The Use of Narratives to Reveal the Secret Data of Organisational Life

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Abstract: This paper considers the use of narrative exchanges in the form of letters and conversations as a legitimate research method when collecting "secret data" within organisational settings. It refers **to** narrative exchanges the authors' undertook over a three-month period, regarding their different perspectives on their University Staff Appraisal System. It explores personal tensions and anxieties that reside within the "secret data" of organisational life. It also reveals a concern regarding "professional commitments" with colleagues and the "managerial" edicts that dominate their work environment. From a "critical management" perspective, the paper initially provides an overview of the postmodern position and its impact upon organisational power relationships and knowledge, as individuals strive to attain and gain their authentic, personal voice within the domination of modernistic organisations. It then explains the methodological approach used for the narrative exchanges and describes the context and relationship of the two colleagues. Commencing from a discussion of organisational policy and postmodernist critiques the conversations increasingly developed into a dialogical meditation on the relationship between "self" and "other". These narratives revealed, through their autographical, autobiographical and at times surreal discourses, messages that are often absent from conventional research data. The paper concludes with a perspective regarding critical management in which individual values, dignity, honesty and respect are upheld. Thus, narrative exchanges of this kind allow dialogical conversations in which statements are agreed, accepted, challenged or sometimes synthesised to be used as a means to explore and collect legitimate "secret data" of organisational life within an environment that respects the ethical and value systems of the participants engaged in narrative exchanges.

Keywords: postmodern, surrealism, autography, autobiography, aesthetic, individual voice, "critical turn"

1. Introduction

Management literature in the last two decades is beginning to witness a growing interest in Critical Management perspectives (see for example Alvesson and Willmott, 1992a; 1992b; 1996; Elliot and Turnbull 2005; Grey and Willmott, 2005). These have identified tensions on the one hand between dominant, modernist and conventional orthodox ideological practices that focus on performance driven "measurable management outputs" and on the other those that are now espousing perspectives that embrace humanistic, ethical, empowering emancipatory perspectives and practices. Thus, the dilemma facing individuals in contemporary organisations and their management is one of competing values where they are torn between the domination of managerial controls that monitors them by performance measures and professional structures and career aspirations that demands they adopt an autonomous and ethical attitude towards their work. At the root of these tensions is the domination of the modernist organisation that is underpinned by power and authority structures as a means to control those who work in these environments and have received much attention historically (see for example Weber, 1947; French and Raven, 1959 Emerson, 1962; Hall, 1972). What follows are accounts of aspects of the organisational life of the authors' (Andrew and Alan) which reveal, from their personal accounts, reflections, tensions and anxieties between their "professional commitments" with colleagues and the "managerial" edicts that dominate their work environment, as they struggle with the modernist domination of the organisation and the need for personal voice and identity. The paper commences with an overview of the postmodern and the power, knowledge and authentic voice that Andrew and Alan have located. It goes on to describe methodological considerations and the context and relationship of the two colleagues that were the foundations for their narrative exchanges. The paper concludes by offering a defence of the dialogical method of research enquiry and a call for a "critical management" perspective to locate this approach.

2. The postmodern: Power, knowledge, truth and authenticity

Foucault refers to powerful discourse as 'regimes of truth' (Couzens and Hoy, 1988:19), and doing so, this enables us to see knowledge as 'tied to politics, that is to power'. This challenges the argument that the concept of truth implies knowledge that is beyond all possible doubt. As Dreyfus and Rabinow (1983) note, Foucault (1981) did not accept the usual sociological categories, both in the questions he posed and the concepts he introduced, his desire was to understand the power relations and the

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mechanisms of power that effect everyday lives. As Foucault (1981:94) states 'Power is not something that is acquired, seized or shared, something one holds on to or allows to slip away. Thus, power is relational; it becomes apparent when it becomes exercised'. As such, power is associated with practices, techniques and procedures. Further, Townley (1993:523) notes 'Power is employed at all levels and through many dimensions' and 'Thus questions such as "who has power?" or "where or in what, does power reside?" are changed to what Foucault termed the "how" of power: those practices, techniques, and procedures that give it effect'.

Power and knowledge relations are inextricably interwoven (see for example Eribon:1991) and according to Usher and Edwards (1994:85) 'modernity's liberal-humanist paradigm, which is dominant in western industrialised countries and whose influence spreads even wider, accustoms us to seeing knowledge as distinct from, indeed as counterpoised to power'. In this view, they claim that 'knowledge is a (disinterested) search for truth which power gets in the way of and distorts'. Thus, they go on to posit the view that the implication is, therefore, that 'truth' and 'knowledge are only possible under conditions where power is not exercised (Usher and Edwards, 1994:85). However, the acknowledgement that the relationship of knowledge, power and truth does exist provides a postmodernist position that questions this ethical stance (See Usher and Edwards, 1994). Postmodernist epistemology challenges us to question our own thinking and our "personal comfort zones". It openly challenges the modernistic scientific discourse, as Johnson and Duberley (2000:109) note 'which imperialistically expunges plurality and forces epistemic closure'. Therefore, postmodernism gives approval to relativism via a subjective epistemology and ontology, and truth becomes relative to an individuals engagement with the world (Jeffcutt, 1994; Alvesson and Willmott, 1996; Johnson and Duberley, 2000). Beliefs, theories, or values are claimed to be relative to the age or society that produced them and not valid outside those circumstances. All knowledge is socially produced and is contingent. Therefore, all knowledge is biased and independent standards of truth do not exist. Postmodernism challenges the notions that truth claims can be objectively arrived at and as Foucault (1988) notes:

> *'My problem has always been the problem of the relationship between subject and truth. How does the subject enter into a certain game of truth? So it is that I was led to pose the problem power-knowledge, which is not for me the fundamental problem but an instrument allowing the analysis - in a way that seems to me be the most exact - of the problem of the relationships between subject and games of truth.'*

From a critical theorists perspective valid knowledge can only emerge from a situation of open, free and uninterrupted dialogue, and takes the form of self-conscious criticism (Kincheloe and McLaren, 1998:260-299). Habermas (1963, and 1970:360-375) being a principal exponent of this genre and an opponent of positivism argues that the idea of a neutral apolitical science, based on a rigid separation of facts and values, is untenable since questions of truth are inextricably bound up with political problems of freedom to communicate and exchange ideas.

As McHale (1992) notes, the essence of the modernistic project is encapsulated by the question 'how can the world be truthfully known?' Therefore, epistemology is value ridden as Usher and Edwards (1994:149) note 'This epistemology is never "innocent" because it always contains within itself a set of values - which means there is always a politics of personal exchanges which implies power relations. Epistemic reflexivity makes us more aware of the necessary place of research communities and the power of the exclusion and closure of such communities'. Within this postmodern context, what follows is the methodology and approach taken in the production of personal narrative exchanges of the two participants that reveals "secret data" potentially open to further analysis and interpretation.

3. Personal exchanges: Methodological approach and setting the scene

Methodology

Postmodern narrative exchanges were used to "unlock" the hidden data of the Staff Appraisal System (see Best and Kelber, 1991; Lyotard, 1984; Jameson, 1991 and 1994; Deluze and Guattari, 1987). Intertextuality was central in the approach we took as it 'posits its alternative network, a dialogical conversation among witters and readers of texts. Intertextuality is all the dialoguing that goes on between and within narratives' (Boje, 2001:13). As Bakhtin (1984) outlined in his concept of polyphonic truth, intertextuality is a number of mutually addressed, albeit contradictory and logically inconsistent, statements. Truth needs a multitude of carrying voices. It cannot be held within a single mind, it also cannot be expressed by "a single mouth". The polyphonic truth requires many

simultaneous voices. This does not imply that that many voices carry partial truths that complement each other, or that a number of different voices make the truth if simply "averaged" or "synthesized". It is the act of mutual voices of engagement and of commitment to the context of a real-life event that distinguishes truth from untruth.

As such, there is a nexus of historicity, productivity and genealogy where these alternatives are part of a system of intertextuality. As Foucault (1972:92) states 'there can be no statement that in one way or another does not reactualize others' and that each alternative is 'plural....[a} weave of signifiers' in an ongoing 'weaving and interweaving fabric of precedent and anticipated texts. As such each storytelling has a genealogy as Foucault has explained' (Boje, 2001:78). Therefore, narratives focus on the ways in which people make and use stories to interpret the world. Moreover, they are not primarily interested in whether stories are 'true' but that they are produced by people in the context of specific social, historical and cultural locations and are interpretive devices through which people represent themselves and their worlds to themselves and to others. As such narrative theory argues that people produce accounts of themselves that are 'storied' i.e. that are in the form of stories/narratives and that the social world is itself 'storied'. For example, 'public' stories circulate in popular culture, providing the means by which people can construct personal identities and personal narratives and therefore link the past to the present. Narrative can be characterised by accounts that contain an element of transformation where action and characters can be brought together in a plot line. As such they have a temporal dimension and use "emplotment" as a process through which they are produced where many disparate elements go together to make up one story. For example, digressions and sub-plots have "a point" which often takes the form of a moral message (see Lawler, 2002). The narratives here were analysed using critical discourse analysis (Myers, 2009) which enabled access to the ontological and epistemological assumptions behind "other worlds" revealing hidden motivations behind the texts and their interpretation. This could be understood as Critical or Discourse Analysis and deconstructive reading and interpretation. Whilst Critical Discourse Analysis does not provide clear answers to issues, it does enable us to understand the conditions behind them and makes us aware of their nature and possible resolution. Thus, Discourse Analysis considers how the texts are constructed and the social contexts in which they are embedded (Myers, 2009). As Myers (2009:173) notes:

> *'The word discourse refers to communication that goes back and forth, like an argument or debate. All language can be treated as a social interaction (there is always a speaker/writer and listener/reader), but discourse analysis focuses mostly on language in use – the use of naturally occurring language in speech and/or written texts'*

Setting the scene

The interlocutors in the exchanges were Alan and Andrew who work in a medium sized UK university and first met when they embarked on their doctoral studies in 1998. They engaged in their personal exchanges after an informal conversation regarding the Staff Appraisal System of the university. Alan, a member of the support staff, had been involved in the development of the system as a union official. Andrew, a member of the academic staff had not. After discussing their personal perspectives and the possibility of a collaborate project, they agreed to exchange their personal perspectives on the system. An initial set of ideas and issues emerged which focused on notions of dominant organisational structures. It was agreed that their exchanges, by electronic communication, would be conducted in an environment of honesty, respect and values that recognised each other's individuality and freedom of thought and speech, thus eliminating, as far as possible, any perceived power relation that might have existed before they agreed to their narrative exchanges. As such, these lines of discourse lead them to explore the relationship between meta-narratives and personal voice. Alan began by suggesting that the appraisal policy represented a meta-narrative sympathetic to personal voice and Andrew replied that this was an illusion and the power relationship between the meta-narrative of the policy and individual voices remained, with the organisation imposing its will on individuals. However, a drama unfolded in which notions of authenticity and an aesthetic dimension emerged in the narrative exchanges. Thus the exchanges were considered "authentic" in the sense that they displayed spontaneity and honesty and "aesthetic" in the sense that a "drama unfolded".

4. Secret data: Reflections of the self and organisation from personal discourse

A stream of "spontaneous" responses allowed the exchanges to follow their own "course of revelation". They revealed personal voice, and a desire for trust, honesty and integrity by the two

participants. The exchanges were conducted within a "safe" environment where mutual respect allowed for, on the one hand, "brutal reposts" and on the other the exploration of esoteric subject matter, as their exchanges became more intense, revealing their organisational life stories. The accounts at times displayed autographical and surreal moments and what might be termed as traditional autobiographical accounts (see Bullough and Pinnear, 2001). As such, the notion of personal voice takes on a "spontaneous turn" according to each individual's immediate sense of conscious state, preserved as "text in the making". What follows are examples and reflections of these exchanges.

Personal voice

The notion of personal voice was for both participants an essential element of the exchanges. At the beginning of the first letter, Alan identifies a postmodern discourse regarding voice:

> *"I've been thinking about our conversation regarding postmodernism and meta-narratives and it seems as if postmodernism encourages and promotes the voices and self determination of small groups and individuals".*

He continues by quoting from the organisations appraisal policy in order to support his belief that the policy statements allow personal voices to be heard and supported. Andrew replies in this same conversational style. He disagrees with Alan's view, feeling that although the organisations representatives sometimes go through the processes of negotiation they retain the power of decision-making. In the opening paragraph of his second letter, he says:

> *"We are faced with a tension between organisational dictates, and individual voice in a world of multiple voices all of which have their own turn on reality".*

The conversations begin to take a poetic turn as feelings and ideas surface. Andrew says at the end of letter two:

> *"Surely what the post-modern tells us is that even if our voices cannot be heard it does not stop us whispering, it does not stop us thinking – a silent voice of consciousness that guides our actions".*

In letter three, Alan comments that Andrew's words and ideas seem reminiscent of Sartre's notion of existentialism. He enters the ontological world with Andrew and the texts shift accordingly. Alan raises concerns regarding the nature of authenticity in the following lines:

> *"Also we search our souls for authenticity which is a shape shifter and the more we attempt to embrace it the more it slips through our embrace"*

In letter five, Andrew begins by musing upon choice and authenticity:

> *"We move like shadows in and out of the world – we are drawn to what is 'for us', and return to the dark when things 'are not for us'"*

The letters continue to oscillate between poetic language attempting to capture notions of ontology and reflections on the organisations appraisal policy sometimes weaving these styles and ideas together in order to communicate something that seems important. What is clear is that there are moments in which the protagonists enter each other's styles of thinking and writing suggesting they are listening to and valuing the others concerns and views. This is particularly evident when Alan says in letter seven:

> *"I find the shift to thinking of postmodernism as identifying/listening to voices/narratives large or small, helpful".*

This is a realisation that echoes Foucault's view that power is relational rather than being owned by one party or another. Individual voice constantly in tension with organisations is a major theme of the exchanges.

The revelation of self: Autography and Autobiography

The exchanges were personal and informal. The texts were conversational and had the characteristics of the authors explicitly imprinted on them and thus embraced autographic tendencies in their production. Autobiographical elements were also prominent in the narrative exchanges. Alan's experience as a union representative and Andrews's experiences as an academic subject to the dictates of the organisation were significant. In addition they were both researchers also involved in

teaching, Alan in education and art and Andrew in business studies. There particular professional experiences naturally influenced the exchanges. Whilst the notion of personal voice was foremost, it was acknowledged by both that this could only be effective if they aimed for authenticity in their exchanges. The desire to produce texts that reveal hidden truths that are allowed to surface from the less conscious to the more conscious mind, could be understood as a desire to be authentic. Sartre (1948:48) suggests that 'bad faith' in terms of lying to ones self is a denial of what it means to be human.

Both Andrew and Alan agreed that they would try not to stifle their inner consciousness and explore its "depths" using the meditative approaches akin to Husserl (1950). At several moments in these exchanges, Andrew felt a certain satisfaction through the freedom to express subconscious ideas and feelings that he wanted challenged, but simultaneously he wanted "brutally" to challenge Alan's thoughts and ideas. Authentic dialogue between Andrew and Alan that at times verged on the aesthetic, revealed hidden truths regarding their individual concerns and methods of "self" revelation regarding personal identification and role in the organisation. The word 'aesthetic' is understood here as a kind of beauty manifest in the style and content of these texts or the interrelationship between them. Sometimes the texts began to read like poetry or prose with a vocabulary, which reflects these categories and the authors enjoyed the process of allowing the texts to flow as it gave them a sense of freedom of thought in their writing. A certain excitement and pleasure is conveyed as the texts twist and turn and the plot thickens. The sense of freedom felt by the authors seemed to be a significant aspect of both the aesthetic of the letters and creative openness in which new understanding might emerge. The aesthetic turn experienced by Andrew and Alan bordered at times on the surreal, whereby a state of unconscious connection was formed in the written textual exchanges. At times, both participants found that they did not "have to think" about what they should write in response to each other, their exchanges became a "stream of consciousness". In the first surrealist manifesto, surrealism is defined as:

> *'Pure psychic automatism through which it is intended to express, either verbally or in writing, the true functioning of thought. Thought dictated in the absence of all control exerted by reason and outside any aesthetic or moral pre-occupation' (Stangos, 1994:124)*

These letters proved liberating in two ways. First, they allowed free expression and second they allowed the exchanges to transcend the "normal boundaries" of research discourse. When traditional qualitative approaches such as semi-structured and unstructured interviews or focus groups are adopted, the notion of researcher reflexivity is an ever-present spectre. This naturally opens such approaches to researcher pre-suppositions and respondent bias that leans towards "what the researcher wants to hear" or may deflect certain issues if they are too painful for the respondent to relay to the researcher. These personal narratives escape these objections because they were exchanges between individuals who had a relationship of trust and understanding and whilst the accounts might be construed as challenging to those involved in the exchanges they aimed to be conducted with transparency and honesty. It is in this way these encounters are considered authentic. Naturally, the analysis of such personal and sensitive data will be of concern to some. Two central questions arise. The first is who is responsible for analysing the data? The second is should the data be analysed at all?

In response to the first question, because of the dialogical approach and an understanding of power as relational, the answer must be the two participants. How any of the data is used should involve dialogue, debate and negotiation in a climate of trust between them. However, it is only if each individual is accountable and has freedom to analyse and interpret their own discourse that power structures can be broken down (see for example Freire, 1970)).

