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On Exploring the Communicative Impact of  
Facilitated Modelling during Strategic Group  
Decision Making: An Interaction Analysis Study

by

Orestis G. Afordakos

A thesis submitted in partial fulfilment of the requirements  
for the degree of  
Doctor of Philosophy in  
Operational Research & Management Sciences.

University of Warwick, Warwick Business School.  
January 2013

*To mom, for teaching me Persistence and Humility. God bless her soul.*

*To dad, for teaching me Optimism and Pride. God bless his soul.*

*To Nikolas, for teaching me Resilience and Curiosity. Thank you.*

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## Abbreviations

- a. AIT: Advanced Information Technology.
- b. AST: Adaptive Structuration Theory
- c. CL: Confrontiveness Level
- d. CM: Conflict Management
- e. CME: Conflict Management Effectiveness
- f. CMES: Conflict Management Effectiveness Score
- g. CMT: Conflict Management Type
- h. DM: Decision Making.
- i. FGPP's: Formal Group Process Procedures
- j. FM: Facilitated Modelling
- k. GDM: Group Decision Making
- l. GDSS: Group Decision Support Systems.
- m. GWRCs: Group Working Relations Coding System
- n. LFMA: Level of Faithfulness of Model Appropriations
- o. MA: Model Appropriation
- p. MACo: Model Appropriations Complexity
- q. MACoS: Model Appropriations Complexity Score.
- r. MACS: Model Appropriations Coding System
- s. MLR: Multinomial Logistic Regression
- t. MV: Model Visibility
- u. MVL: Model Visibility Level
- v. PRQ: Primary Research Question
- w. PSM: Problem Structuring Method
- x. RQ: Research question
- y. SAMM: Software Aided Meeting Management
- z. SDM: Strategic Decision Making
- aa. SGDM: Strategic Group Decision Making

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## **ABSTRACT**

Well into the 21<sup>st</sup> century strategic decisions remain at the forefront of organisational managerial activity. The ever increasing complexity and uncertainty of the modern world dictates the need for effective strategic decision making. In the attempt to pool together the necessary capabilities strategic decisions in large organisations take place in group settings thus bringing at the forefront the role of group decision making. Group decision making is fundamentally a communicative activity riddled with the intricate processes of negotiation. With negotiation comes conflict with group participants' differences over perspectives and worldviews being viewed as the fundamental cause of it. Not all conflict is destructive. Benefits are also to be reaped if conflict is managed effectively. A number of techniques and methods have emerged in the field of the Management Sciences and Information Systems that intent to alleviate the destructive and promote the productive aspects of conflict. One technique that follows a rational approach to decision making and incorporates strong elements of facilitation and qualitative modelling has been termed as Facilitated Modelling (FM). The key distinction between FM and other approaches is the use of qualitative models as transitional objects argued to enhance the effectiveness of group conflict management. In the past two decades numerous calls for evaluating the impact FM models may have on conflict have been made with little to no response. This thesis is an exploratory attempt to offer partial insights and inform these calls. The theoretical perspective of Adaptive Structuration Theory acted as the under-bed guiding this exploration. The exploration adopted a multiple case study approach as the methodological avenue for collecting data. Interaction data derived from three workshops, during which strategic decisions were made, have been micro-coded and analysed using both statistical as well as flexible mapping techniques. The results revealed complex relationships between the manner in which the model is appropriated and the resulting conflict management processes. Specifically, findings indicate that when models are appropriated they will reduce the ineffective conflict management behaviours. The concept of Model Appropriations Complexity (MAC) has been introduced as a moderating variable between the model appropriations and conflict management effectiveness with the findings supporting a positive relationship between MAC and effective conflict management. Additional preliminary analyses indicate prior FM-related experience of group participants as another potential explanatory variable for future research to explore.

# 1 Introduction

## 1.1 Background to the Study

Strategic Decision Making (SDM) usually takes place within (or about) organisations and is concerned with making decisions about problems that bear certain ‘strategic’ characteristics (Nutt & Wilson, 2010: 3).

SDM problems go beyond the realm of well defined organisational problems (often termed as *operational* problems) and are usually riddled with limited information, complexity, ambiguity and conflicting viewpoints about the very nature of the problem (Rosenhead & Mingers, 2001). Depending on the academic discipline one follows, such problems have been termed as *strategic* in Strategic Management (Nutt & Wilson, 2010:4), *messes* in Operational Research (Ackoff, 1981), *wicked* in Planning (Rittel & Weber, 1973), *swampy* in Systems (Schon, 1987), *soft* (as opposed to hard) in Systems Thinking (Checkland & Scholes, 1991) as well as *practical* (as opposed to technical) in Philosophy of Science (Ravetz, 1971).

Modern organisational SDM takes place in Top Management Teams (TMT’s), thus bringing ‘the group’ at the epicentre of SDM studies. To date a number of studies have shown that group SDM is riddled with issues not allowing the teams to reach their full potential (Brouthers et al., 2000; Miller et al., 1998; Papadakis & Barwise, 2002;) with Mathieu, Maynard, Rapp and Gilson (2008) concluding that the group processes TMTs are faced with are highly complex, and in need of further study if they are to be improved. Addressing these issues brings to the fore the need to specifically delve into the studies of Group Decision Making.

A long stream of scholarly research indicates that GDM can act as a double edged sword (Hirokawa & Poole, 1996; Sunwolf & Seibold, 1999; Schultz, 1999). If the group communication processes during decision making are managed and performed effectively, GDM may prove to be helpful, thus having a multiplicative effect on the collective cognitive capability of the group and subsequently on its decision making ability, resulting in better decisions (Propp, 1999: 225). This effect has also been referred to as the “assembly-bonus effect” (Sunwolf & Seibold, 1999: 415). On the other hand if the group communication processes are managed and performed ineffectively it is likely that GDM will result in worse decisions than those made by a single individual. This is mainly due to communication related deficiencies observed in GDM processes, with the main ones being those of groupthink, social loafing and self-censorship (Sunwolf & Seibold, 1999: 396-397; Schultz, 1999: 382-383).

Facilitated Modelling (FM) emphasis lies on attending to multiple mental models thus uncovering and aiding to the effective negotiation of differences on perceptions and positions. It has been further argued that this may prove a fruitful avenue towards effective conflict management as well as towards reaching to ‘commitment to action’ for a given problematic situation (Ackermann, 2012: 655; Ackermann & Eden, 2011; Franco & Montibeller, 2010).

A further claim made by FM literature is that the appropriation of models during FM workshops shall allow for overall better decisions that are more likely to be implemented (Ackermann, 2012: 654; Eden & Ackermann, 2010:241). The rationale for such a statement is that the dynamic formulation of a diagrammatic depiction of the problematique (i.e. the model and model building process), acting both as a

transitional object as well as a script assisting group interaction, should, among others, allow for more effective conflict management.

Persistent calls for more process related research in order to uncover the effects models have in Strategic GDM, have gone largely unnoticed (Ackermann, 2012; Eden, 1995; Finlay, 1998; Franco & Rouwette, 2011). Unfortunately, little research has been conducted, in an empirical and systematic manner, that could offer evidence, for or against, the model appropriation and process related claims FM scholars make, with most of the evidence being confined to anecdotal and subjective accounts of FM interventions (Ackermann, 2012: 656; Franco & Rouwette, 2011: 169; Franco & Montibeller, 2010: 498; for an exception see Ackermann & Eden, 2011).

This thesis is an attempt to answer these calls and put the conflict management related claims to the test by exploring, in a systematic and rigorous manner, the intricate relationships between the complex nature of model appropriations and conflict management behaviours, within the context of Strategic Group Decision Making.

## **1.2 Primary Research Question.**

From the above the following Primary Research Question (PRQ) is stated:

***What, if any, is the relationship between appropriations of FM models and conflict management?***

## **1.3 Contribution of exploring the Primary Research Question.**

Gaining a better understanding about the effects FM models have on conflict management would contribute to furthering knowledge in two broad areas being

academia and practice. In terms of academia, this research touches upon a number of academic fields.

In the academic field of Management Science and Decision Support Systems, scholars have explicitly raised concerns about the lack of empirical evidence that when systematically analysed would offer support for or against the usefulness of FM models (Eden, 1995; Finlay, 1998; Franco & Rouwette, 2010; Ackermann, 2012).

Furthermore, this research offers insight as to ‘What takes place within a FM workshop’ within the context of conflict management, a to-date neglected area (Ackermann, 2012; Franco & Rouwette, 2010).

In the academic subfield of Strategic Management and Strategic Decision Making, scholars have persistently called for more systematic and rigorous process research in the view that doing so would allow contemporary scholarship to move from describing SDM interventions to prescribing specific behaviours for realising the desired benefits of SDM interventions (Beer, 1992; Bowman, Singh & Thomas, 2002:44; Nutt & Wilson, 2010:12-13; Nutt, 2010:581-582 & 589; Pettigrew, 1997; Pettigrew, Woodman & Cameron, 2001; Wright, Van der Heijden, Bradfield, Burt & Caims, 2004). I attempt to address this lacuna within the context of Facilitated Modelling as the analytical technique claiming to result in benefits towards the process of group strategic decision making processes.

In the academic field of Group Communication, this thesis attempts to address the call for more research on the manner communication technologies are used in group settings (Scott, 1999: 465), building from and adding to the accumulated corpus of knowledge (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990 & 1992).

FM roots are deeply buried in the field of practice (Rosenhead & Mingers, 2001; Rosenhead 1989). Thus practitioners, be it in the role of process designers, model users or facilitators, would gain a better appreciation of the strengths and weaknesses of FM in relation to conflict management.

#### **1.4 Structure of the thesis.**

This thesis is structured as follows:

In the second chapter, I begin my exploration by positioning this research within the realm of group strategic decision making and conflict management by identifying the issues that have been suggested as possible causes for inefficient conflict management. I then describe the various technology-led responses to these causes, clearly delineating the focus of this study as being into *how the use of models may assist towards more effective conflict management*. Moreover, I situate the thesis within the theoretical realm of Adaptive Structuration Theory and the Research Questions derived from the Research Model are articulated.

In the third chapter, I describe the methodological approach adopted. Choices in terms of the level and unit of analysis are made explicit. Data related questions of collection, transformation and analysis are further covered.

In chapter four, I present the descriptive statistics for each stage of each case and further report on the results of the analysis. For reasons of clarity, the cross and within case interpretation and findings of the results is depicted on a per Research Question basis.

In chapter five I discuss the impacts of the findings to both theory and practice while attempting to offer some ideas for improving the FM processes. Furthermore, I

summarise the limitations of this thesis's research and offer directions for future research.

In chapter 6, I conclude the thesis offering some personal remarks.

In chapter 7, the list of reference is to be found.

As such my exploration journey starts with the following review of the relevant literature. Godspeed.

## **2 Literature Review**

### **2.1 Introduction**

This chapter attempts to highlight the key concepts in a wide area of disciplines that this thesis has been informed from.

This literature review is not meant to be exhaustive of the many published research conducted in each of the areas of interest.

The purpose of this review is to position the research within a specific 'conversation' in the world of academia and identify the key 'conversants'.

This review starts by positioning the research within the broad area of Strategic Decision Making. The key issues and considerations are identified and discussed. What becomes apparent is that groups and teams play an important role in today's SDM processes.

As such, Strategic Decision Making is then viewed within the realm of Group Decision Making. The key issues surrounding GDM are identified as related to ineffective conflict management processes, when viewed through a communicative perspective.

Adopting a specific viewpoint stemming from the areas of Management Sciences and Information Systems, I further identify the major MS-IS responses intended to alleviate the communication-related causes of conflict management ineffectiveness.

Last, I position the key constructs and conceptualisations of this thesis within the theoretical framework of Adaptive Structuration Theory.

## **2.2 Strategic Decision Making**

### **2.2.1 Introduction**

Well into the 21<sup>st</sup> century, decision making (DM) remains an issue of academic concern for a large number of scholars, coming from a number of scientific strands, be it from Management Science, Sociology, Psychology, Organisational Studies, Mathematics and Information Systems to name a few (Meyers & Brashers, 1999: 288; Nutt & Wilson, 2010: 3; Sunwolf & Seibold, 1999: 395). Decision making by individuals and groups, living in organised societies, remains (and is expected to remain) at the epicentre of any purposeful human activity.

### **2.2.2 Strategic Decision Making in Context**

A specific branch of DM is strategic DM (SDM). SDM usually takes place within (or about) organisations and is concerned with making decisions about problems that bear certain ‘strategic’ characteristics (Nutt & Wilson, 2010: 3).

SDM problems go beyond the realm of well defined organisational problems (often termed as *operational* problems) and are usually riddled with limited information, complexity, ambiguity and conflicting viewpoints about the very nature of the problem (Rosenhead & Mingers, 2001). Depending on the academic discipline one follows, such problems have been termed as *strategic* in Strategic Management

(Nutt & Wilson, 2010:4), *messes* in Operational Research (Ackoff, 1981), *wicked* in Planning (Rittel & Weber, 1973), *swampy* in Systems (Schon, 1987), *soft* (as opposed to hard) in Systems Thinking (Checkland & Scholes, 1991) as well as *practical* (as opposed to technical) in Philosophy of science (Ravetz, 1971).

