable. This pattern is visible in Table 3.

Table 3: Regression of purchase intentions on attitude

Dell	A ₅	A ₄	A ₃	A ₂	A ₁	R ²
PI ₅	0.68*	-0.10	-0.09	-0.13	0.03	0.43
PI ₄	0.34*	0.24*	-0.03	-0.18	0.03	0.33
PI ₃	-0.11	0.18	0.28*	-0.30	-0.02	0.14
PI ₂	-0.12	-0.03	0.19*	0.52*	0.07	0.39
PI ₁	-0.28	0.07	0.16	0.37*	0.38*	0.46
HP	A ₅	A ₄	A ₃	A ₂	A ₁	R ²
PI ₅	0.53*	0.10	0.00	-0.09	-0.04	0.32
PI ₄	0.35*	0.35*	0.00	-0.03	-0.02	0.32
PI ₃	0.02	0.24	0.37*	0.09	-0.21	0.18
PI ₂	-0.07	-0.18	0.25	0.43*	0.06	0.33
PI ₁	-0.04	-0.23	0.13	0.33*	0.43*	0.40
Gateway	A ₅	A ₄	A ₃	A ₂	A ₁	R ²
PI ₅	0.72*	-0.01	0.03	-0.02	0.11	0.47
PI ₄	0.35*	0.32*	0.11	-0.02	0.15	0.40
PI ₃	0.04	0.28	0.49*	0.08	0.03	0.30
PI ₂	-0.19	0.12	-0.01	0.54*	0.06	0.34
PI ₁	-0.29	0.05	-0.07	0.30*	0.36*	0.41

* Significant at p -value < 0.05

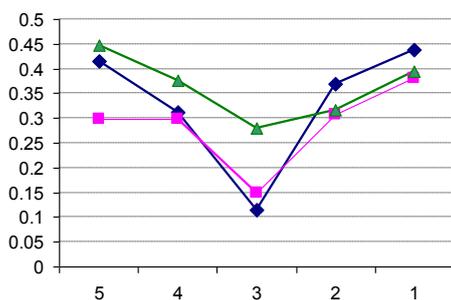
A – attitude, PI – purchase intention

The fact that only a few independent variables were significant per regression was due to multicollinearity, which in this case was desirable. In regression with multicollinearity, the item that shares the highest level of variance with the dependent variable will be significant and will ‘kick-out’ other independent variables that share similar but less variance with the predicted variable. This happens because the variance of non-significant predictors already is accounted for by the items with highest covariance with the independent variable. The presence of the common component among items measuring the same concept can lead to multicollinearity, and any difference in their variances should be due to PNMF. Therefore, one can expect that it is this difference that will affect the inclusion or exclusion of items in the regression. The diagonal pattern observed in Table 3 demonstrates that PNMF affects the predictive ability of measures with similar intensity. Therefore, Hypothesis 4 is supported. One unexpected finding is the U shaped pattern of R^2 in the positive-negative continuum, which suggests not only that items with similar intensities are predicted better, but also that the explained variance increases as a function of intensity.

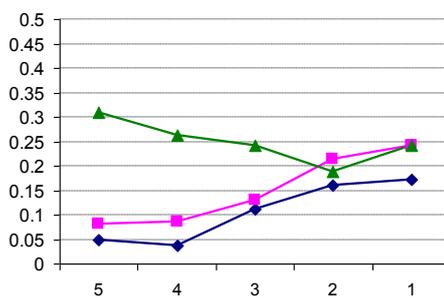
Hypothesis 5 states that the effect of the positive-negative method factor is more pronounced in negatively-worded items. To test this claim, it was necessary to separate the two sources of variability as captured by Likert items. An alternative measure not affected by the positive-negative method factor present in Likert scales in the same way was required. For this purpose, I measured the attitude toward each brand by a single-item semantic-differential scale in addition to the Likert scale. Semantic-differential measures also may be affected by a method factor specific to them (not discussed in this study), but a semantic-differential item measuring attitude also would capture variability due to the attitude it measures. Consequently, if the Likert item is regressed on the semantic-differential item, then the covariance due to the common concept will be accounted for by the semantic-differential scale and the residuals produced by the regression will contain mostly variability due to PNMF. If it is true that PNMF is expressed more in negatively worded items, then the explained variance in purchase intentions as a function of attitude residuals will be higher for negatively worded than for positively worded purchase intentions. The shared attitude component from all Likert attitude measures was removed by regressing them on the semantic-differential attitude measure, and the resulting residuals containing the variability of PNMF were saved. Then all fifteen regressions, as in Table 3, were repeated and purchase intentions of all intensities were regressed on the saved residuals (i.e., $PI_{ji} = f(ResA_{j5}, ResA_{j4}, ResA_{j3}, ResA_{j2}, ResA_{j1})$, where i is intensity index, j denotes brands, and $ResA$ is attitude residuals). In this case, any explained variance of the purchase intention items would be due to the remaining variance of PNMF in the residuals. The resulting R^2_{res} (variance explained by residuals) were compared to R^2_A (variance explained by the attitude Likert items) of the original measures. Attenuation coefficients were calculated as the ratio of R^2_A and R^2_{res} and their graphs are presented in Figure 2.

Figure 2: Explained variances in purchase intentions

a) Explained Variance by Attitudes (R^2_A)



b) Explained Variance by Attitude Residuals (R^2_{res})



Attenuation coefficient (R^2_A / R^2_{res})

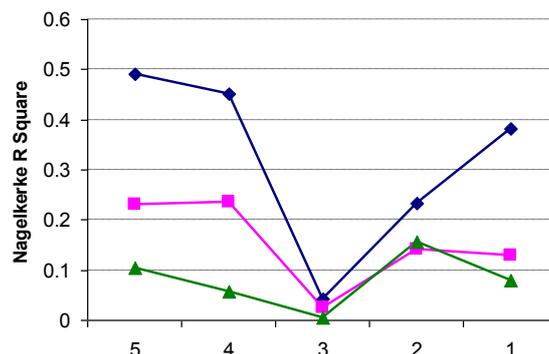
	5	4	3	2	1
Dell	8.49	8.43	1.02	2.30	2.54
HP	3.68	3.48	1.14	1.44	1.57
Gateway	1.45	1.44	1.15	1.69	1.63

◆ Del, ■ HP; ▲ Gateway;

Index 5 refers to the highest positive intensity, index 1 refers to the highest negative intensity, and index 3 refers to a neutral intensity.

The results demonstrated that the explained variance of the positive purchase intention items is reduced more than the explained variance of the negative purchase intention items. This result is consistent for Dell and HP. For example, the attenuation coefficient of Dell for the item with highest positive intensity tells that R^2_{res} is 8.48 times attenuated compared to its original value R^2_A . The effect for HP is less pronounced, with a coefficient of 3.68. In comparison, the attenuation coefficient for the item with highest negative intensity is only 2.54 for Dell and 1.57 for HP. The attitude residual explained 18% and 25% in negative purchase intention items and 5% and 7% in positive purchase intention items for Dell and HP, which makes a strong case that PNMF is contained more in negatively worded items than in positively worded items. The exception is Gateway, where the removal of the attitudinal component doesn't seem to affect much R^2_{res} . Therefore, Hypothesis 5 is partially supported. It should be noted that the only significant attitude residuals exhibited a diagonal pattern identical to the pattern in Table 3. This result provides additional support that PNMF plays a critical role in the relationships of Likert scale items.

Two interesting results obtained in a post-hoc analysis are worth mentioning. First, the predictive ability of purchase intentions items with different intensity on purchase behavior was examined. Using binary logistic regression, the purchase behavior (PB) for each brand was regressed on all purchase intentions with different intensities, one independent variable at a time (i.e., $PB_j = f(PI_{ij})$, where i is intensity index and j denotes brands). Fig. 3 shows the Nagelkerke R^2 of fifteen binary logistic regressions for the three brands. It should be noted that binary logistic regression does not have a real R^2 reflecting goodness-of-fit. The Nagelkerke R^2 is a pseudo-measure of R^2 representing strength of association. However, as it ranges from 0 to 1, it is a good indication about the overall quality of the regression. The items with higher intensity on Fig. 3 explained more variance than those with moderate intensity, and the effect is slightly more pronounced for positive items. Similar results were obtained during the test of Hypothesis 4, where explained variance was highest for regressions including items with higher intensity, no matter whether positively or negatively worded.



◆ Del, ■ HP; ▲ Gateway;

Index 5 refers to the highest positive intensity, index 1 refers to the highest negative intensity, and index 3 refers to a neutral intensity.

Figure 3: Explained variance in purchase behavior as a function of the intensity of purchase intention items

Second, when measuring the simulated purchase behavior, of the 153 respondents, 89 selected Dell, 39 selected HP, 9 selected Gateway, and 36 selected 'Other.' In addition, half of the respondents indicated that they were slightly to not at all familiar with Gateway. Considering these results, a logical question is: To what was the variability in the Gateway scales due, if respondents were not very familiar with this brand? It seems that when a person does not have an opinion, he/she will respond to a positive item in a way he/she usually responds to all positive items, and to a negative item in a way he/she usually responds to all negative items. As a result, the variance captured by measures will be dominated by PNMF, which can significantly affect dimensionality of constructs. Indeed, Table 1 reveals that the variables for Dell loaded as expected: attitudes and purchase intentions loaded on separate factors. For HP, the results were inconclusive; but for Gateway, both attitude and purchase intention items split and loaded on positive and negative factors. The results have a pattern corresponding to the level of brand familiarity of the respondents. For the familiar brand, the

dimensionality was as expected, but for the unfamiliar brand, the dimensionality seems to have been affected heavily by PNMF. In other words, when respondents do not have an opinion and construct it on the spot, a negative factor is likely to emerge.

6. Discussion

Several important results were found. First, it was replicated that opposite items are not true opposites. Second, the means of reversed items are higher, and the differences between them increase as a function of item intensity. This difference achieved almost 20% on the most positive side for Dell. Third, independent variables predict better dependent variables with similar intensity, and the stronger the intensity, the more the explained variance seems to be. Finally, PNMF can account for up to 30% of the variance in a dependant variable, even after the removal of the main component as an actual predictor. Obviously, the implications of such results are significant, and the question begging an answer is if Likert scales are usable. My stance is that despite the results, Likert scales have a place in single-item measures. Considering that (1) the natural tendency of humans toward the positive and their positivity bias as an *a priori* hypothesis about reality; (2) the subjective nature of the positivity bias compared to the objective nature of the negativity bias, leading to a higher level of the measured concept captured by positive items; and (3) the better predictive ability of positive items and their normal sound, then the logical conclusion is that a *Likert scale should be positively-worded with a fairly high level of intensity*. Finally, the reviewed literature and the presented empirical evidence demonstrate that the bipolar assumption of the semantic-differential scale is not necessarily true. The presentation of positivity and negativity as opposites may be restraining. Also, the unique nature of the neutral factor is a warning sign against focusing on neutral points as basis for justification. Therefore, semantic-differential and other scales, which use positive and negative wording, should undergo similar scrutiny. Different biases and method effects specific to them may be discovered.

7. Appendix 1: Survey instruments

Question	Abbreviations used in the data analysis ^c
Attitude (Likert)^a	
My attitude toward Dell is very positive	A ₅
My attitude toward Dell is somewhat positive	A ₄
My attitude toward Dell is neutral	A ₃
My attitude toward Dell is somewhat negative	A ₂
My attitude toward Dell is very negative	A ₁
Attitude (semantic-differential)^b	
What is your overall attitude toward DELL	A _{SD}
Purchase Intentions (Likert)^a	
I am very confident that my next purchase of a computer will be Dell	PI ₅
I am somewhat confident that my next purchase of a computer will be Dell	PI ₄
I am not sure if my next purchase of a computer will be Dell	PI ₃
I am somewhat confident that my next purchase of a computer will NOT be Dell	PI ₂
I am very confident that my next purchase of a computer will NOT be Dell	PI ₁
Purchase Behavior	
If you needed a computer today which brand would you purchase? (click on a picture)	
	
^a The answer format was from 'Strongly Disagree' to 'Strongly Agree'; ^b The answer format was from 'Very Negative' to 'Very Positive'; ^c Index 5 refers to the highest positive intensity, index 1 to the highest negative intensity, and index 3 refers to a neutral intensity. SD - semantic differential A – attitude, PI – purchase intention	

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The Factors that Influence Adoption and Usage Decision in SMEs: Evaluating Interpretive Case Study Research in Information Systems

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Abstract: The conventions for evaluating information systems case studies conducted according to the natural science model of social science are now widely accepted, as a valid research strategy within the Information System research community. While these criteria are useful in evaluating case study research conducted according to the natural science model of social science, however, they are inappropriate for interpretive research. The nature and purpose of interpretive research differs from positivist research. Although, there are no agreed criteria for evaluating research of this kind, nonetheless, there must be some criteria by which the quality of interpretive research can be evaluated. This paper evaluates a case study research conducted under the interpretive philosophy. The paper discusses the criteria proposed by Myers (1997) for evaluating interpretive research in information systems.

Keywords: Interpretive research, case study, IS evaluation, internet, SME

1. Introduction

This paper presents an evaluation of an interpretive in-depth case study. It uses Myers (1997) for the evaluation. The conventions for evaluating information systems case studies conducted according to the natural science model of social science are now widely accepted. Benbasat et al (1987), Lee (1989) and Yin (1994) formulated a set of methodological principles for case studies that were consistent with the conventions of positivism. As a result, case study research is now accepted as a valid research strategy within the Information System research community. The principles proposed in their work have become the de-facto standard against which most case study research in information systems is evaluated. However, while their criteria are useful in evaluating case study research conducted according to the natural science model of social science, the positivist criteria they suggest are inappropriate for interpretive research.

The use of interpretive approach is relatively new to information systems field, the approach has emerged as a valid and important strand in information systems research and most mainstream IS journals now welcome interpretive research and significant groups of authors are working within the interpretive tradition (Walsham, 1995). One of the main aims of interpretive research is seeking meaning in context. The use of interpretive perspective can help researchers to understand human thought and action in social and organisational contexts. It has the potential to produce deep insights into information systems phenomena including the use and the management of information systems. The interpretive research does not subscribe to the idea that a pre-determined set of criteria can be applied in a mechanistic way, it does not follow that there are no standards at all by which interpretive research can be judged.

Striving and ensuring rigor in interpretive study requires different criteria through which one views and judges the quality and completeness of the research process. Many researchers (Orlikowski et al, 1991; Walsham, 1993, 1995; Klein and Myers, 1999) have addressed qualitative research and they have shown how the nature and purpose of interpretive research differs from positivist research. At present, there are no agreed criteria for evaluating research of this kind. Nonetheless, there must be some criteria by which the quality of interpretive research can be evaluated. Myers (1997) and Klein and Myers (1999) have proposed a set of criteria for the conduct and evaluation of interpretive research in information systems.

This study is not concerned with adhering to the scientific tenets of precision and replication, instead the study is concerned in seeking a theory that is compatible with evidence that is both rigorous and relevant and generally useful to other areas. The remainder of the paper is structured as follows. It begins with an overview of case study method and a discourse on the use of case study in

Information Systems. This will be followed by a description of the procedures involved in collecting and analyzing data in grounded theory method. Then the criteria proposed by Myers (1997) for evaluating interpretive research will be discussed in relation to this particular study. Myers suggests that interpretive research can be evaluated in terms of theory and in terms of data. Finally, the paper presents further research and some conclusions

2. Methodology

2.1 Case study

The purpose of using case study was to provide an understanding of the factors that influence Small to Medium-sized Enterprises (SMEs) decision to adopt and use Internet in business. The aims of using case study are: (1) to elicit qualitative information (2) to produce an in-depth and holistic study (Yin, 1994), that gives the reader sufficient contextual and environmental descriptions to allow them to transfer the case studies based on conceptual applicability. The case studies are reported with sufficient detail and precision to allow judgements about transferability. (3) And to generate theory which is fully grounded in the data (Dey, 1993). The case study involved extensive interviewing of key participants (e.g. company owner or manager in each of the SMEs), coupled with the use of documentary evidence such as company reports.

Case study has a long tradition in IS research as a method of providing rich and contextual data, and it is the most widely used qualitative research method in information systems research (Benbasat et al, 1987; Orlikowski and Baroudi, 1991; Galliers, 1992; Myers, 1997; Yin, 1994; Gable, 1994; Walsham, 1993, 1995; Cavaye, 1996). Orlikowski and Baroudi (1991), Benbasat et al (1987) and Myers (1997) argue that case study method is particularly appropriate for the study of information systems development, implementation and use within organizations. It is particularly appropriate when theoretical knowledge on the phenomenon under investigation is limited and an understanding is not well developed (Benbasat et al, 1987), these include areas where a phenomenon is dynamic and not yet mature or settled, such as Internet adoption and usage where there are few existing theories to explain the phenomenon.

The benefits of multi-case study have been discussed by other information systems researchers (Yin, 1994; Benbasat et al, 1987). According to Yin, case study can involve single or multiple cases and numerous levels of analysis. Yin suggests that multiple case designs are desirable when the intent of the research is descriptive, theory building or theory testing. Benbasat et al. (1987) argue that multiple case studies enable the researcher to relate differences in context to constants in process and outcome and also multiple cases allow for cross case analysis and the extension of theory. Miles and Huberman (1984) add that multiple cases enable the researcher to verify that findings are not merely the result of idiosyncrasies of the research setting.

Earlier studies (Baker et al, 1997; Poon and Swatman, 1999) on SMEs and the Internet have made use of multi-case studies to gather data. The multi-case study was designed as a series of interviews and site visits. Most authors are vague when it comes to suggesting how many actual cases to study, but Eisenhardt (1989) suggests that multiple case designs require the study of at least four, but not more than ten cases. For pragmatic reasons of time, the number of cases in this study was planned in advance; the study involved seven SME cases that were purposefully selected.

2.2 Case participants

The criteria for inclusion were based on a need for each participating SME to conform to the definition of SMEs and a willingness on the part of the SME owners/managers to disclose details of their business. Several potential SMEs were rejected on the grounds that they did not satisfy the criteria. A total of seven SMEs that satisfied the criteria were chosen to participate in this study. These SMEs were chosen across business sectors so that the study could investigate the existence of sector-independent issues. This was important to avoid observations specific to a particular sector. The first SME was selected at random from the seven SMEs to provide the first body of data. Then subsequent data collection was guided by the theoretical sampling principle of grounded theory as defined by Strauss and Corbin (1990); i.e. sampling on the basis of concepts that have proven theoretical relevance to the evolving theory. The primary details of the SMEs that participated in the case study are shown in table 1 in no significant order.

Table 1: Details of SMEs that participated in the case study

SMEs	Type of business	Size (employees)	Turnover (£m)	Established
BIL	Peugeot cars franchise holder	20	7.5	1932
BPC	Publishing	25	N/A	1973
SAH	Health care	200	6	1969
MGL	Manufacturer of contract carpets	9	1.7	1972
AL	Manufacturer and seller of educational engineering equipment	40	5-7	1960
FP	Specialist flooring manufacturer	110	N/A	1984
CLR	Cigarette paper manufacturer	180	N/A	N/A

Source: (case study data, 2006)

3. Data analysis

Grounded theory is chosen for analysing the case study data, with the aim of generating a descriptive and explanatory theory of the adoption of the Internet rooted in the experiences of the SMEs. It is a general style of doing analysis that does not depend on any particular disciplinary perspectives (Strauss 1987). A grounded theory is one that is discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to a particular phenomenon (Strauss and Corbin, 1990). Strauss (1987) emphasises the usefulness of the case study approach when used with grounded theory. It is an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical data (Martin and Turner, 1986; Glaser and Strauss, 1967). This generative approach seemed particularly useful here given that the objective of the case study was the discovery of theory that explains the factors that influence adoption of the Internet in SMEs.

Grounded theory is iterative, requiring a steady movement between concept and data, as well as comparative, requiring a constant comparison across types of evidence to control the conceptual level and scope of the emerging theory. It offers a way of attending in details to qualitative material in order to develop systematically theories about the phenomena being studied. Turner (1981) suggests that grounded theory is particularly well suited to dealing with qualitative data of the kind gathered from participant observation, from the observation of face-to-face interaction, from semi-structured or unstructured interviews, from case-study material or documentary sources. Typically, these particular kinds of inquiry generate large amounts of data, which accumulate in non-standard and unpredictable formats. The grounded theory approach offers the researcher a strategy for sifting and analysing material of this kind. A particular strength of utilising grounded theory is that a documented record of the progress of the analysis is generated. Hence, it is always possible to trace the derivation of any concept or model by checking back through the data and memos.