In response to the second question, for those who reside within traditional research approaches, not to analyse interpret the data is an untenable position as convention research methodologies demand that the analysis and interpretation of data is the obligation of the researcher. This is problematic if we are to avoid "doing violence" to the data generated from the free flowing dialogue and freedom of expression and can be a difficult issue to resolve. Tensions can arise within the postmodern research perspective, where data is presented "just as it is" for the reader to analyse and interpret from a personal perspective. However, this becomes a "double imperative" when confronted with narrative exchanges between two participants. The counter argument is not to analyse and interpret personal accounts. In other words, they should be "left just as they are" and interpreted by those who read

them on their own terms as they encounter and immerse themselves in the narratives. This approach has an ethical dimension whereby those engaged in narrative exchanges and those who read them have the right to their personal voice whether participants or receivers of such accounts. Rand (1957 and 1964) argues the ethical should embrace the right of *rational* individuals to pursue their own lives to their full potential and fulfilment. Values are immutable which an individual holds at the core of their being. These are an individual's right of independent and intellectual freedom; the upholding of an individual's contribution to society and organisational decision-making; and self worth. These values should not be open to compromise, to do so would be to "sell out" and leave an individual open to corruption.

When ethical and value lead approaches are introduced we are awoken to the understanding that recognises the domination of organisations that reside within a modernistic value system that diminishes individual worth. Decision must ultimately be those of the participants involved in the exchanges and a common understanding has to be reached if they wish to project their concerns and issues onto their organisational world (see Habermas, 1984). Here a philosophical turn ensues if we are to establish the essence of what confronts us, if it is to embrace action rather than rhetoric and verbal posturing. Indeed one could say a "critical turn" has been arrived at that might offer a more promising road for us to travel, through an ethical and value lead management research approach. Couched within the ethical and value lead approaches to management research the word "critical" takes on an existence that transcends our everyday awareness of what it normally means in our taken for granted parlance. Its meaning takes on a dimension that goes beyond the negative connotations of passing judgements and criticism, however well meaning these may be. It challenges us to confront the tensions of contemporary organisational and business practices differently by introducing an ethical and value driven dimension that goes beyond legalism. It challenges us to question how social justice is administered within the workplace and the way individuals can reach their full potential as human beings. It is a position that espouses that every person should have freedom of thought to judge independently. It is a position whereby values are those placed in the free intellectual domain of an individual and one that Rand (1954) extols within her objectivist philosophy whereby an individual's life is the ultimate standard of value.

5. Conclusions

Whilst personal narrative and discourse analysis always remains a matter of interpretation because of the lack of "hard data" provided, it has to be recognised that the reliability and the validity of such encounters depends on the force of the arguments provided as they are all subject to their own deconstructive reading and counter-interpretations. As such, the validity of critical analysis of such encounters is dependent on the quality of the rhetoric. This appeal to idealism can possibly only be achieved if rational minds meet, that recognise individual freedoms that must be respected. Nor should they be curtailed to the banal customs and practices that are expected in the cultural setting that they were created (see Rand, 1957 and 1964). However, idealistic notions of individuality often have to give way to traditional research practices that require an interpretative framework to make sense of the data. Thus, those who engage in personal narrative exchanges (as presented in this paper) will be challenged with a tension between the freedom to express their personal stories and that of modifying their position in order to address the irrationalities of the world they confront.

However, notwithstanding this, the use of personal exchanges has unveiled an approach that proved to be liberating and revealing to the participants involved in ways not normally transmitted or communicated when using traditional qualitative data collection methods such as semi and unstructured interviews or focus groups. These exchanges allowed "free expression", explored the aesthetics of contemporary organisational life and at times verged on the surreal, thus offering insights that are not normally open to conventional data collection methods. The narratives, whilst commencing with the "concrete" reality of the Staff Appraisal System, "abstracted" to more fundamental issues of organisational power, politics and the need for individual freedom and the authentic voice of individuals working within contemporary organisations. These narratives therefore revealed through their autographical and autobiographical styles and at times surrealist discourses hidden messages that candidly call for individual values and an ethical perspective that is not part of "common" discourse. The relational nature and trust engendered when undertaking such exchanges in which keeping an open mind is a prerequisite is a position that both correspondents advocate to attain a more authentic account of organisational life. In a complex world of diverse narratives and vested interests, this process offers a chance of actions being taken that are guided by consideration and compassion regarding the personal needs and desires of others as well as one's self.

Thus, we radically need to define the territory of the "critical turn" if we are to "unfreeze" individual concerns within the research act. Therefore, we believe that the "critical turn" is the recognition of the individual voice in organisational research settings, the rejection of the meta-narrative and the acceptance of the personal experiences individuals want to share with the world. We therefore offer the following to stimulate comment and debate in the furthering of individual freedom:

> *Critical Management are practices that uphold ethical and moral values in the pursuit of individual liberty and freedom. It supports and creates working environments where individuals can critically judge business and management practices without fear of retribution. It upholds and respects the dignity of an individual by giving them a voice and meaning to their social and work environments in their pursuit of intellectual freedom, fulfilment and expression of thought. (Armitage, 2008)*

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Mixed Methods: Combining Expert Interviews, Cross-Impact Analysis and Scenario Development

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Abstract: The article depicts a mixed methodology case which uses a qualitative-quantitative-qualitative approach. The research described used qualitative work with expert interviews for data collection, a quantitative analysis of the interviews and then a qualitative method of final scenario development for analysing and presenting the results. The case is offered to demonstrate that the introduction of the quantitative step of a cross-impact-analysis, which gives a mixed methodology, was beneficial for the overall research leading to surprising results that could not have been achieved with only a qualitative approach. Having a quantitative analysis step in-between, which demonstrated the most frequent and consistent results out of a wide range of overall possibilities, helped reduce researcher bias, thereby increasing the credibility of the findings. The paper concludes that judiciously used mixed methodology in general, and this approach in particular, will give researchers using qualitative data collection a much stronger foundation in terms of the analysis and display of data.

Keywords: research methods, mixed methods, expert interviews, cross-impact analysis, scenario building

1. Introduction

Mixed methods in social science research are defined as a technique that "mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (Johnson and Onwuegbuzie, 2004:17). In the last ten years there has been considerable interest raised in using mixed methodological designs for research (Creswell, 2003; Johnson and Onwuegbuzie, 2004; Creswell and Tashakkori, 2007; Gorard and Cook, 2007; Johnson et al., 2007; May, 2007; Tashakkori and Creswell, 2008; Symonds and Gorard, 2010). The argument is made that methodological pluralism or eclecticism enables researchers to increase both the scope and the level of possible analysis (Johnson and Onwuegbuzie, 2004). However, despite increasing acceptance of the concept of mixed methodology research, much research is still presented as either qualitative or quantitative (Hesse-Biber and Leavy, 2011; Patton, 2010; Smith, 2008; Thyer, 2010). The broader skill set that is required to apply qualitative and quantitative methods is impacted by the lack of training, which Plano Clark has been describing as the biggest barrier towards the application of mixed methods research (Plano Clark, 2005). Creswell and Plano Clark (2007) as well as Teddlie and Tashakkori (2009) have published handbooks looking to offer mixed designs, but the literature on applications and successful utilisation is still rare (Varum and Melo, 2010). It is this gap that this paper seeks to address.

This paper will outline and discuss a specific mixed methodological example. The researcher chose to use scenario creation as the methodology of choice (Bea and Haas, 2004; Mietzner and Reger, 2005; Varum and Melo, 2010), but rather than a more common approach where qualitative data analysis is used as a foundation for qualitative scenario building (Brauers and Weber, 2006; Fink, 2001; List, 2003; Tulbure, 2004), this paper outlines the use of a quantitative data analysis stage. The strength of the technique is seen as reducing bias while adding credibility; the paper will assess both the strengths and the areas for development of this mixed method application.

Initially, the recent developments in mixed methodological thinking will be explained, before an outline of the methodological approach of the paper itself it proffered. The case example will then be described and analysed, before the implications of the example are given. The paper concludes that the use of this approach enables a more rigorous approach to scenario construction and strengthens this form of data collection and analysis.

2. Why undertake mixed methodology?

Mixed methodology today is a natural complement to traditional qualitative and quantitative research (Johnson and Onwuegbuzie, 2004:14). While still being under pressure from monomethod researchers like the quantitative purists (Ayer 1959; Maxwell and Delaney 2004; Popper 1959; Schrag 1992) as well as qualitative purists (Guba and Lincoln 1989; Lincoln and Guba 2000; Schwandt

2000), mixed methodologies are increasingly accepted. It has come a long way since the paradigm wars with Howe (1988) as an advocate for the incompatibility thesis, stating that qualitative and quantitative methods "cannot and must not be mixed" (Onwuegbuzie and Leech, 2005:376). With the post- (paradigm)-war came the emergence of the three major schools, the purists, situationalists and pragmatists (Rossman and Wilson, 1985); for the latter the discussion has moved on to focus on similarities rather than differences (Onwuegbuzie and Leech, 2005:376). Mixed methods are still not the norm, but are often seen as an appropriate third way to judge ideas on the grounds of empirical and practical consequences (Johnson and Onwuegbuzie, 2004:17; Collins et al., 2006). Mixed method advocates have now established their own body of literature alongside the authors of the two traditional research methods (Brannen, 1992; Bryman, 1988; Creswell, 1994; Tashakkori and Teddlie, 1998, 2003). Bryman (2006) concedes that we see paradigm peace while Symonds and Gorard (2010) see the rebirth of research as a craft. Most recently Morse (2010) explores the use of simultaneous and sequential mixed method designs, while Hesse-Biber (2010) discusses emerging methodologies and methods practices in the field.

3. Methodology

This paper offers a single case as an exemplar, an in-depth description of a specific context. It suits this approach which enables an analysis of certain ideas and criteria (Yin, 1993, 1994). This is an instrumental case (Stake, 1995) as its purpose is to provide insight into a specific issue; specifically, the advantages of using a mixed methodology in this context. The investigation of phenomena within a single case is supported by Yin (1994) and Tellis (1997) who argue that single case studies are particularly appropriate where there is access to novel, not commonly found phenomena.

According to Greene et al. (1989:259) there are five rationales for conducting mixed method research:

- Triangulation: Seeking convergence and corroboration of results from different methods and designs studying the same phenomenon.
- Complementarity: seeking elaboration, enhancement, illustration, and clarification of the results from one method with results from the other method.
- Initiation: discovering paradoxes and contradictions that lead to a re-framing of the research question.
- Development: using the findings from one method to help inform the other method
- Expansion: seeking to expand the breadth and the range of research by using different methods for different inquiry components

Of the examples available in the literature, those most commonly offered are those which enable triangulation (Campbell and Fiske, 1959; Jick 1979; Kritzinger and Michalowitz 2008; Wolf 2010) and complementarity (Greene and McClintock, 1985; Rossman and Wilson, 1985; Greene and Caracelli, 1997; Sale, Lohfeld and Brazil, 2002). In particular, much of the work advocates a range of different data sets in order to develop a more holistic picture (cp. Hammersley, 2008; see also Johnson et al., 2007:113-115; Tashakkori and Teddlie, 1998/2008:21; Jick, 1979; Brewer and Hunter, 2006:4). It is rarer to find examples of initiation, development or expansion and this is where this paper makes a contribution. The case design that will be explained is one which was designed for development and expansion. The difference is that, instead of collecting and comparing different data sets, the design posited in this paper uses the different techniques within the same overall data collection system. The mixture is within a chain of data management.

Introduction to case

The case presented here is a theory excerpt using a former work towards a topic on demographic change and its implications on consumer, travel and leisure behaviour and education in the year 2020 (Muskat, 2008). Demographic change in this context describes the fact that many industrialised countries have a so-called sub-fertility rate of below 2.1 children per woman. Combined with an inefficient migration policy, these countries face an ageing population. This ageing average of a population has direct effects, such as an increase in the demand for health care for older people, or a decrease in demand to build new kindergartens. There are also indirect effects such as a gradual shift towards addressing older customers in advertising, using older models and advertising different products.

These effects have different implications for different cohorts, e.g. for the *Baby Boomers* being the generation born after World War II until 1961, *Generation X* being born from 1961 to 1976 and *Generation Y* being born from 1976 until 1991 (cp. Coupland, 1991; MacKay, 1997; Salt, 2006). One of the examined implications of the demographic change is the upcoming retirement of the Baby Boomer generation. They will retain their high spending power and will then have the time to spend it. Different travel and leisure behaviour was analysed to show different market segments within the travel market. Also an *age effect* vs. a *cohort effect* was discussed. This describes the fact that former older generations have travelled according to what seemed appropriate to their current age, while today's older generation travel maintaining their acquired travel behaviour.

For the younger *Generation X* and *Generation Y* other aspects in life are more important e.g. tertiary education, family planning and the question of both male and female participation in the work force. A university education model was discussed with a focus on the recent shift in Germany from a more education led system with long years of study towards a more applied business oriented model with the introduction of a bachelor degree as a first qualifying degree. Family planning has been seen as shifting from very young parents to becoming parents at an older age, leading to a decrease in the overall fertility rate as families then have fewer children. Also, a shifting pattern in the female participation in the work force can be seen, with more women acquiring tertiary education (Muskat, 2008).

Within the case study the methodological structure used was to have a qualitative approach overall with data collection using expert interviews, having key terms determined and then displaying findings through building scenarios. Usually, the determination of key terms after transcribing interviews would be done with a content analysis (Krippendorf, 2004; Krippendorf and Bock 2008). However, within this research design a quantitative element was favoured in order to reduce bias in determining key terms and enable a more structured approach to determining the scenario options. A software supported cross-impact analysis was chosen to allow the computation of a larger amount of possible scenario data.

Table 1: Mixed-method design matrix

		Time order decision	
		Concurrent	Sequential
Paradigm emphasis decision	Equal status	QUAL + QUAN	QUAL → QUAN QUAN → QUAL
	Dominant status	QUAL + quan QUAN + qual	QUAL → quan qual → QUAN QUAN → qual quan → QUAL

Note. "qual' stands for qualitative, "quan" stands for quantitative, "+" stands for concurrent, "→" stands for sequential, capital letters denote high priority or weight, and lower case letters denote lower priority or weight.

Source: Johnson and Onwuegbuzie, 2004:22. Notation based on Morse, 1991.

With reference to table 1 the design of this research was, therefore, to be found in the lower right quadrant with a "QUAL → quan" sequential approach. As another major qualitative step is applied with building scenarios for displaying the results, the model would evolve to be a "QUAL → quan → QUAL" pattern.

Data collection with qualitative step expert interviews

28 experts were interviewed using a semi-structured interview guide (Holstein and Gubrium, 1995; Mayring, 2002). The interviews, which typically lasted for 45 minutes, were recorded using a digital recorder with a subsequent transcription. The approach of an *expert interview* is a speciality within the semi-structured interview as the experts are determined deliberately (Abels and Behrens, 2005; Bogner et al., 2005; Meuser, 2001; Meuser and Nagel, 1991; Schnell, Hill and Esser, 1999). The

experts were either senior academics or senior managers in demography, geography, tourism, economics, human resources and statistics, who were able to discuss the particular scenario contexts. They contributed to at least one of the following fields, later called descriptors: politics, workforce, migration, fertility, education, market segments and travel behaviour. The experts had been chosen so that most could contribute to several fields, ensuring that at least 7 interviewees were contributing to any one of the descriptor topics.

Quantitative cross-impact-analysis using the software Szeno-Plan

Cross-impact analysis is a method for revising estimated probabilities of future events in terms of estimated interactions among those events (Dalkey, 1972:341; Turoff, 1972). The probability for a certain event to come about is affected by the occurrence or non-occurrence of another event. Cross-impact analysis permits the determination of the probability of two events occurring simultaneously. Using this combination of different descriptors leads to an array of new possible outcomes not thought of at the initial stage of data collection. It is this multitude of new combinations which will lead to scenarios both new and surprising for the researcher and the experts involved.

Smith et al.'s (2005) have presented a research sequence with the same components 'interviews – cross-impact analysis – scenario building', but remained solely on the qualitative side (Smith et al. 2005; Godet, 1987). We will see that the here presented mixed methods approach is a development from there and highly beneficial in its uniquely new approach. The benefits and the detailed development will be contrasted at a later point at the beginning of the part 'Unforeseen results and credibility'.

Cross-impact analysis can be used as a tool for evaluation leading to several ways of showing results, e.g. using it for simulation modelling (Fink, 2001; List, 2003; Tulbure, 2004; Brauers and Weber, 2006). In the featured case study, the topics *consumer, travel and leisure behaviour* and *education* were used as implications of demographic change, so that cross-impact analysis could be used in order to build scenarios based upon the results of the expert interviews. The information given by the interviewees was sorted by key words according to the different areas of expertise, field of interest or professional experience. According to the terminology used by Szeno-Plan these key words are called *descriptors* and comprised *politics, workforce, migration, fertility, education, travel market* and *travel behaviour.*

The descriptors condensed structure and defined the content of the expert interviews. They allowed the conversion of the large collection of qualitative data into an exhaustive set of variables that fed into the quantitative cross-impact analysis. When analysing the interview transcripts not only the descriptors themselves were identified, but at the same time *descriptor tendencies* were established. The descriptor tendencies indicated a personal tendency according to the following table 2. *Descriptors* (e.g. politics) and *descriptor tendencies* (e.g. 'being demographically aware' vs. 'not being demographically aware') are shown here with additional information.

Table 2: Descriptors and descriptor tendencies (with explanations and examples) [1]

Politics	
Being demographically aware Having a high priority for political topics 'Ageing society' and 'low fertility rate'	Not being demographically aware No priority for political topics 'Ageing society' or 'low fertility rate'
Workforce	
Modern Being oriented towards women participating in the workforce. Also part-time and work-life-balance oriented.	Traditional Male bread-winner with fulltime jobs as the rule
Migration	
Driven by social security Less educated migrants	Driven by economic chances Well educated migrants
Fertility [2]	

Rise Younger parents, encouraged by political decisions like parental leave. Families with more children as the social norm	Stagnation No change of the current fertility rate. Ongoing trend toward older first parents being less likely to have a second or third child
Education [3]	
Education oriented Keeping the German academic model with a late master degree (German: *Diplom*) after studying 5 or more years. PhD students would then stay at the university, some of them never to enter the private sector.	Business oriented New model with bachelor as first degree of then younger graduates. Having possible master and PhD options to follow at a later point in life after having acquired business experience outside academia.
Travel Market	
Former market segments Family travel, youth travel, cruise ships with more senior target group	New market segments One-parent-kid-travel, Grandparents-grandkids-travel, Three-generation-travel, Active travelling for all target groups, Comfort travelling for all target groups
Travel Behaviour	
Age effect Future older people will travel in general as nowadays older people do	Cohort effect Future older people will maintain their current travel behaviour

Note.[1] Only *descriptors* and *descriptor tendencies* form part of the cross-impact analysis.