This type of problems shall be further referred simply to as ‘problems’ adopting the *strategic* perspective.

A useful summary of the key characteristics that SDM problems display has been offered by Nutt & Wilson and can be summarised in the following (Nutt & Wilson, 2010:3-5):

Strategic decision making problems:

- Are elusive and lacking a precise definition.
- Require a thorough understanding for a viable solution to be found.
- Present a number of viable solutions instead of one best solution.
- Give rise to questions about priorities and trade-offs
- Offer no clear end point against which a possible solution can be assessed.
- Are of a systemic nature with other problems in the organisation. Fixing one problem may create a new one or cause deterioration on an existing problem.
- Present high levels of uncertainty and ambiguity in terms of their solutions.
- Are of high risk in terms of realising the hoped for benefits.
- Are subject to political pressures arising from conflicting interests amongst key stakeholders.

Therefore, SDM is about decisions that (Nutt & Wilson, 2010: 3-17):

- Cannot be easily (or with low cost) reversed once made.

- Are subjected to political interplays.
- Cannot be easily assessed.
- Are of high risk.
- Have a high (if not detrimental) impact on the future of the organisation.
- Decision makers may not have full control over their implementation.
- Are subjected to various, sometimes unknown, externalities within their application environment and organisational context.

Two main strands of research in SDM can be identified with the distinction being as to whether the focus of the research is on the *content* or on the *process* of SDM (Blair & Boal, 1991). Content research on SDM attempts to answer questions about *what* kind of strategic decisions were made and possibly implemented (Miller, 1989; Miller, 2006; Jennings & Seaman: 1994), while process research attempts to explore *how* these decisions came to be made (Hart & Banbury, 2006; Huff & Reger, 1987; Pettigrew, 2003).

This dichotomy has received relative criticism by scholars arguing that it is not possible to understand the process if not referring to the content as well as context and vice versa (Papadakis, Lioukas & Chambers, 1998; De Wit & Meyer, 2005). Nevertheless, strong evidence suggests that the processes followed will have an impact on aspects such as decision quality (Hough & White, 2003; Olson, Parayitam & Yongjian, 2007), decision effectiveness & efficiency (Elbanna & Child, 2007; Nutt, 2008), commitment towards the decision (Olson, Parayitam & Yongjian, 2007) as well as satisfaction with the decisions (Nooraie, 2008).

For example, there is cumulative evidence supporting the notion that better decisions will be made if a rational approach towards decision making is adopted (Goll & Sambharya, 1998; Goll & Rasheed, 2005, Mueller, Mone & Barker, 2007).

These key characteristics SDM problems bear call for an as large a 'pool of relevant information' as possible to be considered when addressing them. Useful sources of information and knowledge that may result in novel problem-solving suggestions are to be found within the organisations' stakeholders minds (Nonaka & Takeuchi, 1995; Nonaka, 1994).

Therefore, the need for ensuring that stakeholders and problem owners will be able to contribute to the 'solution' and express their concerns about it [the solution] becomes evident (Eden & Ackermann, 2010). Thus, the earlier view emerging in the 1950's being that of the one great planner seeking the optimal solution, has been gradually adapted to incorporate groups of managers seeking to satisfy processes that may allow for reaching viable solutions (Eden, 1995; Eisenhardt & Zbaracki, 1992; Huber & Power, 1985; Hutzschenreuter & Kleindienst, 2006; Kilduff, Angelmar & Mehra, 2000; Miller, Burke & Glick, 1998; Olson, Parayitam & Yongjian, 2007; Rosenhead & Mingers, 2000: 12-13). It is reasonable to indicate that decision making at the strategic level of modern large organisations will most probably take place at the higher echelons of the organisational hierarchy (Hambrick & Mason, 1987).

Still, to date a number of studies have shown that group SDM is riddled with issues not allowing the teams to reach their full potential. For example, Miller et al. (1998) identified that cognitive diversity of TMT participants had a negative impact in the process of strategic decision making, thus resulting in ineffective strategic

planning. Furthermore, Papadakis and Barwise (2002) assessing strategic decision making, indicated that the context in which TMTs operate is more important than the personality traits of both the CEO and the TMTs. Contradicting these findings is the work by Brouthers et al. (2000) who identified that decision making processes will be influenced more by TMT's individual characteristics than the contextual factors TMTs are faced with. Mathieu, Maynard, Rapp and Gilson (2008) concluded that the group processes TMTs are faced with are highly complex, and in need of further study if they are to be improved.

This view gives rise to the importance of groups and the DM processes they follow as they 'strategize' (Whittington, 2003), stressing that if group decision making processes are to be improved direct benefits for strategic group decision making shall accrue.

### **2.2.3 Summary**

Thus far I have identified that SDM is at the epicentre of managerial and organisational life. I have further indicated that when SDM is made by groups it may result to both positive as well as negative impacts to the success of organisational strategy. Key to enhancing organisational strategic decision making, within the context of TMT's, are the decision making processes followed when 'strategizing'. SDM TMTs, as the name indicates, can be viewed as groups that make strategic decisions. Strategic group decision making is essentially group decision making about strategic issues.

Therefore, group decision making (GDM) comes at the forefront of this thesis exploration. In the following section I adopt a communicative perspective and attempt to highlight the key characteristics and issues GDM is faced with.

## 2.3 Group Decision Making

### 2.3.1 Introduction

In the past 30 years Group Decision Making (GDM) has been gaining ground in academic publications and has become a widely adopted practice in today's organisations (Hirokawa & Poole, 1996; Poole, 1991; Sunwolf & Seibold, 1999, Hambrick & Mason, 1984; Priem, 2006; Simons, Pelled & Smith, 1999).

The process of GDM usually happens in a face-to-face fashion and the organisational setting is that of a 'meeting' or 'workshop'<sup>1</sup> depending on the techniques, procedures and technologies used to assist in the process of GDM (Ackermann, 2012). Due to the high costs associated with GDM, ranging from transportation and accommodation to specialised technology and consultants' costs, it is most often the case for GDM to be observed in situations that are of strategic importance to the organisation than not (Ackermann & Eden, 2011; Eden & Ackermann, 2010:239-241; Rosenhead & Mingers, 2000:9). In this research, GDM is viewed as a fundamentally *communicative* process involving the interaction of the group members<sup>2</sup>, also referred to as group interaction.

The definition of group interaction offered by McGrath and Altermatt (2001: 525) has been adopted for this research, being that:

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<sup>1</sup> Some scholars make the distinction between meeting and workshop in that a workshop is a "...meeting without formal agenda or chairing but with a shared commitment to making progress with the issue at hand" (Rosenhead & Mingers, 2001: 13), while others use the term meeting as to include workshop situations (Poole, 1991). In this research the term workshop is adopted so as to avoid confusion.

<sup>2</sup> In this research the words 'group members' and 'group participants' shall be used interchangeably bearing the same meaning being the individuals that take an active role in participating in the meeting.

“By “group interaction” I mean the simultaneous and sequential behaviours (verbal and motor) of group members as they act in relation to one another and to the tasks that the group is trying to accomplish, over time”.

### 2.3.2 GDM -- Not Problem Free.

A long stream of scholarly research indicates that GDM can act as a double edged sword (Hirokawa & Poole, 1996; Sunwolf & Seibold, 1999; Schultz, 1999). If the group communication processes during decision making are managed and performed effectively, GDM may prove to be helpful, thus having a multiplicative effect on the collective cognitive capability, of the group and subsequently on its decision making ability, resulting in better decisions (Propp, 1999: 225). This effect has also been referred to as the “assembly-bonus effect” (Sunwolf & Seibold, 1999: 415). On the other hand if the group communication processes are managed and performed ineffectively it is likely that GDM will result in worse decisions than those made by a single individual. This is mainly due to communication related deficiencies observed in GDM, with the main ones being those of groupthink, social loafing and self-censorship (Sunwolf & Seibold, 1999: 396-397; Schultz, 1999: 382-383).

It has been further advanced that, alongside information processing and member actions coordination, a key behaviour resulting in communication related deficiencies is the *ineffective* management of cognitive conflict<sup>3,4</sup> **during negotiations**, arising during the face-to-face group interaction that takes place in

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<sup>3</sup> It is important to note that a distinction between two types of conflict can be made, one type is the conflict of interest stemming from differences in goals and motives, and the other is cognitive conflict stemming from differences in interpretation and understanding of a given complex problematic situation (McGrath, 1984), with the focus of this research being on cognitive conflict.

<sup>4</sup> It is important to note that by conflict management both notions of conflict surfacing and conflict resolution are involved (Sambamurthy and Poole, 1992; Kuhn and Poole, 2000).

GDM workshops (McGrath & Argote, 2001: 608; Meyers & Brashers, 1999: 297-300; Schultz, 1999: 382-383; Sunwolf & Seibold, 1999: 396-397).

### **2.3.2.1 Conflict: A Definition.**

At this point I need to define conflict. I adopt the definition offered by Folger, Poole & Stutman (2009:4) being that:

*“Conflict is the interaction of interdependent people who perceive incompatibility and the possibility of interference from others as a result of this incompatibility”.*

As such conflict is viewed as a fundamentally communicative and complex perceptual process, which has the potential to escalate and involve more parties than the ones that initialised it.

Moreover, conflict can be classified in two broad categories termed as cognitive conflict (also termed as issue-based conflict) and conflict of interests (also termed as relational conflict) (Miranda & Bostrom, 1993; Rahim, 1983; Rahim 2001; Sambamurthy & Poole, 1992:226). *Cognitive conflict* is conflict about the task and stems from individuals’ differences in interpretations and worldviews (Sambamurthy & Poole, 1992). Conflict of interests somehow detracts from the task and focuses on the differences of motives and goals (Sambamurthy & Poole, 1992; Miranda & Bostrom, 1999). In this thesis I am interested only in cognitive conflict.

Having positioned and defined conflict within the GDM context, in the next section I will try and position conflict management effectiveness within a negotiation context.

### ***2.3.2.2 Effective Negotiation = Effective Conflict Management***

The usefulness for effective negotiations has been well documented in the managerial, social psychological and cognitive sciences (Carnevale & Leung, 2001; Carnevale & Pruitt, 1992; Fisher & Ury, 1983; Nutt, 2002:24-25; Pettigrew, 1973; Weingart, Hyder, & Prietula, 1996).

Depending on the academic literature one refers to, there appears to be striking similarities between the characteristics of effective negotiation and effective conflict management (Carnevale & Leung, 1999: 484; Kuhn & Poole, 2000). This is understandable since effective negotiation entails effective conflict management between group participants in order to reach a commonly accepted way forward in terms of agreed actions; on the other hand effective conflict management entails the negotiation of multiple perspectives in order to resolve the conflict in an acceptable manner by making mutual concessions. Negotiation, in its broader sense, may not necessarily involve conflict management and conflict management may not necessarily involve negotiation.

As such part of a decision making related negotiation *may be* conflict management, and part of conflict management *may be* (if the conflict management is to be termed as effective) the negotiation about a mutually agreed solution to that specific issue causing the conflict.

Conflict management has become such an integral part of decision making that scholars usually omit the negotiation part, focussing directly on the conflict management in relation to decision making (Kuhn & Poole, 2000; Sambamurthy & Poole, 1992). This should not be viewed as a weakness in terms of the research quality since a large body of research has argued for and demonstrated that conflict

situations can influence decision making even when decisions do not display conflict. Past conflict situations achieve that by creating future communicative norms in terms of shaping the quality of the critical thinking a group displays (Gouran & Hirokawa, 1996; Gouran, Hirokawa, Julian & Leatham, 1993; Hirokawa & Sheerhorn, 1986; Hirokawa & Rost, 1992; Kuhn & Poole, 2000; Mayer, 1998).

Notwithstanding the above discussion, there is a need for clarification in terms of the special case of negotiation this research is concerned with. The special type of negotiation this research refers to is that of social and psychological negotiation (henceforth referred to simply as ‘negotiation’), and can create both a new socially negotiated order (SNO<sup>5</sup>) as well as a new negotiated social order (NSO<sup>6</sup>) (Eden & Ackermann, 2010: 240). Its importance to DM lies in that if the negotiation process is managed effectively it may lead to improved implementation of the decisions made (Eden & Ackermann, 2010: 240). In terms of the cognitive and socio-political aspects of DM, the focus on the processes of negotiating meaning while managing multiple perspectives, is argued to enhance the ability of the participants to manage complexity and come closer towards politically feasible agreements (Ackermann, 2012: 655; Eden & Ackermann, 2010: 238-239).

In the context of this specific research effective conflict management is viewed as a key element of effective negotiation. As Haslett and Ruebush (1999: 124) argue, conflict occurrence “...appears to be inevitable in task groups because of the challenges inherent in getting individuals to work together and make decisions.”, while stressing that conflict can go both ways and depending on how it is managed,

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<sup>5</sup> A socially negotiated order deals with the relationships amongst group members (Eden & Ackermann, 2010:240).