The focus here is on developing a context-based description and explanation of the phenomenon, rather than an objective, static description expressed strictly in terms of causality (Boland, 1979, 1985; Chua, 1986; Orlikowski and Baroudi, 1991). The research developed theory which described and explained the adoption and usage of the Internet in terms of an interaction of contextual conditions, actions, and consequences, rather than explaining variance using independent and dependent variables (Orlikowski, 1993).

3.1 Grounded theory analysis of case data

The data analysis process involved in identifying patterns in the case study data. These patterns included issues raised repeatedly across interviews, commonly found in Internet commerce activities or opinions, which kept re-appearing. The data were analysed within each case as well as across the cases to detect similarities and compare differences. The initial concepts that emerged in one case context were then contrasted, elaborated, and qualified in the other. Within the first case, the iterative approach of data collection, coding, and analysis was more open-ended, and generative, focusing on the development of concepts, properties, and relations, and following the descriptions of how to generate grounded theory set out by Glaser and Strauss (1967) and Eisenhardt (1989). The detailed

write-up of the cases and all the data generated by interviews, and documentation were examined and coded by focusing on the factors that influence adoption and use of the Internet in business.

The case data was read and categorised into concepts that were suggested by the data rather than imposed from outside. This is known as open coding (Strauss and Corbin, 1990, 1998) and it relies on an analytic technique of identifying possible categories and their properties and dimensions. Once all the data were examined, the concepts were organised by recurring theme. These themes became prime candidates for a set of stable and common categories, which linked a number of associated concepts. This is known as axial coding (Strauss and Corbin, 1990) and it relies on a synthetic technique of making connections between subcategories to construct a more comprehensive scheme.

The case data were then re-examined and re-coded using this proposed scheme, the goal being to determine sets of categories and concepts that covered as much of the data as possible. This iterative examination yielded a set of broad categories and associated concepts that described the salient conditions, events and experiences associated with adoption and use of the Internet in this first SME case. These initial concepts guided the remaining case study, allowing the process of data collection, coding, and analysis to be more targeted. Following the constant comparative analysis method (Glaser and Strauss, 1967), the initial SME case's experiences were systematically compared and contrasted with the second SME case. This analysis also used Miles and Huberman's (1984, 1994) technique for across-site pattern comparison and clustering that involves matrix displays to compare key events, triggers, and outcomes.

Data from the second SME case was first sorted into the initial concepts generated by the first SME data. It soon became clear however, that the initial concepts generated by the first SME case did not accommodate some of the findings emerging from the second SME case. Accommodating the second SME case's experiences, led to some important elaborations and clarifications in the emerging theoretical framework, and forced a reconsideration of some of the first SME case's experiences. For example, the category environmental factor did not include a concept of external pressure from trading partners, as this was not salient in the first SME case. The second SME case's experiences, however, indicated that they started using the Internet because they were pressurised into doing so by their trading partners, which was indeed very relevant in shaping the interpretations and use of the Internet, and substantially influenced their decision to adopt the Internet.

The process of comparing and contrasting the SME case data was repeated for the remaining SME cases. Redefining the initial concepts to incorporate considerations of the second SME case's experiences required returning to the first SME case data, and re-sorting and re-analysing them to take account of the richer concepts and more complex relations now constituting the framework. This ability to incorporate unique insights during the course of the study is one of the benefits of a grounded theory technique, an example of what Eisenhardt (1989) labels "controlled opportunism," where "researchers take advantage of the uniqueness of a specific case and the emergence of new themes to improve resultant theory".

The iteration between data and concepts ended when enough categories and associated concepts had been defined to explain what had been observed at all the SME cases, and no additional data was found, to develop or add to the set of concepts and categories, a situation Glaser and Strauss (1967) refer to as "theoretical saturation". The resultant framework is empirically valid as it can account for the unique data of each SME case, as well as generalise patterns across all the SME cases (Eisenhardt, 1989). The core categories and subcategories that emerged from the analysis are shown in table 2.

4. Evaluation of interpretive research in terms of theory

With regard to theory, Myers (1997) suggested that interpretive research could be evaluated in terms of its contribution to the field and whether the author has developed or applied new concepts or theories? The theoretical focus of this study was the factors influencing adoption and use of Internet in small to medium-sized enterprises (SMEs). The result of the case study analysis was used to develop a theoretical model that explains the factors that influence SMEs decision to adopt and use the Internet in business. The results of the case study were discussed in terms of the categories that emerged from the grounded theory analysis process (see Table 2 above for the categories that emerged from the case study analysis) and integrated insights from the existing body of literature. The theoretical model was then revisited and reconsidered in light of the literature review and the

empirical findings. Existing literature has also been integrated into the reporting and discussion of this research study.

Table 2: Core categories and subcategories that emerged from the data analysis

Core categories	Subcategories	
<i>Technological factors</i>	Compatibility	
	Complexity	
	Cost effectiveness	
	Benefits of using the Internet <i>The Internet generates new business opportunities</i> <i>Communication medium to improve organisational efficiency</i> <i>Better customer service</i> <i>Easy entry into new markets</i> <i>Promotional and adverting</i> <i>Global markets reach</i> <i>Easy access to global information</i>	
	Perceived usefulness of the Internet	
	Perceived richness of the Internet	
	Perceived Ease of use of the Internet	
	<i>Organisational factors</i>	Management Support
		Organisational resources
		Organisational size
<i>Environmental factors</i>	Competitive pressure	
	External pressure	
<i>Barriers to Internet adoption</i>	Security	
	Lack of knowledge	
	Cost of Investment	
	Limitation of infrastructure	
	Uncertainty about the Internet	
	Limitation of personal contact	
	Lack of universal electronic payment systems	

Source: fieldwork 2006

Another key issue considered by Myers (1997) is whether the author offers rich insights into the human, social and organisational aspects of information systems development and application. The analysis of the data from the field study provided rich insight into how SMEs currently use the Internet to carry out tasks, and it offers a far richer understanding of the factors that influence their decision to adopt the Internet. The rich varieties of SMEs' viewpoints were captured through the use of different data collection techniques, such as questionnaire and interview. Each of these techniques offered a different avenue for the SMEs to express their perception of Internet usage in business and the materials provided consistency in the same procedures being used for each case (Yin, 1994). The use of multiple techniques to elicit SMEs' viewpoints acted as a means of testing one source of information against other sources and this helped in improving the quality of data and provided a richer, contextual basis for interpreting and validating results (Kaplan and Duchon, 1988).

The final key issue Myers (1997) considered is whether or not the study contradicts conventional wisdom and thus provides richer understanding. The study developed a theoretical model that provided a far richer understanding of the factors that influence SMEs decision to adopt and use the Internet in business. The categories of technological, organisational and environmental factors were shown to be relevant in influencing adoption and use of the Internet while barriers to Internet adoption hinder adoption of the Internet. The theoretical model proposed in the study (see figure 1) is different from the existing frameworks of Rogers (1983) diffusion of innovation theory and the technology acceptance model of Davis (1989), because the proposed model added new constructs to these theories.

The technology acceptance model (Davis, 1989) with its two constructs of perceived usefulness and perceived ease of use and the diffusion theory (Rogers, 1983) with its innovation attributes are limited in explaining the adoption and use of the Internet in SMEs. These models considered only the technological aspect of adoption of innovation; they are based on the deterministic assumptions of

technological imperative, and hence discount the importance of human intentions and action in shaping the adoption and use of technology. They are variance models, and hence do not adequately capture the contextual issues that are fundamental in explaining adoption of Internet in SMEs.

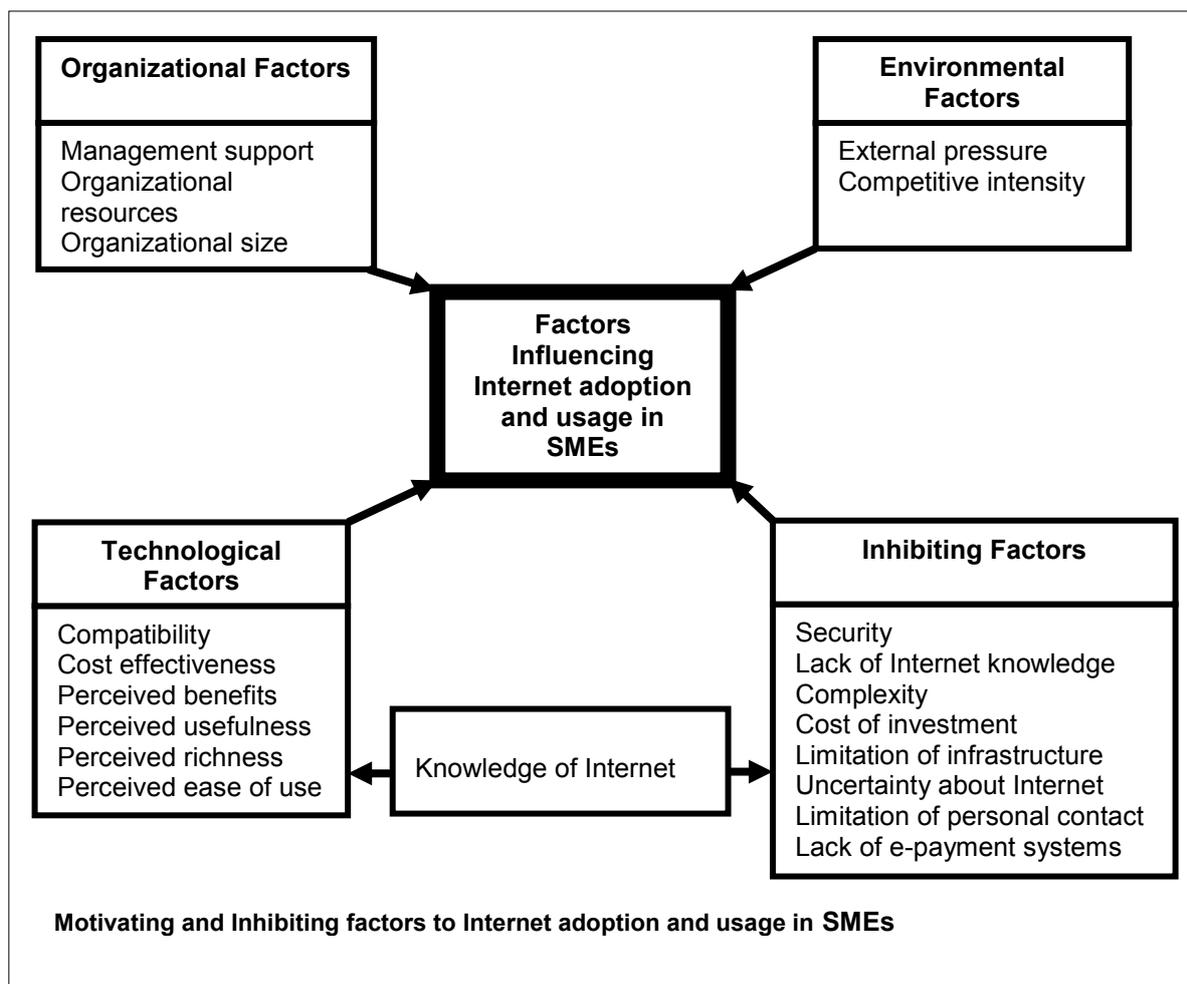


Figure 1: SME internet adoption and usage model (source: fieldwork 2006)

The theoretical model developed in this study redressed the limitations of these models by accounting for organisational and environmental factors relevant to adoption and usage of IS in organisation. The case result has shown that other factors such as organisational characteristics (e.g. resources) and environmental characteristics (external pressure) are necessary in explaining the adoption and use of the Internet in SMEs. The study extended the diffusion of innovation theory and the technology acceptance model by adding these new constructs of organisational and environmental factors to better explain the adoption and use of the Internet in SMEs.

5. Evaluation of interpretive research in terms of data

With regard to data, Myers (1997) suggests a significant mass of data must have been collected for significant insights to emerge. The combination of different data techniques provided a significant quantity of data that enabled significant insights to emerge. It provided a sufficient range of examples of how and why SMEs adopted and used the Internet in business. The study provided sufficient citations and quotes in each of the cases used and this provided an important way of ensuring internal validity in the study. The diversity of SMEs backgrounds in this study provided a considerably broader context and process of Internet usage in business. It also provided rich insights into the human, social and organisational aspects of information systems adoption and use.

Myers (1997) suggests that a good piece of interpretive research should represent multiple viewpoints and alternative perspectives. Multiple viewpoints and alternative perspectives occurred in this study through the inclusion of adopters of the Internet and non-adopters. When the participants were selected, it was decided that both SMEs that used the Internet and those that did not use the Internet in business be selected for this study. The inclusion of SMEs with different level of Internet use and

those that did not use the Internet in business enabled the researcher to gather different viewpoints from the participating SMEs and it provided different viewpoints on the factors that influence adoption. Therefore, given the diversity of backgrounds of the SMEs selected for this study, both the context and the process of Internet usage differs considerably, thus providing a broad social context.

Another issue Myers (1997) considered is whether sufficient information about the research method and the research process has been presented. The application of the specific research method chosen for this study, which was based on interpretive paradigm and used qualitative case study, was discussed in the methodology section above. The interpretive approach shows that the whole arena of social relations revolves around shared meanings, interpretations, and the production and reproduction of cultural and social reality by humans. It motivates investigations into how humans enact a shared social reality through understanding human behaviour from their point of view of the world. Considerable attention was devoted to the research process, in terms of both the philosophical underpinnings of the research method as well as the practicalities of conducting the study. Details of this have been provided in Lawrence (2002), which outlined how the data was gathered, when and where the research took place, how the research was developed over time, and how the data was analysed.

Myers (1997) concludes that the most important question relating to the quality of the contribution concerns the significance of the findings for both researchers and practitioners. This study has several important strengths in addition to having been designed explicitly to develop a theory of adoption and usage of Internet in SMEs. The study adopted a strategy of methodological triangulation that yielded both qualitative and quantitative evidence intended to facilitate the interpretation of results.

6. Contribution of interpretive research

The contribution of this study can be judged from a number of perspectives. The research has presented a broader picture of how SMEs currently use the Internet to carry out tasks, and the factors that influence their decision to adopt it in business.

A number of recent developments indicate that the factors influencing the decision to adopt IT is one of the most important issues facing many organisations, particularly SMEs. The UK Labour government published a white paper on the uptake of the Internet in SMEs in response to growing global competition of information technology, particularly the Internet. The importance of Internet in organisation continues to be important today than ever before. The white paper (entitled 'Information Highway') relates specifically to the role and importance of SMEs to the economy. It reinforces the importance of SMEs participation in global trade and for researchers in examining the role of the Internet in SMEs business. This present research is therefore both relevant and timely. The findings make a significant contribution to the understanding of the factors that influence SMEs decision to adopt and use the Internet in business.

The limited research conducted in the UK into adoption of the Internet in SMEs has tended to focus on Internet usage. The factors influencing the decision to adopt the Internet in SMEs have not attracted the attention of the research community. This trend is consistent with the research focus in other countries. Within the context of the UK this study breaks new ground because it focuses exclusively on SMEs decision to adopt and use the Internet.

The factors influencing large organisations decision to adopt and use the Internet are significantly different to the factors influencing SMEs. Findings from the relatively substantial amount of research conducted into adoption of IT in large organisations may not be relevant for an understanding of SMEs decision to adopt similar technologies which have a range of different functional characteristics. The findings from this study go some way towards addressing this imbalance in the research focus. The study is also useful for researchers interested in understanding factors that influence the adoption of information systems in organisations; or it may be used in studies within and across organisations by researchers who are interested in understanding the diffusion of information technology and the determinants of technology adoption.

The findings from this study can also act as a guide to help decision-makers take advantage of the Internet for business and it can help practitioners and researchers understand its growth in the marketplace. The study provides researchers and business planners with information on the growth

and development of the Internet in the UK, and allows them to compare and contrast developments in the UK with the growth of Internet in North America and other European countries.

Another significance aspect of this study is the development of an Internet adoption model based on theory-driven case study that explains the factors that influence or inhibit SMEs decision to adopt and use Internet in business. The model shows technological, organisational and environmental factors as important constructs that explains IT adoption and usage in organisation.

Drawing on the rich data of SMEs' experiences, the study generated a grounded understanding of the factors that influence adoption and use of the Internet in SMEs. This grounded theory is valid empirically because the theory-building process is so intimately tied with evidence that the resultant theory is consistent with empirical data. While many believe that building theory from a limited number of cases is susceptible to researchers' preconceptions, the author argues persuasively that the opposite is true. The iterative comparison across cases, methods, evidence, and literature that characterises such research leads to a constant comparison of conflicting realities that tends to "unfreeze" thinking. The process has the potential to generate theory with less researcher bias than theory built from incremental studies or armchair, axiomatic deduction (Orlikowski, 1993).

The grounded theory developed in this study added substantive content to the understanding of the factors that influence SMEs decision to adopt and use the Internet, such an understanding has been absent from the research and practice discourses on the use of the Internet in SMEs. The approach followed here focused specifically on developing such an understanding, thus bringing a fresh set of issues to the already-researched topic of the Internet. The study integrates grounded theory with the more formal insights available from the innovation literature, developing a more revised general theoretical model that allows researchers and practitioners to explain the adoption and use of the Internet in organisations.

7. Implications of research findings

The study has shown the areas SMEs used the Internet most and how they currently used it to carry out tasks in their business. It has presented the results of a grounded theory analysis into the adoption and use of the Internet and a deeper understanding of the main factors responsible for SME decision to adopt and use the Internet in business. It has developed an enriched theoretical model for conceptualising the adoption and use of the Internet in SMEs. The study results indicated that technological, organisational and environmental factors influenced adoption and use of the Internet, while barriers to Internet adoption hindered adoption. The findings and framework articulated here have important implications for both researchers and practitioners.

7.1 Implications for research

From an academic researcher's perspective, the findings suggest that innovation adoption theories should not only account for technological factors (innovation characteristics), but also organisational and environmental factors should be included in IT adoption and use in organisation. Although the adoption of the Internet in SMEs has been led by Internet attributes, however, the case result has shown the importance of organisational and environmental factors in SMEs decision to adopt and use the Internet in business.

The existing theories such as technology acceptance model (Davis, 1989) and diffusion of innovation theory (Rogers, 1983) were developed with the concept of static individual computing environment in mind. As such, in today's rapidly changing IT environment, they do not provide adequate explanations of an organisation's IT usage behaviour (Kang, 1998). Further, there has been little or no previous study done to examine the applicability of these models to the SME context.

The technology acceptance model (Davis, 1989) posits that both perceived ease of use and perceived usefulness correlate with system use. The model's two constructs are limited to technological attributes of usefulness of computer technology and the ease of use of the technology. The model, with its assumption of users being motivated primarily by job performance expectations from IS use, may be considered as a model of compliance. In this model, the users are motivated to use the IS to gain specific rewards. However, the model is influential in the contribution to the enduring line of IT adoption and diffusion research. It has proved useful for understanding the factors involved in organizational adoption decision making.

The same criticism goes to diffusion theory (Rogers, 1983) that considers innovation characteristics for adoption of innovation. However, diffusion theory provided a useful perspective on the adoption of innovations and diffusion in organisation. Fichman (1992) argues that conclusive results were most likely when the adoption context closely matched the contexts in which diffusion theory was developed for example, individual adoption of personal-use of technologies or when researchers extended diffusion theory to account for new factors specific to the IT adoption context under study. There are other factors to consider when organisations are adopting any technological innovation, such as the organisational characteristics (e.g. resources) and environmental factors (external pressure); these factors emerged as important in the adoption of the Internet in SMEs.

An alternative model that extended the technology acceptance model and diffusion of innovation has been proposed see Lawrence (2002) based on the findings from a theory-driven case study. The proposed theoretical model redressed the inadequacies of these models by developing a more enriched adoption model that considered not only the technological characteristics, but also the organisational as well as the environmental factors. The diffusion of innovation of Rogers (1983) and technology acceptance model of Davis (1989) have been expanded by incorporating, both technological organisational and environmental factors. Within the proposed model, each of these factors was shown as having an influence on the decision to adopt and use the Internet in SMEs. The models were extended to an SME context, whereas most previous research has used these models in large firms or on college students (Igbaria et al, 1997; Davis, 1989).

Empirical validation and elaboration of these concepts in other settings are clearly needed. The theoretical model was generated by only examining few cases, albeit in depth. More empirical grounding and comparisons will sharpen and enrich the concepts developed here and yield more complex understanding of the phenomenon. It is also necessary to investigate different contexts where the Internet has been introduced. While the SMEs studied here differed significantly on environment, strategy, size and structure, they still only represent few organisational types.