[2] Fertility is discussed keeping in mind non-replacement rates in western industrialized countries with a range from Japan (1.27) and Germany (1.36) to Australia (1.79) and the UK (1.82). The USA with near replacement at 2.05 is an exception in the western world (United Nations 2006).

[3] Was developed as a discussion of the German traditional academic model versus the introduction of the more international Anglo-American model in Germany from 2005.

Source: Muskat, 2008:100-101.

Using the software Szeno-Plan is not itself novel: Lindgren and Bandhold have shown an example with 6 variables, i.e. the herein named *descriptors* (Lindgren and Bandhold, 2003:155). However when there are 6 variables a manual analysis of each interdependency is still feasible, generating a maximum of 64 ($=2^6$) results. With having n=2 for each descriptor tendency while having m=7 descriptors we can think of obtaining a maximum of $n^m=2^7=128$ different CIS in our case. As the output always doubles with each additional variable, the use of the software Szeno-Plan is recommended for cross-impact analyses with 7 or more variables.

Frequency and consistency

Two major outputs can be obtained from a quantitative cross-impact analysis namely listings according to frequency and to consistency.

'Frequency' here refers to how often any mathematically possible cross-impact scenario (CIS) output can and does occur (here $2^7=128$). In reality some of the 128 CIS permutations will be the same. As they occur more often, they are called 'strong by frequency'.

On the other hand the term 'consistency' refers to different strengths in interrelationships between the descriptor tendencies. By filling in the level of dependence for each variable (i.e. descriptor tendency,

cp. tables 4+5 below) in both directions, we can determine to what extend each variable influences each other variable (Lindgren and Bandhold, 2003:155).

The example in table 3 reads as: The cross-impact scenario (CIS) with the running number 3 is determined to include demographically aware politics, modern workforce and social security driven migration. The CIS with the running number 10 is slightly different; the politics are not demographically aware, it has a traditional workforce, but again the migration is driven by social security reasons.

Table 3: Example for cross-impact-scenarios (CIS)

NO. of THE CIS:		3	10
Politics	**Demographically aware**	yes	no
	Not demographically aware	no	yes
Workforce	**Modern**	yes	no
	Traditional	no	yes
Migration	**Driven by social security**	yes	yes
	Driven by economic chances	no	no
Fertility	**Rise**	no	yes
	Stagnation	yes	no
Education	**Education oriented**	no	yes
	Business oriented	yes	no
Travel market	**Former market segments**	no	no
	New market segments	yes	yes
Travel behaviour	**Age effect**	no	no
	Cohort effect	yes	yes

Source: Muskat, 2008:104.

A first result of the software Szeno-Plan at this stage was the frequency of all cross-impact scenarios. Szeno-Plan computed 128 different combinations overall, with some more frequent than others: for example, the two CIS used in table 3 occur very frequently with 10 CIS overall with the same combination as CIS no. 3 and 5 CIS overall with the same combination as CIS no. 10.

Szeno-Plan additionally interprets consistency when the input data for the cross-impact matrix is filled in according to a Likert scale from -2 to +2 with -2 stating that there is *no influence at all* and +2 for *having a strong influence*. The evidence for the several figures was to be found within the transcribed expert interviews. Each descriptor tendency was determined as having, or not having, an influence on each descriptor tendency. Tables 4 and 5 show excerpts of the overall table depicting the vice-versa influences and their interpretations.

Table 4: Influence of politics on workforce

		Politics	
		Being demographically aware	Not being demographically aware
Workforce	Modern	a) +2	b) -2
	Traditional	c) 0	d) 0

Source: Muskat, 2008:103.

The example in table 4 reads as:

a) There is a strong influence (+2) of demographically aware politics on modern workforce.

b) Politics which is not demographically aware has a strong negative effect on modern workforce (-2).

c) Demographically aware politics does not seem to have an influence on a traditional workforce (0).

d) The same as in c) is true for non-demographically aware politics. Again there is no influence to be seen on a traditional workforce (0).

Table 5: Influence of workforce on politics

		Workforce	
		Modern	Traditional
Politics	Being demographically aware	a) +1	b) 0
	Not being demographically aware	c) 0	d) +1

Source: Muskat, 2008:103.

The example in table 5 reads as:

a) Modern workforce has a weak positive effect (+1) on demographically aware politics.

b) Traditional workforce has no effect (0) on demographically aware politics.

c) Modern workforce has no effect (0) on non-demographically aware politics.

d) Whereas a traditional workforce does have a slight supporting effect (+1) on non-demographically aware politics.

The cross-impact scenario with the highest consistency, i.e. the highest match of descriptor tendency values are shown in figure 1. CIS no. 1 is the most consistent with the highest value followed by CIS no. 2 with the next highest value. The subsequent CIS have lower values.

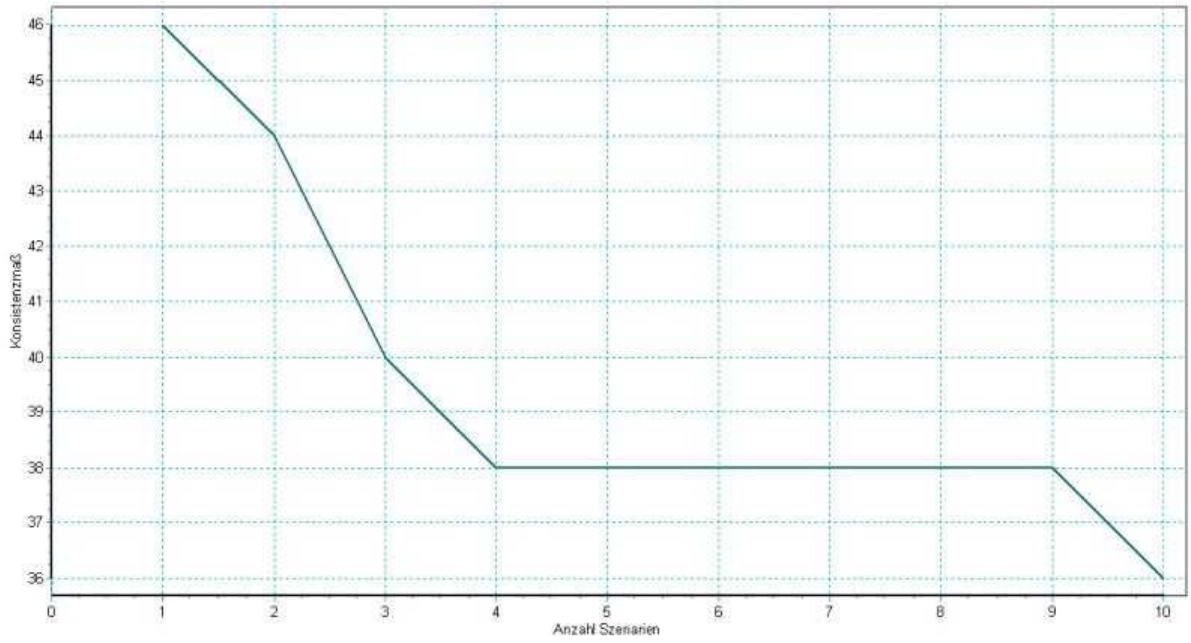

Figure 1: CIS distribution according to consistency

Note: Value of consistency shown vertically; CIS in decreasing order of consistency shown horizontally.

Source: Muskat, 2008:105.

Building scenarios

Scenario technique as a qualitative method allows the description of possible complex situations in the future. It is used to integrate findings out of quantitative or qualitative analysis (Tulbure, 2004, p. 29). Historically developed within the military to display the outcome of different strategies, it has been further developed by the Frankfurt Battelle Institute in the 1980s and from there found its way into strategic corporate planning (List, 2003; Fink, 2001). With the rise of strategic and management consultancies in the 1990s it became a consulting and evaluating tool there (Fink et al., 2001; Gausemeier et al., 1996).

According to Fink (2001) scenario technique covers three steps:

- *Analysis* on the scenario field finds descriptors and their cross linking.
- Within the step *prognostic* several basic alternatives are described.
- The final scenario *development* then checks on consistency between the several projections. The remaining 2 to 8 plausible scenarios can then be analysed, interpreted and described in a communicable form.

To display a *typical* scenario, chosen from several possible ones, more often than not a *trend variant* will be used. It is important to mention, however, that all depicted variants within a scenario cone (cp. fig. 2) are equally probable. A prediction of the probability of occurrence relative to the other scenarios is not possible. The trend variant is not the most probable but at best the least extreme.

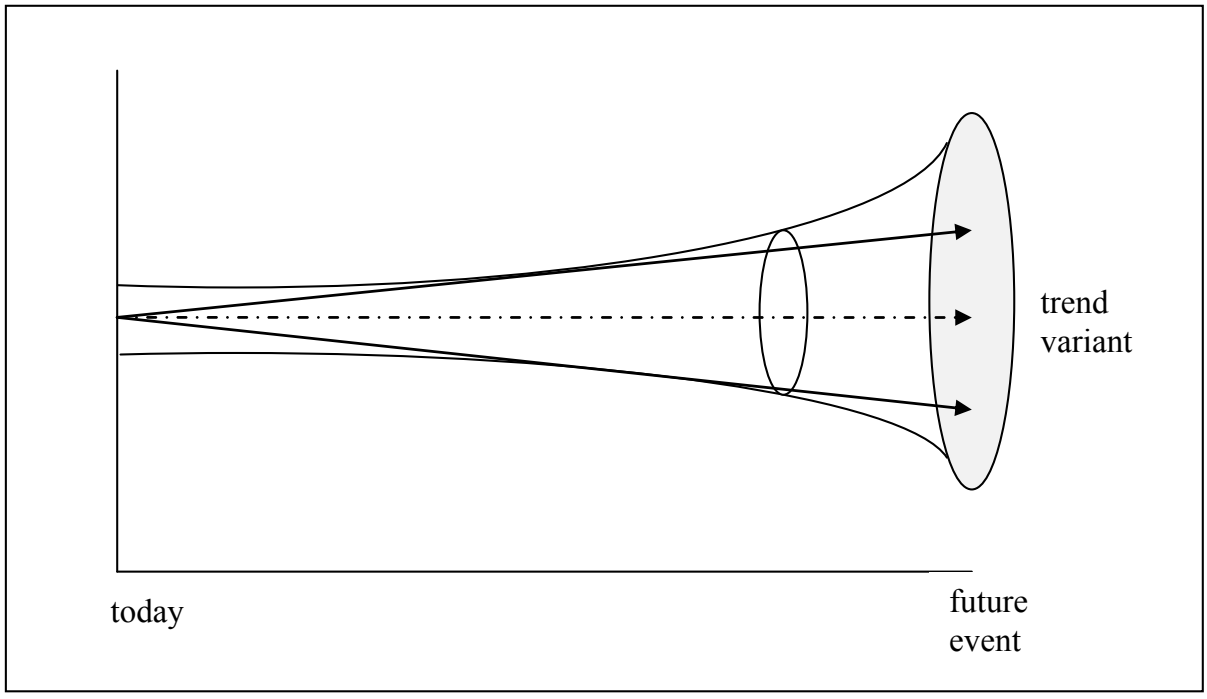

Figure 2: Scenario cone

Source: Muskat, 2008:91; modified from Gausemeier et al., 1996:109.

In the case study being discussed in this paper the output data of the cross-impact analysis was then presented in form of 4 scenarios, constructed out of the strongest 2 CIS by frequency and consistency respectively. The in depth scenarios, indicated as the most pertinent from the quantitative analysis, were then constructed using a qualitative approach based upon an in depth, thematic analysis of the expert interviews, whereby the specific expert knowledge was used to build scenarios according to the given descriptors. The specific scenarios are not shown within this paper which intends to only

give an overview of the method used, but more information on their content can be obtained from the corresponding author.

4. Evaluation of quantitative results

The outcomes of the quantitative step *cross-impact analysis* are CIS that are frequent and consistent at the same time. This allowed building scenarios with a much wider range of different descriptors than would have been possible with only a qualitative thematic analysis. Furthermore cross-impact scenario data had been presented with descriptor tendencies that was not in the focus of research and might have not been chosen with using a qualitative analysis. These emerging, less biased results were evidence of the higher level of quality pursued with the decision to use the mixed methods approach over a pure qualitative approach. The additional quantitative step opened up both a new horizon of possible cross-impact scenarios and a demonstration of which of these CIS were frequent and consistent. Assuming a typical qualitative research setting at this stage, we most probably would have seen a thematic text analysis with the necessary decision to be made concerning which data to use for building scenarios based upon the *most interesting* or *most specific*. In the current setting, however, we can use the quantitative analysis to show that the data used to underpin the scenarios are the *most frequent* and *most consistent.*

Another interesting aspect of the use of the mixed methods, demonstrating a possible improvement, is to be found in the area of utilising expertise, and how able the researcher is with the role of coordinating this expertise. Assuming again an overall qualitative setting, we find the researcher in the uncomfortable position of assuming the role of a decision maker, in terms of which of the provided facts within the interviews to select while not having equivalent expertise as any of the interviewees. Moreover, the interviewer is not an expert in all the fields, but neither are the experts: they only hold expertise in their specific research or business field and would not be experts in other areas. The system presented here enables the selection to be undertaken in a more structured way, utilising the expertise but guiding the researcher at the same time providing reliable data.

Unforeseen results and credibility

At this stage, contrasting the presented mixed method approach to a purely conducted qualitative approach is useful in shedding more light on the benefits of the former. Lindgren and Bandhold (2003) have presented cross-impact analysis both as qualitative and quantitative approaches and Smith et al. (2005), having used the same sequence of data gathering, analysis and presentation as the present paper, have opted to have their cross-impact analysis undertaken in a purely qualitative way.

The approach demonstrated within this paper has two clear potential benefits, when dealing with size or opportunity and when dealing with bias. Smith et al. have been using three three-day workshops with varying participants of 25 to 35 for each workshop (Smith et al., 2005:4). In some research situations it might not be advantageous or technically possible to have series of large workshops like these, and there are benefits of the sequence proposed in this paper over the traditional approach. We have already demonstrated earlier that with 7 or more variables (descriptors) the approach proposed in this paper is the feasible one.

Addressing the issue of possible bias we hear from Smith et al.'s report that "the outcome of this exercise [i.e. the cross-impact analysis] was the identification of the main driving forces […] After some further *discussion* in a *plenary session*, it was *agreed* that there were two sets of variables […] from which the *desired* scenarios could be built." (Smith et al., 2005:7+8; our italics). In contrast this paper advocates the acceptance of cross-impact analysis outcomes *as is*, without the bias of several participants to have to come to an agreed majority decision. It is the current paper's research advantage to have results unforeseen by the researchers involved who would not have had been inclined towards these specific factual outcomes.

Only through the use of a *quantitative* cross-impact analysis can a meta-level emerge that allows the researcher to see a new and surprising outcome. It is this specific data analysis step that combines the content of different expertise holders and presents a wide range of here 128 possible cross-impact analysis scenarios (CIS). Instead of bringing the experts together again in a second data collection step (cp. Delphi Method, e.g. Linstone and Turoff, 2002) and have them decide on convincing outcomes (Smith et al., 2005), we can confidently claim at this stage that, from the variety of CIS, there are some more frequent and more consistent than others. At no point within a solely

qualitative approach would this claim be possible. We can conclude that a cross-impact analysis created a new angle with surprising results, consequently giving credibility at the same time.

Within the given case the outcome was that a highly consistent and frequent CIS would have the factors *rise in fertility*, a *migration driven by social security and* a *travel behaviour with a cohort effect* (cp. table 3). It is then possible for the researcher to go back to the transcriptions of the different interviews and find exactly the right passages that correspond with the CIS findings. Using these passages would result in the development of the final qualitative scenario building to present the findings of the research. These findings are less biased by the author as the composition was prescribed through the quantitative research step.

Critique and outcome

A potentially critical step in determining a qualitative result from the transcribed interviews is the finding of key terms, in this case called *descriptors*, within the text. Depending upon the method used, evidence can be found or overlooked or evaluated to different degrees. For the underlying work of the method presented in this paper the evaluation of which descriptors to find within the transcripts to be used as input data for the qualitative step was done by the author by reading through the interviews, highlighting passages and then allocating descriptors and descriptor tendencies manually.

In hindsight this is seen as a lack of methodological approach in determining the evidence for the descriptors. At the time of using Szeno-Plan for calculating the cross-impact probabilities it had not been discussed if the input-data for Szeno-Plan should have been determined in a quantitative way as well. Instead the data was found through qualitative text analysis, i.e. finding evidence within the interview for descriptors and their descriptor tendencies. It was then at this point decided along the interviewee's expressions if the expert strongly disagrees with a combination, is indifferent or favours a given combination. It is recommended that in future studies, a researcher would use a text analysis tool, e.g. *Leximancer* in order to further justify choices.

Having decided upon a "QUAL → quan → QUAL" method it can be discussed how and if alterations within the methodological approach would have lead to different outcomes. The qualitative steps 1, the expert interviews, and 3, the scenarios, have been held fixed from the very beginning of the research planning, with the quantitative step 2, the cross-impact analysis, being the addition. Having decided upon a quantitative second step within an overall mixed method approach, there are several possible ways of combining input, analysis and output methods. In order to generate data for output scenarios for prospective forecasting studies cross-impact analysis is recommended, different research disciplines will use different software.