<sup>6</sup> A negotiated social order deals with the status-quo and the existing norms about how a given problematic situation is to be addressed (Eden & Ackermann, 2010:240).

conflict may equally prove to be a positive or a negative, characteristic of a negotiation process (Haslett & Ruebush, 1999), group outcomes (Jehn, 1995; Jehn & Mannix, 2001), as well as of decision making per-se (Kuhn & Poole, 2000; Putnam, 1986).

### ***2.3.2.3 Effective Conflict Management.***

An effective cognitive conflict management process is when the group accomplishes two conflict related functions. First, the group must allow for the surfacing of the conflict and second for the effective resolution of the conflict surfaced (Sambamurthy & Poole, 1992).

Thus, conflict management, as a communicative process, needs to be split into four separate key conflict behaviours, one about the conflict surfacing and three about the possible ways a surfaced conflict may be resolved (Poole & Roth, 1989a; Kuhn & Poole, 2000; Sambamurthy & Poole, 1992).

Conflict surfacing is observed during interaction when it becomes evident that there is some sort of opposition amongst 2 or more group participants. This conflict causing opposition needs to be clearly separated from situations in which the group interaction progresses constructively and in a non-confrontational manner criticising each other's ideas (Poole & Roth, 1989a; Kuhn & Poole, 2000; Sambamurthy & Poole, 1992).

Once conflict has been surfaced it can be resolved in one of the following three ways (Poole & Roth, 1989a; Kuhn & Poole, 2000; Sambamurthy & Poole, 1992). First, it can be resolved in an integrative manner in which the group participants make a conscious attempt to gain a better understanding of one-another's viewpoints

and explore the causes of their differences. Ultimately, the conflict is resolved in an integrative manner by group participants making mutual concessions.

Second, the conflict can be resolved in an avoiding manner in which the conflict is tabled thus not allowing any further specific conflict-related discussion of the group participants.

Third, the conflict can be resolved in a distributive manner in which powerful group participant(s) impose their position(s) to powerless group members.

These four behaviours (i.e. conflict surfacing plus three behaviours for conflict resolution), result in the degree of confrontiveness a group displays at any given time (Sambamurthy & Poole, 1992). The notion put forth, argued for, and empirically supported by Sambamurthy and Poole's research, is that higher levels of confrontiveness will result in higher degrees of post-meeting consensus.

Moreover, in their field study, Kuhn and Poole (2000), using a 29-item questionnaire indicated that groups that displayed an integrative type of conflict management resulted in more effective decisions<sup>7</sup>. On the other hand, experiments conducted by Sambamurthy and Poole (1992) indicated that higher levels of confrontiveness resulted in higher levels of post meeting consensus.

It has been further shown that group decision making outcomes such as satisfaction with the decision, decision quality and consensus also depend on the manner in which conflict is handled (Brett, Shapiro, & Lytle, 1998; deDreu, Weingart, & Kwon, 2000; Kuhn & Poole, 2000; Sambamurthy & Poole, 1992; Weingart, Hyder, & Prietula, 1996; Wall, Galanes, & Love, 1987).

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<sup>7</sup> To be more precise effectiveness was assessed as "perceived effectiveness" (Kuhn & Poole, 2000: 571)

#### 2.3.2.4 Summary

In this section I have identified as a key issue for having suboptimal group decision making processes to be the ineffective conflict management, when the latter takes place within a negotiation context. In the next sections I will try and highlight the various ways in which the Information Systems, and Management Science disciplines have attempted to address the issue of ineffective conflict management.

#### 2.3.3 Previous Responses to GDM Issues.

A number of ways for addressing the conflict related issues have been advanced in the literature and practice, with the main streams being those of technology<sup>8</sup> and/or model<sup>9</sup> and/or facilitation<sup>10</sup> supported formal group process procedures<sup>11</sup> as well as otherwise unsupported, formal group process procedures (Rosenhead & Mingers, 2001; Hollingshead, 2001; Scott, 1999; Sunwolf & Seibold, 1999;). From hereafter Formal Group Process Procedures shall be referred to as FGPP's. We shall concern ourselves a bit more with exploring the three different types of dealing with the conflict related issues.

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<sup>8</sup> In this context by 'technology', the use of computer hardware and software is meant (Scott, 1999).

<sup>9</sup> In this context by 'model', an amenable to formal analysis diagrammatic depiction of the problematic situation as perceived by the group members is meant (Rosenhead & Mingers, 2001: 13, Eden & Ackermann, 2001: 27).

<sup>10</sup> In this context facilitation focuses only on the group level facilitation. By 'facilitation' is meant the process by which an individual acts as a process and content agent with the purpose of increasing the effectiveness of group members in resolving the 'primary task' the group is faced with (Phillips & Phillips, 1993; Franco & Montibeller, 2010, p.492;).

<sup>11</sup> In this context formal group process procedures are defined as "...any imported or created structure enacted by a task group specifically for the purpose of enhancing discussion, problem solving, or decision making" (Sunwolf and Seibold, 2001: 398-399).

### ***2.3.3.1 Formal Group Process Procedures - FGPP's***

By offering structure as well as a certain degree of restrictiveness in the processes a group follows, it is hoped that the instances of ineffective conflict management would be minimised.

Well known FGPP's include, but are not limited to: Devil's Advocacy, Brainstorming, Dialectical Inquiry, the Nominal Group Technique as well as the Delphi Technique (Delbecq, Van de Ven & Gustafson, 1975; Gallupe et al., 1992; Schweiger, Sandberg, & Ragan, 1986; Schwenk, 1990, 2006; Sutton & Hargadon, 1996; Van de Ven & Delbecq, 1971; Van de Ven & Delbecq, 1974)

FGPP's when examined in terms of conflict management research have been predominantly concerned with the manner in which FGPP's analyse, rather than resolve, conflict (Sunwolf & Seibold, 1999: 413). Such a comment seem to be in line with Kuhn & Poole (2000: 559) noting that most group conflict related studies focused on the direct outcomes of the conflict, be it in terms of decision quality, commitment to the solution or satisfaction (O'Connor, Gruenfeld & McGrath, 1993; Pelled, Eisenhardt & Xin, 1999). Attempts to enrich and improve the capabilities of FGPP's gave rise to the field of Group Decision Support Systems (GDSS)

### ***2.3.3.2 Group Decision Support Systems - GDSS***

Advancement on GDM came as academics and practitioners combined technological aids with FGPP's (DeSanctis & Gallupe, 1987; Fjermestad & Hiltz, 1999, 2000; Hollingshead, 2001; Scott, 1999). The technologically aided procedures focusing specifically on GDM were termed as Group Decision Support Systems

(GDSS) (DeSanctis & Gallupe, 1987; for a treatise on terminology and the different strands of technology aided groups see Hollingshead, 2001; and Scott, 1999;).

GDSS can be described in relation to three levels of support they are meant to provide decision making groups with. The key characteristics each GDSS level is meant to display are explicated in the following paragraphs.

The first level GDSS intends to “...*remove common communication barriers*” between participants (DeSanctis & Gallupe, 1987:593). As such, it offers technological support in terms of the participants each having a computer in front of them, which is linked to the main server as well as a large ‘public’ screen display. Other than the visual capabilities, Level 1 GDSS software allows for voting and rating of ideas as well as for summarisation of ideas and time keeping.

Level 2 GDSS intends to “...*reduce uncertainty and ‘noise’ during the group decision processes*” (DeSanctis & Gallupe, 1987:593). Therefore, they build on level 1 GDSS by offering additional technological capabilities by incorporating in their software advanced problem structuring and decision analysis aids such as: PERT, social judgement and MCDA models. Furthermore, level 2 GDSSs offer automation for FGPPs such as Delphi or Nominal Group Technique (Delbecq, Van de Ven & Gustafson, 1975; Van de Ven & Delbecq, 1971; Van de Ven & Delbecq, 1974).

Level 3 GDSS intend to fully automate the decision making process. As such, a level 3 GDSS further builds on level 2 GDSS by incorporating automated versions of Parliamentary Procedures (Davidson, 1968) and Robert’s Rules of Order (Robert & Honemann, 2011).

In regards to conflict, the rationale behind technology driven FGPP’s (i.e. GDSS’s) was that the GDSS build-in capabilities (i.e. ability for simultaneous input

of ideas, anonymity of participants, electronic voting and greater reliance on written media) would result in more effective conflict management behaviours (Poole, Holmes & DeSanctis, 1991:945). While some of the research findings remain, to a certain degree, inconclusive<sup>12</sup>, the field of GDSS-related conflict management presents a solid background of scholarly research with a number of important findings under its belt (Meyers & Brashers. 1999: 297-300).

### **2.3.3.3 Problem Structuring Methods - PSMs**

Around the same time as when GDSS were being developed, a different family of methods emerged bearing a similar focus on assisting groups in making better decisions and dealing with complex problems surrounded by uncertainty and conflict. The family of these participatory methods has been termed as Problem Structuring Methods (PSM's) (Ackermann, 2012; Rosenhead & Mingers, 2001; Rosenhead, 1989).

PSM's share similarities to GDSS in that they incorporate distinct FGPP's, while some also share the technological element found in GDSS (Eden & Ackermann, 2001:27; Friend, 2001: 125). Moreover, the key difference of PSM's to GDSS is their distinct focus in using qualitative, and sometimes diagrammatic, models as part (or even as the whole) of their FGPP's (Rosenhead & Mingers. 2001; Ackermann, 2012). While certain strands of GDSS attempt to incorporate the use of diagrammatical models (i.e. Level 2 GDSS) (DeSanctis & Gallupe, 1988; Sambamurthy & Poole, 1991: 246; Poole, et al., 1991: 930), the theoretical and conceptual background offered by PSM model-building and analysis *formal*

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<sup>12</sup> For example, significant evidence was found for only one of the six conflict management related impacts that were hypothesised by Poole et al. (1991), with the remaining five hypotheses not supported.

procedures appear to be more advanced, offering a pluralism of theoretical and philosophical underpinnings (Rosenhead & Mingers, 2001; DeSanctis & Gallupe, 1987; Sambamurthy & Poole, 1991;).

Thus, the PSMs have incorporated in their FGPP's clearly defined modelling languages, resulting in models amenable to formal analysis (Eden & Ackermann, 2001, p. 26-27). As such and while PSMs offer similar technological capabilities, the diagrams resulting from the model building process can be viewed as the very outputs of the group discussion and not merely as aids to the discussion. Scholars view the typical context in which PSMs operate as (Ackermann, 2012; Franco & Montibeller, 2010):

- dealing with messy, complex problems usually at the strategic level;
- operating in a group workshop fashion;
- group participants usually communicate via face-to-face group interaction;
- facilitation is required at different stages and to different extent according to the PSM used and the problematic situation the group is faced with.

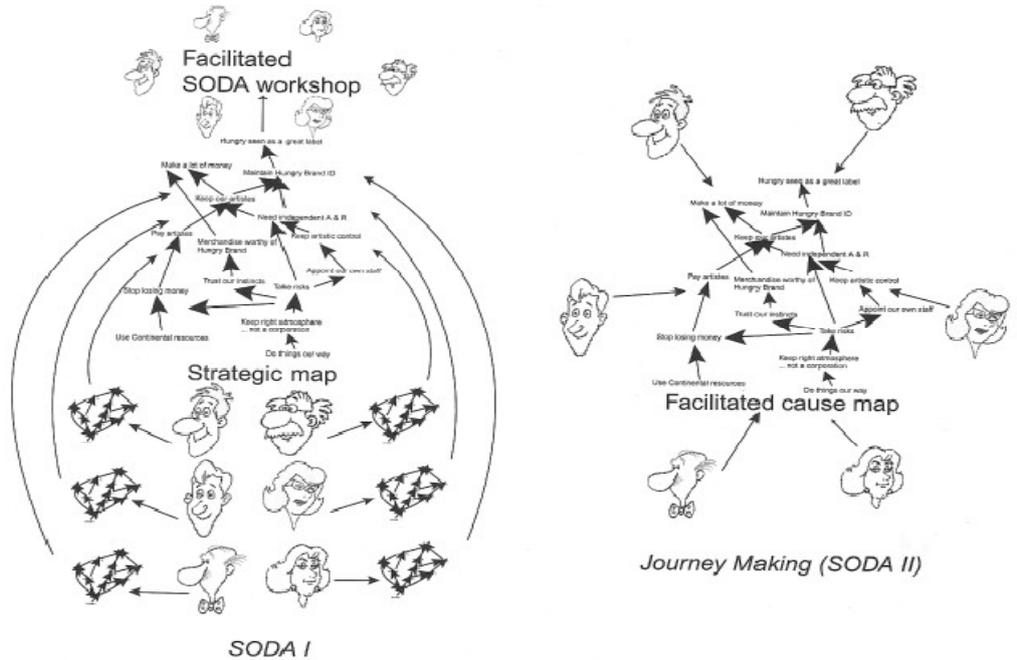
A well established PSM is SODA (Rosenhead & Mingers, 2001). When SODA is explicitly combined with facilitation and computer support it can be classified as facilitated problem structuring thus belonging to the wider family of Facilitated Modelling explored in later sections. Before introducing Facilitated Modelling, I will introduce SODA since it is the method employed in the FM workshops this thesis explored.