More organisations need to be examined to ascertain whether the proposed concepts and model are relevant in other situations. In this way, the analytic generalisation posited here, that other organisations' experiences with the Internet would resemble the patterns detailed above will be tested and elaborated. While more empirical work is necessary to elaborate and verify the theoretical model, it is believed that a useful starting point has been made. Understanding the factors that influence adoption of the Internet allows researchers to explain why SMEs introduce Internet technology in their business.

7.2 Implications for practice

There are many characteristics of the Internet that are useful to SMEs in particular and organizations in general. The Internet is non-proprietary and offers gains in both effectiveness and efficiency and it has the potential to change the nature and diversity of interpersonal interactions and how business is conducted (Fulk et al, 1986) as well as the organisation itself (Rogers, 1986).

A growing issue in organizations is the overuse of paper for hard copies. Paper copies must be stored physically, which incurs great cost, and environmental concerns are beginning to weigh heavily on organizations, leading to pressure to reduce paper consumption when possible. Although FAX transmissions are fast, they still consume paper, and costs rise quickly if the transmission is a long one over great distances. On the other hand, the Internet is fast and through its asynchrony, eliminates the need for communication to take place at the same time. The asynchrony of the Internet helps to reduce "telephone tag". It also lessens the impact of geographical distance between customers, suppliers and business partners and through its email function provides directness between sender and receiver. Due to automatic time and date stamping, email messages, if saved, can serve as useful audit trails and organizational histories.

The study has also identified key factors that influence adoption and use of the Internet in SMEs. The results point out that compatibility of the Internet and their relative advantages (in terms of operational and strategic benefits potential) are important facilitators of adopting the Internet in business. This suggests that SMEs contemplating using the Internet should explore and set up appropriate mechanisms to become more clearly aware of the technology. Industry-based associations and trade publications may be a few mechanisms to generate in-depth awareness of the Internet. Interaction with peer firms in the industry and their experiences may motivate SMEs to adopt and use the

Internet. Such efforts would also help them to engage in initial experimentation that can significantly aid their own learning process and better understand the degree to which the Internet would be compatible with existing environments and work practices. The results also point out that management support and commitment is a crucial element in adopting and using the Internet in SMEs.

The study findings indicated that efforts should focus initially on greater management support. Education and training programs should aim to increase awareness of the Internet and emphasise the benefits of using it in the organisation. The theoretical model developed and presented here suggests that before the implementation of a technology such as the Internet, managers in the organisation should articulate their intentions with respect to the technology and assess its usefulness and the resultant organisational consequences of the technology. A better understanding of these factors may enable practitioners to formulate strategies for improving the adoption and usage of the Internet in organisations.

The theoretical model developed here meets the criteria of practical applicability proposed by Glaser and Strauss (1967). It fits the substantive area of study. The concepts and relations posited as central are intimately related to the arena of the Internet adoption and usage. The theoretical model is sufficiently general to be applicable to a range of situations around the adoption and use of the Internet in particular and IT in general. It is readily understandable by practitioners, and should consequently provide some useful guidance in the organisations introducing the Internet. By providing practitioners with some insight into the context and the factors that influence the decision to adopt and use the Internet, the theoretical model serves as a basis from which the IS practitioner can assess and manage what is typically a poorly understood, complex, and dynamic situation (Orlikowski, 1993).

The theoretical model generated from the empirical findings has shown that the technological, organizational and environmental factors as well as the context, in which the Internet is used, played an important role in shaping the adoption of the Internet in SMEs. It has provided valuable insights for practitioners, detailing the factors that influence the decision to adopt and use the Internet in a business environment. The study has suggested that practitioners will be better able to adopt the Internet in business, if they understand how these factors influence its adoption and usage.

While all research methodologies have strengths and weaknesses, the use of the grounded theory approach for the case study analysis here was particularly appropriate, generating a set of insights, concepts, and interactions that address the main factors involved in adopting and using the Internet in business, elements to date largely overlooked in the adoption literature (Orlikowski, 1993). The study has made it clear that the success of adoption of an innovation in organization is dependent on a large number of factors. Managers should be aware of their potential impact on the adoption and diffusion of an innovation and of their interdependency. Applying the model of Internet adoption in organizations, as presented here, can enhance such an understanding.

8. Further research

This study is cross-sectional in nature, and the focus of the present study is on the adoption and usage of Internet in SMEs, which limits the ability to examine the processes involved in Internet adoption. The research has drawn conclusions about the adoption and use of the Internet in SMEs and has laid a foundation on which further longitudinal studies could be undertaken. It has identified technological, organisational and environmental factors and barriers that facilitate or hinder adoption of Internet technology. A longitudinal study tracing the factors during the various processes of adoption can address this limitation. Alternatively, instead of focusing on organisations, it may also be useful to examine the adoption of the Internet by individuals. Comparison can then be made between individuals and organisations in terms of factors influencing the adoption of the Internet, for example, characteristics such as purpose of use and usage behaviours or patterns. Additional research could be conducted to determine if other kinds of technological innovations are affected by these factors.

The study has developed a theoretical model of Internet adoption and use in SMEs. Two of the main strengths of this model are its parsimony and the derivation of its factors from the empirical case study. Although the case-based investigation of the theoretical model has provided insights into the factors influencing adoption and use of the Internet in SMEs, further empirical study is needed to assess the validity of the theoretical model proposed in this study in order to develop an appreciation of the relative contributions of the model's constructs.

Because this is one of the earliest attempts to build a theoretical approach to modelling SME adoption and use of the Internet, the researcher believes that the theoretical model and propositions can form the basis of larger scale studies to examine the validity and applicability of the model and improve and refine it. As with any other simple model, there is a danger that additional significant factors have not been included in the model. Researchers who believe that additional variables play a critical role in the adoption of the Internet could use the constructs developed in this study in their own studies to better estimate the influence of each factor.

A cross-sectional study such as this is useful in identifying the patterns of relationships among the relevant factors, but large-scale longitudinal research design is essential particularly, it would allow researchers to measure the explanatory factors that emerged from the case study before the adoption of the Internet and more objectively assess the impact of the Internet on the organisations. Finally, the researcher suggests that the model be applied in the context of larger organisations as well. Such empirical testing will allow the identification of the necessary modifications to the model to enlarge its generalisability and isolate the differences in the factors that influence the adoption decisions of both SMEs and large organisations.

9. Conclusions

The central concern of this study has been in gaining deep insight into current Internet usage in SMEs and the factors that influence their decision to adopt it in business. This study, which was based on empirical data, examined Internet usage as it is actually used in SMEs. The study has developed a model that considered the technological, organisational and environmental factors that explained the adoption and use of the Internet in SMEs. The author has argued both theoretically, and where possible, using empirical evidence, as to why these categories helped to better understand and explain Internet adoption and usage in SMEs. The study's results provided significant support to past findings in innovation and information systems literature.

The study was presented in a descriptive form and chronicles the perceptions and experiences of SMEs adoption and use of the Internet in business. Zeller (1991) suggests that studies with an interpretive perspective don't report out "data", they report "scenes" that is accounts of researchers' engagement over time with participants in their surroundings (Zeller, 1991 cited in Miles and Huberman, 1994). In addition, Hammersley (1992) argues that "an account is valid or true if it represents accurately those features of the phenomenon that it is intended to describe, explain or theorise". The study has presented the current picture of how SMEs used the Internet in practice and the factors that influenced their decision to adopt the Internet in business. It has told story of Internet adoption and use from the perspective of the SME cases examined.

The conclusions of the study were based on the analysis of the SMEs studied and not on a population. It is not the goal of an interpretive study to make generalisations from the examined SMEs, but rather to offer understanding or insights about the adoption and use of Internet in SMEs. A rich, thick description of the case allows readers to make decisions regarding transferability of the research (Merriam, 1988). This study has presented significant progress in Internet usage and toward explaining the factors influencing the adoption of the Internet in SMEs. The findings provided theoretical and practical insights into the adoption and use of the Internet in SMEs. The study has contributed to the existing body of research on IT usage in general and Internet usage in particular. Finally, the research reported here contributes to what is hoped will be a continually expanding body of empirical evidence that can increase knowledge of Internet technology usage in business.

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Strategies for Gaining Access in Doing Fieldwork: Reflection of two Researchers

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Abstract: One of greatest pitfalls in conducting research successfully is the inability to obtain access to the research field. Obtaining access to the research field can vary to a considerable extent, depending on the kind of cases being investigated. In fact, researchers often spend considerable amount of time on this task. However, many researchers do not even describe their access to the research field in their research reports. The main aim of this paper is to share the experiences of two researchers in gaining access to fieldwork practice. We believe that the issues we discuss based on our experiences in gaining access would benefit other qualitative researchers. We also hope that comparing the experiences of two different researchers in two very different research fields would help highlight issues which are often neglected in doing qualitative research. In this paper, we present our comparison of the different approaches we used in the various stages in gaining access. We discuss our strategies in gaining access using a four stage model: pre-entry, during fieldwork, after fieldwork and getting back. Finally, we present a basic framework for gaining access successfully which other researchers can use, and also critically analyze our experiences in using the two different approaches, formal and personal, in gaining access in our respective research projects.

Keywords: gaining access, ethnography, gatekeepers, fieldwork, mixed method

1. Introduction

One of greatest pitfalls in conducting research successfully is the inability to obtain access to the research field. Researchers often spend considerable amount of time on this task, especially when the research requires an in-depth study of their respective research field (Okumus et al., 2007; Patton, 2002; Shenton and Hayter, 2004). This task can be even more difficult if it involves a sensitive topic. Many researchers do not even describe their fieldwork practice in their research report. It is only in ethnography based research access to the research field is often described explicitly.

Obtaining access to the research field can vary to a considerable extent, depending on the kind of cases being investigated. For instance, obtaining access in large profit enterprises can be more difficult as their managers would value the cost of time. Thus, for such situations questionnaires are often considered to be more feasible rather than interviews and observations (Easterby-Smith, Thrope and Lowe, 2002). According to Van Maanen and Knolb (1985), gaining access to the research field is crucial and should not be taken lightly. As for ethnographic research work it requires negotiating environments that are foreign to the researcher. The need for social skills is greatly required (Wasserman & Clair, 2007). It is important for one to gain the trust and acceptance of the participants in order to conduct one's research (Wasserman & Clair, 2007). This would involve some combination of strategic planning, hard work and opportunities. Furthermore, researchers who are considered outsiders of an organization are often not welcomed, especially if they ask questions that are considered to be sensitive and awkward (Okumus et al, 2007).

Often many academics face numerous obstacles in trying to gain access to various organizations where they would like to carry out their research. The hurdles are often neglected or it is seen as merely tactical issue (Gummesson, 2000). Organizations are usually skeptical about the role of outsiders and may not value academic studies (Laurila, 1997). In addition, many organizations deny access due to academic's failure to provide answers about what, how and why they are carrying out the study, and whether the study would provide value to the organization itself (Coleman, 1996). It has been acknowledged the importance of gaining access but very minimal has been written on issues and problems of gaining access (Feldman et al, 2003). We address this oversight by sharing our experiences in gaining access to the research field, based on our respective doctoral studies (Johl, 2006; Renganathan, 2005).

Our main aim of this paper is to contribute our experiences to building of the literature on gaining access. This paper shares the experiences of two researchers on fieldwork practice. We believe that

the issues we discuss based on our experiences of gaining access into our respective research fields, would benefit other qualitative researchers. First, a brief background of the two research projects that this paper is based on will be discussed. Next, by combining Laurila's (1997) and Buchanan's (1988) classification, we present our comparison of the different approaches we used in gaining access to our respective research fields at different stages. We discuss our strategies in gaining access to our respective research fields using a four stage model: pre-entry, during fieldwork, after fieldwork and getting back. Finally, we critically examined our experiences in using the different approaches in gaining access into our respective research fields. We also hope that comparing the experiences of two different researchers in two very different research fields would help highlight issues which are often neglected in doing qualitative research.

2. Gaining access to fieldwork

In conducting research it is important for the researcher to think about how to go about gaining access. Gaining access involves convincing people that the researcher has decided upon on who should be the informants that would provide information in conducting research. (Feldman et al, 2003). This would require the researcher to talk to many people by developing rapport with them and to be in a position to learn from them (Feldman et al, 2003). Therefore, gaining access is not a simple task where it requires some combination of strategic planning, hard work and luck (Van Maanen and Kolb, 1985).

Some researchers have tried to categorize and organize their access to the research field. Buchanan et al (1988) developed a four-stage access model: getting in, getting on, getting out and getting back. At the getting in stage researchers are expected to be clear about their objectives, time and resources. Once access has been gained it becomes necessary to renegotiate entry into the actual lives of people in the organization, whereby having basic interpersonal skills and procedures such as good appearance, verbal and nonverbal communication plays an important role (Burgess, 1984). As for the getting out stage, the best strategy is agreeing on a deadline for the closure of data collection process. Finally, the option of returning back for further fieldwork should be maintained, thus, the researcher must be able to manage the process of withdrawal from the organisation favorably (Buchanan et al, 1998). On the other hand, Laurila (1997) suggested three types of access. The first type is considered to be formal access which refers to achieving an agreement between the organization and the researcher on specific condition in terms of what, when and how empirical data are collected and what might be the return. The second type is personal access where the researcher knows relevant executives, managers and individuals in the organization. Finally, in the third type of access, the researcher is able to foster individual rapport where a good understanding is developed and there is collaboration between the researcher and the organization.

Gummesson (2000) also identified three different types of access. The first, physical access is where the researcher is considered to have the ability to get close to the object of study. The second, continued access, refers to maintaining an ongoing physical access to the research setting. The third, mental access, refers to the researcher being able to understand what is happening and why it is happening in the investigated settings (Okumus et al., 2006).

Gaining access to individuals may require years of preparation depending on the level of access required by the researcher (Feldman et al., 2003). Researchers need to develop reputation for consistency and integrity. This is very much required when one is conducting an ethnographic based research that requires the researcher to live and show commitment to the community before being trusted with the information that he/she is seeking for. Also, finding the right individuals to interview or observe can be challenging especially if the study is on individuals that are not connected to an organization (Feldman et al., 2003). Often in the early access process it is important for the researcher to have someone of the community to vouch for his or her presence. In addition, this will help the researcher to build webs of relationships which will aid and provide the researcher lateral and vertical connections to people. Also, Feldman et al., (2003) finds that it is important for researchers to establish relationship with gatekeepers to gain access to multiple informants. These gatekeepers' maybe individuals but often are organizations. It is important to bear in mind in order to be granted access the study has to be in line with the gatekeepers' hidden agendas, ideologies and cultures which may require the researcher to change how the research is talked about to conform to the gatekeepers attitude about what is being researched on (Lee, 1993). Gatekeepers can stop the access process into some parts of the sample and prevent introductions to certain key informants who can provide valuable information due to political and personal reasons (Gummesson, 2000). This is

very much described by Cole (2004) in her longitudinal study in eastern Indonesia on how power relation relations between her and the gatekeeper seesawed as he introduced her to some people before others and made some meetings much easier than others (Okumus et al., 2007). Often researchers are in the weak position due to their few bargaining resources beyond their academic respectability (Lee, 1993).

In terms of informants who can provide information about the investigated area are categorized into four groupings by Laurila (1997): survivors, disbelievers, cautious and candid analyzers. The analyzers that are categorized as survivors will only provide basic information reluctantly and the disbelievers would talk about general issues which will not provide any useful information. As for the cautious analyzers simple issues will be discussed openly but will not provide sufficient information on the investigated area. On the hand, the candid analyzers talks about the investigated area in a very open manner and provides very detailed information (Okumus et al., 2007).

Categorizing access to the research field, based on the literature above, would provide some form of structure for researchers to follow. However, issues related to access may vary according to the types of research being investigated. Thus, suggestions from existing literature are not always appropriate for every researcher at different stages of their research. In fact, the obstacles related to gaining access are often neglected or seen as merely a tactical issue (Gummesson, 2000).

3. Background of the two research studies

In this section we briefly discuss the context and methodology of the two research projects this paper is based on. Both research projects are in the field of Social Science. Research Project 1 (Table 1) is based on a doctoral study in Business and Management (Johl, 2006) and Research Project 2 is based on a doctoral study in Education (Renganathan, S., 2005).

Table 1: Comparing background information of research project 1 and 2

Research Project 1	Research Project 2
Mixed-method approach (qualitative – quantitative – qualitative); Questionnaires, interviews, secondary data (annual reports); Social science – Business and Management discipline.	Mixed-method approach (quantitative – qualitative); Questionnaires, interviews, observations; Social science – Language and Education discipline.

Research Project 1

The first researcher explored the relationship between corporate governance and corporate entrepreneurship activities among the FTSE 100 companies. This study used a mixed method approach for testing propositions, triangulating and elaborating the relationship between corporate governance and corporate entrepreneurship activities in firms. Two qualitative studies were undertaken to ascertain the nature of corporate entrepreneurship and corporate governance. This, along with other evidence, enabled the development of a corporate entrepreneurship index and a corporate governance index. A quantitative analysis was then undertaken, based on the FTSE 100 companies to ascertain the nature of any relationship between the two indices. Qualitative case studies were then used through an interview process to gain a deeper understanding of the issues involved.

This study collected data in three stages. In stage one an exploratory study was conducted to obtain the perception of corporate entrepreneurship and to determine the understanding and familiarity level of this concept. The second phase of this study used the quantitative approach to measure the entrepreneurial and governance levels of the companies. Two indexes were developed to measure the corporate entrepreneurship and corporate governance levels of the FTSE 100 companies. Finally, in Stage three the qualitative approach was used to ascertain consistent patterns in the results identified earlier as well as to elaborate the quantitative findings.

Research Project 2

In this research, the researcher explored the social practices of learning and using English among university students in a private university in Malaysia (Renganathan, S., 2005). The private university uses English language as its medium of instruction, and thus, the research explored the use of

English as a social practice among the university students. This research adopted an “ethnographic perspective” (Green and Bloome, 1997) and the relevant data were obtained from surveys, interviews and observations. These data were used to explore students’ perceptions of using English in their everyday lives both inside and outside the language classrooms in the university.

The second researcher also used a mixed method approach. However, the qualitative aspect of the research had more weighting as compared to the quantitative. Data for the research were collected in three stages. In Stage 1, through a pilot study, the researcher gathered information from the students in the university through survey questionnaires. The researcher intended to identify relevant issues that will require in depth investigation in the following stages. Thus, in Stage 2, the researcher carried out interviews with some of the students and two of their language lecturers, gathered information from a larger population of students through surveys in the form of questionnaires, and observed some of the language classes. Finally, in Stage 3, the researcher carried out follow-up interviews with some of the student participants in Stage 2 of the research and interviewed the rest of the language lecturers in the university.

4. Strategies in gaining access

Pre-entry to the field

In this section, we describe and compare (Table 2) how both researchers using different types of access employed relevant strategies in gaining access to their respective research sites.

Table 2: Comparing pre-entry access of research project 1 and 2

Research Project 1	Research Project 2
Formal access; Online-directory, telephone calls (to public relations manager), eMail (questionnaire attached), eMail (cover letter with official letter head attached); Fix appointments based on interviewees availability; Researcher felt obligated because of infringement on interviewees’ time; Need to emphasise benefits of research to the organization; Issues of anonymity and confidentiality assured.	Personal Access; Informal eMails, telephone calls to familiar people; No formal appointments were made; Colleagues felt obligated to help; Benefits of research is taken for granted by the organization; Issues of anonymity and confidentiality assured.

Research Project 1

The first researcher used a formal way of obtaining access in organizations. The Northcote Website: <http://www.northcote.co.uk>, an online directory of public listed companies in the U.K was used to identify the population of the FTSE 100 companies. Listing 100 top companies in the country, the latest version (2004) at the time of the research was used to obtain their addresses and contact numbers. A number of ways were used to gain respondents’ co-operation and motivate them to respond (Oppenheim, 1992) and in identifying the most appropriate person within the firm that would be able to participate in answering the questionnaire. Firstly, telephone calls were made as a preliminary notification to the companies in explaining about the research project and to identify the most appropriate person prior to eMailing the questionnaires. The telephone calls were made to the company’s Public Relations Manager to determine who would be the most appropriate person in the corporation that would be able to participate in answering the questionnaires according to his/her best knowledge. This strategy was utilised with the intention of maximising the response rate. Also, this approach helped to identify a contact person within the firm who could then be referred back to in order to obtain any further information about the organisation. After locating the most appropriate person within the firm, eMails were then sent that contained a cover letter stating the research objectives and requesting participation. This was designed and attached as a file with the eMail and questionnaires (Bell, 1993; Cohen and Manion, 1994; Oppenheim; 1992). A similar letter was also eMailed to each of the case study participants. Although the cover page of the questionnaire contained an introductory statement to indicate the purpose of the study (Sudman & Bradburn, 1982), it was considered important that respondents understood and accepted the aims of the study and hence, willingly imparted information (Foddy, 1993). Also, it was crucial to seek legitimate access to avoid the participants from being bias to non-response (Oppenheim, 1992).