5. Conclusion

The advantage of the quantitative layer in the demonstrated case study can be seen when comparing with a purely qualitative approach. In that case a qualitative step 2 using a thematic text analysis or discussions in workshops would be used to generate the input data for the scenarios. But this has been seen as being prone to be biased by the researcher in favouring some topics unintentionally while omitting others. The strength and the value of this mixed methods approach is that it provides researchers with a broader set of analysis and a more substantial way of data interpretation. This paper demonstrated that qualitative data collection, combined with quantitative data analysis will lead to potentially more robust results. The outcomes of the research outlined within this paper could not have been anticipated with one method only, neither qualitative nor quantitative.

As this paper used qualitative expert interviews, followed by a quantitative cross-impact analysis we can further claim to offer and demonstrate results of high frequency and consistency. Those emerging less biased conclusions that can be drawn were additionally obtained and contributed well to the qualitative step. Instead of only having the accumulated expertise of all interviewees for consideration, a new level of results has become apparent. It is this added quality which contributes to the elevated value of mixed methods research. Thus, we recommend using a quantitative layer within a qualitative research to reduce bias. Mixed method research is beneficial to use in order to produce a research output that is of higher value than single approaches in qualitative or quantitative methods.

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The Multidisciplinary Nature of Business Strategy: Suggesting a Rhizome Paradigm

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Abstract: Though business strategy has long been the subject of academic interest, neither the question of the unified philosophical paradigm that govern it, nor the scientific disciplines that guide it has not yet been resolved (Mintzberg et al.1998). We argue that by adopting the rhizome paradigm to explain business strategy we can set the ground for understanding the intellectual foundation of business strategy and resolve the diverse, inconsistent or one may say complementary, definitions of business strategy. The article starts by presenting the various concepts of business strategy. It then portrays the many scientific disciplines that impinge on strategy, showing how none of them may be considered as a base for a unified paradigm. Turning to philosophy for a solution, we try first to look into the traditional western arbores cent philosophies but find that they do not give the needed framework for business strategy. The next step is to look at the rhizome philosophy as a possible paradigm. We follow with a brief description of the six principals of the rhizome, demonstrating how it does offer the necessary way to blend the influences of the various scientific disciplines on business strategy. We then explain how the rhizome paradigm serves to establish an intellectual foundation for business strategy that provides us with a rationalization for the coexistence of its many definitions. We conclude by describing the contribution of this article to the emerging discipline of business strategy as well as suggest directions for further research.

Keywords: business strategy, rhizome paradigm, strategy schools, network organisation

1. Introduction

Though business strategy has long been the subject of academic interest, neither the question of the unified philosophical paradigm that govern it, nor the scientific disciplines that guide it has not yet been resolved (Mintzberg et al.1998). We argue that by adopting the rhizome paradigm to explain business strategy we can set the ground for understanding the intellectual foundation of business strategy and resolve the diverse, inconsistent or one may say complementary, definitions of business strategy.

We start by presenting the various concepts of business strategy. We then portray the many scientific disciplines that impinge on strategy, showing how none of them may be considered as a base for a unified paradigm. Turning to philosophy for a solution, we try first to look into the traditional western arborescent philosophies but find that they do not give the needed framework for business strategy. The next step is to look at the rhizome philosophy as a possible paradigm. We follow with a brief description of the six principals of the rhizome, demonstrating how it does offer the necessary way to blend the influences of the various scientific disciplines on business strategy. We then explain how the rhizome paradigm serves to establish an intellectual foundation for business strategy that provides us also with a rationalization for the coexistence of its many definitions.

2. The components of business strategy

Long after the emergence of the concept of business strategy, we find this surprising statement, published in 2001: “After more than 30 years of hard thinking about strategy, consultants and scholars have provided an abundance of frameworks for analyzing strategic situations. Missing, however, has been any guidance as to what the product of these tools should be – or what actually constitutes a strategy” (Hambrick and Fredrickson 2001). Markides (2004) makes much the same argument, while Dudik (2000) stirs up the debate with the following rather provocative and controversial pronouncement on the present state of strategy: “It might seem shocking that today, in this high-tech age, I should be calling for an end to the Middle Ages in corporate strategy”.

De Wit and Meyer (1999) open their book Strategy Synthesis with the argument that the differing opinions on the nature of strategy are so wide in range that even a common definition of the term “strategy” is elusive. Andrews (1987) suggests a very elaborate definition. In his view strategy in a company is the pattern of decisions that determines its goals, the principal policies to achieve those

goals, the range of business to pursue, the kind of organization it intends to be and finally, the contribution it intends to bring to its stakeholders.

Hambrick and Fredrickson (2001) define strategy as "the central integrated, externally oriented concept of how we will achieve our objectives." Dudik (2000), as ever unconventional and pragmatic, describes strategy as a hypothesis of the "if-then statement" type. A much broader definition of strategy is "the pattern in the stream of decisions" (Mintzberg and Waters 1985).

Beside the diverse views on content of business strategy we can find assorted concepts in the way business strategy is developed while ignoring the various definitions of business strategy itself (Mintzberg and Waters 1985; Hart and Banbury 1994; Bailey et al. 2000).

Some scholars have tried to suggest a more specific definition of strategy. Noy (1998), for instance, proposes five elements of "total strategy", Hambrick and Fredrickson (2001) present another five, Markides (2004) defines three and Collis and Rukstad (2008) – three, as presented in Table 1. Several of the definitions share some common ground. None of them is accepted as the dominant one.

Table 1: Strategy components

	Andrews 1980	**Noy 1998**	**Hambrick and Fredrickson 2001**	**Abell 2006**	**Collis and Rukstad 2008**
Markets	Markets to be served		Arena – the domain of the firm's activities	Definition of customers, function or technology	Define the scope, or domain, of the business
Products	Products/ services to be served	Customers' needs to be satisfied		Needs to satisfy customers	
Channels	Channels to reach the markets		Vehicles – the way to pursue the strategic objectives		
Financing	Means of financing				
Quantitative objectives	Profit objectives	Long range quantitative goals of profit and growth	Economic logic and the way the firm obtains the returns on its investments	The goal structure – long or short range investments	The goals that strategy is designed to achieve
Risk	Risk return objectives	Risk strategy			
Competitive advantage		Cost leader or differen-tiator	Differentiators	Perceived value/price positioning. Segmen-tation to focus on	A clear sense of advantage
Leadership		Leader, fast follower or follower	Staging – the firm' speed and sequence of moves		

3. The scientific paradigm of business strategy

If there is no agreement on the definition of strategy we should go back to the more general question – what is the paradigm from which business strategy draws its legitimacy as a subject of academic debate? We find a hint to the answer to this question in Hafsi and Thomas (2005), who argue that there is an academic field of strategy, but it is still underdeveloped, despite the incredible surge of research in the last twenty years.

Another argument (Calori 1998, quoting Martinet 1996) claims that strategic management has all the formal attributes of a self-sufficient discipline – professors, journals, and associations, but has not yet reached the status of a science as it has not produced a unifying paradigm. In a more recent research, Nag et al. (2007) argue that the successful development of the strategic management field

of research has contributed to the fact that its intellectual content consists of numerous conceptual elements, thus allowing exploration of a wide array of theoretical and practical issues.

Though having no leading paradigm is, on one hand, preventing us from understanding the intellectual foundation of business strategy, on the other hand, researchers are beginning to recognize that strategy is an experiential arena where philosophy matters (Powell 2002). In the last few years there has been an upsurge of philosophy articles dealing with organization studies in general and with strategic management in particular. The most comprehensive article, encompassing a large number of references to philosophy, organization studies and strategy is "Philosophizing on strategic management models" (Calori 1998). The main purpose of this "essai" (as the author defines it) was to offer an epistemological critique of orthodox prescriptive models of strategic management – Planning, Design and Positioning. Although his arguments are deep and well referenced, they touched on only three out of ten strategic schools of thoughts.

There are some more focused philosophy articles relevant to strategy. For example, Bronn (1998) deals with applying epistemic logic and evidential theory to strategic arguments. Mir and Watson (2000), followed by a commentary by Kwan and Tsang (2001), deal with constructivism as opposed to the realist paradigm. Powell (2001) presents his argument for "Competitive advantage: Logical and philosophical considerations" and, responding to comments by Durand (2002) with his views on "The Philosophy of Strategy", concludes that "strategy's philosophical foundations are worthy of further exploration" (Powell 2002).

None of these scholars has addressed the question of how to place business strategy in its proper position among the many scientific disciplines that influence it. This situation may be the reason for the rising concern about the need for a philosophical framework for strategy, notwithstanding that philosophy has been slow to enter strategy research even when it is clearly relevant, as argue by Powell (2002):

> *"The recent increase in philosophy of science articles in strategic management reflects researchers' rising concerns with understanding and securing the field's intellectual foundations. This paper argues for a proactive approach to the philosophy of strategy, and for the rejection of conventional, off-the-shelf philosophies that neither contemplated, nor can assimilate, the epistemological messiness and action-connectedness of strategic management."*

In our search for an encompassing paradigm for business strategy we run through the gamut of the common western philosophical theories, which are mostly vertically arborescent developments branching from a centre stem connected to the roots of historical philosophical thoughts with a well defined reference between any new idea and the various previous arguments (Edwards 1967). However, as the interrelations between the many scientific disciplines and business strategy are neither hierarchical nor arborescent, we have to look elsewhere for a paradigm and came out with the horizontal philosophical concept of the "rhizome" (Deleuze and Guattari 1988. Published originally in French in 1975). This concept origins in Deleuze's philosophy of *transcendental empiricism* and is considered by the philosophical circles as part of the post-structuralism and postmodernism movements.

In the history of philosophy, at the last quarter of the 20th century, we find a number of philosophers that support the horizontal philosophical concept of Deleuze and Guattari. Foucault (2002), in his book Archaeology of Knowledge, demonstrates the limitation of the positive arborescent model for understanding the behaviour of the history of philosophy. Lyotard (1988) attacks the meta-narratives of science, culture and philosophy and argues that the horizontal model, that supports the Deleuzeien model and that of Foucault's model of Discourse, is the one most adapt to our time. Another French philosopher (Derrida 1978, 1982) analyzes with his methods the deconsructivist concepts that criticize the positive historical approach and conclude by supporting the horizontal and critical concepts of Deleuze.

The "rhizome" (A rhizome is, in botany, a root like subterranean stem, commonly horizontal in position that usually produces roots below and sends up shoots progressively from the upper surface) with its multiple horizontal roots best represents the nature of the relation between business strategy and the many scientific disciplines to which it is connected, (Mintzberg et al. 1998) though the rhizome may be an appropriate paradigm covering the implications of such multi-root connections as presented in Figure 1.

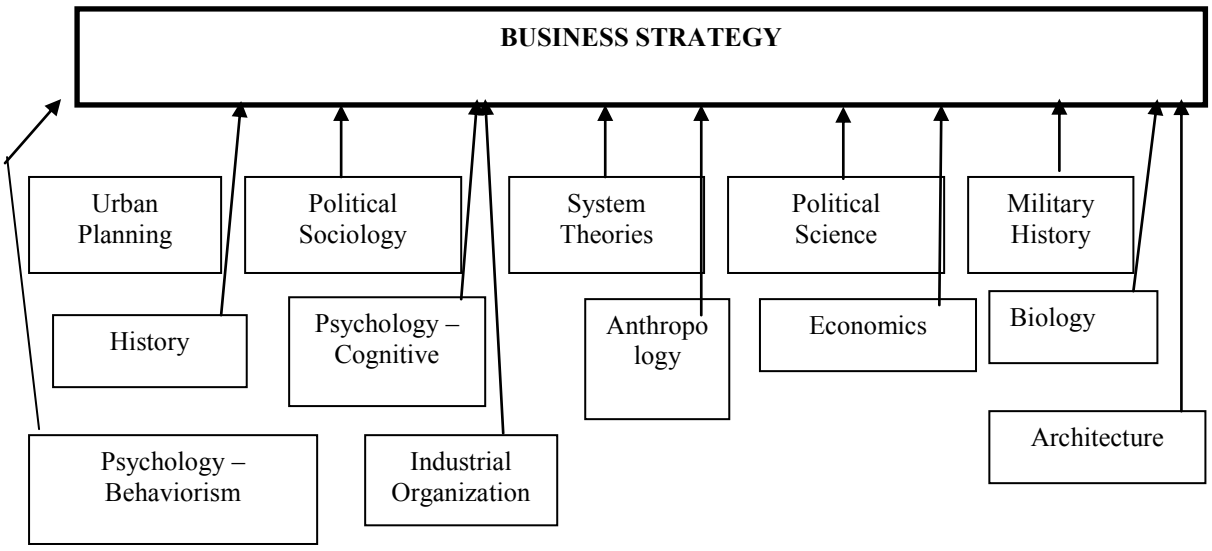

Figure 1: Business strategy and the scientific disciplines

We argue that applying the rhizome paradigm to business strategy (based on rhizome philosophy of Deleuze and Guattari 1988) leads to a unifying philosophical paradigm for business strategy

4. Rhizome philosophy

The rhizome concept has been adopted by certain post-modern schools in western philosophy (Foucault, 2002; Lyotard, 1988; Derrida, 1978, 1982), To give the reader a sense of the whole theory, we first briefly present the principles of rhizome philosophy, mostly in the form of adaptations from Deleuze and Guattari (1988), Boundas (1993) and Luski (2001), before embarking on the task of applying each principle to business strategy.

The central ideas of rhizome are: first, "conjunction" which means a departure from the "either/or" and accepting "and, and, and…"; second, connection to multiple roots and as such connection from any root to any other root; third, accepting that everything is in the process of "continuous change". These ideas are embodied in its six principals.

Connection and heterogeneity, the first two principles, requires that any part of a rhizome system can be connected to any other part. In other words, the rhizome is not hierarchical (arborescent) in structure. It is anti-hierarchical, but all its parts are and must be connected.

The third principle of the rhizome is that of *multiplicity*. There are no points or positions in a rhizome, such as those found in a structure, tree, or root. There are only lines. In contrast to centred (even polycentric) systems with hierarchical modes of communication and pre-established paths, a rhizome is made up of plateaus. A plateau is always in the middle, not at the beginning or the end.

The fourth principle is *asignifying rupture*, according to which, the rhizome may be shattered at a given spot, but will start up again on one of its old lines, or on new lines. Every rhizome contains lines of segmentarity according to which it is stratified, territorialized, organized, signified, attributed etc.

The fifth and sixth principles of the rhizome are *cartography and decalcomania*. These principles state that the rhizome is not a tracing mechanism, but rather a map with multiple entry ways. The map is open and connectable in all dimensions; it is detachable, reversible, and subject to constant modification. It can be torn, reversed, adapted to any kind of mounting, and reworked by an individual, group or social formation.

To summarize the key aspects of Deleuze and Guattari's rhizome, it is an acentered, non-hierarchical, nonsignifying system without a general and without an organizing memory or central automation, defined solely by a circulation of states.

5. Business strategy and the rhizome paradigm

It is our proposition that business strategy, in its broadest definition like "the pattern in the stream of decisions" (Mintzberg and Waters 1985) conforms to the concepts and the six principles of the rhizome paradigm, and that this view explains the concurrent influence of the many scientific disciplines as well as the coexistence of many definitions of business strategy.

The rhizome concept of "conjunction" is the answer to the question raised by Mintzberg et al. (1998):

> *".. we have to get beyond the narrowness of each school: we need to know how this beast called strategy formation, which combines all of these schools and more, really lives its life".*

On the other hand, the idea that strategies are in a permanent process of learning and change, defined as "emerging strategies" (Mintzberg and Waters, 1985), is the result of strategy conforming with the "continuous change" concept of rhizome paradigm.

The fit of business strategy to the rhizome can be demonstrated in each of its six principles:

1 and 2: Principles of connection and heterogeneity

The connection of business strategy to many scientific disciplines has been elaborated by Mintzberg et al. (1998) as demonstrated in table 2.

Table 2: The strategy schools as per *Strategy Safari* (Mintzberg et al. 1998)

	School	Discipline	Reference – initiators	Contribution to business strategy
1	**Design School**	Architecture	Selznick (1957) Andrews (1971)	Strategy formation as a process of conception of fit
2	**Planning School**	Urban planning, system theories.	Ansoff (1965) Steiner (1969)	Strategy formation as a formal process
3	**Positioning School**	Economics –industrial organization, military history	Sun Tzu (2001) Porter (1980, 1985)	Strategy formation as an analytical process
4	**Entrepreneurial School**	Economics	Schumpeter (1950) Cole (1959)	Strategy formation as a visionary process
5	**Cognitive School**	Psychology -cognitive	Simon (1947, 1957), March & Simon (1958).	Strategy formation as a mental process
6	**Learning School**	Psychology - behaviourism	Lindblom (1959, 1968) Cyert & March (1963) Weick (1969) Quinn (1980)	Strategy formation as an emergent process
7	**Power School**	Political science	Allison (1971) Pfeffer & Salancik (1978) Astley (1984)	Strategy formation as a process of negotiation
8	**Cultural School**	Anthropology	Rhenman (1973) Lorsch (1985)	Strategy formation as a collective process
9	**Environmental School**	Biology, political sociology	Hannan & Freeman (1977) Pugh et al. (1968)	Strategy formation as a reactive process
10	**Configuration School**	History	Chandler (1962) Miles et al. (1978) Miller (1986,7)	Strategy formation as a process of transformation

Moreover, the scientific disciplines themselves become interwoven, as can be well demonstrated by what is happening in economics, the discipline that claims the strongest connection to business strategy (Porter 1991). Thus, also Chapter 17 of Besanko et al.'s (2004) *Economics of Strategy* is titled "Environment, Power and Culture", and out of the eight Nobel Laureates in Economics of the last four years, D. Kahneman is a psychologist and, as stated by the Nobel Prize Committee, he was awarded the prize:

> *"….for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty" (Royal Swedish Academy of Science 2002).*

Two other Nobel Laureates are mathematicians (C.W.J. Granger and R.J. Aumann), one is a mathematician and economist (E.C. Prescott), one is a physicist and economist (R.F. Engel) and only three are plain economists (V.L. Smith, T.S. Schelling and F.E. Kydland).