#### 2.3.3.3.1 SODA

SODA's underlying philosophy was to find out using cognitive maps how people are continually striving to 'make sense' of their world in order to 'manage and control' that world. This thought was guided by the 'Theory of Personal Constructs' initially developed by Kelly (Adams-Weber & Kelly, 1979, Kelly, 1955) and has been also termed as Cognitive Theory. SODA's approach essentially lies in 'subjectivism' meaning that the different worldviews and perceptions of individuals shall constitute different interpretation of 'reality' and the 'real world' (Rosenhead & Mingers, 2001).

A clear distinction is given by Pidd (2003), between what existed and how SODA developed through time. In its essence, Pidd (2003) indicates that when SODA technique was used to construct cognitive maps for individuals it was in its early stages and was named SODA 1. SODA 2, on the other hand, took SODA 1 a step further and indicated a clear methodology of constructing cognitive maps for groups (Figure 1) as a way of exploring the group's as well as the consultant's different subjective views (Eden & Ackermann, 2004).

**Figure 1: SODA I Vs SODA II.**



Adopted by Pidd (2003)

Developments by Eden and Ackermann (1998) suggested that SODA 1 and SODA 2 together form what they call JOURNEY Making. JOURNEY is the acronym for JOintly Understanding, Reflecting and NEgotiating strategy and it is used as a tool to reach an agreement towards the **strategy** to be followed. What JOURNEY Making actually is, as proposed by Eden and Ackermann (1998), is using cognitive mapping in order to gain as rich an appreciation as possible about what people believe about a situation, *and how this situation can be improved in order to formulate a sound and feasible strategy.*

The underlying intent of SODA applications is in the context of action orientation i.e. the aim being to move people toward some commitment to act. SODA aims to support negotiation and argument, stemming from different perceptions, and

essentially help people move to a joint commitment to action. Furthermore, for SODA to be applied it requires the analyst to work with what Pidd (2003) calls the ‘sense-making systems’ people use rather than with the world as the analyst sees it.

The fact that maps generated by large groups can get quite large in size making them hard to manage and manipulate, led to the development of specialised software<sup>13</sup> to help consultants work through the SODA procedures more efficiently (Eden & Ackermann, 2010: 243). The twelve guidelines to cognitive mapping explicating the process can be viewed in appendix 1 (Eden, Ackermann & Cropper, 1992).

#### *2.3.3.4 Summary*

In this section I have highlighted the key responses, stemming from the field of Information Systems and Management Science that intend, among others, to improve the group communication processes causing ineffective conflict management. Formal Group Process Procedures (FGPPs) have been identified as offering participatory procedures for enhancing group communication processes. Group Decision Support Systems (GDSS) have been identified as systems that through computerisation intend to enhance the application of FGPPs. Problem Structuring Methods (PSMs) have been identified as a family of participatory methods that intend to enhance decision making and group communication procedures through the explicit development and appropriation of models. Furthermore, I have identified SODA to be the PSM utilised as part of the FM applications I examine in this thesis.

In the following section I explicate Facilitated Modelling and position it within the context of conflict management effectiveness. I further go on to describe the

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<sup>13</sup> Decision Explorer®. <http://www.banxia.com/dexplore/>

claims made by FM scholars as to how the appropriation of model could enhance conflict management effectiveness.

## **2.4 Facilitated Modelling - FM**

### **2.4.1 Introduction**

Using content facilitation appears in the literature of GDSSs as a relatively scarce practice, with facilitation being predominantly confined to the process related aspects of the group workshop.

To elaborate, facilitation in GDSS predominantly focused on assisting group members with using the technology (e.g. data input to electronic computers etc.) with few exceptions such as Kelly and Bostrom (1998) who explored the manner in which facilitators should manage socioemotional issues. The overall purpose of facilitation in GDSS appears to have been in ensuring a smooth unfolding of the workshop process as well as in minimising training requirements and instruction-rigidity drawbacks (Anson, Bostrom & Wynne, 1995; Dickson, Partridge & Robinson, 1993; Wheeler & Valacich, 1996).

On the other hand, many PSMs have, albeit some more implicitly than others, been designed to use facilitation as an integral part of their overall process (Eden & Ackermann, 2001: 22).

While Facilitated Modelling does not theoretically require the use of Advanced Information Technologies hardware (DeSanctis & Poole, 1994; Franco & Montibeller, 2010), most professional and specialised applications nowadays do employ AIT hardware such as computers and projector screens (Ackermann & Eden, 2011; Ackermann & Eden, 2001; Eden & Ackermann, 2010:243)

#### **2.4.2 FM -- Types.**

Recent literature coined the term 'Facilitation Modelling' (FM) to denote the facilitated process of model building by combining facilitation with a number of FGPP's and technologies (Franco & Montibeller, 2010; Franco & Rouwette, 2011).

Specifically, three types of FM are identified in the literature all bearing differences and similarities, these are (Franco & Montibeller, 2010: 495):

- **Facilitated Problem Structuring:** Based on the PSMs addressed in the earlier sections. Their philosophical underlining is that of subjectivism. Their modelling language is that of natural language with little to no emphasis on quantification. Facilitated problem structuring views the group as the key resource for effective SDM (Franco & Montibeller, 2010).
- **Facilitated System Dynamics:** Originating from the development of system dynamics by Forrester (for review see Forrester, 1994). Their focus is on identifying the unintended consequences an implemented decision may produce, thus placing strong emphasis on causal feedback loops. The process moves from building qualitative models to quantitative model building (Andersen & Richardson, 1997; Lane, 1992; Richardson & Andersen, 1995; Franco & Montibeller, 2010; Williams, Ackermann & Eden, 2003).
- **Facilitated Decision Analysis:** Builds on normal Decision Analysis using facilitation for handling the group processes (Belton & Stewart, 2002; Franco & Montibeller, 2010).

The focus of this research is on FM that is performed through the application of PSM-related analytical methodologies and FGPP's. In the next section I will try and dissect the process of FM to its core components. I will then address the claims that FM literature makes in terms of the model appropriations and conflict management effectiveness. This discussion starts with explicating the role of the facilitator in FM interventions.

### **2.4.3 FM -- The Role of the Facilitator.**

As the name clearly indicates Facilitated Modelling is a modelling practice that actively employs the assistance of one (or in some cases more) facilitator(s).

A key distinction that can be made in terms of facilitation is between process and content facilitation (Miranda & Bostrom, 1999). Process facilitation attempts to aid in adhering to the FGPP's or GDSS processes the group has to follow. For, example process facilitation is explaining to group participants how to use the FM technology for voting. Another example is when the facilitator explains to group participants what FM 'model building blocks' mean and how they are to be used. Thus, in the context of a FM application using SODA a content facilitator would try and answer questions such as the following: " what a line and arrow link means?" "Does the head signify a cause and effect relationship or the opposite?" (Miranda & Bostrom, 1999).

Content facilitation on the other hand is predominantly concerned with helping the group to 'open-up' and interact more freely taking into consideration silent members. For example, a content facilitator would prompt group members to interact by asking questions of clarification, paraphrasing and summarising ideas as well as by balancing the discussion (Franco & Montibeller, 2010).

The FM process usually employs both types of facilitation, thus making the facilitator an inseparable part of the group interaction that takes place within a FM workshop (Eden, 1990).

A key role of the facilitator is to clearly delineate the different stages that the group is going through by constantly assessing whether the model has reached saturation in terms of the complexity and detail it intends to capture (i.e. requisite model) (Franco & Montibeller, 2010: 495). This process of situated closure generates clearly visible stages of interaction within a FM workshop. These stages are briefly summarised in the next section.

#### **2.4.4 FM -- Workshop Stages.**

The task a group is faced with has been shown to be an important element that needs to be taken into account in any study concerned with how groups work (DeSanctis & Gallupe, 1987; Franco & Rouwette, 2011: 166; Hirokawa & Salazar, 1999). It is important at this point to make a clear distinction between the task and the issue that a group is faced with. In the context of this thesis, the task refers to the cognitive processes group participants have to undergo as the process of an FM workshop unfolds through stages. An example of two cognitive processes is brainstorming followed by criticism of the ideas produced. Brainstorming can be classified as a creativity task while criticism can be broadly classified as a cognitive conflict task (DeSanctis & Gallupe, 1987:601).

As mentioned earlier, the process of FM usually unfolds in a series of stages during a single or a two-day workshop. These stages can be further mapped onto the task types employed in typical GDSS applications (DeSanctis & Gallupe, 1987) as

well as onto more generic group task types (McGrath, 1984). The focus of this thesis indicates that the most relevant mapping is the one followed in the GDSS literature.

The stages and their corresponding processes and task types can be observed in table 2.1 (Eden and Ackermann. 2010:241; DeSanctis & Gallupe, 1987).

**Table 2:1 Stages, Processes and Task types of a typical FM workshop.**

Stage	Process	Task type
1	Gathering contributions (i.e. brainstorming)	Creative
2	Concept Clustering (i.e. elimination of duplicate concepts and thematic grouping)	Intellective
3	Goal System Development (i.e. hierarchical ordering of concepts in terms of importance)	Preference
4	Identification and Discussion of Strategic Goals.	Cognitive conflict
5	Allocation of Future Actions to Participants.	Mixed

As can be observed these stages display a rational approach towards decision making, thus fitting neatly within that paradigm (Dean & Sharfman, 1996).

It should be noted that the tasks are not mutually exclusive, meaning that it is possible to observe in any given stage a multitude of tasks. The above table merely intends to highlight the *dominant* task type expected to be observed across the stages of a FM workshop.

Furthering the introduction to Facilitated Modelling, in the next two sections I will explicate the role of the models build as well as the claims made by FM on how the model may assist in improving the effectiveness of conflict management and negotiation.

#### **2.4.5 FM -- The Model**

Franco and Montibeller (2010) argue that a key outcome of FM interventions is the model itself in that, as it is being developed, the model building process “...increases managers’ multiple understandings of the situation and supports them in negotiating courses of action that are culturally and political [sic] feasible for the client organisation” (p. 493). Moreover, the participatory process through which a group facing a problematic situation jointly defines, makes sense negotiates and evaluates various different aspects relevant to the problematic situation at hand, gives rise to the consideration of a number of group related process deficiencies (Franco & Montibeller, 2010). Any group-work will require some form of communication between the group constituting members. As such group-work in face-to-face workshop settings is viewed as a highly communicative process manifested through participants’ face-to-face verbal<sup>14</sup> group interaction (Franco, 2006).

#### **2.4.6 FM Models -- Claims for Effective Conflict Management**

FM emphasis lies on attending to multiple mental models thus uncovering and aiding to the effective negotiation of differences on perceptions and positions. It is further argued that this may prove a fruitful avenue towards ultimately reaching to ‘commitment to action’ in a given problematic situation (Ackermann, 2012: 655; Ackermann & Eden, 2011; Franco & Montibeller, 2010). A claim made by FM literature is that the appropriation of models during FM workshops shall allow for overall better decisions that are more likely to be implemented (Ackermann, 2012: 654; Eden & Ackermann, 2010:241). The rationale for such a statement is that the

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<sup>14</sup> It should be noted that while interpersonal communication also involves non-verbal interaction, such an all-encompassing research endeavor falls outside the scope of this research.

dynamic formulation of a diagrammatic depiction of the problematique (i.e. the model and model building process), acting both as a transitional object as well as a script assisting group interaction, should, among others, allow for more effective conflict management. To be more precise:

The model is claimed to allow for the realisation of the following benefits in terms of the conflict management process:

- Attendance to multiple perspectives, thus surfacing and discussing ideas without suppressing dissent (Eden & Ackermann, 2010: 240) and avoiding groupthink (Janis, 1972) . The trade-off between the need for differentiation and integration fits neatly within the effective conflict management conceptualisation stating that conflict needs to be surfaced and then effectively managed (Kuhn & Poole, 2000; Sambamurthy & Poole, 1992).
- More procedurally just processes (Kim & Mauborgne, 1995), thus enhancing the on-process commitment of participants. Process-committed participants are more likely to invest more effort in dealing with conflict in an effective manner (Ackermann & Eden, 2011).
- Managing complexity without losing richness. Incorporating multiple perspectives will inevitably cause an increase to the task complexity the group is faced with (Eden & Ackermann, 2010: 253). Task complexity has been shown to have a direct effect on a group's conflict management processes (Kuhn & Poole, 2000: 579 & 583). Scholars claim that FM models should allow for this complexity to be constructively managed (Eden & Ackermann, 2010: 253-262).