Respondents were promised anonymity in terms of revealing information as their name and contact numbers would not be revealed publicly. This helped to gain their trust and confidence in terms of

revealing information. In addition, to obtain the requested information as legitimate and to garner respondent trust (Foddy, 1996), it was essential to promise confidentiality to the respondents. Oppenheim (1992) argued that it is crucial for all surveys to be treated as confidential in the sense that only researchers have access to them and steps were taken to ensure that no information about identifiable persons or organisations was published without permission. Both the survey and case study respondents were also promised a copy of the results in due course (Cohen & Manion, 1994). Also, the respondents were provided with a named contact in the event of a query and finally the letter ended with a note of thanks (Sudman and Bradburn, 1982).

There being no interviewer to provide additional information, the length of the cover letter in the eMail questionnaire might be longer than the introduction to a personal interview (Sudman & Bradburn, 1982). However, the length of the cover letter was limited to one page in order to prevent respondents from skimming and ignoring it completely. The letter used the official letterhead of the University of Nottingham Institute for Enterprise and Innovation as a channel in building contacts and network with the organisations. This was expected to be significant in securing widespread co-operation (Johl, 2006; Oppenheim, 1992). In addition, telephone calls and eMails were used to fix appointments with the interviewees based on their time availability.

Research Project 2

In the second research project, the researcher used “personal access” (Laurila, 1997) and established individual rapport to get the relevant information for the study. In this research project the researcher was a staff member who was on study leave from the organisation where the field work was carried out. Thus, the research site was familiar to the researcher and thus the researcher employed various familiar ways to gain access to the research site.

Entry to the field was established through informal emails, and phone calls to familiar people in the organisation (the university). The researcher was familiar with the university’s semester system, thus it was easy to determine suitable time to gain the relevant information from the research site. Furthermore, the researcher was a member of staff, thus, the researcher’s requests were often easily met. In addition, because of the researcher’s familiar identity within the research site, access to relevant information was mostly based on trust. Some of the interviewees for the research were the researcher’s colleagues. Thus, none of these colleagues declined to be interviewed. In fact, the researcher believes that her colleagues even felt obligated to help her with the research.

The issue of confidentiality was also very important because the researcher was a member of the staff. The researcher was aware that the interviewees, especially those who were colleagues, would not be comfortable disclosing information which can be considered “private” or sensitive” to another member of staff. Thus, the researcher promised that the information obtained would be confidential and only pseudo names will be used in the writing of the research. As for the students, they were given a confidentiality letter, which promised to treat all information obtained in the interviews confidentially.

During Field work

In this section we compare the issues we experienced and discuss the strategies we employed during our fieldwork at the respective research sites.

Table 3: Comparing issues and strategies in Research Project 1 and 2

Research Project 1 (formal)	Research Project 2 (personal)
Dressed formally; Adapting from Asian culture to Western culture; Addressed interviewees formally using surnames – vice versa; Familiarizing with British accent; Permission obtained to tape-record interviews.	Dressed casually; Share same cultural practices, values and languages; Encourage interviewees to use researcher’s first name; Well-versed in interviewees’ mother tongue language; Permission obtained to tape record interviews.

Research Project 1

During the field work, the first researcher dressed in a formal way in order to gain the trust and confidence from the interviewees. This was considered to be very pertinent as the researcher interviewed individuals who are from the top management team of the corporation and it is important to set a good impression to these individuals. Also, the researcher's background is from the Asian culture therefore she had to learn and adjust to the Western culture in order to blend in and to be accepted as knowledgeable in their business practices. This was pertinent to gain the trust and willingness of the interviewees to reveal information without any hesitation. In addition, the researcher had to familiarize herself with the British accent in order to communicate effectively with the interviewees. The interviewees were addressed formally by using their surnames as it was the first time the researcher was meeting them. All respondents permitted the conversations to be tape-recorded. The interviewees expressed their views openly. This is because the researcher was able to make them feel comfortable by assuring them about confidentiality and anonymity in revealing information.

Research Project 2

The researcher's familiarity with the research site also facilitates the information gathering process. The research was carried out in a multilingual, multi ethnic population. Thus, the researcher's familiarity with the interviewees' cultural practices, values, and languages helped greatly in obtaining the relevant information for the research. The second researcher purposely dressed casually especially when interviewing the students to avoid emphasising power relations in interviewing students in an educational setting (Scot and Usher, 1999). According to Scot and Usher (1999), respondents in an interview will give responses based on the setting and role they are positioned in. Therefore, they stated that an education researcher may find the interviewees responding as they would to a teacher in relation to their role as a student. Furthermore, the students were also encouraged to call the researcher using her first name which is uncommon in an educational setting where the research was carried out. These were purposely done to encourage the students not to strictly see the researcher in the role of a lecturer. Using the languages which were familiar to the interviewees was also an advantage. The researcher did not share the same mother tongue language as the interviewees. In fact, many of the interviewees preferred to be interviewed in their mother tongue language. Thus, it was crucial for the researcher to be familiar with the interviewees' mother tongue language in order to obtain the relevant information.

After Fieldwork

Table 4 below, summarises our experiences after leaving the research sites once we have collected the relevant data for our respective research.

Table 4: Comparing after fieldwork practices of research project 1 and 2

Research Project 1 (formal)	Research Project 2 (personal)
Transcribed each interview session; Analysed using 2 steps: within case analysis and across case analysis; Used conventional method – to establish unique patterns; Emailed a formal thank-you note immediately; As promised, sent a copy of the result (report) to the respective organization.	Transcribed verbatim each interview; Used QSR Nudist software to assist analysis; Informal appreciation; Results were not revealed to the organization.

Research Project 1

The case study interviews were recorded and then transcribed after each interview session. This permitted greater flexibility in analysis and provided a better grasp of the underlying meanings. A primitive classification system was created which was continually revised as more data was assimilated. The data was searched for patterns, and regularities which formed the basis of the initial categories into which units of data could be placed. The explanation building process was iterative and based upon the propositions that were developed. This study did not utilize any qualitative data analysis package (for example, NVivo or QSR NUDI.ST software) which allows rich text documents to be coded and thus formulate models of underlying categories and constructs. This was because the research study involved a relatively small number of interviews and the use of primitive classification systems was considered to be a sufficient and convenient way of analysing the data. The data was analysed in two steps: within case analysis, followed by across case analysis (Eisenhardt, 1989). As a

first step, detailed case study write-ups were generated. Although primarily descriptive, they helped to cope with the high volume of data, while at the same time enabling familiarity with each case as a stand-alone entity. This, in turn, allowed the unique patterns of each case to emerge by comparing the similarities and differences across cases thus allowing the generalization of patterns across cases. Immediately after each interview session, a formal thank you note was eMailed to the interviewee. This is to ensure good rapport is being built with these individuals and to ensure if any further information is required from these individuals they would be willing to share it. Also, as promised a copy of the results were provided in a report form to the respective individuals.

Research Project 2

The researcher left the research site to analyse the data obtained from the interviews and observations carried out in Stage 2. All the interview data were transcribed verbatim. The interview data in the students’ mother tongue language were retained and only necessary excerpts were translated for the research report.

The analysis of the interview transcripts for this research was facilitated with the use of the QSR NUDI.ST programme. QSR NUDI.ST is a computer programme which assists the data analysis of qualitative data. This programme was very helpful in coding sections of the transcribed interview texts, and enabling easy retrieval and search of coded texts segments, words, and phrases.

Using QSR NUDI.ST, the researcher established a preliminary list of coding categories by going through each interview transcript. The initial coding categories reflected a combination of themes and issues that were closely related to the research questions as well as categories of expressions that the interviewees themselves used. The coding categories formed different levels of generality in order for retrieval of information at various levels. From the preliminary list the researcher identified eight coding categories that best fit the whole data.

Getting Back

In this section, we discuss the options we had on whether there was a need to get back to the research sites again.

Table 5: Comparing the choices of getting back for research project 1 and 2

Research Project 1 (formal)	Research Project 2 (personal)
Established good rapport, easy to get back to the research field; Sufficient information gathered to complete research; Need not get back to the organization.	Familiar with the research site, easy to gain access again; Insufficient data collected, this required to get back again to the research site.

Research Project 1

The researcher had built good rapport with the interviewees and thus, would not have faced many obstacles if there was a need to get back to the research site to obtain further information. However, the researcher was not required to do so as she has had sufficient information and managed to complete her research project without getting back to the organisations.

Research Project 2

After the analysis of data obtained at Stage 2, the researcher realised that further information was needed. Thus, the data at Stage 3 was collected a year after obtaining information from the students at Stage 2. Although, it was easy for the researcher to go back to the research site again, it was difficult to contact all the students who took part in the interviews at Stage 2. However, with the help of some of the administrative staff, the researcher managed to get in touch with some of the students. The purpose of this interview was to clarify certain issues and information which emerged during the analysis of data obtained at Stage 2.

5. A framework for gaining access successfully

Based on the discussion above, we provide a basic framework (Figure 1) which a qualitative researcher can use in gaining access either using the formal or informal approach as discussed in this paper.

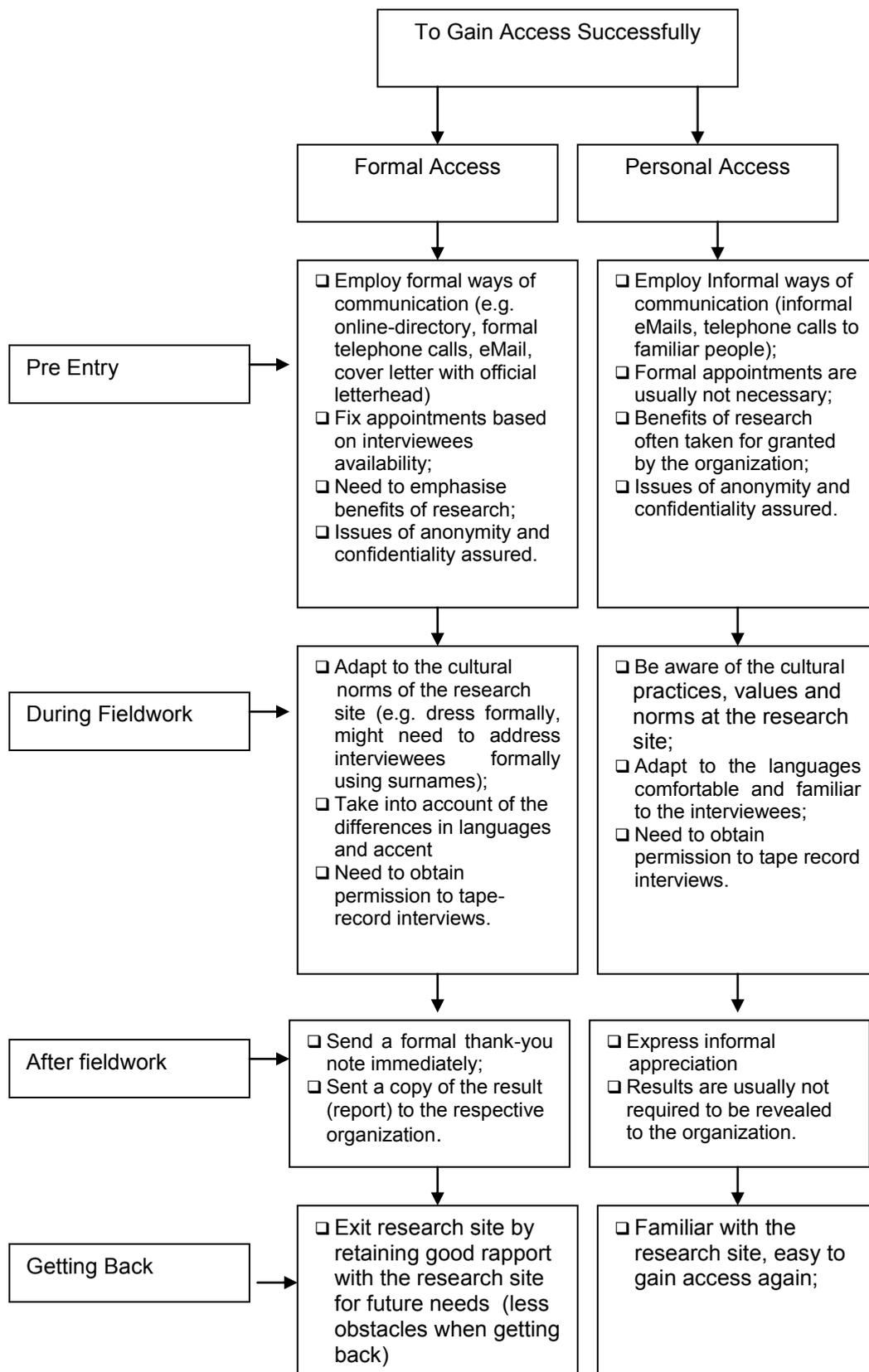


Figure 1: A framework for gaining successful access

We believe this framework can provide a basis for other researches to utilize in gaining access to their respective research sites.

6. Critical analysis of using two different approaches in gaining access

Gaining access to the field is considered crucial in ensuring success in conducting research. As discussed in the earlier section there are two ways of gaining access: formal and informal. The first researcher used a formal approach in gaining access whereby the researcher was not familiar to the field which can be considered as a drawback. However, the researcher was able to benefit using this approach due to the following reasons:

- A formal structured way was used in approaching the respondents. The first researcher was very sensitive in terms of the respondents' availability. She fixed appointments according to the interviewees' convenience. This was very much appreciated by the interviewees and they were very cooperative during the interviews.
- The first researcher is not familiar to the field. Therefore, she has no preconceived ideas about the organization. Thus she was not biased towards the information given by the interviewees;
- The first researcher comes from different cultural background and country where business practices differ from that of her research site (United Kingdom). However the interviewees took extra effort and were patient enough in providing detailed explanation about their business practices;
- The first researcher had no prior relationship with the interviewees. Therefore, the answers given to her were not influenced by any form of prior relations between the researcher and the respondents. In fact. The respondents were very frank in giving their views and opinion;
- As a formal approach was used in gaining access to the companies the interviewees kept to the appointments seriously without any cancellation as they would need to set a good impression of their company and themselves;
- The letters that were sent to the respondents bore University Nottingham letter head and were endorsed by the researcher's supervisor who holds a prominent position in the university. This gave an impression of the importance of the research project and therefore the interviewees paid extra attention and gave full cooperation to the researcher.

On the other hand, the second researcher used the personal approach in gaining access to her research site. Although existing literature supports that if the researcher is familiar with the research site, obviously gaining access would be easier as compared to an outsider. However, a critical analysis of the researcher's access to her research site showed that although as an insider it is much easier, it should not be taken for granted.

- As the research site was familiar to the researcher, appointments and schedules were often changed. This is because the interviewees, especially the researcher's colleagues, and the researcher could easily accommodate one another at short notices without jeopardizing the relationship between the researcher and participants.
- The researcher was familiar to the research site under investigation, thus, it was extremely important for the researcher to consciously acknowledge her own personal feelings towards the research. The researcher also paid careful attention not to influence the interviews and observations with her own preconceived ideas.
- The researcher shared many of the values and cultural practices of the participants. The researcher is even well versed in the participants' mother tongue language. During the interviews, the participants made a lot of assumptions that the researcher would be able to easily understand their explanations. Thus, sometimes there were awkward situations where the participants were asked to explain explicitly the meanings underlying their explanations.
- The researcher had known the participants, especially her colleagues, before embarking on her research. Thus, there is always the possibility that the participants' responses during the interviews are influenced by the relationship the participants share with the researcher.
- Since the researcher made informal appointments, often they were not taken seriously by the interviewees. There were quite a number of last minute cancellations and changes. Some interviewees did not even turn up at the agreed time.
- During fieldwork at the university, the importance of the research was only acknowledged by the researcher. The participants and the university merely assisted the researcher. None of the participants or members of staff from the university questioned any of the researcher's actions during her fieldwork.

7. Conclusion

In this paper we have shared our experiences especially on the various strategies we used in obtaining access to the two different research sites in our respective research projects. We discussed specific issues which were salient in gaining access using the four stage model: pre-entry, during fieldwork, after fieldwork and getting back. The first researcher found that choosing the right strategy in gaining access to the field is considered to be paramount in ensuring a high response rate. This is demonstrated in her research as she was able to obtain a high response rate of 42%. Also, all the six interviewees for the case study that were contacted after the questionnaire session were all agreeable to be interviewed. As for the second researcher, she found that planning was very important in gaining access to obtain the relevant information for her research. However, the second researcher also believes that it is also equally important to be flexible and adaptable to the changes which occur at the research site. Different researchers would encounter and experience different types of issues in gaining access to their research sites. However, it is only through the sharing of the researchers' experiences in gaining access that important issues can be highlighted and discussed for the benefit of other fellow researchers. It is hoped that the various issues and strategies we discussed in this paper would benefit other researchers in gaining access in doing field work for their own research projects.

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Group Model Building Using System Dynamics: An Analysis of Methodological Frameworks

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Abstract: The main objective of this paper is to study existing methodological frameworks on group modelling projects using system dynamics. Such projects are more and more applied in organizations in order to support their strategic decisions. In this research, key frameworks were first identified and then classified allowing for an in-depth analysis. The results of this analysis indicate that existing frameworks proposing a global vision of projects are scarce. Moreover, few of them consider both aspects of structure and process simultaneously. In addition, three crucial issues are highlighted: the elicitation of participants' knowledge, the establishment of a consensus among participants, and the aspects of facilitation.

Keywords: system dynamics, group model building, modelling process, methodological frameworks, systematic analysis

1. Introduction

A system is defined as a complex set of interacting elements. The notion of system underlies the concept of totality, according to which "the whole is greater than the sum of parts" (von Bertalanffy, 1968). A system is said to be complex due to the multiplicity of its elements (natural, technical, economic and social) and of their interactions, but also because of the diversity of behaviours and properties it can exhibit (dynamic, emergent, etc.). A complex system is dynamic when characterized by: (1) strong interactions between the various actors of the system, (2) a strong dependency on time, (3) an internal complex causal structure subjected to feedbacks, and (4) delayed behavioural reactions, which are counterintuitive and difficult to predict (Sterman, 2000).

In such systems, actions often result in effects that differ from expected results and desired outcomes, even though decision-makers try to implement "rational" decisions according to set objectives (Friedman, 2004; Sterman, 2000; Forrester, 1975). Indeed, because of systems' characteristics, decision-making processes are carried within difficult contexts: they are affected by both complex structures of systems and cognitive limits of decision-makers (Rouwette, Gröfslér and Vennix, 2004). In this context, modelling approaches are particularly useful to better understand and analyze complex systems (Lyons et al., 2003; Friedman, 2004). For instance, systemic modelling is a methodological tradition that involves the use of formal or simulation models to analyze a complex system and to favour its understanding, and consequently it helps to improve the effectiveness of the actions that are conducted by the system's actors (Trochim et al., 2006).

In 1958, Forrester developed a discipline that is cast in this strand of systemic modelling and is mostly inspired by cybernetic systems: industrial dynamics. This approach leads to a modelling and simulation technique, known as system dynamics, which can be applied to any type of complex systems that emphasize behavioural dynamics over time (von Bertalanffy, 1968). Allowing a better understanding of the behavioural dynamics of a system, the system dynamics approach aims at supporting the decision-making processes that should lead to the improvement of the system (Sterman, 2000) and was hence applied to complex managerial problems, such as: the development of inter-organizational networks (Akkermans, 2001), the strategies of international alliances (Kumar and Nti, 2004), the prevention and management of crises in organizations (Rudolph and Repenning, 2002), the process of innovation management (Milling, 2002), to name but a few.

Many conceptual frameworks were developed in order to support the process of modelling using system dynamics (Luna-Reyes and Andersen, 2003). This process can be entirely managed by one or more modellers who are experts in the system dynamics field. Nevertheless, the system dynamics literature has highlighted the value of directly involving many participants in the modelling process (Rouwette, Vennix and van Mullekom, 2002), such as researchers specialized in part(s) of the system

and/or its key actors. Consequently, an increasing number of projects in system dynamics modelling are carried out collectively (Andersen and Richardson, 1997) and such group modelling projects are more and more applied in organizations in order to guide their strategic decisions (Akkermans and Vennix, 1997). However, involving many participants during the model design process presents a number of methodological challenges (e.g. Luna-Reyes et al., 2006). Research relative to the application of group modelling using system dynamics is developing (Andersen and Richardson, 1997), and many techniques have been elaborated to guide such projects (Rouwette, Vennix and van Mullekom, 2002; Akkermans and Vennix, 1997). Nevertheless, research related to the application of this type of modelling rarely puts the emphasis on the course of the modelling project itself: the accent is mainly put on the results and not on the means (Visser, 2007; Morecroft and Sterman, 1994; Richardson and Andersen, 1995). For instance, Andersen, Richardson and Vennix (1997: 187) note that “*group model building is still more art than science*” and highlight the problem of improvisation that concerns the majority of group modelling projects. In fact, it is difficult to obtain a global vision of the procedures to follow to carry out such a group project, in order to model a system using system dynamics. Moreover, the documentation of group modelling projects remains basic in the system dynamics literature (Andersen and Richardson, 1997). Thus, the realization of these projects can be seen as a perilous adventure, and the question is to know how to proceed to carry them out.