At the same time, the three main scientific disciplines affecting business strategy, namely economics, sociology and psychology (Baum and Rau 1998), although interconnected are directly connected to business strategy horizontally and not hierarchically. For example "markets" and "products" (see Table 1) are a result of consumer behaviour that derives from a combination of non-hierarchical economic, social and psychological considerations (Schiffman and Kanuk 2007).

Risk taking, once considered by economists to be the result of pure rational economic consideration, was later proven to be guided by both economics and psychology (Caplin and Leahy 2001).

Thus the inter-connection among the scientific disciplines and their direct independent connection to business strategy conforms to the rhizome principles of connection and heterogeneity.

3: Principle of multiplicity

The approach to business strategy can start at any discipline or at the concept of strategy itself. But, whatever the starting point, it will lead us to another, say from the planning school to the economic school, the cultural school, etc. We cannot disregard any of the disciplines, though the magnitude of their influence might vary from one firm to another. In any event there is no mandatory entry point to the process of formulating business strategy, nor is there any obligatory hierarchical sequence. Strategy formulation and planning started with the market-based strategy, with markets and customers as the entry point (Andrews 1980), and developing resources to fit the market was only the second step. Just few years later, Wernerfelt (1984) introduced the concept of "resource-base strategy" that changed the starting point of strategy formulation to the firm's resources, with assessing the market and customers as the second step.

4: Principle of asignifying rupture

Hamel and Prahalad (1994) came forward with the revolutionary idea of proactive strategy, introducing concepts such as "rewriting industry rules and creating new competitive space", "exploratory and open-ended strategic planning", "strategy as stretch" and above all "shaping the market", contrary to the conventional "fit into the market". These ideas shattered the traditional concepts of market-based strategy and gave a major twist to resource-based strategy. The proactive strategy concept is a good example of how strategy follows the first part of the asignifying rupture principle of the rhizome. The next step of the proactive strategy is resuming strategic planning procedures by reconnecting to old lines of the strategic rhizome grid, though not necessarily accepting an established definition of strategy. Business strategy is always open to new ruptures of existing concepts in the future.

5 and 6: Principles of cartography and decalcomania

The turbulence of the environment in which businesses have been operating in the last decade or so has turned the topic of change management into a dominant feature of the business literature: "Organizations have to change to stay alive", claims Abrahamson (2000). Two of the suggested ways to cope with the need for change are "tinkering and kludging", which means reshuffling the present components, products and markets to construct a new competitive map. Beer and Nohria (2000) claim that "Not since the Industrial Revolution has the stakes of dealing with change been so high." They suggest "planning for spontaneity" and "explicitly embracing the paradox between economic value and organizational capability".

There are no boundaries to the concept of business strategy and new scientific developments, such as those that appear in Carroll and Hannan's (2000) *The Demography of Corporations and Industries*, whose influence has still to be fully evaluated, or the Red Queen concept of competition (Barnett 2008), which claims that competition has a positive influence on the firm's viability.

These principles of "cartography and decalcomania" are well demonstrated in the many ways proposed to cope with strategic change. They vary from the operational – "selectively use the past to jump-start new opportunities" (Brown and Eisenhardt 1998), to the behavioural (Kotter 1996) – "developing a new vision and defining a new strategy", to the proactive (Hamel 2000) – "elastic business definition with unreasonable expectations" and to combinations of all three, but they all surrender to the concept of cartography and decalcomania – the present business strategy and systems are detachable, reversible, and amenable to constant modification. They can be torn, reversed, adapted to any kind of mounting without any boundaries, and this is the new strategy.

6. Discussion

Some concepts of rhizome paradigm with its central ideas of "conjunction" which means a departure from the "either/or" and accepting "and, and, and…", as expressed by Deleuze and Guattari (1988), have been subliminally infiltrating business strategy for a number of years in the realm of one of the most important fundamentals of business strategy, namely competition. Insofar as competition is the governing force of business strategy, one could not be faulted for saying that "Business is War." A company has to capture the market, beat the competition, make a killing, and bury the competition, implying only winners and losers, either/or and zero-sum games in the relationships among competing firms, between suppliers and firms and between the firm and its customers. At the same time, when we consider the importance of partnership, alliances, working together, listening to the customer, and working with suppliers, a more appropriate metaphor might be "Business is Peace". But that cannot be right either, because we know there is conflict with rivals over market share, conflict with customers over prices, and conflict with suppliers over costs (Lado, Boyd and Hanlon 1997).

It was Novell founder Ray Noorda who coined the term "co-opetition" (cooperation combined with competition) in the 1980s to define the idea of competitors working together to open new markets, develop new products, or improve the market position of all parties involved; he was followed by Brandenburger and Nalebuff (1996) who introduced the concept into the business world. Using the pie analogy to explain co-opetition, they argue that everyone (organizations/businesses within a market) wants a piece of it, but there are those who want bigger pieces or all of the pie. Co-opetition, they claim, allows for a bigger pie so that everyone can have a nice share. Partners in co-opetition contribute their skills, knowledge, and resources to creating the service and providing the quality that the market demands (Le Tourneau 2004). Co-opetition introduced a new value net, composed of four types of competitors, namely – direct competitors, complementors, customers and suppliers, showing that each player in this net can be at any one of a variety of different positions at any given instance. This development, evolving from the rhizome paradigm of "principles of connection and heterogeneity", may well be demonstrated in the new relation between buyers, sellers and competitors as presented in Figure 2.

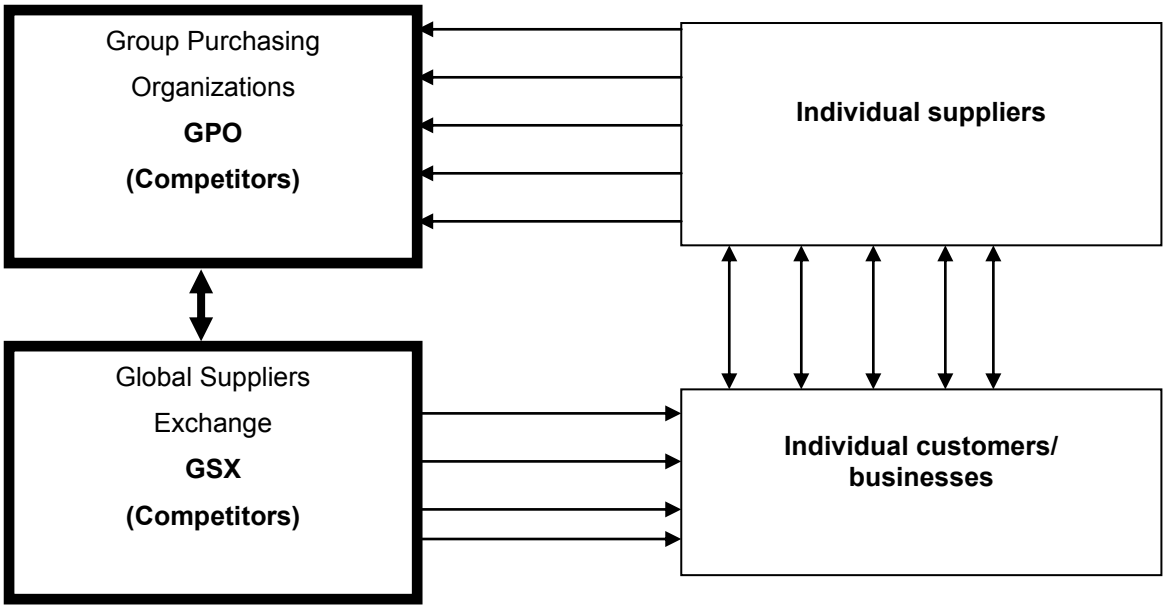

Figure 2: The rhizome competitors-suppliers-customers relations

Accepting this proposition encourages them to cooperate for the benefit of all players. Although co-opetition might have started as a way to maximize the company's short-range profit, it has become a new concept for doing business – not looking to immediate profits but to the long range. Co-opetition is demonstrating a rhizome approach to doing business that abandons the ferocity of either/or competition on the one hand and the non-business orientation of full cooperation on the other hand, to accept the "and, and" of combining competition and cooperation for the benefit of all parties – customers, suppliers, complementors and direct competitors.

Chia (1999) explicitly applied the rhizome paradigm in his metaphysical perspective of organizational change, offering an inherently dynamic, complex, and indeterminacy-based mode of organizational transformation that is replacing the prevailing static and equilibrium-based concepts of change as follows:

> *"Change is essentially 'rhizomatic" in nature. Evolutionary emergence does not occur in a linear stage-like manner. Rather creative evolution is what best describes the outcome of the creative tension between 'organization' and 'change'."*

This concept of "creative evolution" together with the rhizome's principle of "asignifying rupture" has created amongst certain authors the notion of strategy as a revolution rather than an evolution (Hamel 2000, Hamel and Prahalad 1994). These authors argue that the goal of the firm is not to predict what is going to happen and fit its strategy accordingly but to make it happen by its visionary unreasonable expectation strategy, which does not have to be connected to its present strategy.

Accepting the ideas of the rhizome paradigm in business strategy might prevent situations in which research on an issue develops independently in two parallel scientific disciplines without referring to one another and with disconnected conclusions, such as happened with "niche strategy". The concept of the "niche" was introduced on the basis of economic theory as market segmentation and niche generic strategy (Smith, 1956; Claycamp and Massy, 1968; Porter, 1980). In parallel with the research of economists and industrial organization scholars, a separate strand of work on the emergence and disappearances of niches has developed in the area of population ecology and demography of corporations (Hannan and Freeman, 1977; Freeman and Hannan, 1983; Carroll and Hannan, 2000). Adopting a different approach, the researchers in the areas of population ecology and demography of corporations disregard the strategic, economic and cost-benefit aspects of niches and attribute the birth and death of niche firms to the concentration and the competitive structure of the markets, rather than the actions of the single firm.

Only by accepting the rhizome paradigm of "and, and" instead of "either/or" was a fully fledged comprehensive theory of niche strategy developed, with roots in economics, game theory, population ecology and corporate demography (Noy 2009).

The need to break the disciplinary boundaries in strategy and acknowledge the "and, and" concept of the rhizome paradigm has, albeit unwittingly, been recognized for a long time. Wilson (1994) found in his research on the changes in strategic planning that there is a growing recognition that motivation, behaviour and company culture are critical elements in determining the success or failure of strategy planning and implementation, dominated as they were by the prescriptive schools of strategy.

Another striking example of the late revelation of the need to look for various disciplinary origins for any strategic concept can be found in the development of the resource-based view (RBV) of the firm. In the first article on this concept (Wernerfelt 1984) the resources mentioned were "brand name, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedures and capital". Ten years later the same author, who is an economist, professed that in the span of the ten years the theoretical aspect of RBV had arrived at a better understanding of "culture" as an important resource of the firm (Wernerfelt 1995).

The rhizome principal of "connection and heterogeneity" in business strategy is demonstrated in the development of the network organization structure (see Figure 3)

In this new structure any single employee, group or manager can be connected to anyone. It is a structure that has become the back-bone of transnational global strategies. Contrary to the traditional sedentary corporate headquarters, there is no longer a single spot but a shifting, headless rhizome type of connections between the firm's executives and its employees (Cubitt. 2001). Does the

Rhizome paradigm of business strategy overshadow any claim of a specific scientific discipline to govern business strategy? A good source in seeking an answer to the question of the disciplinary involvements in business strategy is Mintzberg et al. (1998), who argue that it can be approached from many schools of thought, representing a large variety of scientific disciplines, as detailed in Table 2 .

E = Employee

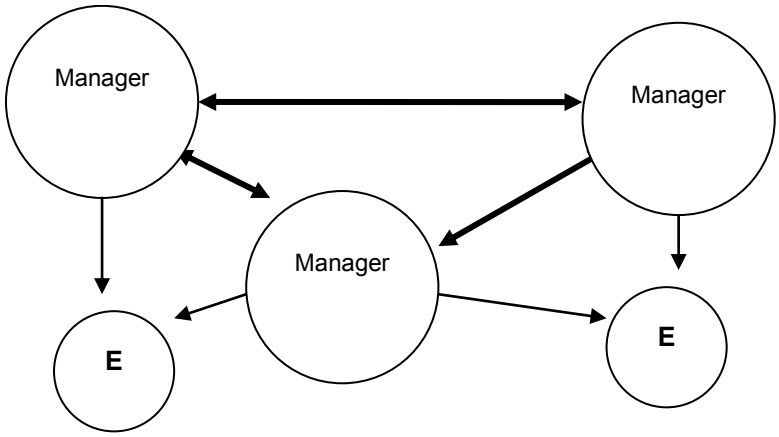

Figure 3: The network organization

The multi-disciplinary argument is supported by the research of Baum and Rao (1998). They analyzed the disciplinary source of articles in strategic management focusing on economics divided into "microeconomics" and "industrial organization", sociology with two fields namely "imperative" and "realist" and psychology, also divided into two fields – "behaviourist" and "cognitive". All in all they found 20 subfields in these three major scientific disciplines, as described in Table 3. However they missed the new field of "behavioural economics", which combines economics and psychology (e.g. Kahneman, 2003) that was in its infancy at the time of their research.

Table 3: Strategic management disciplinary matrix

Root Discipline	Economics		Sociology		Psychology	
Field	Micro-economics	I/O economics	Interpretive	Realist	Behaviorist	Cognitive
Subfield	*Transaction cost economics*	*Structure-conduct-performance*	*Institutional sociology*	*Contingency theory*	*Behavioral theory of the firm*	*Managerial & organizational cognition*
	Agency theory	Strategic groups	Social networks	Resource dependence	Behavioral decision theory	Computational theory
	Institutional economics	Game theory	Social construction of technology and markets	Organizational ecology	Organizational learning	
	Evolutionary economics			Organizational evolution		
	Resource-based view					

From Baum J.A.C., Rao H. 1998. Strategic management as a fish-scale multiscience. In *Advances in Strategic Management* (Vol. 15, pp. 1-18). JAI Press Inc.

Summing up the academic disciplines involved in business strategy we find the following:

- Social sciences – economics, sociology, psychology, anthropology, political science.
- Humanities – military history, history.
- Exact sciences – mathematics (game theory), biology.
- Engineering – general engineering, architecture, urban planning.

Does any of the scientific disciplines claim to be the exclusive foundation of a paradigm of business strategy negating our argument for multidisciplinary and the need for a comprehensive paradigm? We find that scholars of one discipline question the validity of others (e.g. Mintzberg 1994, Hamel and Prahalad 1989) and one of the critiques on the prescriptive schools of strategy (planning, design and positioning schools) is that they fail to recognize feelings (cognition, cultural and learning schools) as a reason (Calori 1998). Dobbin and Baum, the editors of Advances in Strategic Management, titled their Vol. 17, published in 2000, "Economics Meets Sociology in Strategic Management". This work was the result of meetings that they arranged between strategic management scholars and sociology scholars, to conduct research on similar subjects from the point of view of the two scientific disciplines, for discussions on their different perspectives. The outcome was that both disciplines contribute to broadening the understanding of the subjects but neither of them has an exclusive solution.

We end this discussion by arguing that accepting the rhizome paradigm as an overall governing concept of business strategy we may not only remove disciplinary blinders but also resolve the present conflicts between the various scientific disciplines involved in strategy and direct all scholars to approach business strategy from a multidisciplinary perspective and not be deterred by reaching a new and even revolutionary definition of strategic business components. It might also invite scholars that researched various aspects of strategy from a single disciplinary lens to re-assess their findings from a multidisciplinary attitude similar to what is presented by Noy (2009).

7. Conclusion

The main direct contributions of applying the rhizome paradigm to business strategy are as follows:

- Developing a unifying philosophical paradigm for business strategy
- Introducing a paradigm that establishes the nature of the connections between the many scientific disciplines and business strategy.
- Helping to accept the diverse definitions and descriptions of business strategy as complementary rather than mutually exclusive.
- Contributing to the development of strategic management as a self-sufficient discipline.

In sum, this article is another step in the call for a much needed comprehensive paradigm for business strategy.

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The Effect of Misspecification of Reflective and Formative Constructs in Operations and Manufacturing Management Research

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Abstract: This paper highlights theoretical and mathematical differences between formative and reflective measurement models, in the context of academic SEM oriented research in Operations and Manufacturing Management, an area of significant current interest. It discusses problems associated with measurement model misspecification. It further illustrates, using survey data, the effects of possible misspecification on model fit parameters and path coefficients in a nomological model, using the Partial Least Squares (PLS) approach. It then proposes guidelines for the use of the PLS methodology for analyzing formative measurement models.

Keywords: formative, reflective, measurement models, PLS, structural equation modeling, model misspecification

1. Introduction

Structural Equation Modeling (SEM) ("a technique to specify, estimate, and evaluate models of linear relationships among a set of observed variables in terms of generally smaller number of unobserved variables." - Shah and Goldstein, 2006) is widely used in Operations and Manufacturing Management (OM) research to empirically define and validate constructs, and study causal relationships among them. There are two parts to SEM. First is a "Measurement Model", where one tests the relationship of an unobserved variable - a "latent variable" or a "construct"[1], - with a set of observed variables - "indicators" or "measured variables". The second part consists of a "Structural Model" or a "Path Model" - where causal relationships among latent variables and/or measured variables are tested.

A "Measurement Model" can be one of two kinds – a "Reflective Measurement Model"[2] or a "Formative Measurement Model" (Bollen and Lennox, 1991; Edwards and Bagozzi, 2000). (a detailed discussion follows in Section 2). Wrongly modeling a reflective model as formative, and vice versa, is known as "model misspecification". Reflective models have their foundation in the classical test theory (Bollen and Lennox, 1991) and have well developed testing criteria and have been widely used in Operations Management (OM) research. The use of formative models however, has remained limited, due in part to the unavailability of appropriate modeling software and lack of proper testing guidelines, even though their origin can be traced back to the work of Blalock (1961).