- Improved sense-making, by allowing participants for ‘mental pauses’. Mental pauses allow for the participants to gain a better appreciation of one another’s viewpoints without having the emotional pressure to immediately reject or accept a proposed idea (Eden & Ackermann, 2010: 249-250). Sufficient elaboration of ideas is seen as critical to effective conflict management (Kuhn & Poole, 2000; Sambamurthy & Poole, 1992)

The model characteristics allowing for these claimed benefits are:

- The linked, clustered and hierarchical structure of the model allows for capturing the multiple perspectives while at the same time effectively managing complexity via categorisation and prioritisation (Eden & Ackermann, 2010: 239, 242, 251, 254 & 260)
- Anonymity of the issues on the map. Depersonalisation of the issues on the map (i.e. the issues are presented anonymously), places equal weight to all the issues. As such, no-one issue deserves a-priori more attention than another, allowing for “...a ‘safe space’ in which participants are able to risk expressing views that they might judge to be ‘out-on-a-limb’” (Eden & Ackermann, 2010: 249). Thus, participants feeling that they can freely air their opinions without repercussions will feel that the procedure followed has been legitimate and just in attending to their own personal viewpoints (Kim & Mauborgne, 1995)
- Modelling language. The modelling language of FM is the natural language expressed through words. Using the natural language allows for a certain degree of “fuzziness” in terms of the way ideas are expressed. This fuzziness is viewed as allowing for small, incremental transitions from a position to

another (Eden & Ackermann, 2010: 249). As such, it offers an easy ‘way-out’ for participants that change their mind and do not want to appear as inconsistent, thus allowing them to “save face”.

- Visible and interactive common repository of ideas and issues allowing for the participants to make mental pauses without running the ‘risk’ that while the conversation moves on, their specific points of interest will be forgotten or disregarded (Eden & Ackermann, 2010: 249-250).

The above clarifies the claim made by FM scholars being that, the appropriation of models constructed during an FM workshop, would result to better decisions via, amongst others, more effective conflict management processes.

Persistent calls for more process related research in order to uncover the effects of models have gone largely unnoticed (Ackermann, 2012; Eden, 1995; Finlay, 1998; Franco & Rouwette, 2011). Unfortunately, little research has been conducted, in an empirical and systematic manner, that could offer evidence, for or against, the model appropriation and process related claims FM scholars make, with most of the evidence being confined to anecdotal and subjective accounts of FM interventions (Ackermann, 2012: 656; Franco & Rouwette, 2011: 169; Franco & Montibeller, 2010: 498; for an exception see Ackermann & Eden, 2011).

A fruitful research avenue towards addressing this lacuna can be found in assessing the effects of FM models in terms of the conflict management processes FM groups display.

In this section I explicated Facilitated Modelling. The different types of facilitated modelling as well as the key characteristics of both the model and the facilitation aspects of FM have been described. FM was positioned within the context of conflict

management effectiveness and the claims FM scholarship make, as to how the appropriation of models could enhance conflict management effectiveness, have been described.

Within the context of this research it is easy to notice the technological as well as the process and procedural similarities of FM with GDSS. Thus, FM designs (i.e. models<sup>15</sup>, methods<sup>16</sup>, techniques<sup>17</sup>, rules<sup>18</sup>, procedures<sup>19</sup> and resources<sup>20</sup>) earn FM a place under the wider umbrella of Advanced Information Technologies (AIT).

A theory that has gained wide acceptance amongst AIT scholarship is Adaptive Structuration Theory (AST). In the following section I explicate Adaptive Structuration Theory as the theoretical test-bed for the conduct of my research.

## 2.5 Theoretical Underpinning - Adaptive Structuration Theory

While a number of different theoretical approaches for the study of AIT exist, they can be broadly classified as stemming out of three main schools of thought (DeSanctis & Poole, 1994:123). These are the Decision Making (Connolly, Jessup & Valacich, 1990; Dennis et al, 1988; George et al.1990), the Institutional (Barley & Tolbert, 1997; Orlikowski & Barley, 2001; Tolbert & Zucker, 1999) , and the Social Technology (DeSanctis & Poole, 1994; Daft, Lengel & Trevino, 1987; Trevino, 1986) schools of thought.

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<sup>15</sup> For example group causal maps.

<sup>16</sup> For example SODA.

<sup>17</sup> For example Brainstorming.

<sup>18</sup> For example modelling rules such as Oval Mapping Technique (OMT) (Ackermann & Eden, 2001:46).

<sup>19</sup> For example Decision Explorer procedures (Ackermann & Eden, 2001:54).

<sup>20</sup> For example software and hardware resources

In brief the Decision Making school adopts a hard-line deterministic approach towards AIT implying that the effects on the interaction will be purely due to the technological capabilities of the AIT and nothing else (George et al.1990).

On the other hand, the Institutional school of thought approach AIT, as well as institutional change, not in a cause-effect but rather in a social evolution manner. The Institutional school of thought criticise the Decision Making conceptualisations as being too close to the technology as well as too rigid to their research approach (Markus & Robey, 1988).

The Social Technology school of thought attempts to integrate the two approaches by combining the concepts of technological capabilities and the social context in which these technologies are appropriated and the interaction between the two (i.e. AIT and context of use) (DeSanctis & Poole, 1994, Orlikowski, 1992).

A key proponent of the Social Technology school is Adaptive Structuration Theory (AST) developed by DeSanctis and Poole (DeSanctis & Poole, 1994). AST is primarily based on the work of Anthony Giddens in structuration (1979, 1984). In relation to communication theory AST can be broadly classified as belonging to the family of pragmatic approaches to communication incorporating both the linguistic form and the communicative context of discourse (Putnam & Fairhurst, 2001:89).

Essentially the notion advanced by AST is that AIT's bring about institutional structures that enable or restrict interaction at the workplace. Moreover, the effects of AIT's on organisations are to be viewed under the lenses of the manner in which these AIT's are appropriated across different time periods and different social and organisational contexts. AST offers specific sources of structure that depending on the manner they are appropriated should produce the claimed effect.

As such if an AIT is to be appropriated contrary to its spirit (or ethos) the theory suggests that any effects are not to be viewed because of the AITs design but because of its misappropriation.

In relation to this research the importance of AIT is that it brings to the fore the distinction that in order for FM to be tested (against any claim), one should observe the manner in which the FM was appropriated and whether it was faithful (or consistent) to the spirit of the AIT or not. Appropriations that are faithfully appropriated are the ones that should bring about the desired effect and on which any AIT claims should be tested.

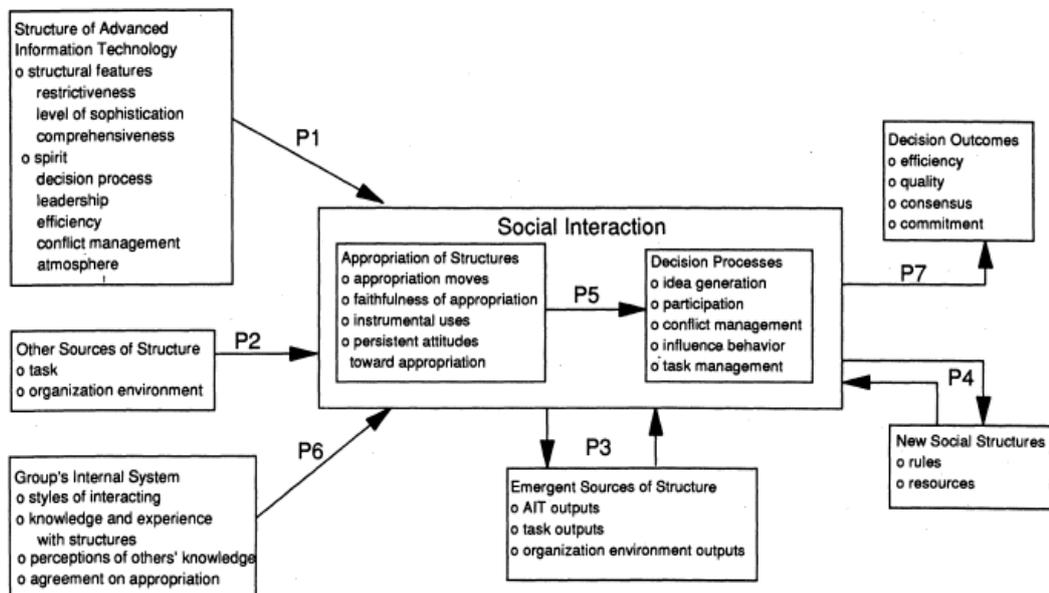
The key propositions of AST are (adopted by DeSanctis & Poole, 1994):

- *P1. GDSSs contain embedded social structures, and these social structures can be described in terms of the structural features and spirit of the GDSS. To the extent that GDSSs vary in their spirit and structural features sets, different forms of group interaction are encouraged by the technology.*
- *P2. The effect of GDSS technology structures on interaction may vary depending on the task, the environment, and other contingencies that provide social structures for interaction.*
- *P3. New sources of structure emerge as the GDSS technology, the task, and environmental structures are applied during the course of group interaction.*
- *P4. The social structures derived from appropriation of a GDSS may evolve into new forms as they are used and reused over time.*

- P5. Group decision processes are influenced by the nature of GDSS appropriations.
- P6. The nature of GDSS appropriations will vary depending on the group's internal system.
- P7. Given GDSS and other structural conditions,  $n_1...n_k$ , and optimal appropriation processes and optimal group decision process, then desired outcomes of GDSS use will result.

A diagrammatic depiction of the constructs, propositions and the interrelationships can be viewed in the following figure (Figure 2).

**Figure 2: Adaptive Structuration Theory.**



Adopted from Poole & DeSanctis (1994)

Figure 2, follows an Input - Process - Output design that is well familiar in the research of group decision making (Pavitt, 1999:315).

In relation to decision making DeSanctis and Poole (1994) went on to describe the properties constituting an idealised profile of AIT appropriation by the group. These

are “(a) appropriations are faithful to the system’s spirit, rather than unfaithful; (b) the number of technology appropriation moves is high, rather than low; (c) the instrumental uses of the technology are more task or process-oriented, rather than power or exploratory-oriented; and (d) attitudes toward appropriation are positive rather than negative.” (131).

Moreover, they stress that if all these properties are to be exhibited by a group, beneficial decision processes will occur (pp.131).

They suggest that an element of the decision processes is conflict management, ergo beneficial decision processes would be also constituted by effective conflict management (pp. 130).

This thesis build on the theoretical framework advanced by DeSanctis & Poole (1994) termed as adaptive structuration theory (AST). The reason for selecting AST is that it is the only theoretical framework I could unearth that:

- a. Has been used in a significant number of relevant research endeavours (Dennis & Garfield, 2003; Poole, & Holmes,1995) .
- b. Explicitly views the effects of FM model as being related to the manner in which the model is used (i.e. appropriated) and not as deriving by the model per-se, thus bringing the notion of group human activity and interaction to the fore.
- c. Explicitly incorporates conflict management as one of the interaction elements between the model and the decision processes (P5 in figure 2).

In the following section I argue for approaching the FM models as a source of structure in relation to AST.

### 2.5.1 The Model as a Source of Structure.

The research focus is on exploring the appropriations of the model-in-use<sup>21</sup> in a number of stages within a FM workshop, thus only one source of structure is concerned (DeSanctis & Poole, 1994). More specifically, I am concerned only with the output (i.e. the model) of a Facilitated Modelling session as it dynamically unfolds, and the manners in which this model<sup>22</sup> is appropriated by the group throughout the duration of the workshop<sup>23</sup>. Adhering to the classification by DeSanctis & Poole (1994), it can be stated that of concern is the output of the advanced information technology (i.e. the model derived through facilitative modelling in our case).

Adapting from DeSanctis & Poole (1994), the output models of a FM workshop are defined as *the output screens, reports and data presented by the technology on private user terminals, on the system's large public screen*. When group members are discussing comments, ideas, or quantitative data displayed on their terminals or on the large public screen, they are invoking and dynamically changing the FM output structures.

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<sup>21</sup> I.e. the diagrammatic capturing and depiction of the group conversation at hand.

<sup>22</sup> From this point onwards the word 'model' is used to signify the source of structure of interest for this research.

<sup>23</sup> DeSanctis & Poole (1994) include a number of structure sources related to the advanced information technology (i.e. the facilitated modelling in this case), the task and the task output as well as the environment and the environment output. Adhering to the research scope I decided not to explore the other sources of structure except the resulting output of the Facilitated Modelling structure. Facilitated Modelling as a structure per-se would mean that the interest would be on the hardware, software and procedures. In this research I am interested in exploring the effects of the model to the group as the model is being constructed. Doing so requires assessing the model appropriation through time. I view the model as the output of an advanced information technology such as Facilitated Modelling. Furthermore, task outputs (i.e. task steps or using procedures as recommended in task instructions) are dealt with by the facilitator, thus allowing little room for identification of appropriations made by the group. Also, exploring larger structures (i.e. general knowledge and rules of action drawn from the environment – be it the organization or the world at large –, organizational norms, structures other than the facilitative modelling such as flipcharts and general norms, knowledge and social principles from the world at large) was felt that would not serve the purpose of this study on exploring the model appropriation impact on conflict management.