The objective of this paper is to analyze the key methodological frameworks which are proposed in the system dynamics literature and which enable to guide the realization of group modelling projects. A methodological framework is defined here as any organized approach, providing process and/or structural guidelines related to any aspect of group model building. The analysis of these frameworks aims at obtaining a global vision of the research that applied a group modelling project using system dynamics, and allows drawing attention to the lack of methodological supports relating to this approach.

The remainder of this article is organized as follows. The next section highlights the foundations and principles of the system dynamics approach, prior to identifying the dimensions and components of group modelling projects using system dynamics. After that, the research method, which is based on a systematic analysis of previous works that applied system dynamics principles in a group modelling project, is described. Before discussing the research results and concluding, the selected and classified methodological frameworks are analyzed.

2. System dynamics and group model building

The system dynamics approach is addressed below, before putting the emphasis on group model building projects.

2.1 Modelling using system dynamics

A system is an organized and ordered set of interrelated elements (Forrester, 1975). The complexity of systems is often defined with respect to three dimensions: (1) the number of elements involved (*quantity*), (2) the number of interrelationships between the elements (*connectivity*), and (3) the inter-functional connection between the elements of the systems (*functionality*) (Sterman, 2000). Interactions between the various elements of a system generate complex behaviours (Limburg et al., 2002) and nonlinear relationships that are responsible for the dynamic transformations that the system experiences (Morçöl, 2005). Indeed, a complex system is structured by interrelated and interacting feedback loops (Forrester, 1975): a system is deemed dynamic due to its internal causal structure and fundamentally, because of the presence of feedback loops that impact the whole system (Meadows and Robinson, 1985). There are two types of feedback loops in systems: positive loops and negative loops (Forrester, 1975; Sterman, 2000). A positive feedback loop generates a reinforcing behaviour, that is, an exponential growth behaviour. A negative feedback loop generates a balancing behaviour, that is, an equilibrating behaviour. Interactions of positive and negative loops generate complex system behaviours of growth and collapse, oscillations, logistics growth patterns, etc (Sterman, 2000).

In complex systems, decision-makers design policies that are often difficult to implement because the design fails to take into account key feedback loops that will generate unintended consequences or limit the benefits of actions (Merton, 1936; Friedman, 2004; Forrester, 1975; Sterman, 2000). This may be the case more specifically in circumstances when the system under consideration has many components that may not be easily taken into account by decision-makers' mental models. Indeed,

mental models are by definition “elusive” and are often imprecise, confused, incomplete and not adapted to determine the dynamic behaviours of systems (Forrester, 1975). This reality justifies the need for using approaches such as system dynamics modelling, which helps to recognize the dynamic behaviour that a system experiences, and consequently, helps to mitigate the cognitive limits of decision-makers. The system dynamics approach is a set of principles that have been used to tackle dynamics structure problems in complex systems using both qualitative and quantitative counterparts (Morecroft and Sterman, 1994). More precisely, it includes a set of qualitative and quantitative modelling principles that can be used to conceptualize the underlying feedback loop structure, and to simulate the repercussions of potential decisions over time (Sterman, 2000). Several conceptual frameworks describing the modelling process using system dynamics were developed. The number of steps may vary from one framework to another, but they are similar in essence (Luna-Reyes and Andersen, 2003). A predominant framework was developed by Sterman (2000), to structure the sequence of the modelling process using system dynamics (see Figure 1). It divides the process of modelling into five stages: the first two steps concern qualitative modelling, that is, the system’s conceptualization, while the other three steps concern computer-based modelling for quantitative simulation.

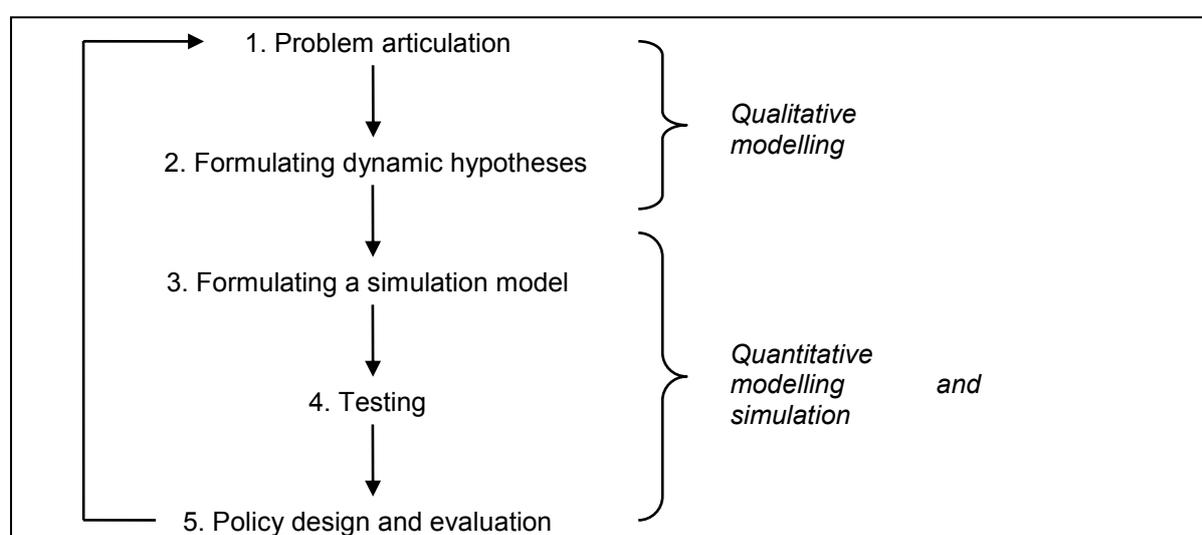


Figure 1: Modelling process using system dynamics according to Sterman (2000)

The first step consists in articulating the problem: it aims at defining the problem to be solved and the objective of the model. The second step, related to dynamic assumptions, leads to the development of an influence diagram. Influence diagrams make it possible to conceptualize the dynamics of a complex system, to exchange mental models between individuals and groups, and to communicate assumed important feedback loops at the source of the problem(s) (Sterman, 2000). Such a diagram highlights both the variables of a system and the links between these variables (Diffenbach, 1982). Moreover, it indicates the polarity associated with causal links in order to distinguish between positive feedback loops and negative feedback loops (Sterman, 2000). In other words, an influence diagram represents a hypothesis of the feedback structure of the system under consideration (Diffenbach, 1982), but it also serves as a tool for the creation of a shared mental model amongst members of a group or of an organization.

The third step aims at formulating a simulation model, that is, a level-rate diagram. Level-rate diagrams are quantitative models that represent a system with stocks and flows. Stocks are accumulators of money, goods and information, calibrated so as to characterize the state of a system at a point in time and to generate the information on which decisions and actions rest. Flows correspond to the change per period of time that increases or decreases levels in the system. This third step also includes the development of decision rules (i.e. mathematical equations), the quantification of variables, and the model calibration using parameters to define initial conditions (Sterman, 2000). The fourth step consists in making sure the model is appropriate for the task at hand. Typically, this step involves a series of tests to obtain the confidence in the model based on both internal and external consistency tests (Martis, 2006). For example, the objective of “behaviour reproduction tests” is to make sure the behaviour of the simulated system corresponds to and

reproduces, to a certain extent, its real behaviour. However, the reality is that no model can be entirely “exact” (Sterman, 2000), and no model can be expected to be valid in an absolute sense (Forrester, 1975). The question that one should ask about a model does not concern its accuracy, but its usefulness in meeting a set of objectives (Sterman, 2000). Finally, the fifth step relates to the formulation of new potential strategies and the evaluation of simulated results. This last step requires on the one hand the identification of scenarios, i.e. alternative strategies, and on the other hand, the analysis of the simulated results generated by the model for each scenario over time. Thus, the simulation model aims at testing and comparing different scenarios of “fictive” actions, to predict the future behaviours of the system under consideration (Sterman, 2000): a simulation model works as a decision-support system.

2.2 Group model building using system dynamics

The modelling process using system dynamics can be carried out through two types of projects: modelling projects versus group modelling projects. The first type is managed by one or more modellers, who themselves design models and gain the expertise and required data from many sources, and often from experts on the modelled system. For the second type of project, experts on the system are not the only source of information, but are invited to elaborate models with the help of an expert or a team of experts in the system dynamics field. Research on group modelling has highlighted the importance of involving many participants in the modelling process, with the aim of increasing the relevance and usefulness of the model (Vennix, 1996). Moreover, group modelling projects help to develop a comprehensive understanding of the scope of the system and to guide the actions that are conducted, while giving advantages at individual and collective levels. At the individual level, the approach improves the mental models of participants. At the collective level, it allows the alignment of the mental models, the achievement of a consensus with respect to decisions, and the involvement of the group with respect to these decisions (Andersen, Richardson and Vennix, 1997).

In a group modelling project, the participants develop one or many models during structured sessions with the help of a facilitator, who must favour the elucidation of knowledge within the group (Rouwette, Vennix and Thijssen, 2000). These sessions are typically referred to as group modelling workshops, work sessions or conferences. The participants are the “clients” for whom the model is developed, and can be researchers specialized in part(s) of the system, and/or practitioners who are themselves actors of the system. Basically, any project of group model building is articulated around a number of common components that encompass three stages of activities: pre-meeting activities, activities during the modelling sessions, and after-care or follow-up activities (see Table 1).

Table 1: Components of group model building

Components	Description
Pre-project client-consultant relationship	- Who initiated the contact, modeller or client? - Type of problem being addressed and goals of project
Participants	- Size and composition of team - Level of top management support
Contacts with participants	- Were pre-meeting interviews scheduled? - What introduction to system dynamics is given?
Sessions and participants	- Participants (number and characteristics of attendees) at each session - Sessions: numbers and average duration - How much work was done off site and how much with the group? - Participation satisfaction with process and outcome
Modelling procedure	- What type and process of modelling was used? - Support: supporting techniques used in the process - Was a preliminary model used or did the meeting start from scratch? - Were questionnaires/workbooks used?
Facilitation aspects	- Number of facilitators and their roles - Degree to which facilitator steers the discussions
Sessions logistics	- Were meetings held away from the office? - Room design and layout

Adapted from Andersen, Richardson and Vennix, 1997: 192-193

2.3 Dimensions of group modelling projects

Group modelling projects can be described according to two dimensions: the structural and process dimensions. Each of them includes several components.

On the one hand, Andersen, Richardson and Vennix (1997) took into consideration some components that are mainly linked to some structural aspects of group modelling projects. More precisely, two structural components were identified based on their study: (1) the group structure, which takes the participants, the composition of groups and sub-groups involved in each session, and the facilitation aspects into account; (2) the logistic component, which includes all the aspects related to the location, fitting and equipment of the room. On the other hand, these authors were also interested in the process aspects of group modelling projects, that is, the modelling activities. However, these activities are relevant only through the realization of the modelling process steps using system dynamics. Consequently, five process components were identified to describe each step of the modelling process, as defined by Sterman (2000): (1) problem articulation; (2) formulation of dynamic hypotheses; (3) formulation of the simulation model; (4) testing of the model; (5) formulation of potential strategies and evaluation.

Hence, the analysis of the studies conducted by Andersen, Richardson and Vennix (1997) and Sterman (2000), permitted to define seven components that are used in this present research to characterize group modelling projects using system dynamics (see Table 2).

Table 2: Dimensions and components of group modelling projects

Dimension	Components	
Structure	Group structure	S1
	Logistics	S2
Process	Problem articulation	P1
	Dynamic hypotheses	P2
	Simulation model formulation	P3
	Testing	P4
	Formulation of potential strategies and evaluation	P5

3. Selection method of methodological frameworks

A systematic analysis of the literature was conducted in order to identify key methodological frameworks that enable to guide the implementation of a group modelling project. A systematic review rests on a rigorous, scientific and transparent process, and is based on two fundamental elements: the identification of inclusion criteria and the selection strategy of relevant works (Alderson, Green and Higgins, 2004).

The previous works proposing a methodological framework in group model building were selected according to three criteria. First, only the articles using system dynamics approach were retained. Second, only the articles published in scientific journals or in research books were included to ensure the “validity” of the selected frameworks. Third, given that a published framework could be updated and improved by it(s) “creator(s)” or by the researchers’ community, only the articles describing the last “version” of a framework were analyzed. On this basis, sixteen methodological frameworks were selected.

4. Classification and analysis of methodological frameworks

The sixteen methodological frameworks were analyzed and classified. This classification (see Table 3) rests on the principal and substantial components of each framework.

4.1 Structural dimension

Even if the structural dimension of group modelling projects is a crucial factor of success (e.g. Andersen and Richardson, 1997), only seven methodological frameworks enlighten this dimension.

Component S1: group structure. Six methodological frameworks stress the group structure component.

The frameworks highlighted by Richardson and Andersen (1995) and Andersen and Richardson (1997) identify five roles to be represented within the group modelling support team: (1) the facilitator,

who acts as a group guide and knowledge elicitor; (2) the modeller, or reflector, who focuses on the model that is being formulated by the group and the facilitator; (3) the process coach, who focuses on the dynamics of individuals and subgroups within the team; (4) the recorder, whose task is to write down or sketch the important elements of the group proceedings; (5) the gatekeeper, who is usually a person within the “client” group who carries responsibility for the modelling project and initiates it. These five roles that have to be represented in any group modelling support team are well accepted in the system dynamics literature. They can either be distributed amongst several participants, or combined (Richardson and Andersen, 1995), and generally, the trend is to include two to five members taking on the roles of facilitator, modeller, process coach, recorder and gatekeeper. However, some authors prefer to duplicate certain roles, and this may be the case more specifically for the facilitator role. For example, Cavana, Boyd and Taylor (2007) involved two facilitators per modelling session in their application of group model building.

Table 3: Frameworks classification according to the two-dimensional scale

Methodological frameworks	Structure		Process				
	S1	S2	P1	P2	P3	P4	P5
Vennix et al. (1992)	✓		✓	✓	✓	✓	✓
Vennix and Gubbels (1992)				✓			
Wolstenholme and Corben (1994)				✓			
Richardson and Andersen (1995)	✓						
Vennix (1996)				✓			
Vennix, Akkermans and Rouwette (1996)			✓	✓			
Andersen and Richardson (1997)	✓	✓	✓	✓	✓		✓
Richmond (1997)							✓
Ford and Sterman (1998)					✓		
Cavana et al. (1999)			✓				
Vennix (1999)	✓		✓				
Rouwette, Vennix and Thijssen (2000)		✓					
Stave (2002)			✓	✓	✓		✓
Howick, Ackermann and Andersen (2006)				✓	✓		
Cavana, Boyd and Taylor (2007)	✓			✓			
Visser (2007)	✓						
Number of frameworks per component							
	6	2	6	9	5	1	4
Number of frameworks per dimension							
	7		13				

Indeed, an important aspect of the process of group model building is facilitation (Rouwette, Vennix and van Mullekom, 2002). Given that the facilitator’s attitude has an impact on the quality of communication and on the establishment of a consensus among participants (Akkermans and Vennix, 1997), this role is relatively well explained in previous works. For example, Visser (2007) proposes an application of the communication theory to the facilitator’s behaviour. In the same vein, Vennix (1999) was interested in the characteristics that are essential for this actor: he must adopt the “right” attitudes (such as mutual aid, neutrality, investigation, curiosity, integrity and authenticity), have a sufficient knowledge of the system dynamics approach, and have process structuring skills, conflict handling skills and communication skills.

As well as the group modelling support team, the groups and subgroups involved in each modelling session should include stakeholders and/or experts on the system or part of the system. The gatekeeper plays an active role for the selection of these participants (Andersen and Richardson, 1997). On the one hand, it is suggested that the number and diversity of participants may have a positive effect on the usefulness of the model designed (Richardson and Andersen, 1995). On the other hand, however, it is recognized that communication among group participants decreases as the group size increases (Vennix et al., 1992), and that the management of large groups underlies issues in terms of interpersonal relations and conflicts, which add an inhibition risk to the process (Richardson and Andersen, 1995). The underlying intricacy may be more apparent in groups that include various stakeholders with conflicting interests: it may justify the need for creating a sub-group per group of stakeholders involved in the modelling project, as recommended by Cavana, Boyd and Taylor (2007).

Anyway, the team size does influence the management of the project (Vennix et al., 1992), and has to be taken into account. First, the roles of facilitator and of modeller have to be necessarily separated in projects involving a large group (Richardson and Andersen, 1995). Second, the fewer the participants

involved, the more unstructured the techniques can be. Third, if a large number of people are involved, labour-saving techniques have to be used (such as questionnaires, workbooks, structured workshops, and software support) (Vennix et al., 1992).

Component S2: logistics. Existing frameworks investigating the logistics are scarce: only two articles are concerned with this component.

The framework proposed by Andersen and Richardson (1997) provides recommendations regarding the room layout and the technical supports, given that a room with a top notch set up and appropriate technical supports facilitates the communication and the implementation of tasks. First, concerning the room layout where modelling sessions take place, chairs must be placed in a semicircle, and one should preferably use swivel chairs. Indeed, as these authors explain, swivel chairs allow participants to turn easily to address each other and/or to create small subgroups. Moreover, whereas small tables can be useful for the occasional writing tasks that may arise during the workshop, tables are often absent from plenary group meeting sites given that tables might interfere with group dynamics. Second, it could be useful to combine technical supports such as whiteboards and projection equipment. The framework suggested by Rouwette, Vennix and Thijssen (2000) also puts the emphasis on technical supports, and more exactly, on electronic equipments. These authors show that electronic communication could be used to avoid the direct costs of convening groups, given that it enables to reduce conformism thanks to the use of anonymity, and to increase the number of participants involved in a modelling session.

In short, the visual coherence and synergy must be maintained during the modelling sessions, and the logistics – in terms of room layout, visual aids and communication channels – are presented as a critical success factor of the group modelling sessions. In particular, the logistics component plays a primary role with respect to the facilitation process.

4.2 Process dimension

The majority of methodological frameworks stress the process dimension of a group modelling project. The group modelling process in system dynamics involves cognitive tasks that can be divergent, convergent or evaluative (judgment and choice). Each activity of this process emphasizes different combinations of these types of cognitive tasks (Vennix et al., 1992). Some techniques can support process activities, but they depend on the type of tasks they involve: whereas divergent tasks have to lean on an individual application of techniques or on small nominal groups, convergent and evaluation tasks require plenary sessions, which can be completed by sub-group workshops (Andersen and Richardson, 1997). Hence, each step of the group modelling process can include a succession of individual activities, sub-group workshops and plenary sessions. Nevertheless, each possesses its own issues and requires its own techniques.

Component P1: problem articulation. The first step of the group modelling process using system dynamics is addressed by six frameworks. This step is crucial for any modelling project, given that it aims at identifying the objective and the scope of the model to be designed.

The problem articulation activities are mainly based on individual meetings with participants, that is, preparatory interviews (Stave, 2002; Vennix et al., 1992), or on small nominal groups (Vennix et al., 1992). Diverse techniques can be used to structure the problem to be solved, such as: the combination of system dynamics modelling techniques and of brainstorming tools (Vennix, Akkermans and Rouwette, 1996); the tool of reference modes sketched as graphs of problematic and preferred behaviour over time (Andersen and Richardson, 1997); the tool of coloured hexagons to identify the stakes and key variables of the system under consideration (Cavana et al., 1999). Whatever the techniques used, this first step mainly relies on divergent tasks in order to increase the quantity and diversity of ideas (for example, about the system boundaries) (Vennix et al., 1992), and on visual aids such as graphs, maps, or diagrams, in order to support the process of eliciting information.

However, opinions in a group can differ considerably regarding the problem to be solved. Two main factors explain the existence of ill-defined or messy problems: the deficiencies in group interaction and the construction of multiple realities in groups (Vennix, 1999). Hence, in the case of messy problems, the role of facilitator is even more crucial to create consensus and commitment within the group.