Prior work on theoretical and statistical issues regarding the differences between reflective and formative models increases the relevance of studying formative measurement models. First, many measurement models in the OM literature are formative, by the very nature of the theoretical and domain concepts underlying them. Modeling such variables (wrongly) as reflective models leads to a misspecification error (Bollen and Lennox, 1991; Edwards and Bagozzi, 2000; Diamantopolous and Winklhofer, 2001). Second, a misspecification in the measurement model (that measures a latent variable or a construct) impacts the structural paths coming in or going out of the latent variable, thus leading to erroneous path coefficients (Mackenzie et al., 2001; Jarvis et al., 2005). To this end, there is a need for understanding (1) when the use of formative measurement models is appropriate and (2) how such models should be formulated and tested.

Current literatures in other management disciplines (strategic management, marketing, management information systems, and organization behavior, e.g.) have initiated an interesting and important discourse about when and why constructs in their respective fields should be modeled as formative or

[1] We have used the words "Construct" and "Latent Variable" interchangeably
[2] Hereafter we refer to "Reflective (Formative) Measurement Model" as simply "reflective (formative) model".

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reflective, and theoretical and domain related errors resulting from model misspecification (Bollen and Lennox, 1991; Diamantopolous and Winklhofer, 2001; Jarvis et al., 2003; Mackenzie et al., 2001; Hulland, 1999). However research in OM has not fully dealt with these issues.

In this paper, we provide a basis for understanding how formative models can be appropriately used and modeled, with specific attention to the OM literature. Towards this end we (a) discuss differences between formative and reflective measurement models and provide a brief overview of commonly used terminology (Section 2); (b) discuss the effects of model misspecification from a theoretical perspective (Section 3); (c) illustrate, through primary (survey) data, the effects of measurement model misspecification on a particular structural model (Section 4); (d) review the OM literature to examine alternate model specification possibilities and the possible scale of misspecification (Section 5); (e) discuss the implications for researchers in OM who would use these techniques (Section 6); (f) provide some broad recommendations for future research which uses measurement modeling (Section 7).

2. Definitional aspects

2.1 Constructs and measures

A *Construct* is defined as "a conceptual term used to describe a phenomenon of theoretical interest" (Edwards and Bagozzi, 2000, p. 156-157). The phenomenon described by a construct may or may not be directly observable, in which case the construct is a *Latent Construct*. Constructs are measured with the help of *Indicators* (Diamantopolous and Winklhofer, 2001) or *Items* (Law et al., 1998) or *Measures*[3]. These are defined as "an observed score gathered through self report, interview, observation or some other means", (Edwards and Bagozzi, 2000, p. 156). The construct in turn measures a real phenomenon, but incompletely; the un-explained or left over part is known as the *Measurement Error*. A *Measurement Model* is used to depict the relationship between a construct and its measures; it therefore bridges the observed variables (measures) with the unobserved variable (construct) (Byrne, 2001).

When studying the phenomenon of interest, a Measurement Model is usually part of a larger network/model which consists of dependence relationships among constructs. The constructs represent different variables which are germane to understanding the phenomenon. This larger network is known as a "Path Diagram" or a "Structural Model". There can be two types of constructs in a Structural Model: Exogenous and Endogenous. Exogenous constructs are "independent", that is, they act "only as a predictor or 'cause' for other constructs in the model" (Gefen et al., 2000, p. 68). That is, they cause fluctuations or variations in the values of other constructs in the model. Endogenous constructs are "dependent", that is they are "dependent on other variables in at least one causal relationship" (Gefen et al., 2000, p. 67) in the model. In a given Structural Model, exogenous constructs are identified by one or more arrows (signifying causal relationships) coming out of (*but none going into*) them. Endogenous constructs have *at least one arrow going into them*.

2.2 Reflective and formative constructs

A latent construct can be modeled in two ways – Reflective and Formative. In a Reflective model (Edwards and Bagozzi, 2000; Diamantopoulos and Winklhofer, 2001), the construct is viewed as the cause and the measures or indicators its manifestations. Thus, the construct determines its indicators (Bollen and Lennox, 1991), as shown in Figure 1. Some examples of reflective constructs in the OM literature are Supply Chain Integration (Vickery et al., 2003), aspects of TQM practices (Kaynak, 2003) and Supply Chain Performance (Benton and Maloni, 2005) and Flexible Manufacturing (Zhang et al., 2003).

In a Formative model, as shown in Figure 2, the indicators determine (Bollen and Lennox, 1991) or cause (Edwards and Bagozzi, 2000) the construct. According to MacCallum and Browne (1993, p. 533), "in many cases indicators could be viewed as causing rather than being caused by the latent variable measured by the indicators." Formative constructs are also referred to as *Composite Models* (Law and Wong, 1999) or simply, *Indexes* (Diamantopoulos and Winklhofer, 2001). A commonly formative construct in management is Socio-Economic Status (SES) (Bollen and Lennox, 1991; Law and Wong, 1999). SES describes the socio economic position of a person and its indicators are the

[3] In this paper, we use the terms "Measure", "Indicator" and "Item" interchangeably.

person's education, occupational prestige, income and neighborhood. Other examples of formative constructs are life stress (Bollen and Lennox, 1991), motivating potential (Hackman and Oldham, 1976), job satisfaction (Hartline and Ferrell, 1996; Law et al., 1998) and job performance (Mackenzie et al., 2005).

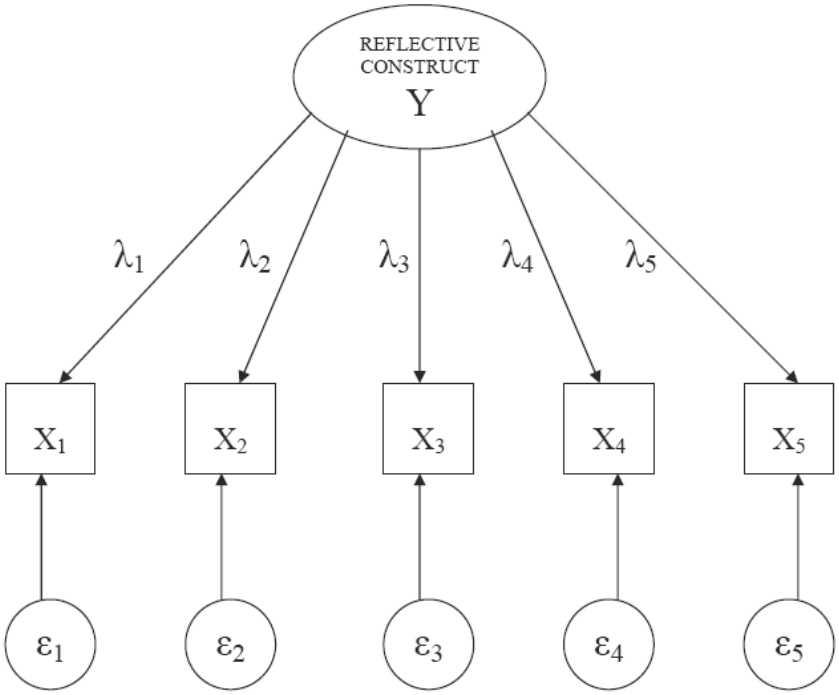


Figure 1: Reflective construct

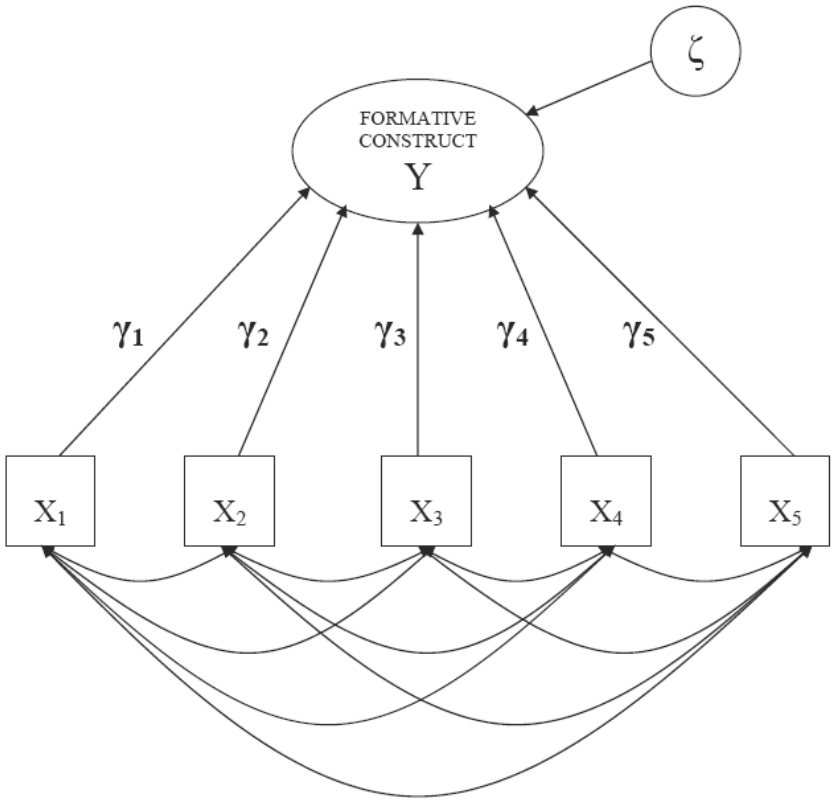


Figure 2: Formative construct

2.3 Differences between formative and reflective constructs

There are five basic differences between reflective and formative constructs which have been described in this section.

2.3.1 Direction of causality between the construct and its indicators

Formative and reflective models have opposing directions of causality vis-à-vis the construct and its measures or indicators. In a reflective construct, the causality flows *from the construct to the indicators*, that is, the indicators are caused by the construct. Thus the indicators are the manifestations of the construct. In a formative construct, the causality flows *from the indicators to the construct*, that is, the indicators cause the construct. Thus, a formative construct is the result of an aggregate of indicator variables.

2.3.2 Notational difference

A reflective construct (Y) is represented as:

$$X_i = \lambda_i Y + \varepsilon_i$$

Where X_i = the i^{th} indicator

Y = the reflective construct

λ_i = coefficient which measures the expected effect of Y on the i^{th} indicator

ε_i = the measurement error for the i^{th} indicator.

Thus, for a reflective construct, each indicator is separately associated with the construct. The covariance of each indicator is shared with all the other indicators, and the random variance for each indicator is treated as error for that indicator (Law and Wong, 1999). Therefore the error terms are reflected separately for each indicator, as unexplained variance for that indicator.

Conversely, a formative construct is represented (Diamantopoulos and Winklhofer, 2001) as:

$$Y = \gamma_1 x_1 + \gamma_2 x_2 + \ldots\ldots\ldots\ldots\ldots + \gamma_n x_n + \zeta, \text{ or}$$

$$Y = \Sigma \gamma_i x_i + \zeta$$

Where X_i = the i^{th} indicator

Y = the formative construct

γ_i = the weight associated with the i^{th} indicator

ζ = the common error term.

Thus, a formative construct is a summation or an aggregate of its indicators. The only variance, which is treated as error, is the random variance at the construct level (Law and Wong, 1999). Hence the error term is associated with the construct as a whole and not with the individual indicators.

2.3.3 Removal of Indicators

A formative construct is theoretically considered to be the composite of *all* its indicators. Therefore an individual indicator cannot be removed without affecting the definition of the construct. Each indicator

of a reflective construct however, being a manifestation of the construct, can be removed if its coefficient is not statistically significant (Bollen and Lennox, 1991).

2.3.4 Correlations between indicators

The indicators in a reflective construct should be highly correlated among themselves since they manifest or represent phenomenon associated with the same construct. Low correlation would indicate poor convergent validity of the construct. Indicators of a formative construct need not be correlated, since they aggregate to form the construct (Bollen and Lennox, 1991).

2.3.5 Identification

A reflective construct can be statistically identified (through a measurement model) in isolation. A formative construct can be statistically identified only by placing it in a larger network (a path model) with other variables (Bollen and Lennox, 1991).

2.4 Unidimensional and multidimensional constructs

A *Unidimensional Construct* (also referred to as *first order* construct) is measured by a single dimension consisting of a set of indicators, as shown in Figure 3. In this context, unidimensionality refers to the existence of a single trait underlying a set of measures (Hattie, 1985). Unidimensional constructs are. A *Multidimensional Construct* is a "higher-level construct that underlies its dimensions" (Law, Wong and Mobley, 1998; p. 743), as shown in Figure 4. The dimensions or facets are distinct, but connected to the higher-level construct through a single theoretical concept. A multidimensional construct does not have a separate existence without its dimensions (Edwards, 2001). The dimensions or facets of a Multidimensional construct can, in turn, be Unidimensional or Multidimensional (Law et al., 1998), leading to constructs of the *second and higher* orders. Most constructs in management research are Multidimensional (Mackenzie et al., 2005).

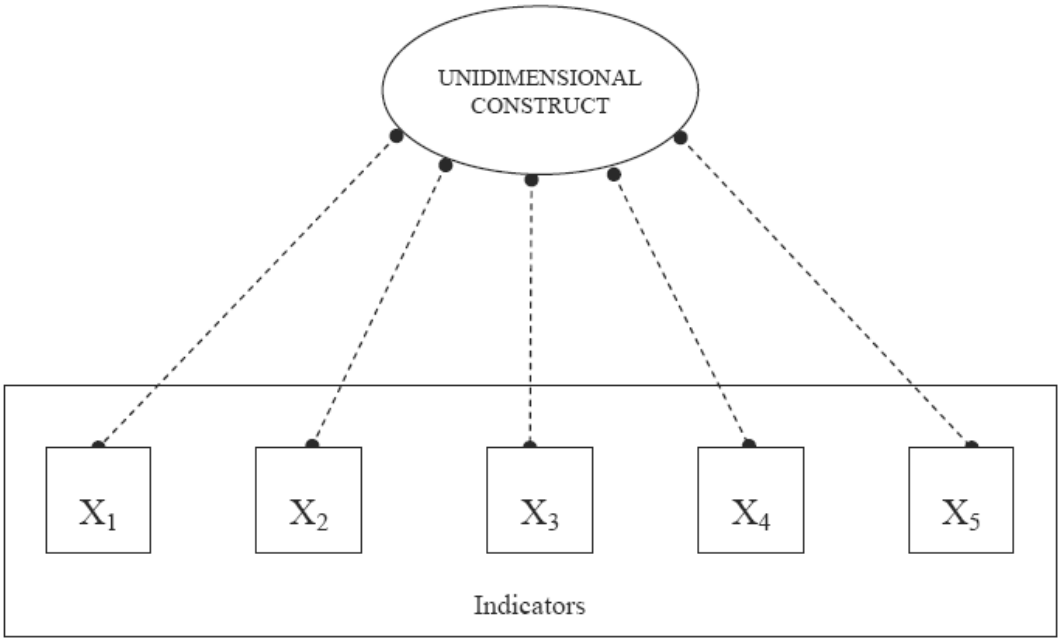


Figure 3: Unidimensional construct[4]

A second order construct can have reflective or formative measurement model/s at its first and second order levels, giving rise to four cases, as shown in Figure 5. Constructs where both orders are reflective (Figure. 5a) have been the most widely studied form of a second order construct in past research. Constructs where both orders are formative (Figure. 5d) or where the first order is formative and the second order is reflective (Figure. 5c) have been rarely studied (Jarvis et al., 2003) in past research. Constructs where the first order is reflective and the second order is formative (Figure. 5d)

[4] The link between the construct and its indicators is a theoretical link and may be formative or reflective depending upon the theory and that will determine the direction of arrows.

are currently being considered by researchers, due in part to the recent availability of appropriate modeling software[5].