An important clarification that needs be made is that, when individual concepts are discussed, the cognitive focus of a participant is on one concept at a time (i.e. the participant first processes the meaning of concept A and then processes the meaning of concept B). As such and for the instances where individual concepts are discussed the structure in focus is that individual concept. The same applies for when all the model components are discussed (i.e. the links, hierarchy and categorisation of the concepts).

To conclude, in this research the source of the structure is viewed as the dynamically changing models presented to the participants as the workshop unfolds, while the structure per-se is the model components making up the model at any given time.

Other than the source of structure it is important to further identify the spirit of the structure so as to be able and judge against it the nature of model appropriations and whether the model has been faithfully or ironically appropriated.

### **2.5.2 Faithful Vs Ironic Model Appropriations.**

A danger lurking in exploring model appropriations is that of faithful or ironic model appropriations. This is because models can be assessed as to their usefulness in conflict management only if they have been appropriated as intended and in accordance to the spirit of the model, thus labelled as *faithful appropriations*. Moreover, unintended and contrary to the spirit appropriations have been labelled as ironic appropriations (DeSanctis & Poole, 1994).

As such, wrong conclusions would be drawn if, for example, it was to be found that ironic model appropriations hinder effective conflict management, since the model has not been appropriated as intended and contrary to its spirit. Furthermore,

and if, for example, it was to be found that ironic model appropriations do hinder effective conflict management it would not necessarily mean that faithful model appropriations should assist in effective conflict management. It easily becomes evident that the spirit of the model appropriations needs to be assessed and controlled for safe conclusions to be drawn. The first step in doing so is by broadly defining the spirit of AIT's.

The spirit of AIT's is defined as

*“...the “official line” which the technology presents to people regarding how to act when using the system, how to interpret its features, and how to fill in gaps in procedure which are not explicitly specified.” (DeSanctis & Poole, 1994: 126).*

In this sense an ironic, and thus an illegitimate, model appropriation would be one that should not be attributed to the model but to a mistaken interpretation and use of it.

In this research the spirit interpretation adopted is the one offered by Dennis and Garfield (2003: 291) drawing on Habermas's ideal speech (Habermas & Nielsen, 1990). As such the spirit of FM is defined as

*“to ensure that (a) all voices in any way relevant can get a hearing, and that (b) the best arguments we have in our present state of knowledge are brought to bear, and that (c) disagreement or agreement on the part of the participants follows only from the force of the better argument and no other force” (Habermas and Nielsen, 1990: 104).“ [as in Dennis & Garfield, (2003)]*

An interesting question arising is what is the relationship between the level of faithfulness of the model appropriations and that of conflict management effectiveness.

In the following section I introduce two more concepts, namely *model visibility* and the *complexity of model appropriations* that may act as moderators of the relationship between model appropriations and effective conflict management.

### **2.5.3 Model Visibility Level.**

By model visibility is meant *the degree of cognitive focus towards the model that a participant expends by performing a certain model-specific appropriation.*

Previous research suggests that four different moves of model appropriation can be identified and are composed from a number of different appropriation types (DeSanctis & Poole, 1994; Poole & DeSanctis, 1992). The four moves are: 1) the move of Direct Use (i.e. when the model is used directly, such as pointing to the model); 2) the move of Relating the model to other structures (i.e. the model is blended with other model(s)); 3) the move of Constraining the model (i.e. interpreting the model) and 4) the move of Expressing Judgement about the model (i.e. agreeing, disagreeing or keeping a neutral stance towards the model). These types can be further classified in terms of the model visibility they are meant to capture.

Appropriation moves of Direct Use (1) and Expressing Judgement (4) about the model display a 'HIGH' model visibility. This is since both (1) and (4), require complete cognitive focus from the participant. This doesn't imply that the participant's cognitive functions are qualitatively of a higher level when engaged in these model appropriation moves, it merely implies that the participant's focus and attention is focussed towards the model than anything else.

The appropriation move of relating the model to other models (2), requires the participants to focus on the existing model but also to pay strong attention and focus to models drawn from a memory-related library of models. These can be models the participants may have in their mind either due to prior training or prior experience with using different models. As such the appropriation move of relating to other models displays ‘LOW’ model visibility.

Appropriation moves that Constraint the model (3), are viewed as displaying a ‘MEDIUM’ model visibility. This is because during the process of interpreting the model, the participant is also cognitively processing information from the “real world” trying to make sense of the “model world” and vice versa (i.e. sense-making) (Eden, 2010: 232). This interplay between the two worlds subtracts some of the model-only cognitive focus.

When the model is not appropriated at all a no-model visibility is the appropriate classification and is equivalent to No Model Appropriation, thus denoted by ‘NMA’.

A summary of the various classifications of model visibility according to model appropriations is given in Table 2.2.

**Table 2:2 Model Visibility Classification Table**

<b>Model Appropriation moves</b>	<b>Model Visibility classification</b>
(1) Direct Use (4) Expressing Judgement	HIGH
(2) Relate to other models	LOW
(3) Constraining the model	MEDIUM
No model appropriation	NMA

#### **2.5.4 Model Appropriation Complexity.**

A claim made by FM scholars in relation to strategic decision making is that the model will allow for the complexity of the task to be managed thus resulting to more

effective strategic decisions (Eden & Ackermann, 2010: 253-262. This thesis has found supportive evidence to that claim as is further argued.

On further explicating the above argument, the conceptualisation made by Ashby in the late 50's and has been termed as Ashby's law of requisite variety (Ashby, 1958) needs to be noted.

Ashby's law of requisite variety stems from general systems theory and has been successfully applied in the context of information systems research and computational science (Burton-Jones & Gallivan, 2007; Banzhaf et.al., 2006) as well as in and the design of PSM based facilitated modelling procedures (Eden & Ackermann, 2000:40; Mingers & Rosenhead, 2000:268). What Ashby's law dictates is that if the complexity of tasks is to be managed, it needs to be met by complexity in method (Eden & Ackermann, 2000:40). In the context of this research Ashby's law of requisite variety indicates that if model appropriations are to reap the complexity related benefits as claimed they should be able and successfully manage the model (i.e. map) complexity.

While Eden & Ackermann (2010) build on Ashby's law to indicate that for complex tasks the models produced would also bear some degree of complexity, I extend this reasoning by asking whether models depicting complex appropriations should also result in increased conflict management effectiveness or not.

#### **2.5.5 Summary.**

In this section I explicated the key concepts and propositions of Adaptive Structuration Theory. I further positioned AST within the context of FM models and appropriations and the spirit of the model has been defined. The model visibility as well as the complexity of model appropriations has been identified as potential

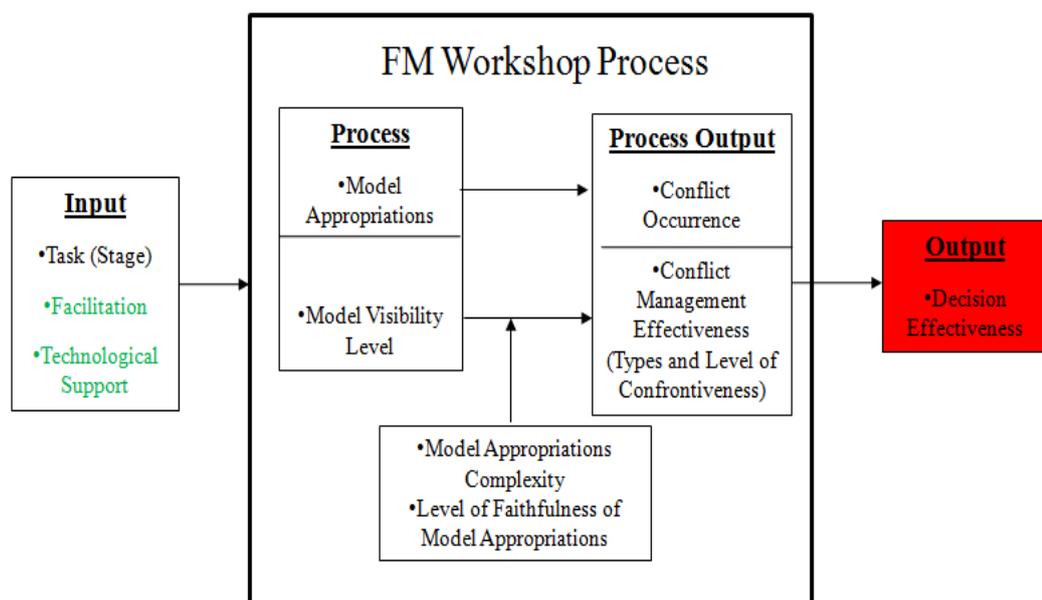
moderators of the relationship between model appropriations and conflict management effectiveness.

Drawing from AST, the research model of this thesis is explicated in the next section.

## 2.6 Research Model.

Drawing from the above depicting the importance of task, facilitation technological support in terms of the level of model visibility and subsequently to conflict management, the following research model is produced (Figure 3).

**Figure 3: Research Model**



The research model follows the Input-Process-Output format which has been well documented in a number of previous similar studies (Poole, et al., 1991; DeSanctis & Poole, 1994) and neatly fit the purposes of studying group decision making processes from a communicative perspective (Pavitt, 1999:314-315).

It posits that variations in the task, facilitation and technological support will result to differences in model visibility levels. Dependant on the complexity of the

appropriations and the level of faithfulness that the model has been appropriated to, model visibility levels will result to various levels of confrontiveness and to various conflict management types (i.e. various levels of conflict management effectiveness). Directly assessing the (FM resulting) decision effectiveness falls outside the scope of this research since prior research indicates that, conflict management effectiveness will have a positive impact on the decision effectiveness (Brett, Shapiro, & Lytle, 1998; deDreu, Weingart, & Kwon, 2000; Kuhn & Poole, 2000; Sambamurthy & Poole, 1992; Weingart, Hyder, & Prietula, 1996; Wall, Galanes, & Love, 1987).

It should be noted that Facilitation and Technological Support have been kept constant by utilising the same facilitator and the same FM procedure (namely JOURNEY Making by Eden & Ackermann, 1998). It has been argued that using a single facilitator across groups provide an increased level of confidence for cross-group facilitation consistency (Wheeler & Valacich, 1996).

Thus, the explanatory variables<sup>24</sup> proposed by the research model are the Stages, the Model Appropriations Complexity and the Level of Faithfulness of Model Appropriations. In contrast, the response variables<sup>25</sup> are the Model Visibility Level and the Conflict Management Effectiveness.

### **2.6.1 Research Questions**

Dissecting the research model posits for the following relationships to be explored, framed as Research Questions, as offering insight to the Primary Research Question (PRQ).

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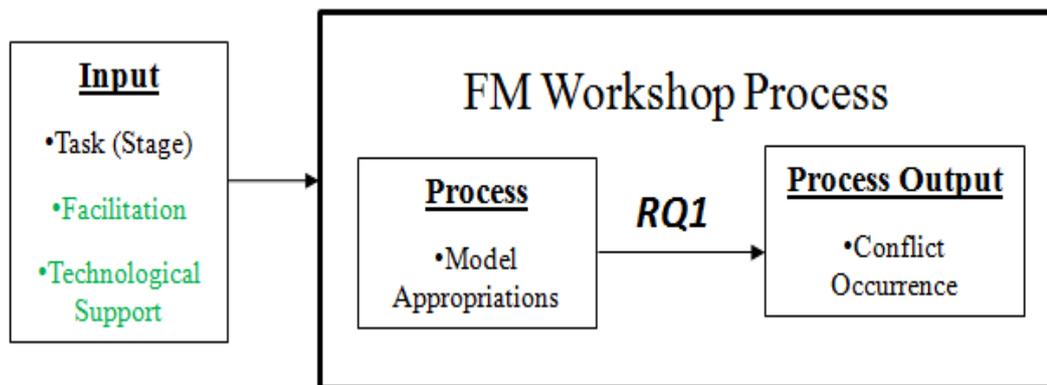
<sup>24</sup> Also called independent variables in experimental research.

<sup>25</sup> Also called dependent variables in experimental research.

### 2.6.1.1 Research Question 1

From the research model the first relationship to be explored is the one seen in figure 4, and seeks to explore the very basic relationship between conflict occurrences, be it of any sort, and model appropriations, again be it of any sort.

**Figure 4: Research Question 1**



Essentially this RQ seeks to partially answer the PRQ by answering the question that when model appropriations are in general observed, how likely is it for conflict to be in general observed.

Furthermore, RQ1 allows for the rest of the RQs to be viewed under a wider perspective. This relationship assumes no a-priori relationship between observing Model Appropriations and Conflict occurrences with Decision Effectiveness (DE), as in the earlier stated case of Conflict Management Effectiveness (CME).