Component P2: dynamic hypotheses. This component is related to the conceptualization of the system under consideration into an influence diagram, in order to highlight its feedback structure. Nine methodological frameworks are concerned by this group modelling step. They are mainly articulated around two common issues: the process of knowledge elicitation and the establishment of a consensus among participants.

This step often requires structured and systematized group activities, with the presence of one or more experts in system dynamics modelling and one or more facilitators (Vennix et al., 1992; Cavana, Boyd and Taylor, 2007). For instance, according to Cavanaugh, Boyd and Taylor (2007), it can be useful to first perform distinct modelling sessions for each stakeholders group, to reduce the risk of limiting the points of view to one dominant stakeholders group. In fact, whereas the conceptualization of a system into influence diagrams can rely on divergent tasks for knowledge elicitation, the design of feedback structures is often performed through convergent tasks in order to explore courses of action (Vennix et al., 1992).

Various techniques can be used to facilitate these activities. For example, Vennix and Gubbels (1992) identify the Delphi method and the nominal group technique. Wolstenholme and Corben (1994) also insist on the usefulness of the Delphi method, specifically if groups of participants are large and geographically dispersed. Vennix, Akkermans and Rouwette (1996) suggest combining system dynamics modelling techniques and brainstorming tools. Andersen and Richardson (1997) put the emphasis on tools that can help participants to reason in terms of feedback, such as system archetypes. Howick, Ackermann and Andersen (2006) describe an approach that links semantically rich scenario maps to formal influence diagrams. Stave (2002) and Vennix (1996) recommend using a preliminary influence diagram, especially if participants have no system dynamics modelling experience, if the facilitator has only little experience in group model building, and if participants do not have enough time and/or are geographically dispersed. In short, the main techniques identified are referred to as information flow supports as well as cognitive aids. However, most previous works highlight the necessity of using appropriate techniques according to the team size, the time available, the localization of participants, etc. Moreover, some of them even recommend combining different techniques of cognitive aids during this second step.

Component P3: simulation model formulation. Five frameworks investigate the model formulation step, which includes the design of a level-rate model, the development of decision rules, the quantification and calibration of the model. These frameworks are mainly interested in the process of knowledge elicitation to collectively design a level-rate diagram.

On the one hand, the tasks related to the design of a level-rate diagram must be based on individual meetings with participants or on small nominal groups, as well as on structured and systematized group activities (Vennix et al., 1992). On the other hand, the tasks related to the development of mathematical equations are rarely completed with the entire group (Andersen and Richardson, 1997). Some authors account for the implementation of this third step. Andersen and Richardson (1997) describe methods that aim at quantifying model variables and refining model. Howick, Ackermann and Andersen (2006) recommend limiting the tasks to key variables and relations, using the reference modes, and trying to formally capture the participants' reactions in order to refine the model. Ford and Sterman (1998) put the emphasis on the codification of expert knowledge, in order to estimate the model's parameters, the initial conditions of the model, and the interrelationships to be specified in the level-rate model.

Nevertheless, the model formulation step is an iterative process that often requires important preparatory activities (off site) from the modelling team (Stave, 2002), in order to reduce the complexity of the task during the group modelling session. According to Rouwette, Vennix and van Mullekom (2002), in most cases, quantitative modelling tasks are not done in front of the group of participants because of their complexity. Thus, this group modelling step is seldom investigated in the literature. As Ford and Sterman (1998: 309) point out, "*the literature is comparatively silent, however, regarding methods to elicit the information required to estimate the parameters, initial conditions, and behaviour relationships*" that must be specified in quantitative modelling.

Component P4: testing. The fourth process component concerns the validation tests of the simulation model. Only one framework investigates this step in the context of group tasks.

This framework is proposed by Vennix et al. (1992). These authors identify some techniques that can be used to perform evaluation tasks that mainly aim at assessing the validity of the model's output, such as: the Delphi method, the social judgment analysis, and the nominal group technique. Nevertheless, internal and external consistency tests are mainly under the responsibility of the modelling team: this step does not require the direct implication of the participants. Hence, this component is of no great interest in group modelling research, even if it is generally recommended that the model should be validated by experts on the system.

Component P5: formulation of strategies and evaluation. This component is related to the development of scenarios and the analysis of simulated results over time. Four frameworks are concerned with this group modelling step. The issue of the establishment of a consensus is omnipresent in these works, regarding the scenarios to be tested and the decision strategies to be ultimately implemented.

Group activities to be carried out in this step mainly involve tasks of judgment and choice: they are especially based on structured and systematized group activities (Vennix et al., 1992). On the one hand, the development of scenarios (i.e. potential decision alternatives) often requires group modelling sessions with a restricted number of participants. On the other hand, the debating and evaluation of simulated alternatives often involve brainstorming sessions with the entire group (Stave, 2002). Certain techniques can be used to facilitate these group activities. For example, Vennix et al. (1992) put the emphasis on using the Delphi method, the multi-attribute utility theory, the social judgment analysis, and the nominal group technique; Andersen and Richardson (1997) suggest that simple voting procedures can be used; Richmond (1997) describes an approach that aims at favouring the coherence between objectives and strategy and that mainly involves discussion and testing in a "strategic forum".

Hence, whereas the underlying evaluation tasks can be generally best performed in strongly structured group sessions (Vennix et al., 1992), the techniques used in practice range from unstructured (such as discussions, simple votes) to specific structured techniques (such as frameworks provided by the multi-attribute utility theory and used to evaluate competing alternatives on multiple criteria).

5. Conclusion

In this paper, the key methodological frameworks on group modelling project using system dynamics, were identified and classified. Their in-depth analysis indicates that existing frameworks proposing a global vision of projects are scarce.

First, few of them consider both aspects of structure and process simultaneously. Given that these two aspects are inextricably linked (e.g. Vennix, 1999), it is now time to further investigate the interrelationships between them and their successful "fit". Second, none of them covers the seven components as defined in the analysis scale used in this present study. On the one hand, the structural dimension suffers from a lack of methodological support, except for the facilitation aspects. On the other hand, while the process dimension is better investigated, the emphasis is mainly put on qualitative modelling: the group tasks for the quantitative modelling process are seldom examined, and the totality of the group modelling process is rarely taken into consideration. Consequently, previous works in system dynamics fail to give a detailed and global picture of the approaches required to implement a group modelling project. However, the framework developed by Andersen and Richardson (1997), and more recently applied by Luna-Reyes et al. (2006), represents an effort to address this gap, since it describes a set of techniques and of sub-processes, commonly referred to as "scripts", for the organization and the planning of group modelling sessions, and for the group tasks directly linked to the modelling process. These "scripts" result from ten years of experience and of literature reviews (e.g. Vennix, Andersen and Richardson, 1997) and their accumulation could be a response to the problem of improvisation that group modelling projects suffer from (e.g. Andersen, Richardson and Vennix, 1997).

A major contribution of this research is the identification of critical issues concerned with any group modelling projects. First, the elicitation of participants' knowledge is at the core of such projects. It is a question of being able to manage relevant cognitive processes and capture the mental models of the participants, in order to create a shared mental model among the entire team. However, this task is a difficult one, and it becomes more and more complex during the quantitative modelling process.

Second, the establishment of a consensus among participants is a necessary condition for making progress in the project, and plays a decisive role when the time comes to articulate the problem to be solved and to evaluate the strategic alternatives. Third, the aspects of facilitation are presented as a critical success factor of the group modelling sessions. The facilitation aspects depend not only on the attitudes and skills of the actor(s) referred to as the "facilitator(s)", but also on the choices that are made about logistics and the techniques used. The system dynamics literature highlights some guidelines that can be followed to cope with these issues, but they depend on the type of cognitive tasks to be performed.

Although this paper makes a useful contribution to the group model building literature, several potential limitations should be noted. First of all, whereas the context in which group modelling projects take place may be important (e.g. Andersen, Richardson and Vennix, 1997), contextual variables are omitted in this present study. Notably, one may suggest that factors such as the type of organization, the organizational culture, the history of participants, to name but a few, can influence the project implementation. In addition, the scope of this research is limited to the methodological frameworks using system dynamics modelling. However, the problems and issues raised by the realization of such projects also exist in other fields of research, such as: problem structuring methods of operational research, multi-criteria decision support, mind mapping, collaborative action research. Thus, these various fields of research could be used to go deeper into the analysis carried out in this article.

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Organizational Inquiry as a Rhetorical Process: The Role of Tropes in Organizational Theory and Methods

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Abstract: We develop a discursive understanding of organizational inquiry in order to challenge the status quo characterized by a positivistic approach to organizational inquiry. Specifically, we re-conceptualize organizational science as an inherently rhetorical process. We propose that the language of theories and methods used within a particular paradigm move from figurative to literal and back to figurative, following a distinctive topological sequence from metaphor to metonymy to synecdoche to irony. We also link the researchers use of four master tropes to particular types of scientific reasoning as well as to particular types of scientific tools. We discuss the research implications of the rhetorical model of organizational science.

Keywords: rhetoric, positivism, semiotics, theory, method

1. Introduction

Although positivism has been discredited by many philosophers of science (see for example Bhaskar 1989), some of the assumptions and principles of positivism, such as verificationism and falsificationism, a pro-observational stance, that reality exists independently of our perceptions of it, and that language represents reality, still dominate mainstream organization theory (Chia 1997: 688-690). In this paper, we develop a discursive understanding of organizational inquiry in order to challenge the status quo characterized by a positivistic approach to organizational inquiry. Specifically, we focus on the positivist or representationalist assumption that theories about reality and methods are independent, and that methods tests theory (Brown 1976;Gergen and Thatchenkery 1996;Morgan 1980). To accomplish our purpose, we re-conceptualize organizational science as an inherently rhetorical process. We bring attention to the power of language to represent and construct, as well as obscure and clarify.

Moreover, we try purposefully to develop a positivistic framework (i.e., a framework with empirically testable hypotheses to test theory) to question positivism. Put differently, we use language to develop a positivistic model that shows the limits of language for developing positivistic models. Thus, the more you are convinced of our model, the more contradictory our model should appear. This is purposely done in order to create a provocative and critical space to reflect on how organizational scientists use language to recursively reflect and construct the process, objects, and findings of organizational inquiry. The systems of truths uttered in this paper are either inconsistent or incomplete. If it is viewed as complete, the audience will realize that it is inconsistent; if it is viewed as consistent, the audience will realize that it is incomplete. This is a natural consequence of the irony of questioning positivism with positivism: If (A) and (Not A) are simultaneously true, we must drop either (A) or (Not A) for consistency, but this leads to incompleteness.

We are also well-aware that the scientific process is way messier than our model suggests. Thus, the tropological sequence we suggest is just that: a suggestion. But if you dig deeper we also suggest that scientific life is a mess. We try to show that science cannot be decoupled from ethics and aesthetics. In fact, we view science as a house of cards. The whole edifice may be brought down if one card is moved. We exemplify this quality of science in our own paper. We try to write the paper in such a way that every section builds on an earlier section, and each paragraph and sentence in each section mirrors paragraphs and sentences in other sections. There is strong symmetry in our writing. To some, symmetry is one of the guarantors of truth. But at the same time, too much symmetry or perfection should create doubts in the audience: Nothing is so perfect. Similarly, to some, logic or logical reasoning is one of the guarantors of truth. The arguments in our paper are logical. But they end up with a logical contradiction. Nonetheless, it is this contradiction that allows human choice and judgment, and it is that contradiction that allows us to realize how integral a part ethics and aesthetics plays in science. In short, the purpose of this critical, complex, and self-referential paper is to bring attention to the power of language to both represent and construct, to make researchers more self-

aware, morally reflective, and skeptical about the language they use, as well as raise questions about the role of language in the conduct of organizational science.

2. Rhetoric in organizational theories and methods

The positivist narrative suggests that theory and method are independent, and that method tests theory (Brown 1976; Gergen et al. 1996; Morgan 1980). Theories are characterized as direct representations of empirical phenomena, and methods as procedures needed to evaluate how well theories mirror or correspond to external reality (Alvesson and Kärreman 2000: 138; Astley and Zammuto 1992: 444-445; Bourgeois and Pinder 1983; Brown 1976; Pinder and Bourgeois 1982). Critics suggest that this conceptualization is flawed and is a result of using a view of language as representation (Alvesson et al. 2000: 141; Astley et al. 1992: 444; Gergen et al. 1996: 361).

These critics argue that a representational view of language distorts and obfuscates our knowledge of organizations. It portrays theories and methods as having only denotative value and underemphasizes how theory and method are deeply entwined conceptually and in practice. As a result, the process of organizational analysis becomes over-concretized as researchers treat organizational theories and methods as descriptions and tests of reality (Manning 1979: 661; Morgan 1980: 619). Such pretension may tend to anaesthetize us to the way in which the language of a community sustains tacit agreement to dominant paradigms, thus shaping and influencing scientific inquiry (Chandler 2002: 124; Kuhn 1970; Lakoff and Johnson 1980; Morgan 1980: 613). For example, we sometimes forget that the labels and categories we invent such as “OB” and “OT”, or “micro” and “macro”, are only that: human inventions to manage organizational phenomena. Moreover, sometimes we reify these categories; we take them as literal or “real”, ignoring their figurative and metaphorical aspects (Pondy and Mitroff 1979: 21).

2.1 A rhetorical view of theory and method

Focusing on discourse and its role in organizational science may solve many of the aforementioned problems (Alvesson et al. 2000: 138-140; Astley et al. 1992: 444-445; Gergen et al. 1996: 361-362). We argue for a rhetorical view of organizational science that details the role of rhetoric in theory and method. Rhetoric is “discourse calculated to influence an audience toward some end” (Gill and Whedbee 1997: 157). A rhetorical perspective emphasizes the role of language in scientific inquiry, and views theory and method as essentially discursive acts (Feyerabend 1993; McCloskey 1998). From a rhetorical perspective, theoretical terms are more than simply labels that correspond with facts disclosed by experience. The rhetoric of a theory contributes to the construction of facts by shaping our perception and experience (Brown 1990; Enos 1996: 438-439). Similarly, methods are not tools for evaluating the correspondence of theoretical statements to external reality. Methods are rules for connecting two sets of discourse: theoretical statements and observation reports (Brown 1976: 183-184; Campbell 1957; Feyerabend 1993; Hacking 1975: 118-120).

We argue that rhetoric in general and tropes in particular shape theories and govern the connection of theoretical statements to observation reports. Following Manning (1979), Morgan (1980; 1983), and Tsoukas (1991; 1993) among others, we view tropes as more than merely literary devices or figures of speech. Tropes are *figures of thought*; they constitute and establish ‘objects’ (Burke 1969b; Manning 1979; White 1978). Tropes are inextricably linked with cognition (Enos 1996: 439-443; Lakoff 1987; Lakoff et al. 1980), and thus with the development of organizational science. Within this framework, organizational science is viewed as an act of persuasion and organizational scientists as rhetors using tropes to create theories and methods.

For the sake of brevity, we focus on the four master tropes: metaphor, metonymy, synecdoche, and irony. We develop propositions that show links between the variation in the four master tropes and how we rationalize theory and method – and ultimately, how we institutionalize organizational paradigms. We use the term paradigm in a Kuhnian sense to describe the consensus among scientists over exemplary research problems and solutions (Kuhn 1970: 13). We propose that scientific discourse moves from figurative to literal and back to figurative, following a distinctive sequence from metaphor to metonymy to synecdoche to irony. For instance, we theorize that the frequency of metaphor use in scientific discourse is highest at the beginning of new paradigms, and the frequency of irony use in scientific discourse is highest when researchers suggest transitioning from old paradigms to new ones. Finally, we discuss the implications of our model for scientific research.

3. A rhetorical theory of organizational science

3.1 Rhetoric of inquiry

Although some scholars suggest that language in general and tropes in particular play no part in creating that which they describe (Brown 1976: 171; Enos 1996), the rhetorical perspective used here proposes that tropes are unavoidably implicated in the construction and comprehension of the world because perception itself is embedded in linguistic conventions (Burke 1969a; Burke 1969b; Lakoff et al. 1980; Nietzsche 1990; Ortony 1993; Richards 1965; Sapir and Mandelbaum 1949: 162; Vico 1984; White 1978; Wittgenstein 1963). Building upon these ideas, we suggest that tropes are essential for the conduct of science, because their use is essential for engaging, organizing and understanding the world (Brown 1976: 178; Lakoff et al. 1980; Manning 1979; Morgan 1983: 601; Nietzsche 1990: 888-896; O'Neill 1997: 217; Oswick, Keenoy, and Grant 2002: 295; Tsoukas 1991; Vico 1984). Tropes generate 'imagery' with connotations over and above any 'literal' meaning (Ortony 1975; Schon 1993). Once employed, a trope becomes part of a larger system of associations beyond our complete control (Chandler 2002: 124; Nietzsche 1990). Just as tropes orchestrate the interactions of signifiers and signifieds in discourse (Enos 1996: 439; Silverman 1983: 87), we propose that tropes shape the interplay of theory and methods because each trope determines what can be known and how we can know it (Foucault 2002; Manning 1979; Morgan 1983: 601; Nietzsche 1990: 888-896).

3.2 The role of rhetoric in theory and methods

Trope as theory: Trope as theory shapes knowledge because it "turns" imagination and understanding, constructing parts of world as meaningful and other parts as insignificant (Manning 1979: 662-663; Morgan 1983: 602), emphasizing one of many interpretations that the scientist will "discover" (Astley et al. 1992: 448; Manning 1979: 661-669). Thus, different theoretical explanations may be attributed to different tropes used by the theorist (Astley et al. 1992: 448). For example, a strategic choice theorist might view a corporate merger as an organization adapting to and shaping the environment, whereas a population ecologist might view the same corporate merger as organizational death through environmental selection (Astley et al. 1992: 448).

Trope as method: Trope as method also shapes how we know (Morgan 1983: 602), because embedded within each trope are tools to investigate and obtain knowledge about the world (Nietzsche 1990: 888-896). In contrast to positivism, a tropological understanding of science suggests that methods are incapable of testing the correspondence of theoretical terms to reality (Brown 1976: 178-184). Methods actually test the correspondence of two realms of discourse: theoretical statements and observational reports (i.e., data) (Brown 1976: 183-184; Campbell 1957; Hacking 1975: 118-120). Within this formulation, theoretical discourse makes predictions about observational discourse as opposed to predictions about reality (Brown 1976: 180; Feyerabend 1993; Nietzsche 1990). Tropes provide the methodological rules and procedures for connecting these two discourses (i.e., theoretical statements and observation reports), and the criteria for judging the persuasiveness of this connection (Brown 1976: 180-186; Manning 1979: 661). Methods are conceptualized as essentially tropes or discursive acts, and each trope provides a different set of rules for making sense. For example, using statistical analysis or a sample to represent the whole often involves tropes that imply a probabilistic understanding of phenomena. Similarly, using narrative analysis or telling a story to describe the world often involves tropes that imply a plausible understanding of phenomena.

The relationship between theory and method: The relationship between theory and method depends upon the trope used. Tropes embedded in organizational theories influence the use of organizational methods, and tropes embedded in organizational methods influence the use of organizational theories. For instance, using a machine trope to create a theory will connote a view of reality as a concrete external structure, whereas using a theater trope may connote a view of symbolic structures and aesthetic interpretations (Morgan 1980: 493). Each trope invokes images for evaluating the connection of theory to data (observation reports) (Tsoukas 1991: 571). Thus, theories using an organization as machine trope may resonate with methods using tropes connoting external and behavioral variables. In contrast, theories using a theater trope may resonate with methods that use tropes that connote cognitions, feelings, and interpretations.

Similarly, tropes embedded in organizational methods will privilege theories using certain tropes. For instance, consider the dominance of the visual trope within modern ways of knowing (Derrida 1974; Kress and Van Leeuwen 1996: 168). This visual trope suggests that the world as we see it is

superior to the world as we hear it, feel it, or dream it (Derrida 1974;Kress et al. 1996: 168). The visual trope dominates conventional scientific methods, favoring theories that are 'observable': empirical in a visual sense. This relegates theories that emphasize ethics, intuitions, feelings, interpretations, and non-visual phenomena to a lower status. In sum, when researchers use tropes, they propose what is salient about the world as well as commit themselves to particular methods of investigation (Brown 1976;Burrell and Morgan 1979: 2;Morgan 1980: 493).