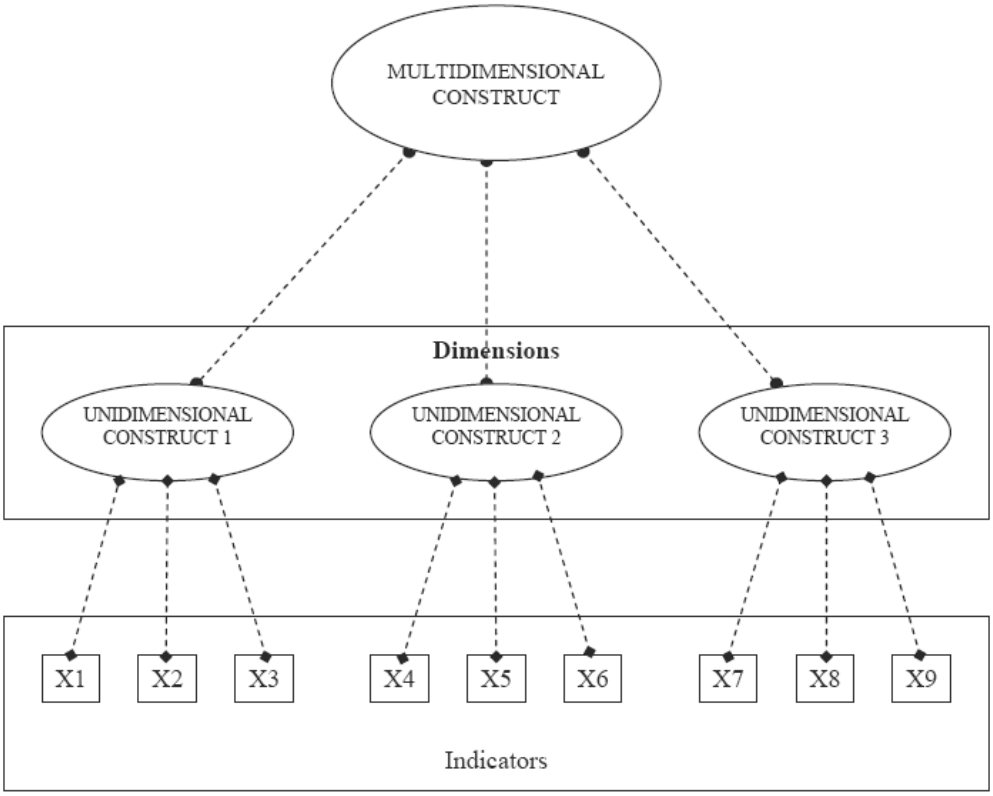
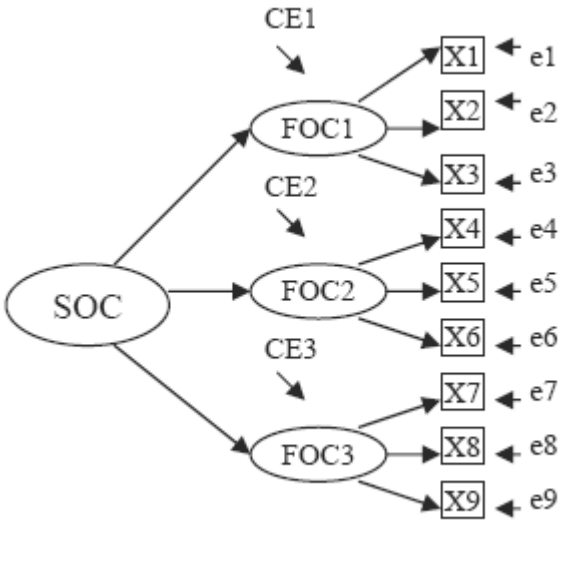
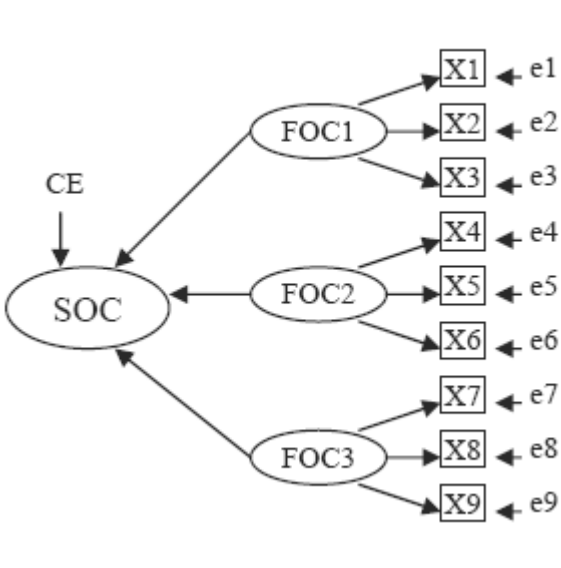


Figure 4: Multidimensional construct[6]

The next section provides an overview of statistical implications of model misspecification.



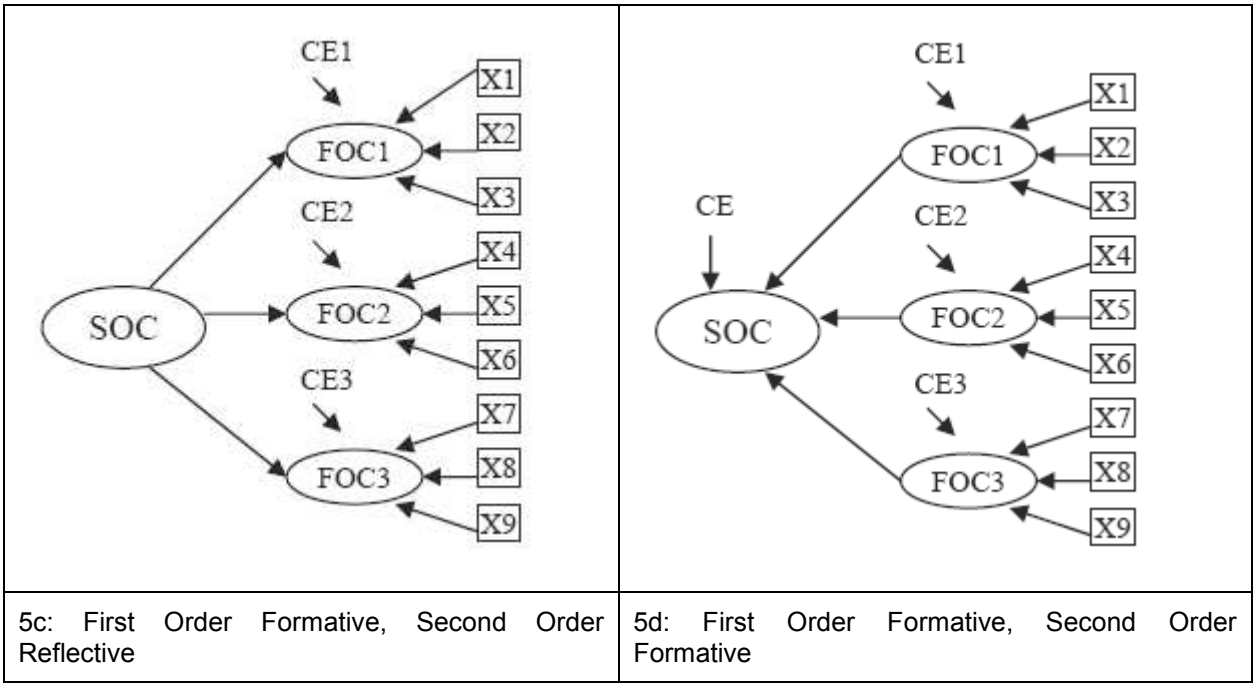
5a: First Order Reflective,



5b: First Order Reflective, Second Order Formative

[5] There can be other forms of higher order constructs, where the lower orders include both formative and reflective models. These have not been described in detail in this paper due to considerations of complexity.

[6] The link between the multidimensional construct and its dimensions or the dimensions and their indicators are theoretical links and may be formative or reflective depending upon the theory and that will determine the direction of arrows.



5c: First Order Formative, Second Order Reflective	5d: First Order Formative, Second Order Formative

Figure 5: Different forms of first and second order constructs

Note: X's are the Measured Variables, e's are the Error Terms associated with Measured Variables, FOC is First Order Construct, SOC is Second Order Construct, CE's are the Construct Errors.

3. Measurement model misspecification

Model misspecification occurs when a reflective (formative) construct is wrongly modeled as formative (reflective). We explain the effects of measurement model misspecification through a mathematical example involving one exogenous and one endogenous construct in a path model.

The path model is represented by the following equation.

$$Y = \beta X + e$$

Where Y is the endogenous construct

x is the exogenous construct

β is the path coefficient, and

e is the error term.

Given the above equation, the variance of Y, i.e. V(Y) can be written as

$$V(Y) = \beta^2 V(X) + V(e)$$

Where $V(X)$ is the Variance of X, and

$V(e)$ is the Error Variance.

For the sake of simplicity, if we assume that V(e) = 0 then

$$V(Y) = \beta^2 V(X)$$

$$\text{or } V(Y)/V(X) = \beta^2$$

We now assume that the correct measurement model for each construct is formative, and illustrate the effects that occur when one or both are (wrongly) modeled as reflective. Figure 6a represents the correctly specified model.

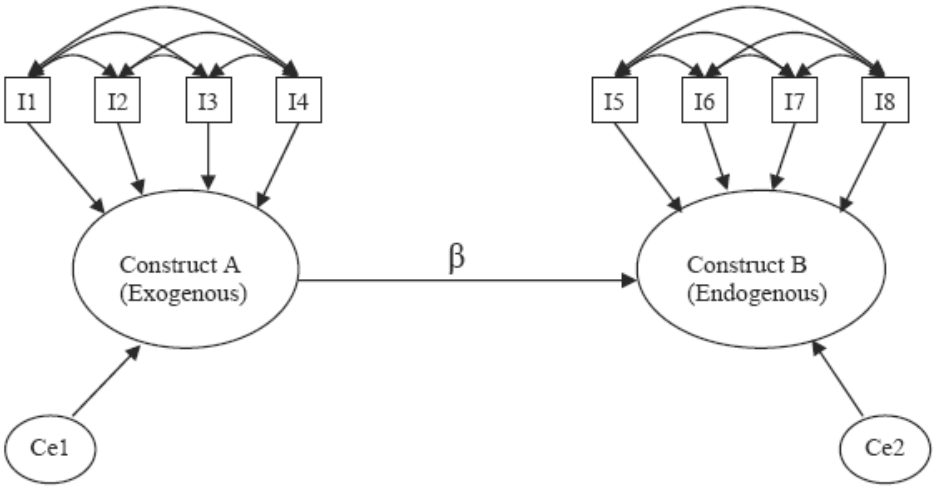


Figure 6a: Correctly specified measurement model (Both A and B are formative constructs)

If the exogenous construct, i.e. X, is misspecified as reflective instead of formative, as shown in Figure 6b, then its variance, i.e. V(X) will decrease, because it will now be shared with the error terms associated with each indicator of X. From the last equation above, the implication that emerges is that for a given V(Y), β^2 will increase, leading to an inflated estimate of the path coefficient. Conversely, if the endogenous construct, i.e. Y, is misspecified as reflective instead of formative, as shown in Figure 6c, then its variance, i.e. V(Y) will decrease because it will now be shared with the error terms associated with each indicator of Y. From the last equation above, for a given V(X), β^2 will decrease, leading to an deflated estimate of the path coefficient. If both constructs are misspecified (Figure 6d), the change in β^2 will depend on the relative magnitudes of change in V(X) and V(Y) respectively. It would also depend on (a) the sample size and (b) the magnitude of inter-item correlations of the constructs (MacKenzie et al. 2005).

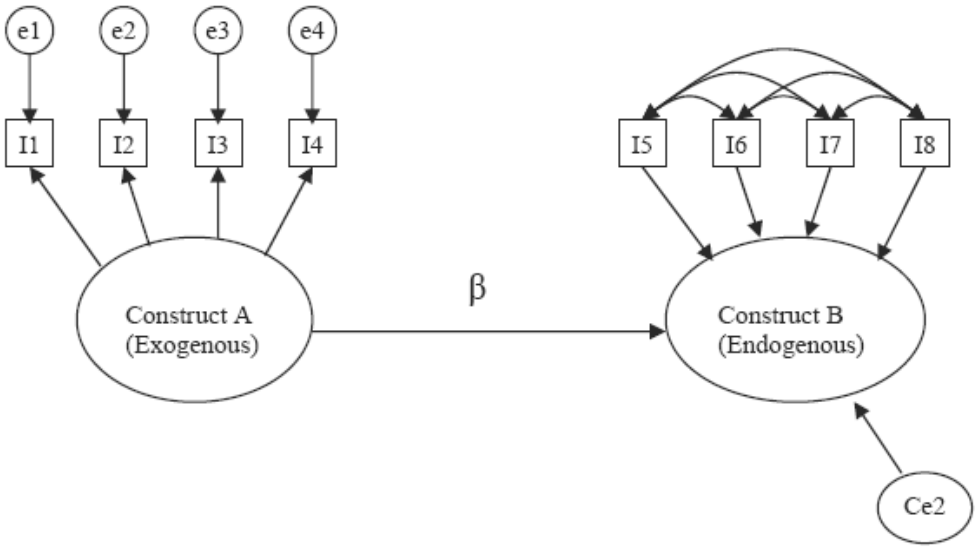


Figure 6b: Incorrectly specified measurement model (Exogenous Construct Misspecified)

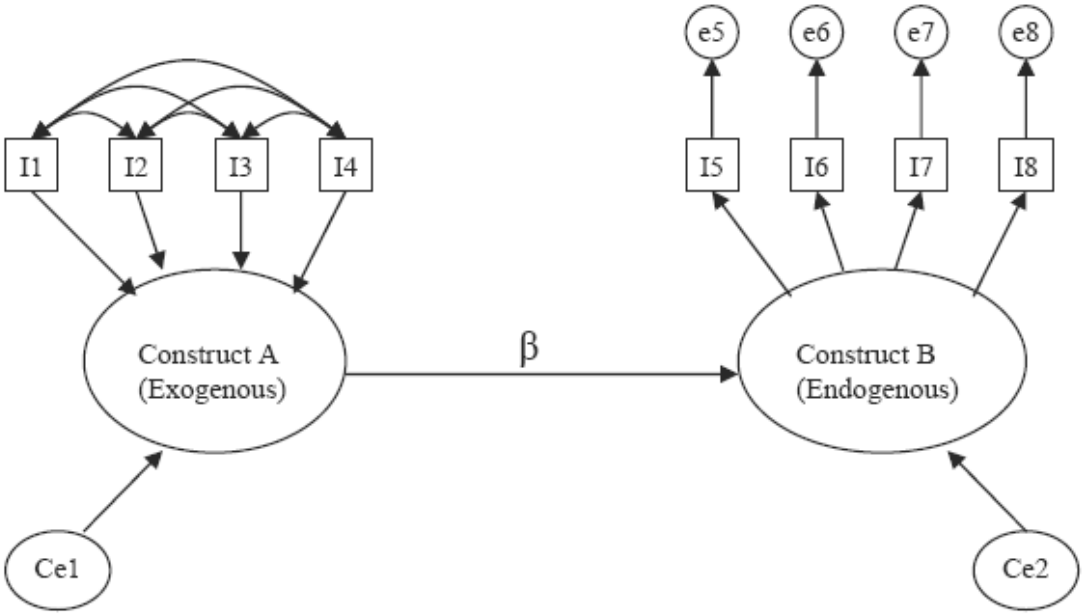


Figure 6c: Incorrectly specified measurement model (Endogenous Construct Misspecified)

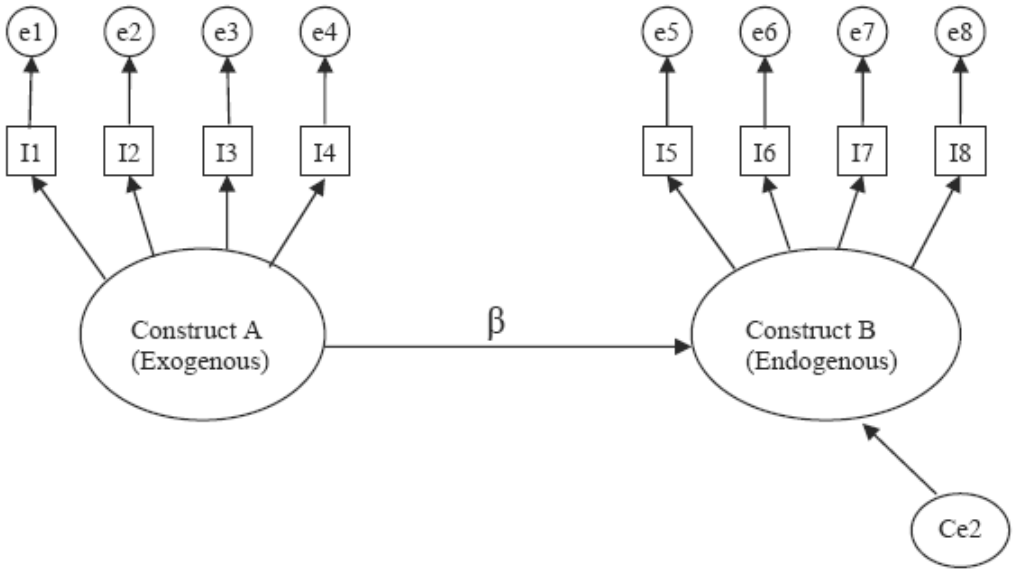


Figure 6d: Incorrectly specified measurement model (Both Constructs Misspecified)

The issue of model misspecification has been addressed to a limited extent in the management literature using mostly Monte Carlo simulations and covariance based SEM (Jarvis et al., 2003; MacKenzie et al., 2005; and Petter et al. 2006). In the next section, we illustrate the possible effects of model misspecification on model parameters and fit statistics using (1) a primary (survey) data set, (2) PLS based SEM, and (3) a prior established nomological path model in the Supply Chain domain.

4. Illustration of model misspecification effects

For illustrating the possible effects of misspecification we use an existing (primary) dataset - Li et al. (2005, 2006) from the domain of Supply Chain Management (SCM). The model that we consider has been excerpted from Li et al. (2005, 2006). It consists of three second order constructs – Supply Chain Management Practices (**scmprac**), Supply Chain Management Performance (**scmperf**), Competitive Advantage (**compadva**) – in a nomological network as shown in Figure 7 and detailed in

Table 3. All first and second order constructs in this network have been previously validated using reflective measurement models by Li et al. (2005, 2006). The endogenous constructs include "**scmperf**" and "**compadva**", while "**scmprac**" is an exogenous construct.

Using Visual PLS 1.04, we tested six different models to analyze and illustrate the effects of alternate specification on model parameters and model fit measures. These models have been shown as cases 1 to 6 in Table 4. For example, in Case 1, all first order constructs were reflective and the three second order constructs were also reflective. Cases 3 and 6 were illustrations of mixed models. In Case 3, all first order constructs were reflective and two of the three second order constructs were formative; In Case 6, all first order constructs were formative and two of the three second order constructs were also formative.

Table 4 shows the results of the structural models in terms of the path coefficients and R square values. The R square value is considered to be a measure of goodness of fit in PLS (Haenlin and Kaplan, 2004). Case 2 displayed the best results. There was not much difference in the values of the path coefficients between Cases 1, 2 and 3. However, the R square value for the **scmperf→ compadva** path was higher for Case 2, compared to Cases 1 and 3. The path coefficients and R square values for Cases 4, 5 and 6 were drastically lower than those for Cases 1, 2 and 3. Compared to Case 2 (which had the highest path coefficient and R square values), the average path coefficient and R square deflations were 38.72% and 91.88% respectively, for cases 4, 5 and 6 in the **scmprac→ scmperf** path. For the **scmperf→ compadva** path**,** the corresponding deflation values were 102.5% and 307.92%, implying poor model fit.