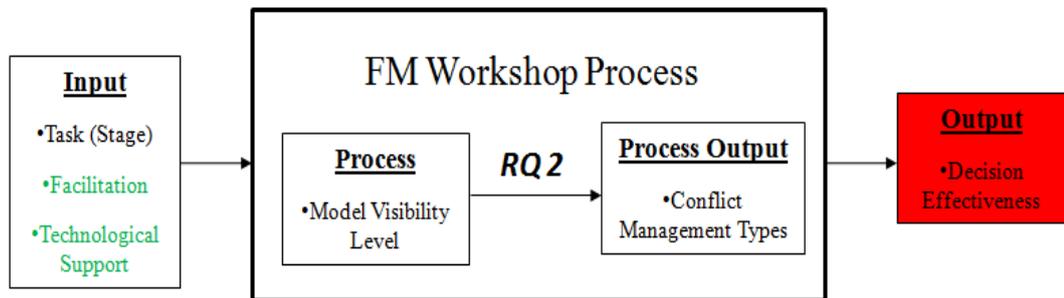
Thus RQ 1 is stated as:

**RQ1: What, if any, is the relationship between model appropriations and conflict occurrences, across the stages of FM workshops for the cases observed?**

### 2.6.1.2 Research Question 2

Figure 5 dissects the research model in terms of Model Visibility Level (MVL) and Conflict Management Types (CMTs).

**Figure 5: Research Question 2**



RQ2 seeks to unravel the relationship between *specific* MVLs and CMTs. Depending on the CMT observed, given that a relationship to DE has been shown to exist (Kuhn & Poole, 2000).

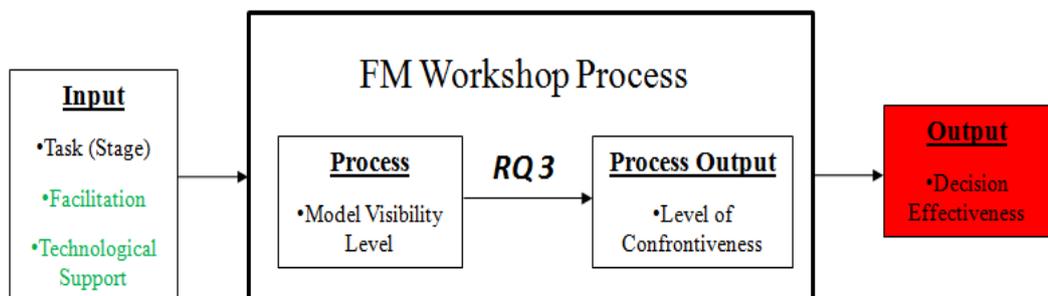
RQ 2 is stated as:

**RQ2: What, if any, is the relationship between the different model visibility levels and conflict management types across the stages of FM workshops for the cases observed?**

### 2.6.1.3 Research Question 3

Figure 6 dissects the research model in terms of Model Visibility Level (MVL) and the Level of Confrontiveness (CL).

**Figure 6: Research Question 3**



RQ3 seeks to unravel the relationship between *specific* MVLs and CLs. As in RQ 2, depending on the CL observed, a relationship to DE has been shown to exist (Sambamurthy & Poole, 1992).

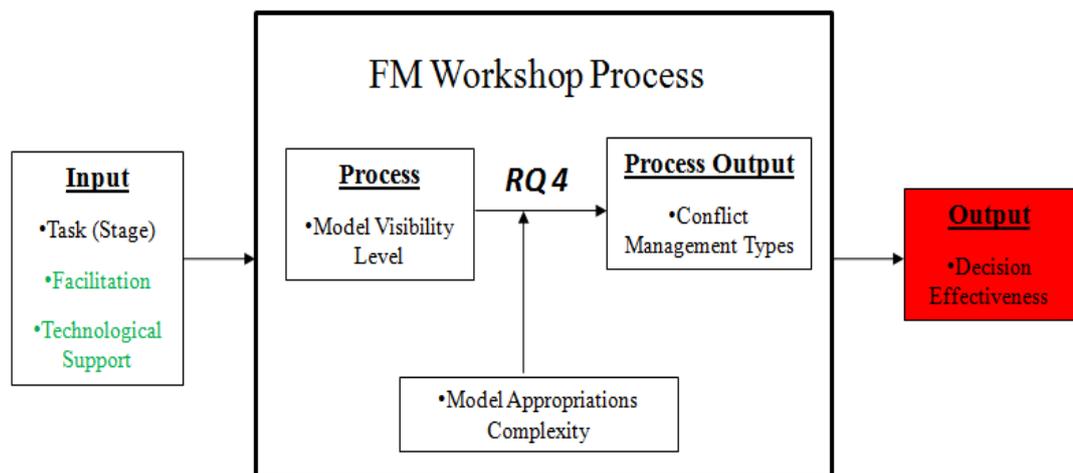
RQ 3 is stated as:

**RQ3: What, if any, is the relationship between model visibility levels and confrontiveness levels across the stages of FM workshops for the cases observed?**

#### 2.6.1.4 Research Question 4

Figure 7 dissects the research model in terms of MVL and CMTs in relation to the Model Appropriations Complexity.

**Figure 7: Research Question 4**



RQ 4 seeks to unravel the relationship between the *overall* MVLs and CMTs in relation to Model Appropriations Complexity (MACo). As in RQ 2, depending on the CMT observed, a relationship to DE has been shown to exist (Kuhn & Poole, 2000).

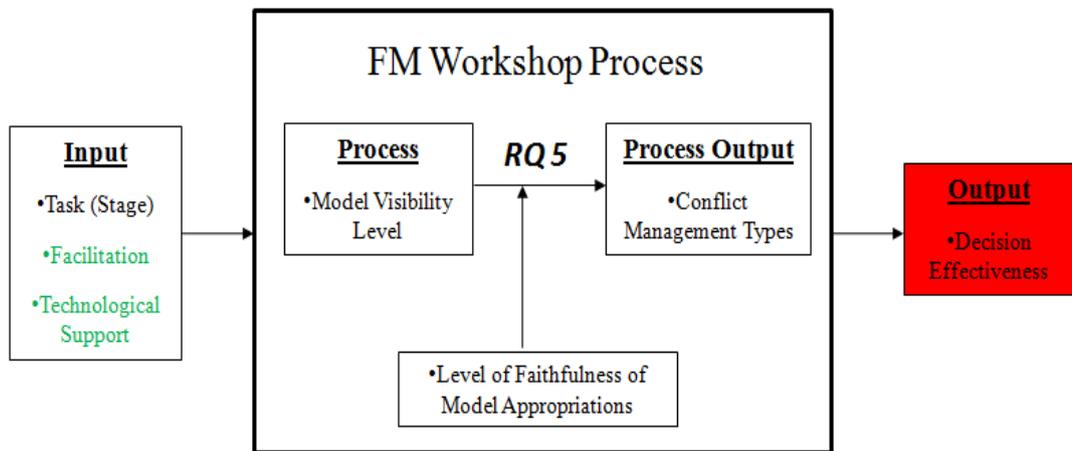
RQ 4 is stated as:

**RQ4: What, if any, is the relationship between model visibility levels and conflict management types in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

### 2.6.1.5 Research Question 5

Figure 8 further dissects the research model in terms of MVL and CMTs in relation to the Level of Faithfulness of Model Appropriations (LFMA).

**Figure 8: Research Question 5**



RQ 5 seeks to unravel the relationship between the *overall* MVLs and CMTs in relation to LFMA. As in RQ 2 and 4, depending on the CMT observed, a relationship to DE has been shown to exist (Kuhn & Poole, 2000).

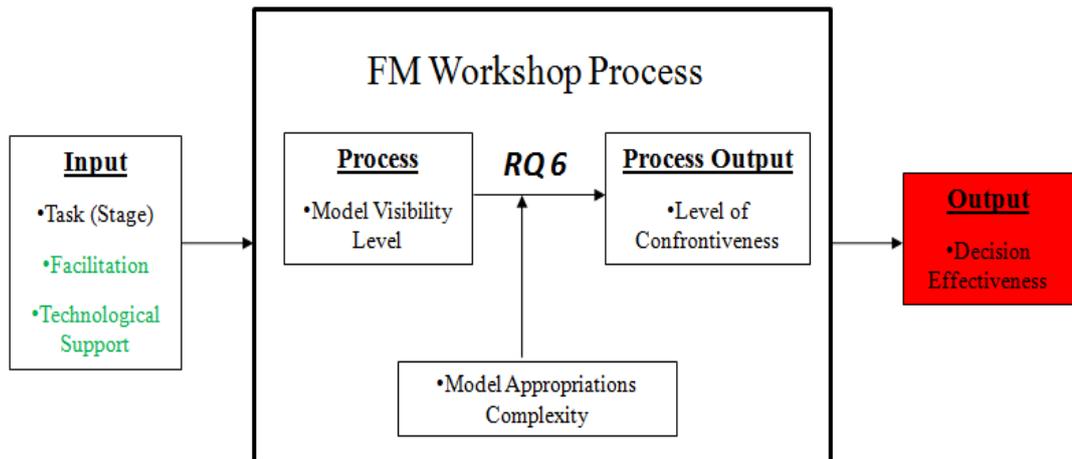
RQ 5 is stated as:

**RQ5: What, if any, is the relationship between model visibility levels and conflict management types in relation to the level of faithfulness of model appropriations, across the stages of FM workshops for the cases observed?**

### 2.6.1.6 Research Question 6

Figure 6 further dissects the research model in terms of MVL and CL in relation to the MACo as displayed in the phasic timelines.

**Figure 9: Research Question 6**



RQ 6 seeks to unravel the relationship between the *overall* MVLs and CL, in relation to MACo. As in RQ 3, depending on the CL observed, a relationship to DE has been shown to exist (Sambamurthy & Poole, 1992).

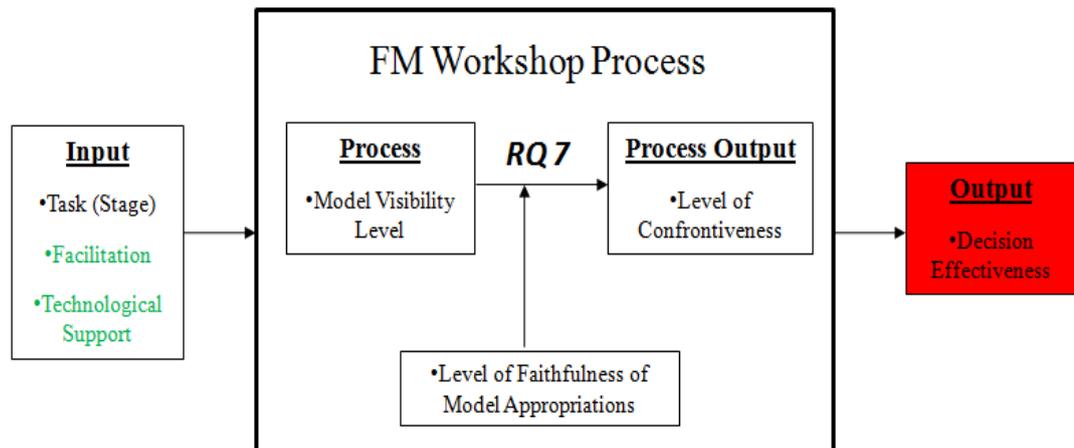
RQ 6 is stated as:

**RQ6: What, if any, is the relationship between model visibility levels and levels of confrontiveness in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

### 2.6.1.7 Research Question 7

Figure 10 further dissects the research model in terms of MVL and CL in relation to the LFMA.

**Figure 10: Research Question 7**



RQ 7 seeks to unravel the relationship between the *overall* MVLs and CL, in relation to LFMA. As in RQ 3 and 6, depending on the CL observed, a relationship to DE has been shown to exist (Sambamurthy & Poole, 1992).

RQ 7 is stated as:

**RQ7: What, if any, is the relationship between model visibility levels and levels of confrontiveness in relation to the level of faithfulness of model appropriations, across the stages of FM workshops for the cases observed?**

### 2.6.2 Summary of Key Constructs.

The Research Questions indicate a number of constructs in need of operationalisation. Specifically:

- a) Operationalisation of the model appropriations construct was required in order to observe model appropriations occurrence as well as to derive the MVL and the LFMA (DeSanctis & Poole, 1994). Model appropriations have been operationalised via coding the group interaction with the Model Appropriations Coding Scheme (MACS). The detailed MACS manual can be

seen in appendix 7 with validity and reliability concerns covered in detail in the Methodology chapter.

- b) Operationalisation of the group working relations construct was required in order to observe conflict occurrences as well as to identify the conflict management types and derive the level of confrontiveness (Kuhn & Poole, 2000; Poole & Dobosh, 2010; Poole & Roth, 1989a; Sambamurthy & Poole, 1992). Group working relations have been operationalised via coding the group interaction with the Group Working Relations Coding Scheme (GWRCs) (Poole & Roth, 1989a). The detailed GWRCs manual can be found in <http://hdl.handle.net/2142/14543> with validity and reliability concerns covered in detail in the Methodology chapter.
- c) Assessing the complexity of model appropriations required the operationalisation of the phasic timelines generated by the phasic analysis procedure performed on both MACS and GWRCs coded group interaction (Poole & Dobosh, 2010; Poole & Roth, 1989a, 1989b; Sambamurthy & Poole, 1992; Poole et al., 2000:229-262). Detailed accounts of how each construct has been operationalised are given in the Methodology chapter.
- d) Assessing the level of faithfulness of model appropriations required the operationalisation of the phasic timelines generated by the phasic analysis procedure performed only on MACS. Detailed accounts of how each construct has been operationalised are given in the Methodology chapter.