Tropological sequence: Building upon a tropological sequence first identified by earlier rhetoricians (Vico 1984;White 1973), we argue that the type of trope used in scientific discourse follows a distinct and measurable sequence: from metaphor to metonymy to synecdoche to irony. At initial stages, tropes are generative and figurative; they evaluate and make the unfamiliar familiar (Chandler 2002: 124;Harr e 1985: 172;Tsoukas 1991: 571). Over time, the way tropes familiarize and evaluate is forgotten or taken-for-granted as cognitive limits render the interpretation created by tropes to appear literal (Brown 1976: 175;Burke 1969b: 506;Chandler 2003;Nietzsche 1990: 888-896;Tsoukas 1991: 568-569). This resonates with arguments suggesting that the tropes we use to understand organizations "often become taken-for-granted such that the prefiguring image disappears from view, leaving the residual concepts as seemingly literal, objective features of organization" (Morgan 1996: 230). In sum, language is essentially figurative, yet over time it often appears literal (Nietzsche 1990: 888-896).

We propose that the language of science moves from figurative to literal and back to figurative, following the distinctive sequence from metaphor to metonymy to synecdoche to irony. This sequence illustrates how tropes as theory and method produce and validate social and organizational facts. We further argue that a tropological understanding of organizational science provides far more insight into how knowledge is institutionalized for scientists and their audiences than about the 'external reality' under investigation (Cassirer 1953;Manning 1979: 660-669;Morgan 1980: 610;Nietzsche 1990: 888-896).

In the following sections, we describe, how, at different stages of scientific inquiry, the four master tropes (i.e., metaphor, metonymy, synecdoche, and irony) operate as theory and method. We use Charles S. Peirce's model of logic and scientific inquiry as semiosis: the relationship of signifier and signified in the methods of abduction, deduction, and induction (Peirce, Houser, and Kloesel 1992a: 186-199;Peirce, Houser, and Kloesel 1992b: xx, 106;Peirce and Ketner 1992c: 146). We use Peirce's model because he describes scientific inquiry as a series of distinct stages, and associates each stage with a method of reasoning. We add to Peirce's formulation the dialectic method (Mitroff and Mason 1981). We argue that the interplay of theory and methods follows a particular sequence of metaphor, metonymy, synecdoche, and irony. Each of these tropes is often connected to a particular type of discursive reasoning. Metaphor resonates with abduction, metonymy with deduction, synecdoche with induction, and irony with dialectic. Note that the tropological sequence is also consistent with Charles S. Peirce's sequence of scientific method (Peirce et al. 1992b: 106). According to Peirce, a scientific theory begins with an abduction or a hypothesis; the next phase involves deducting the consequences of the hypothesis; and the third phase involves inductive testing of the hypothesis (Peirce et al. 1992b: 106). Thus, the type of trope exhibited by a theory or method illustrates the dominant type of discursive reasoning taking place. Finally, we construct four propositions that show how theory and method follow the tropological sequence and model the institutionalization of organizational paradigms.

4. A tropological model of theory and methods

4.1 Metaphor

A metaphor is a tool for knowing one thing in terms of something else, by bringing out the "thisness of a that, or the thatness of a this" (Burke 1969b: 503;Lakoff et al. 1980). It triggers a particular mode of thought or perception (Burke 1969b: 503;Jakobson 1971: 494;Lakoff 1990: 47-51). Metaphor combines at least two "semantic domains," creating and constructing new meanings (Cornelissen 2004). Metaphor is also "a basic structural form of experience through which human beings engage, organize, and understand their world" (Brown 1976: 170;Morgan 1983: 601). For example, organizational researchers use metaphor when they describe organizations as machines or organisms (Morgan 1983: 614-615). The trope of metaphor operates as theory, explaining and highlighting plausible relationships between two sets of discourse: theoretical terms and observation reports (Berger and Luckmann 1966;Brown 1976: 180;Tsoukas 1993: 325). For example, the

mechanistic metaphor employed by the rational systems paradigm emphasizes design and calculation, whereas the organic metaphor employed by the natural systems paradigm emphasizes evolution and spontaneity (Scott 1992: 28, 75). Within this framework, a new theory is essentially a metaphor and the connotations it evokes determine its persuasiveness (Harr e 1985; Keeley 1980; Tsoukas 1991: 570). The trope of metaphor also operates as method. Metaphor provides methodological rules for connecting two sets of discourse: theoretical statements and observation reports. These rules are essentially discursive practices that evaluate the plausibility of hypothesized relationships between theoretical terms and observation reports (Brown 1976: 180-184; Morgan 1980: 611-612; Tsoukas 1991: 570). This evaluation process resonates with the method of abduction (Peirce et al. 1992a: 186-189). Where abductive inference plausibly connects two premises (facts/observation reports) through an explanation (Peirce et al. 1992a: 186-200), metaphor plausibly connects the signified of the source (one premise) with the signified of the target (another premise) (Enos 1996: 439-441; Tsoukas 1991: 573).

Population ecology arguments (Hannan and Freeman 1977; Tsoukas 1991: 580) describing organizations as organisms provide an excellent example of theory and method as metaphor. For instance:

Premise 1 (Observation Report): Species of organisms (A) are subject to variation (C)

Premise 2 (Observation Report): Species of organizations (B) are subject to variation (C)

Metaphoric or Abductive Inference (Theoretical Statement): Species of organizations (B) are like species of organisms (A)

As graphically shown in the metaphor column of Figure 1, the signifier Organisms, represented by circle (A), and the signifier Organizations, represented by circle (B), are connected to the same signified Variation, represented by circle (C) (see Figure 1). Specifically, Premise 1 connects the signifier Organisms (A) to the signified of Variation (C), whereas Premise 2 connects the signifier Organizations (B) to the signified of Variation (C).

Trope	Metaphor	Metonymy	Synecdoche	Irony
Method of reasoning	Abduction	Deduction	Induction	Dialectics
Premise 1				
Premise 2				
Inference				
Conclusion				
Inference	Plausible	Certain	Probable	Contradictory
Relationship between the signifier and the signified	~ (is like)	=> (implies)	= (is)	≠ ~ => = Self Referential

Figure 1: Tropological interplay of theory and method

This allows the researcher to infer that the two signs, Organisms (A) and Organizations (B), are related in a plausible way. As theory, this metaphor explains the less familiar sign "Organizations" with the more familiar sign "Organisms" (Tsoukas 1991: 573). Within this metaphoric argument, the

signifier and signified of the unfamiliar sign “Organizations” are loosely coupled. Connecting the signified of Variation (C) to the sign of Organizations (B) and the sign of Organisms (A), allows for the syllogism¹ to slide the signified of Organisms under the signifier Organizations in the abductive claim that “species of organizations are like species of organisms” (Peirce et al. 1992a: 186-199).

This metaphorical or abductive syllogism also demonstrates the methodological rule for seeing one thing (Organizations) like another (Organisms). Specifically, two subjects, Organizations and Organisms, are connected to the same predicate Variation in order to make one subject Organisms the predicate of the other subject Organizations. Methods such as narrative analysis and grounded theory often operate under this methodological rule (Ricoeur 1984). For example, narrative analyses connect subjects or seemingly independent aspects of social phenomena: events, causes, and characters, into a predicate or coherent story, helping researchers see new patterns, develop new hypotheses, and make abductive inferences. The validity and reliability of narrative analyses are based on the plausibility, not the certainty, of these inferences. Thus, narrative analyses are flexible enough to handle uncertainty and to elicit the imagination of the audience (See Table 1).

Table 1: Tropes and the type of method

Trope	Metaphor	Metonymy	Synecdoche	Irony
Inference	Abduction	Deduction	Induction	Dialectics
Tools	Narratives, Stories and anecdotes, Metaphorical analysis, Grounded theory	Algorithm, Simulation, Optimization, Mathematical modeling, Linear programming	Experimentation, Case study, Content analysis, Interview, and Statistical methods such as sampling, regression, variance analysis	The Socratic method, Satire, Ethics, Aesthetics, Epistemology, Ontology

As shown in Table 1, each trope is categorized by its particular type of inference or discursive reasoning, as well as the organizational methods that utilize these discursive rules.

Conceptualizing metaphor as theory and method provides insight into the interplay of theories and methods, as well as into the types of theoretical and methodological constructs that dominate various stages of paradigm development. For instance, at the beginning stages of new paradigms, metaphors provide lenses through which researchers make sense of the novel (Giddens 1993;Manning 1979: 661;Morgan 1983: 602;Morgan 1996: 228;Tsoukas 1993: 324-325;White 1978: 72). At this stage, researchers build their own perspective from scratch for there are no common, institutionalized, taken-for-granted set of values, beliefs, techniques, and guidelines (Kuhn 1970: 13). Applying these ideas to organizational inquiry suggests:

Proposition 1: The frequency of metaphor use in theory and method (e.g., narratives, stories, anecdotes) will be highest at the beginning of new paradigms.

Metaphors require enormous cognitive resources and interpretative efforts (Brown 1976: 173;Chandler 2003;Oswick et al. 2002: 299). As researchers become familiar with the new phenomenon, and their understanding begins to institutionalize, they begin to take-for-granted certain aspects of the metaphor (Chandler 2003;Morgan 1980: 612;Nietzsche 1990: 896). We suggest that the researcher’s language changes to reflect this increased taken-for-grantedness. Specifically, researchers’ overall use of metonymy begins to increase, which demonstrates a more specific and detailed relationship between the target and source of the metaphor (Tsoukas 1991: 573). In sum, metaphors prefigure the subject under study, creating the context for further elaboration and specification by metonymy, synecdoche, and irony (Brown 1976: 173;Manning 1979: 661;Morgan 1983: 602-603).

4.2 Metonymy

Once a metaphor provides a plausible framework for making sense of unfamiliar phenomena, scholars elaborate and analogize the conceptual scheme implied by the metaphor, moving from

¹ A syllogism is an argument consisting of three stated propositions: a major premise, a minor premise and a conclusion (Aristotle, 1991)

similarities to more concrete and literal identities (Tsoukas 1991: 572, 581). Where metaphor unlocks a domain of understanding and implies a relationship of similarity, metonymy elaborates the details of structural correspondences and shows relatedness through direct association or contiguity (Chandler 2003; Cornelissen 2004; Jakobson 1971: 91-95; Morgan 1996: 228-231; Oswick et al. 2002: 295). For example, the organization-as-machine metaphor might elicit the metonymic phrase 'managers fix organizational problems' (Morgan 1983: 60). This metonymical phrase directly associates engineers with managers, and breakdowns with problems. If an organization is like a machine, then managers fix organizational problems like engineers fix mechanical breakdowns. This builds upon the metaphoric similarity of machines and organizations, and details how machines are related to organizations by directly associating managers with engineers.

The trope of metonymy operates as theory, elaborating the plausible relationships implied by metaphor. This elaboration arranges theoretical statements such that observation reports are predicted (Brown 1976: 180). In a sense, the plausible explanation of metaphor is transformed into a prediction that is logically certain (Brown 1976: 180; Tsoukas 1991: 582).

The trope of metonymy also operates as method. Like metaphor, metonymy provides methodological rules for connecting theoretical statements and observation reports. These rules are essentially discursive practices that evaluate the certainty of predicting observation reports from theory (Brown 1976: 180; Tsoukas 1991: 577, 581, 582). This evaluation process is consistent with the method of deduction (Peirce et al. 1992b: 216). Where deductive or metonymic inference moves from whole to parts, predicting with certainty an observation report from two premises (Peirce et al. 1992a: 186-200), metonymy connects two signifieds in a contiguous or direct relationship of whole to parts (Burke 1969b: 506; Manning 1979: 661; Morgan 1983: 602; Oswick et al. 2002: 295).

Prefigured by the metaphor of organizations as organisms, population ecology predictions of organizational extinction provide excellent examples of theory and method as metonymy (Hannan et al. 1977; Tsoukas 1991: 580). For instance:

Premise 1 (Observation Report): Species of organisms (A) go extinct (C)

Premise 2 (Theoretical Statement): Species of organizations (B) are like species of organisms (A)

Metonymic or Certain Inference (Predicted Observation Report): Species of organizations (B) must go extinct (C)

As graphically shown in the metonymy column of Figure 1, the signified of Extinction (C) is connected to the signifier Organisms (A). The signifier Organisms (A) then becomes the signified of the signifier Organizations (B). This allows the researcher to infer that the signified of Extinction (C) is connected to the signifier Organizations (B) in a distinct and certain way. Within this metonymic argument, the signified of Extinction (C) is deduced or necessarily implied by the signifier Organizations (B). Connecting the signifier Organisms (A) to the signified of Extinction (C), and the signifier Organizations (B) to the signified of Organisms (A), allows the syllogism to connect the signified of Extinction to the signifier Organizations in the deductive prediction that "species of organizations go extinct" (Peirce et al. 1992b: 216; Tsoukas 1991: 580).

This metonymical or deductive syllogism demonstrates the methodological rule for having one thing (Organizations) imply another (Extinction). Specifically, Extinction is made a predicate of the subject Organisms, and Organisms is made a predicate of the subject Organizations. This allows the researcher to infer that the Extinction is also a predicate of Organizations. Methods that make use of mathematical models or simulations often operate under this methodological rule (Lakoff and Nunez 2000: 74-75) (see Table 1). Specifically, behaviors, properties and relationships are made into predicates of subjects like variables, constants, and functions. These variables, constants, and functions are then made predicates of subjects like simulations or mathematical models. This allows for simulations or mathematical models to stand for behaviors, properties, and relationships in the social phenomena. Researchers, without knowing the particulars of each case, interpret changes in the mathematical models or simulations as deductive (certain) inferences and predictions about social phenomena. For example, sensitivity analyses and objective functions are often used to describe and predict organizational outcomes.

Theoretically and methodologically, accepted metonymies move us one step further along the process of inquiry (Tsoukas 1991: 572;Tsoukas 1993: 339). Initially prefigured by metaphor (Morgan 1983: 603;Oswick et al. 2002: 296), metonymy as theory reduces the similarity implied by a metaphor to a more literal or related sense (Burke 1969b: 506). This allows us to build a more scientific or exact theoretical model from the metaphorically created conceptual model, because metaphors cannot directly explain or predict (Tsoukas 1991: 572- 582;Tsoukas 1993: 339). Applying these ideas suggest the following:

Proposition 2: The frequency of metonymy use in theory and method (e.g., simulation, mathematical modeling) will be highest during the development phase of paradigms.

In sum, metonymic models are a necessary step in turning metaphorical insights into scientific knowledge about organizations and furthering the maturation of a new paradigm (Tsoukas 1993: 336). Assuming that the paradigm is progressing and not in decline, the transition of metaphors to metonymies indicates that researchers are beginning to take for granted the substitution of one sign for another sign (Morgan 1983: 603). This increase in taken-for-grantedness mirrors the increase in the familiarity and naturalness of the metonymy (Lodge 1977: xiv). Overtime, metonymic models become taken-for-granted as researchers' explanations institutionalize into synecdochic or apparently literal and concrete descriptions.

4.2.1 Synecdoche

The definition of synecdoche varies from theorist to theorist (Burke 1969b: 508;Chandler 2002;Enos 1996: 712;Jakobson and Halle 1971: 95;Manning 1979: 661). We define synecdoche as the substitution of the parts for the whole, where the elements are linked to something wider (Chandler 2003;Morgan 1980: 602;Oswick et al. 2002: 295). Synecdoche is often associated with representation and quantification, and reflects the closest link that a signifier can have with a signified (Burke 1969b: 503;Chandler 2003). Any attempt to represent reality by treating a single example as the microcosm of a larger whole can be seen as involving synecdoche (Manning 1979: 662). Organizational researchers use synecdoche when they expand meaning from a part to a whole (Manning 1979: 661), for example when they interpret a change in stock price as a change in organizational performance.

As theory, synecdoche operationalizes the metonymy or conceptual scheme prefigured by the metaphor (Manning 1979: 661;Morgan 1980: 607). The conceptual scheme is collapsed or reduced into its measures (Brown 1976: 181;Burke 1969b). This connects the particulars of actual observation reports to more generalized hypotheses (i.e., theoretical statements) metonymically deduced from the metaphor.

Like metaphor and metonymy, the trope of synecdoche also operates as method, providing methodological rules for connecting the theoretical and observational discourses. These rules are essentially discursive practices that evaluate the probability that the actual observation reports support the theoretical statements (Tsoukas 1991: 572). This evaluation process is consistent with the method of induction (Peirce et al. 1992a: 186-199). Where inductive inference moves from parts to whole, deriving theoretical statements that follow probabilistically from two premises or observation reports (Peirce et al. 1992a: 186-200), synecdoche connects signifieds into a probable relationship where "the part is taken as an accurate reflection of the whole" (Barthes 1974: 162;Chandler 2003;Jakobson et al. 1971).

Prefigured by the metonymic inference "species of organizations go extinct", population ecology tests of organizational bankruptcy as organismic extinction (Hannan et al. 1977;Tsoukas 1991: 580) provide an excellent example of theory and method as synecdoche:

Premise 1 (Predicted Observation Report): Species of organizations (B) go extinct (C)

Premise 2 (Actual Observation Report): Species of organizations (B) go bankrupt (A)

Synecdoche or Probable Inference (Theoretical Statement): Bankruptcy (A) is extinction (C)

As graphically shown in the synecdoche column of Figure 1, two signifieds Bankruptcy (A) and Extinction (C), are connected to the same signifier Species of Organizations (B). This allows the researcher to infer that the two signs Bankruptcy (A) and Extinction (B) are related in a probabilistic

way, because at least some species of organizations have gone bankrupt and extinct. Within this synecdochic argument, the signifier Species of Organizations (B) is connected to the signified of Bankruptcy (A) and the signified of Extinction (C). This allows organizational bankruptcy, a likely form of organizational extinction, to operationalize or represent organizational extinction. Connecting the signifier Species of Organizations to the signifieds of Extinction and Bankruptcy simultaneously, allows for the syllogism to represent the signified of Extinction with the signifier Bankruptcy in the inductive claim that “bankruptcy is extinction.”

This synecdochic or inductive syllogism demonstrates the methodological rule for taking the part (Bankruptcy) as an accurate reflection of the whole (Extinction). Specifically, two predicates, Extinction and Bankruptcy, are connected to the same subject Species of Organizations in order to make one predicate Bankruptcy the subject of the other predicate Extinction. Methods such as statistical analysis, case studies, and experimentation, which proxy and test hypothesized and predicted relationships with actual observation reports often operate under this methodological rule (see Table 1). For example, hypothesized and predicted social behaviors, properties, and relationships are made into predicates of subjects like populations. Similarly, samples, experiments, and case studies are also made into predicates of subjects like populations. This allows us to make predicted social behaviors, properties, and relationships a predicate of subjects like samples, experiments and case studies. Researchers interpret the information contained in the samples, experiments, and case studies to make inductive (probabilistic) inferences about the social behaviors, properties, and relationships in the population.

Conceptualizing synecdoche as theory and method moves us another step in the process of inquiry. In the early stages of an organizational paradigm, metaphor creates new insights that are conceptually modeled with metonymy. Over time, the initial metaphor and the metonymic implications prefiguring synecdoche are institutionalized and thus taken-for-granted. The use of synecdoche implies a relationship of quantitative and representational convertibility (Burke 1969b: 508), where the signifier is equated with the signified. The signifier and signified appear denotative or literal as the figurative aspects of earlier tropes are forgotten (Morgan 1980: 612). Applying these ideas to organizational inquiry suggests:

Proposition 3: The frequency of synecdoche use in theory and method (e.g., statistical method, case study, experimentation) will be highest during the maturity phase of paradigms.

In the conduct of normal science, metaphor, metonymy, and synecdoche institutionalize a paradigm by transforming figurative and connotative explanations into literal and denotative descriptions. However, literal descriptions provide the foundation for anomalies (i.e., tolerable aberrations from the ruling belief system) – observation statements that violate “the paradigm-induced expectations that govern normal science” (Kuhn 1970: 52). Anomalies offer a “means of exploring previously unthought, overshadowed, or marginalized possibilities” (Oswick et al. 2002: 296). As anomalies increase, organizational researchers may begin to realize the limits of their theoretical explanations, eventually questioning the initial metaphor and its taken-for-granted aspects in radical and novel ways (Oswick et al. 2002: 296). This leads to the use of the trope of irony, which questions the institutionalized or ‘literal’ connection of the signifier and the signified (Enos 1996: 357; Manning 1979: 662; White 1978: 73).