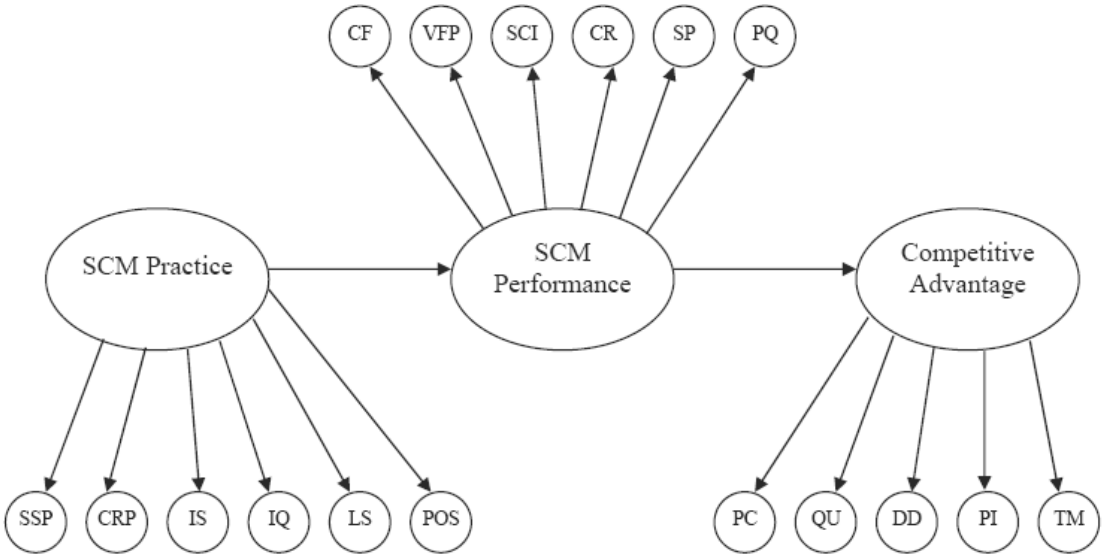


Figure 7: Illustrative model

As the results show, possible misspecification at the first order level could lead to drastic changes in the path coefficients and R square values. Assuming that the correct first order representation is reflective, wrongly specifying it as formative (that is going from Cases 1,2 and 3 to Cases 4, 5 and 6) resulted in ***deflation*** of path coefficients and R square values; this would lead one to erroneously conclude the absence of significant path relations and to possibly reject the model. Similarly, assuming that the correct first order representation is formative, wrongly specifying it as reflective would result in ***inflation*** of path coefficients and R square values; this would lead one to erroneously conclude the presence of significant path relations and to possibly accept an incorrect nomological model. Our results support and illustrate the discussions in Section 4. They underline the need for prior analysis of theoretical and domain related considerations while conceptualizing and modeling constructs as formative or reflective.

In the next section, we provide an overview of the PLS methodology for modeling of formative constructs and suggest guidelines for the same.

5. Overview of formative and reflective constructs in the OM literature

The issue of measurement model misspecification, has not been addressed in manufacturing and operations management research in any detail, to the knowledge of the authors. Recent literature though has initiated discussion on various caveats of the use of structural equation modeling (Shah and Goldstein, 2006). The relevance of this section is to find out the nature of construct modeling in OM research, i.e. whether predominantly reflective specifications have been tested by the researchers. Thus in this section we (a) comprehensively identify formative and reflective constructs that have been studied in the important OM journals. Moreover this section also tries to present the possible scale of measurement model misspecification. Since it is not possible to present a discussion on all of them, we have presented some of the majorly used reflective constructs and tried to suggest based on related literature how some of these could have been alternatively modeled.

5.1 Journal selection

We selected four journals which are widely considered to be the leading journals (Barman et al., 1991; Vokurka, 1996; Soteriou, 1998; Barman et al., 2001) in the disciplines of production, manufacturing and operations management, and which publish SEM based research. The journals are - Management Science (MS), Journal of Operations Management (JOM), Decision Sciences Journal (DS), Journal of Production and Operations Management Society (POMS). These journals have formed the basis of recent summative and review oriented articles involving SEM based research (Shah and Goldstein, 2006; e.g.).

5.2 Time frame and paper selection

We chose the time period 2002-2006 for our selection of articles, since we did not find relevant articles discussing formative and reflective constructs prior to that. We looked at all issues of the above mentioned journals during this time period (some 2007 issues were also included). We considered a total of 134 issues of the following journals JOM (31 issues), DS (21 issues), MS (61 issues) and POMS (21 issues). Each issue had multiple articles, for a total of approximately 800 articles.

Manual search of each paper followed its inclusion in the sample if the article had (1) a formative or reflective measurement model (using confirmatory factor analysis) or (2) a formative or reflective measurement model (using confirmatory factor analysis) along with a structural model. A total of 94 (JOM – 41, DS – 35, MS – 10, POMS – 8) articles met these criteria and formed the basis of our subsequent discussion. Three papers tested a formative measurement model. Six articles used the PLS software (Ranganathan and Sethi, 2002; Teigland & Wasko, 2003; Brown and Chin, 2004; Looney et al., 2006; Venkatesh and Agarwal, 2006; Modi and Mabert, 2007), and the rest used covariance based software (LISREL, e.g.) for analysis. The details are shown in Table 1a. The 94 articles yielded a total of 642 constructs, of which 586 were reflective first order constructs and 6 were formative first order constructs. There were 50 second order constructs, all of which were modeled as reflective. Details are shown in Table 1b.

5.3 Scale of misspecification

To identify the scale of misspecification we carried out a further literature search of the possible definitions of the constructs and its conceptualizations. Once they were obtained, two of the coauthors analyzed the possibilities of alternate specification (formative instead of reflective) based of the definition and conceptualization. This led to the list of constructs which had possible alternate specifications. This list was then cross verified by the other two coauthors and the final list was prepared. It was found that out of the 586 first order constructs, 254 could have alternate specifications (as high as 43%). Similarly for the second order constructs, 21 out of 50 were found to have possible alternative specifications (42%). These figures point out to the possibilities of measurement model re-specification and the scale of possible misspecification (Refer Table 5). The next subsection discusses some of the constructs obtained from OM literature and discusses the bases on which they were suggested to have alternative specifications.

Table 1a: Summary of the literature survey

Journal	Number of Articles	Methodology	Number of papers in which First Order Construct/s were tested	Number of papers in which Second Order Construct/s were tested	Number of papers in which a Path Model was tested
JOM	41	Reflective	40	14	29
		Formative	1	0	1
DS	35	Reflective	34	9	20
		Formative	1	0	0
MS	10	Reflective	9	0	7
		Formative	1	0	0
POMS	8	Reflective	8	1	5
		Formative	0	0	0
TOTAL	94	Reflective	91	24	61
		Formative	3	0	1
		Total	94	24	62

Note: JOM- Journal of Operations Management; DS- Decision Sciences Journal; MS – Management Science; POMS- Journal of Production and Operations Management Society

Table 1b: Summary of constructs

Journal	Reflective First Order Construct	Formative First Order Construct	Reflective Second Order Construct	Formative Second Order Construct	Total
JOM	272	1	28	0	301
DS	227	3	21	0	251
MS	57	2	0	0	59
POMS	30	0	1	0	31
TOTAL	586	6	50	0	642

Table 2: Summary of formative constructs in the literature

Journal	Author/s	First Order Construct/s Tested	Model	Methodology
JOM	Johnston et al., (2004)	Buyers Assessment of Performance	Formative	Partial Least Squares
DS	Brockman & Morgan, (2003)	Entrepreneurship Organization structure Cohesiveness	Formative Formative Formative	Covariance based (LISREL)
MS	Venkatesh and Agarwal, (2006)	Use Behaviour Purchase Behaviour	Formative Formative	PLS

Table 3: Constructs and sub-constructs used in the illustrative model

Second Order Construct	First Order Constructs	Code Used in Model
SCM Practice	Strategic Supplier Partnership	SSP
	Customer Relationship Practices	CRP
	Information Sharing	IS
	Information Quality	IQ
	Lean System	LS
	Postponement	POS
SCM Performance	Customization Flexibility	CF
	Volume and Product Flexibility	VFP
	Supply Chain Integration	SCI
	Responsiveness to Customers	CR
	Supplier Performance	SP
	Partnership Quality	PQ

Competitive Advantage	Price/Cost	PC
	Quality	QU
	Delivery Dependability	DD
	Product Innovation	PI
	Time to Market	TM

Table 4: Result of the trials

Case No	First Order Construct Type[7]	Second Order Constructs			Path Coefficients		R Square value	
		SCM Practice (scmprac)	SCM Performance (scmperf)	Competitive Advantage (compadva)	scmprac→ scmperf	scmperf→ compadva	scmperf	compadva
1	Reflective	Reflective	Reflective	Reflective	0.650	0.605	0.423	0.366
2	Reflective	Formative	Formative	Formative	0.670	0.642	0.449	0.412
3	Reflective	Formative	Reflective	Formative	0.662	0.620	0.438	0.385
4	Formative	Reflective	Reflective	Reflective	0.475	0.300	0.225	0.090
5	Formative	Formative	Formative	Formative	0.487	0.339	0.238	0.115
6	Formative	Formative	Reflective	Formative	0.488	0.312	0.238	0.097

Table 5: Suggested nature of misspecification

Journal	Reflective First Order Construct	Alternative Specification Possible	Reflective Second Order Construct	Alternative Specification Possible	Precentage of Alternative Specification
JOM	272	123	28	12	44.85
DS	227	98	21	9	42.63
MS	57	24	0	0	40.68
POMS	30	9	1	0	29.03
TOTAL	586	254	50	21	42.83

5.4 Brief discussion of constructs

In this subsection we identify some first and second order constructs, selected from the 642 constructs that we identified, which have been modeled reflectively in the OM literature. We then illustrate possible alternate modeling formulations for these constructs, basing our arguments on findings from other disciplines and on domain specific theoretical considerations.

To begin with, first order constructs comprising the **Technology Acceptance Model (TAM)** and its extensions, such as perceived-ease-of-use and perceived-usefulness of information systems have traditionally been modeled reflectively (Venkatesh et al., 2002; Somers et al, 2003; Kim and Malhotra, 2005; Abdinnour-Helm et al., 2005; Malhotra et al, 2006; Yi et al., 2006). However, researchers have, based on the definitions of these two constructs, suggested that they could be modeled formatively (Chin, 1998; Gefen et al., 2000). In this context, recent research has modeled some of these constructs formatively (Sánchez-Franco, 2006).

Satisfaction is another construct that has been modeled reflectively but lends itself to formative modeling as well. Satisfaction may be ***Job Satisfaction*** (Tesch et al., 2003; Janz and Prasarnphanich, 2003; Brown and Chin, 2004) or ***Customer Satisfaction*** (Goldstein, 2003; Kassinis

[7] First order constructs for all the second order constructs have similar type in a single case, either all reflective or all formative.

and Soteriou, 2003; Douglas and Fredendall, 2004; Marley et al. 2004; Babakus et al., 2004; Johnston et al., 2004; Froehle, 2006) or simply ***Satisfaction*** (Athanassopoulos and Iliakopoulos, 2003; Balasubramanian et al., 2003; Spreng and Page, 2003). All of these have been modeled reflectively. However, with respect to job satisfaction (Locke, 1969, p. 331) states that, "*a valid overall index of satisfaction would, in the present view, be a sum of the evaluations of all job aspects to which the individual responds*." This definition suggests a formative nature of this construct; Hartline and Ferrell (1996) have modeled job satisfaction as a formative construct and Fornell et al. (1996), Spreng et al. (1996) and Kristensen et al. (1999) have discussed the formative nature of the customer satisfaction construct.

The construct **Belief** (beliefs on investing in facilities and equipment, beliefs on usefulness, beliefs on learning, e.g) is another construct that we found to be modeled in a reflective manner (Froehle and Roth, 2004; Nahm et al., 2004). In contrast, marketing literature has previously discussed belief in a formative way (Ryan, 1982; Shimp and Kavas, 1984), which suggests opportunities for reconsidering the reflective formulation in the OM literature.

It is interesting to note that **Belief**, **Satisfaction** and the constructs related to **TAM** have a common conceptual basis in the Theory of Reasoned Action (Ajzen and Fishbein, 1973; Fishbein and Ajzen, 1975).

Knowledge has also been measured as a reflective construct (Calantone et al., 2002; Morgan et al., 2003; Fedor et al., 2003; Brockman and Morgan, 2003; Droge et al., 2003; Tu et al., 2006). Studies in business strategy and information systems literature have however hinted on both formative and reflective formulation of knowledge based on Activity Theory (Blackler, 1993) and Social Exchange Theory (Wasko and Faraj, 2005).

Research has modeled various aspects of **Performance** reflectively. These include Financial/Market Performance (Kaynak, 2003; Chen et al., 2004; Swink et al., 2007), Customer or Buyer Based Performance (Zahay and Griffin, 2004; Johnston et al., 2004), Product/Process Performance (Kaynak, 2003; Walace et al., 2004), and Supplier Performance (Prahinski and Benton, 2004). Johnston et al. (2004) however, measure performance (Buyers Assessment of Performance) as a formative construct. This implies that different aspects of performance can also be measured in a formative way.

Second order constructs that lend themselves to alternative formulation include **End User Computing Satisfaction**, **Flexible Manufacturing**, **Time-Based Manufacturing** and **Business Performance**. All of these have been modeled reflectively; domain related theoretical considerations lead us to possible arguments for formative modeling. Consider, for example the construct of **End User Computing Satisfaction**, which has first order dimensions of ***Content***, ***Accuracy***, ***Format***, ***Ease of Use*** and ***Timeliness*** (Somers et al., 2003). **End User Computing Satisfaction** can be argued to be an effect of its first order dimensions rather than their cause. In such a case it would be a formative construct. The construct **Flexible Manufacturing** (Zhang et al., 2003) can be posited to be the result of its first order dimensions - Machine Flexibility, Labor Flexibility, Material Handing Flexibility – rather than their cause. Hence it can be evaluated from a formative point of view. **Business Performance** (Cao and Dowlatshahi, 2005) can similarly be argued to be the aggregate of its first order constructs - Market Growth, Financial Performance, Product Innovation, and Company Reputation – if one argues that these dimensions determine business performance, rather than reflecting it. In that case the construct could be evaluated as formative. In a similar vein, one can review the second order construct **Time-Based Manufacturing Practices** (Tu et al., 2006) and argue for a formative model.

In this section we found that reflective measurement modeling has been predominant. The following section discusses the research implications with measurement model misspecification.

6. The implications for researchers in OM using measurement modeling

Reflective measurement models have been widely used in OM research and there is extensive mathematical and software support for their measurement and analysis. This is one of the reasons for which formative specification has not been followed to a high extent. However as our study points, there is a huge number of constructs (our study suggests around 42%) which could be alternately modeled and still would have theoretical support. This raises a big question in front of OM

researchers. Should we try to have a relook at the way we were measuring constructs? Taking hint from section 5 we could observe that misspecification could be a possibility in practice and taking cue from section 4 we could also assume that misspecification may lead to erroneous results. Thus our study calls for a relook into measurement model specification and also offers a few guidelines which should be taken into note by the researchers before they embark upon measurement modeling in research.

7. Recommendations for future researchers

First and foremost, the theoretical and subject matter domain of the construct being studied should determine whether or not it is formative and would in turn influence the selection of appropriate indicators (Nunnally and Bernstein, 1994, p. 484). The items or indicators selected for measuring a formative construct should cover the entire scope of the construct and should be completely enumerated (Bollen and Lennox, 1991). Starting from such a standpoint the first step is to theoretically specify whether the construct is reflective or formative.

A more practical approach would also be to check for alternative model specifications and check for the scale of difference. As we found in our sample data possible misspecification could occur at the first order level or the second order level (provided second order constructs are considered). Both would have its own manifestations in the output coefficients and may render potential significant estimates as insignificant and vise versa. Thus one possibility open to the researcher is to try out alternate model specifications and to check out the range of difference in the output thus obtained. However, there is a note of caution. This approach would only be possible when the indicators on the construct could work as formative as well as reflective. Regarding proper selection of indicators, Mackenzie et al. (2005) have suggested that, an indicator will be formative provided (a) it defines a distinct characteristic of the construct, (b) any change in the its value is expected to explain changes in the construct, (c) it may or may not have a common theme (i.e. correlations) with other indicators, (d) removing an indicator may alter the conceptual domain of the construct and (e) it may not have the same antecedents and consequences as other indicators.

The researchers who would resort to formative modeling could try out the Partial Least Square based modeling instead of the more popular variance-covariance based structural equation modeling. The PLS approach lends itself well to the modeling of formative constructs, primarily for three reasons. First, using PLS, a researcher can test a formative latent variable in isolation. Second, it has less stringent restrictions on sample size, residual distributions and assumptions about normality of the data (Chin, 1998; Chin et al., 2003). Finally, recent availability of software (For a detailed review of PLS software, refer to Temme et al., 2006) based on the PLS approach (such as PLS Graph, VisualPLS, SMARTPLS, SPADPLS) has led to greater understanding of associated requirements and issues.

8. Conclusion

This paper presents a discussion of the use of formative measurement models in the context of SEM research in Operations and Manufacturing Management. We first highlighted theoretical and mathematical differences between formative and reflective measurement models. We then illustrated with a nomological model from the Supply Chain domain and using primary survey data, the impact of possible measurement model misspecification on model parameters and goodness of fit measures. Based on an extensive review of the OM literature, we identified the scale of measurement model misspecification and suggested alternative possible (formative) formulations. We also discussed the seriousness of the problem and suggested some operational guidelines for modeling formative constructs. While reflective constructs have been extensively modeled in the OM literature, the use of formative constructs has been relatively rare and software support has, until recently, not been extensively available. As a result of our study, we expect the research output obtained to be more grounded in theory and also mathematically correct. This paper therefore addresses a timely and important subject for SEM based research in OM.

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