4.3 Irony

Irony is the “most radical of the four master tropes” (Chandler 2002: 134) as it typically signifies the opposite of its literal signification (Enos 1996: 355-357). It juxtaposes opposites “such that in the silence between the two, the deeper meaning of both may emerge” (Brown 1987: 173-174). For example, consider Willmott’s assertion that managers empower subordinates who then act in accordance with management’s expectation (Oswick et al. 2002: 299; Willmott 1993). The connotations of our normative understanding of empowerment are juxtaposed against the connotations of empowerment taking place in organizations. The writer entreats the reader to take a perspective of perspectives. As theory, irony allows us to comprehend difference in similarity and involves the interplay of opposites that create insight through paradox and contradiction (Brown 1989; Oswick et al. 2002: 296). For example, when we talk about anarchy as an organizational form (Morgan 1983: 602), we recognize that the connotations of anarchy are in contradiction to the connotations of organizations. This takes the audience to the “cognitive discomfort zone” (Oswick et al. 2002: 299),

challenging conventional assumptions (Putnam 1992: 109). Consider another example: Pundy and Mitroff argue that the metaphor of an open system is insufficient to understand organizations, and therefore, we need to go “beyond” it (Pundy et al. 1979). But what is *beyond* an *open* system? The writers place the connotations of these terms in contradiction, creating both a new perspective and a perspective of perspectives. In sum, there are two conversations, two contexts, two perspectives. Thus, the connotations of the ironic sign are derived from more than its context, but context of contexts, demanding “an intuitive *reflexivity* about the deceptive character of appearances” (Oswick et al. 2002: 299).

The trope of irony also operates as method. Like the other tropes, irony provides methodological rules for connecting theoretical statements and observation reports. These rules are essentially discursive practices that evaluate how hypotheses connect as well as fail to connect to observation reports. Specifically, irony allows the researcher to see a paradigm “from the viewpoint of its antithesis” (Putnam 1992: 108). This evaluation process is consistent with the method of dialectical reasoning (Brown 1987: 172-173; Burke 1969b: 503). Where dialectic infers a contradictory theoretical statement from two premises, irony connects a signifier to diametrically opposed signifieds. This shows that something is and is not, revealing the power of language both to obscure and to clarify (White 1973: 37).

For example, consider the following argument,

Premise 1 (Observation Report): Bankrupt organizations (A) are extinct organisms (C)

Premise 2 (Observation Report): Bankrupt organizations (A) are not extinct organisms (C)

Irony or Contradictory Inference (Theoretical Statement): Species of organizations (A') are species of organisms that don't go extinct (C')

As graphically shown in the irony column of Figure 1, the signifier Bankrupt Organizations (A) is and is not connected to the signified of Extinct Organisms (C). This allows the researcher to infer that the signifier Bankrupt Organizations (A) has and does not have the property signified by Extinct Organisms (C). The contradictory connection between the signifier Bankrupt Organizations (A) and the signified of Extinct Organisms (C) also triggers a conversation about conversations, thereby allowing the researcher to question the plausibility of the organism metaphor and to realize that the sign Organizations (A') is and is not connected to the sign of Organisms (C').

The ironic syllogism demonstrates the methodological rule for the juxtaposing of opposites. Specifically, the subject (Bankrupt Organizations) is and is not connected to the same predicate (Extinct Organisms) in order to initiate a conversation in which the taken-for-granted connection between the subject (Organizations) and its predicate (Organisms) is contradicted. The Socratic Method and methods such as satire operate under this methodological rule. These methods often initiate self-reflective conversations that question the ethical, aesthetic, and scientific aspects underlying researchers' choice of theories and methods, or research problems and solutions. Researchers interpret these conversations to make dialectical inferences about scientific theories and methods, and their scientific community.

Theoretically and methodologically, ironies move us another step along the process of inquiry by destabilizing old paradigms, and creating space for new metaphors and paradigms (Brown 1989: 172). Where synecdoche reflects the solution of puzzle solving activities such as hypothesis testing (Morgan 1980: 606), irony indicates the rise of anomalies. Specifically, as anomalies are detected, researchers may use irony to question the community's taken-for-granted conceptions underlying normal science research and/or its practical implications (Enos 1996: 357; Kuhn 1970: 62-64, 82; Oswick et al. 2002: 299). This questioning does not result from a Popperian falsification (Popper and Bartley 1993) or an inability to connect theoretical statements to reality, but from a Kuhnian discursive re-interpretation of theoretical statements and observation statements within a different paradigm or metaphor (Kuhn 1970: 77).

As theory, irony demonstrates that “any signified can become a signifier” (Brown 1987: 187; Eagleton 1981: 160). Where the other tropes shift what is being referred to, irony refers to itself or the act of referring (Chandler 2002: 134-136). It creates a sign for the act of signification. This invites a

conversation about conversation, decoupling interpretation from the interpreter, evaluating the intentions and perceived truth status of a paradigm (Chandler 2002: 135;Oswick et al. 2002: 301). Irony allows researchers to interpret inconsistent results as more than just an anomaly, thus increasing the potential development of new paradigms. Applying these ideas to organizational inquiry suggests:

Proposition 4: The frequency of irony use in theory and method (e.g., satire, the Socratic Method) will be highest when researchers suggest transitioning from an old paradigm to a new paradigm.

Irony reminds us that the Cartesian method for deriving absolute truth is a fiction (Nietzsche 1990;Quinn 1996;Taylor 1991), because paradigm choice cannot be “forced by logic and neutral experience” (Kuhn 1970: 150). This does not mean that paradigm choice is an irrational act. On the contrary, scientists must be persuaded to accept a new paradigm, and this persuasion involves more than scientific arguments such as accuracy, precision, and generalizability. It also involves a broader notion of reason that includes arguments based on aesthetics, ethics, and emotions (Kuhn 1970: 152-155;McCloskey 1998:30;Taylor 1991). Irony also focuses attention to the incommensurability of paradigms, highlighting the socio/psychological factors underlying the choice of research problems and the acceptability of particular solutions (Kuhn 1970: 111-126 & 148-160).

4.4 The sequence of tropes

Propositions 1 – 4 describe a distinct relationship between language and the conduct of organizational inquiry. Figure 2 illustrates this relationship. The Y1-axis represents the taken-for-grantedness of a paradigm (see Green Jr. 2004, for rhetorical techniques that may be used to operationalize taken-for-grantedness). The Y2-axis represents the change in the frequency of trope use over time.

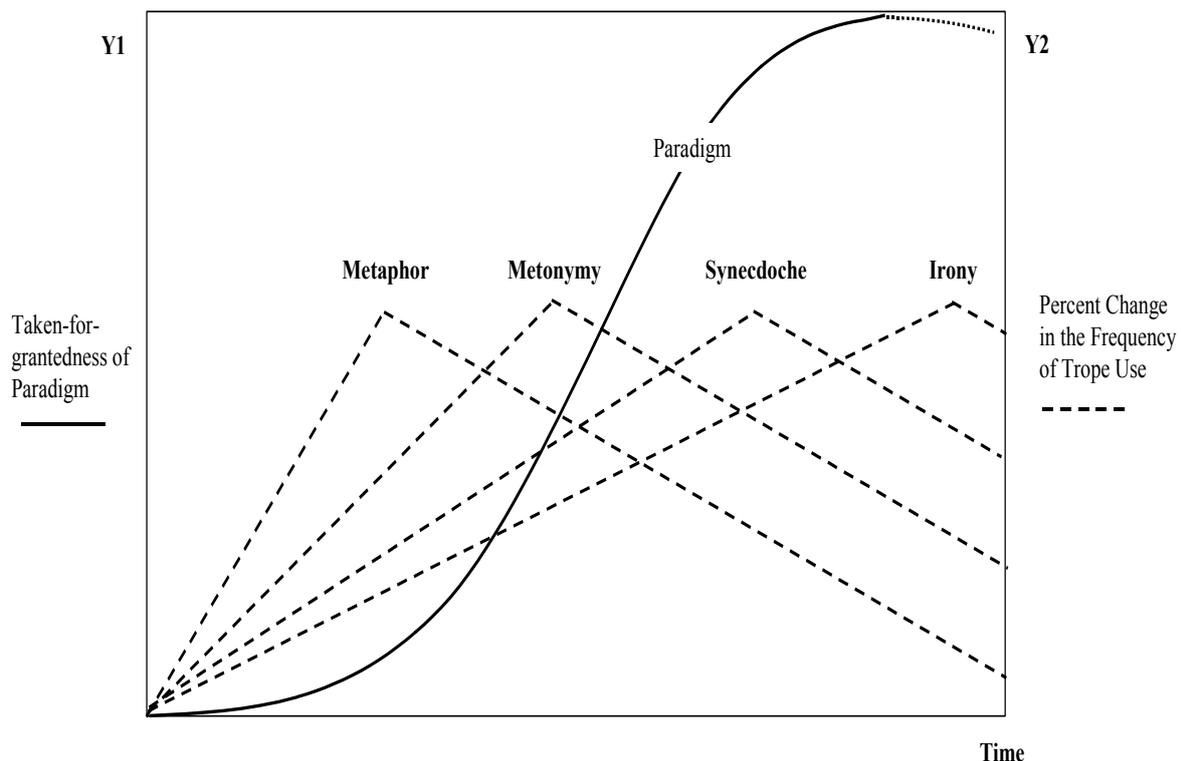


Figure 2: The tropological sequence

The beginning of a new paradigm is marked by increased use of metaphor to create new theory that explains the unfamiliar in terms of the familiar. At this stage, the method of abduction dominates. Thus, plausible stories and narrative analyses are more persuasive vehicles for making sense. At the development stage of a paradigm, researchers within the paradigm take the metaphor for granted and use metonymy to create conceptual models for relationships. The use of metonymy indicates an increased familiarity and comfort with the metaphor. At this stage, the method of deduction dominates,

and mathematical models or simulations that emphasize certainty are more persuasive. As the paradigm reaches its highest level of institutionalization, researchers use synecdoche. Synecdoche operates as denotation, measuring, quantifying, operationalizing, and testing the generality of metonymic explanations. At this stage, the method of induction dominates, and experiments or statistical analyses are more persuasive. This provides a probabilistic test of whether patterns in the actual observation reports can serve as proxies for metonymic explanations. The use of synecdoche indicates the strongest connection between a signifier and a signified, and thus reflects the highest level of taken-for-grantedness. In sum, researchers move from a tenuous belief in a paradigm to a highly institutionalized and taken-for-granted acceptance of a paradigm. Within this framework, the use of metaphor, metonymy, and synecdoche may comprise what Kuhn has described as “normal science” (Kuhn 1970;Morgan 1980: 607). As shown in Figure 2, the level of taken-for-grantedness, or proportion of research studies as percent of all research studies, peaks during this period as more and more scientists engage in normal science research.

Proposition 4 suggests that the trope of irony may mark the transition from normal science to revolutionary science (Brown 1989: 173-174;Oswick et al. 2002: 299). Although the tropes underlying a highly institutionalized paradigm appear frozen, the use of irony unfreezes the literal and denotative aspects of the paradigm, highlighting and emphasizing the paradigm’s figurative core (Enos 1996: 357;Manning 1979: 669). Researchers realize that normal science proceeds by ignoring the figurative characteristics of language (Brown 1987: 114-115). At this stage, methods that trigger self-reflective conversations help researchers reinterpret established paradigms.

In sum, the tropological sequence suggests that scientific language is initially metaphorical or figurative, yet over time its figurative aspects are taken-for-granted reflecting a more literal or denotative scientific language, reducing, abstracting, and segmenting experience (Berger et al. 1966;Nietzsche 1990;Tsoukas 1993: 337). As a paradigm institutionalizes, concepts and conceptual relationships appear more and more literal and denotative of the world. Finally, the use of irony uncovers the illusion of this literalization created by metaphors, transformed by metonymies, and operationalized by synecdoches. In a sense, the tropological sequence suggests that scientific knowledge is built like a house of cards. The foundational cards are taken as literal. Yet, there is always the possibility of transitioning back to a figurative state and thus reweaving the scientist’s *web of belief* (Quine and Ullian 1978;Tsoukas 1993: 339). In Table 2, we apply the tropological sequence to Scott’s threefold typology of organizational paradigms: rational, natural, and open systems (Scott 1992: 28). Table 2 illustrates the generalizability of our framework, by showing a set of syllogisms that model the tropological sequence for each of these three paradigms.

5. Discussion

5.1 A rhetorical theory of organizational science

The rhetorical theory of organizational science developed here attempts to make explicit the role and power of tropes in the inquiry process. This is important for the training of new researchers because an increased awareness of tropes in scientific language (theoretical statements, observation reports, and methods) marks the difference between using tropes and being used by them (Brown 1976: 175). For example, a deeper understanding of connotations triggered by different tropes may help researchers define more persuasive research constructs and variables, and understand why some research problems and solutions are more persuasive than others.

Implications of the sequence: The tropological sequence suggests that the familiar parts and source of metaphors may be closer to the center of the scientist’s *web of belief*—taken-for-granted or highly institutionalized—but no closer to the truth than the unfamiliar parts and target of metaphors (Nietzsche 1990: 888-896;Quine et al. 1978). Theories, methods, and the knowledge they produce are made truthful through language (Brown 1990). This stance resonates with arguments that conceive of truth as discursively produced (Burke 1969b: 503;Feyerabend 1993;Foucault 1984: 72-75;Nietzsche 1990: 888-896;Wittgenstein 1963). It also rejects the illusion of a fixed method of scientific inquiry and the notion that empirical observations are self-evident (Bartunek, Bobko, and Venkatraman 1993: 1366;McCall and Bobko 1990: 412;McCloskey 1998: 22-23). In other words, ‘facts’ and empirical observations do not ‘speak for themselves’: organizational researchers use rhetoric to rationalize and legitimize their ontological and epistemological status (Brown 1976;Manning 1979: 661, 668;McCloskey 1998: 51-52). The persuasiveness or truth of a fact is determined by the paradigmatic interpretations or social conventions of a community (Astley et al. 1992:445;Brown

1976;Foucault 1984;Kuhn 1970;Nietzsche 1990). Thus an organizational ‘truth’ produced by organizational science provides far more insight into what is persuasive to organizational scholars and their audiences, than it does into the features of organizations that scientists anthropomorphically deemed salient.

Table 2: Examples of paradigms as tropological arguments

	Rational	Natural	<i>Open</i>
Metaphor	Machines (A) are designed to attain specified goals (C) Organizations (B) are designed to attain specified goals (C) Organizations (B) are like machines (A)	Natural systems (A) grow and evolve (C) Organizations (B) grow and evolve (C) Organizations (B) are like natural systems (A)	Open systems (A) interact with their environment (C) Organizations (B) interact with their environment (C) Organizations (B) are like open systems (A)
Metonymy	If machines (A) have mechanical parts that have no meaning and no function separate from the machine (C) And organizations (B) are like machines (C) Then organizations (B) must have mechanical parts that have no meaning and no function separate from the organization (C)	If natural systems (A) satisfy their essential needs (C) And organizations (B) are natural systems (A) Then organizations (B) must satisfy their essential needs (C)	If open systems (A) adapt to their environment (C) And organizations (B) are open systems (A) Then organizations (B) must adapt to their environment (C)
Synecdoche	Organizations (B) have mechanical parts that have no meaning and no function separate from the organization (C) Organizations (B) have employees (A) Employees (A) are mechanical parts that have no meaning and no function separate from the organization (C)	Organizations (B) satisfy organizational needs (C) Organizations (B) have structures (A) Organizational structures (A) satisfy organizational needs (C)	Organizations (B) adapt to their environment (C) Organizations (B) increase differentiation and integration (A) Organizational differentiation and integration (A) are adaptations to the environment (C)
Irony	Employees of an organization (A) are parts of a machine (C) Employees of an organization (A) are not parts of a machine (C) Organizations (A') are and are not machines (C')	Structures of organizations (A) satisfy organizational needs (C) Structures of organizations (A) do not satisfy organizational needs (C) Organizations (A') are and are not natural systems (C')	Differentiation and integration in organizations (A) are adaptations to the environment (C) Differentiation and integration in organizations (A) are not adaptations to the environment (C) Organizations (A') are and are not open systems (C')

In addition, the tropological sequence questions the privileged role of skepticism in the conduct of science. Specifically, the sequence emphasizes the way metaphors engage the imagination, metonymies elaborate scientific models, and synecdochies operationalize hypotheses (see Brown 1976: 176). These processes require assent to many assumptions that may not be demonstrable. From a rhetorical perspective, a full-fledged skepticism appears to take place only when researchers transition from an old paradigm to a new paradigm. This transition is marked by the use of irony, which questions pre-ordained categories and un.masks metaphors (Brown 1976: 176;Oswick et al. 2002: 299). Remarkably, this emphasis of assent over skepticism resonates with philosophers of science who argue that conventional views of science overemphasize the role of skepticism at the expense of the role of assent in scientific inquiry (Booth 1974;Duhem 1954;McCloskey 1998;Quine 1980).

The relationship between theory and method: A rhetorical perspective sheds light on the complex relationship between theory and method. Specifically, a rhetorical perspective argues that ontology and epistemology are inseparable, and thus, theory and method are deeply connected. Furthermore, this connection is embedded in figures of thought such as tropes, which shape what we know and how we know it (Chandler 2003: chapter 8;Manning 1979: 661). In other words, tropes make knowing, and hence theory and method possible by providing both form and content to thought.

As shown in Figure 1, the tropological interplay of theory and method takes four different forms. Specifically, each trope differs in the way that signifiers and signifieds are substituted (Chandler 2003: chapter 8). This substitution reflects changes in the context of reasoning (i.e., abductive, deductive, inductive, and dialectical); thus, the interplay of signifiers and signifieds mirrors the interplay of theory and method. In a sense, the connotations of each trope provide a creative and predictive logic that simultaneously enables and constrains how researchers reflect on organizations. This resonates with formulations that suggest that methods and theory are profoundly interconnected (Bartunek et al. 1993: 1364; Drazin and Kazanjian 1993: 1374). As mentioned above, many scholars argue that theory and method can generate and shape each other. At the very least, the choice of a theory entails a particular set of methods, and the choice of a method privileges a particular set of theories. A rhetorical perspective aims to show that these choices and the mutual interaction between theory and method are deeply embedded in language, and can be tracked empirically by focusing on the tropes researchers use and the connotations these tropes trigger. Such empirical knowledge of trope use in a scientific field may help researchers improve the development of both theories and methods.

Alternative tropological sequences: The tropological sequence used in this paper resonates with previous sequences for the conduct of science and history (Peirce et al. 1992b: 106; Vico 1984; White 1978). Nonetheless, the sequence is not automatic or context independent. Alternative sequences are possible. For example, some of the qualitative methods such as grounded theory often follows a sequence which begins with a “symbiosis” of abduction (metaphor) and induction (synecdoche), and ends with deduction (metonymy), and verification (synecdoche and irony) (Rennie, 1998:111). Which sequences are most common is an empirical question for researchers. Researchers may also look at the relationship between the level of taken-for-grantedness of a paradigm and the tropological sequence it follows. We believe that the tropological sequence (from metaphor to metonymy to synecdoche to irony) creates the highest level of taken-for-grantedness for a paradigm. Researchers may also include other tropes such as simile, hyperbole, aporia, and personification. Studying and integrating these tropes into the current framework may prove useful in understanding further the relationship between theory, method, and scientific paradigm.

6. Conclusion

Rhetorical theory provides a unique analytical framework for understanding the role of tropes in organizational inquiry in general and theory and methods in particular. It must be emphasized, however, that our perspective is neither relativist nor irrationalist. We do not advocate that certainty in the pursuit of truth is impossible. That claim would undermine its own credibility and certainty. Rather, we advocate studying how organizational researchers persuade: focusing on how the tropes embedded in theory and method make sense of the world. An awareness of tropes and the tropological sequence enables researchers to manage scientific inquiry better. This view suggests that researchers need to learn more than sciences. They must also learn arts and morals because the artful and moral creation and employment of tropes will increase their ability to understand and influence organizations (Pondy et al. 1979: 30). Perhaps the most important implication of a rhetorical theory of organizational inquiry is its emphasis on morality. “‘Normal science’ is by definition literal science (Brown 1987: 114) and a literalist view of reality is apolitical and amoral (Brown 1987: 116). A rhetorical perspective sheds light on the ideological underpinnings of organizational science, emphasizing the moral and political choices researchers make in constructing knowledge claims (Brown 1987: 117). It does so by demystifying the dominant positivist paradigm through an ironic realization that the advocacy of amorality is itself a highly moral act (Brown 1987). This creates room for self-reflection and triggers an awareness of the power of language to both obscure and clarify (Brown 1987). The positivist view of theory and method is a persuasive and highly institutionalized perspective. In fact, our model is positivistic in that we can operationalize, measure, and test the four propositions to determine if scientists’ language follows the tropological sequence. Within our framework, however, it is a rhetorical construction, and thus a powerful trope about the correct way to *trope*. We raise serious questions about a positivistic view of science, theory, and methods. In other words, we question positivism in a positivistic way. If on one level you are persuaded by this model, on another level you should not be persuaded. This is self-contradictory, yet we hope it illustrates the contextual, self-referential, and ironic nature of a rhetorical perspective. In a sense, it is our willingness to go beyond positivism that makes it possible to create a truly positivistic science. How ironic.

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