## **3 Methodology**

### **3.1 Introduction**

Process research attempting to unravel group interaction intricacies is essentially time-related research (McGrath & Altermatt, 2003; Nutt, 2010; Pettigrew et al, 2001; Poole, 2010; Poole, Van de Ven, Dooley & Holmes, 2000)

Studying group processes and interaction over time gives rise to a number of methodological questions, related to the nature, context and manner of the data to be collected as well as the appropriate manner that these data are to be analysed (McGrath & Altermatt, 2003; Poole et al., 2000). In this chapter I attempt to tease out these methodological intricacies of the above. I start my exploration by defining the level and unit of analysis used in this thesis.

### **3.2 Level and Unit of Analysis – Groups.**

The level of analysis describes the specific context in which a research delves into. As such differing levels of analyses can be observed, for example the level of analysis can be at the individual, the intra-group or the intergroup level (Poole, Keyton & Frey, 1999: 95-97).

Groups of individuals are complex, adaptive and dynamic systems, in which their elements (i.e. the group participants) constantly interact, reflect, learn and feel in complex manners (McGrath & Argote, 2001: 603). Thus, and while helpful, the lessons learned from studying individual decision makers do not directly apply when studying groups and their dynamics (Poole, 1998). Moreover, and specifically when groups are viewed under the prism of communication-focused research, scholars tend to exert rather strongly the notion that the level as well as the unit of analysis should

be the group (Poole, 1998: 94). As such, groups need to be studied as separate entities from the individual group participants that comprise those groups.

The unit of analysis refers to the units that when analysed will produce the findings which will then relate to the level of analysis (Nutt & Wilson, 2010: 10). In this research the units of analysis are the different observed phases of intra-group interaction, that correspond to the theoretical constructs developed (namely the conflict-related and model visibility constructs) (Poole & Roth, 1989a).

By unit of observation is meant the direct raw unit that is to be coded via theoretically meaningful coding schemes (Franco & Rouwette, 2011). Depending on the research context and objectives, observation units may be obtained directly from raw data without any transformation, or they may be obtained by transforming and classifying raw data into unitised segments by following a unitisation procedure (Folger, Hewes & Poole, 1984; Sillars, 1986; Franco & Rouwette, 2011). In this research the raw data were unitised into what Sillars (1986) terms as ‘thought units’ with the unitization procedure covered in detail in the following sections.

A useful summary table of the level and unit of analysis as well as of the unit of observation is provided in Table 3:1.

**Table 3:1 Level and Unit of Analysis.**

<b>Research Term</b>	<b>What is?</b>	<b>Situated in this research.</b>
Level of analysis	Specific research context	Intra- <b>group</b> FM modelling stages.
Unit of observation	Methodological units to be coded employing theoretically appropriate	Group participants <b>thought units</b> (Sillars, 1986)

	coding scheme(s), thus forming the raw datasets to be further analysed.	
Unit of analysis	Methodological units from which research findings are drawn. They are derived from the units of observation usually using data reduction techniques.	Phases of intra-group interaction clustered at the <b>group</b> level. They have been derived from the participants thought units after applying the Phasic Analysis method by Poole and Roth (1989a)

While this research focuses on groups and adopts *the intra-group* as the *level*<sup>26</sup> of *analysis*, choosing any analysis level bears a number of associated methodological considerations as discussed in detail by Poole et al. (1999: 96-97). These are further addressed throughout the rest of the methodology chapter.

In the next section the data collection methods and procedures are discussed.

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<sup>26</sup> There appears to be a slight confusion in the literature about what constitutes the Level of analysis and what constitutes the Unit of analysis (Poole, Keyton & Frey, 1999: 96 & 103; Nutt & Wilson, 2010: 10). The following clarifications seem due.

Essentially the level of analysis is the context of enquiry in which the research immerses. In simpler terms, the level of analysis seeks to answer *whom* are we interested in making claims about (by exploring the research questions)? Are we interested in making claims about the individual participants in a group (i.e. individual group member interaction)? Are we interested in making claims about *group(s)* behavior in terms of how the group participants interact within that group (i.e. intra-group interaction)? Are we interested in making claims about the way groups (as entities) interact with each other (i.e. inter-group interaction)?

On the other hand the unit of analysis are the units from which, when analyzed, claims about the level of analysis can be made. As such, units of analysis function both as a focusing construct as well as a proxy for the level of analysis.

### 3.3 Data Collection

#### 3.3.1 Group selection , group size and facilitation considerations

While a long stream of studies following an experimental design can be found in the Group Communication and SDM literature, in this research a multiple case study<sup>27</sup> research design has been adopted. This choice is largely based on 3 related but different reasons: First, specific calls made by the SDM literature (Jarzabowski & Wilson, 2006) and FM (Ackermann, 2012; Franco & Rouwette, 2011), for observing “...*master practitioners (decision makers) during a period of peak performance*” (Nutt, 2010: 607), meant that episodes in which strategic decision makers display ‘peak performance’ would have to be identified. It seems reasonable to state that such practitioner-involving episodes are unlikely to be observed in experimental settings.

Second, the very characteristics required to classify decision making as ‘strategic’ make the observation of experimental decision making groups an unfruitful avenue, since an experimental group would not have to ‘live’ with its strategic decisions nor bear the long-term costs and consequences of those [decisions] (Nutt & Wilson, 2010: 4).

Third, and related to the first reason, is the need to answer the calls found in FM literature (Eden, 1995; Finlay, 1998) as well as in SDM research, for more *relevant* research. The need for more relevant research led Nutt and Wilson (2010:20) in stating that:

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<sup>27</sup> Case study is defined by Robson (2002, p.178) as “*a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence.*”.

*“Relevance stems from confronting the phenomena of interest, a decision, and not some artificial simulation with naive participants. Dealing with a decision and not an abstraction makes it more likely that the research finding will be useful in practice”.*

Thus, the multiple case study design seemed appropriate since methodological theory further suggests that it presents a useful way for building theory from empirically derived data while maintaining high levels of realism (Robson, 2002, p. 183; Eisenhardt, 1989; Miles & Huberman, 1994, p.24; Yin, 1994).

Following the rationale explicated in the above three points, and primarily due to the pragmatic lack of alternatives, the access approach towards the multiple case study research design was that explicated in action research (Argyris & Shon, 1989; Hult & Lennung, 2007; Susman & Evered, 1978). The key weaknesses of following an action research approach towards data collection is discussed in the Discussion chapter (i.e. Limitations of the Research).

While fully controlling about the task characteristics is not possible in action research designs, the fact that all the issues that the groups were facing were at the strategic level and at close periods in time allowed for some degree of commonality in terms of context as suggested by Eisenhardt (1989) (e.g. the wider environmental factors were not significantly altered, for example there were no changes in legislation or government during the period in which the cases were observed). To the extent possible, a conscious attempt was made to identify cases in which the number of the participants was as similar as possible (i.e. between 7 and 10 people in each group). Participants’ cultural differences could introduce unwanted variance since there is strong evidence that culture affects the manner in which group

participants interact and manage conflict (Haslett & Ruebush, 1999:127-128). As such, an attempt to observe cases in which group participants shared the same cultural background was made.

Different facilitation styles have been shown to have different effects in groups (Dickson, et al., 1993). Facilitation in all groups was performed by the same facilitator, thus controlling to some degree for the variance that rotating/different facilitators would introduce due to personality and facilitation style differences.

### **3.3.2 Data Recording**

A number of different data collection methods are put forth in literature ranging from no record of the interaction behaviour observed (observation and coding happening in real-time), to the use of electronic recording devices such as video-cameras and voice recorders (McGrath & Altermatt, 2003). Seeking to unravel the intricacies of group interaction requires a data collection method which should, optimally, allow for the ability to permanently record the data so that the interaction can be played, paused and re-played. As such, it is hoped that potentially important details, that could otherwise be overlooked, will be spotted by playing back the foci of the interaction. McGrath and Altermatt, (2003: 530) conclude that the most comprehensive way towards data collection for studying group interaction over time is by obtaining the interaction data through multiple recordings captured by both audio and video capturing devices.

In this research a web-camera combined with a digital camcorder was used in order to ensure a better angle of view when covering the workshop while ensuring the unobtrusiveness of the data collection method (the web camera being a relatively small visual object was placed facing the group). Digital audio recordings were made

using two handheld digital audio recorders. An example of positioning the video recording devices in relation to a typical layout of a FM workshop can be viewed in figure 11<sup>28</sup>.

**Figure 11: Example of recording devices positioning.**

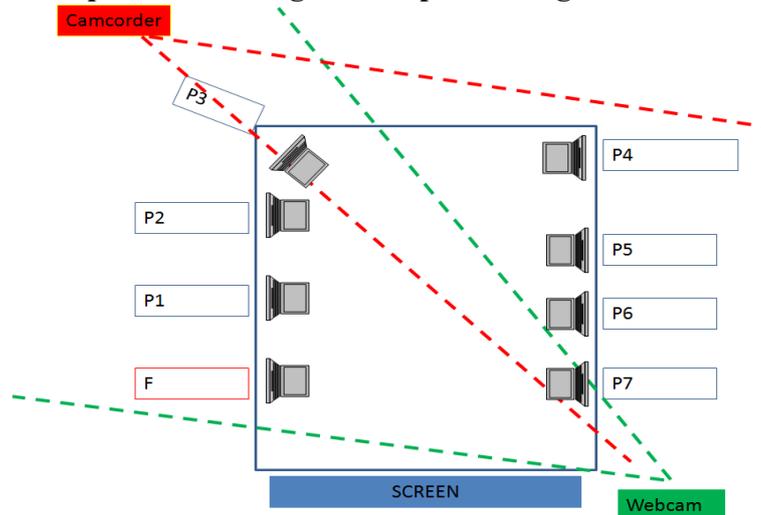
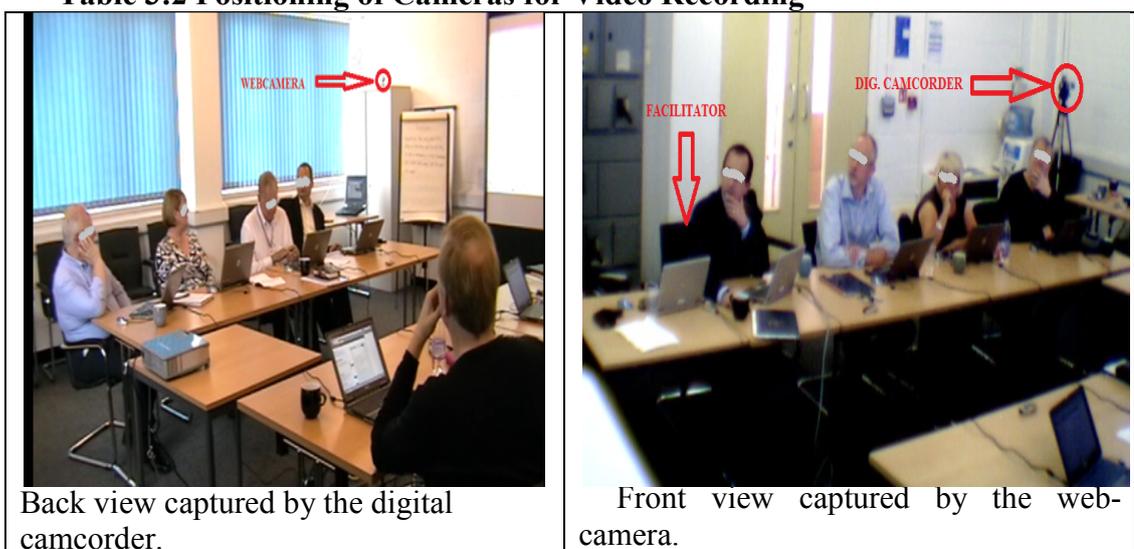


Table 3.2 offers two pictures that show the angle of video recordings obtained by positioning the digital camcorder and the webcam in a diagonal manner. The pictures reveal a typical layout and the positioning of the web-camera and the digital camcorder as well as the facilitator. It can be seen that each visual recording device compensated for any ‘blind spots’ of the other.

**Table 3:2 Positioning of Cameras for Video Recording**



<sup>28</sup> Clarification note: in the diagram participants are represented by ‘P’ while the facilitator is represented by ‘F’.

### **3.3.3 Ethics in Research.**

The group participants have not been coerced in any way possible, to participate in this research. Prior to data collection I fully informed them of the scope and research objectives as well as to the manner in which the data collected would be used. I further answered any questions they had in an honest and direct manner.

An informed consent form was administered and signed by all participants prior to the collection of data. The informed consent form can be seen in appendix 3.

### **3.4 Data Transformation.**

Raw data collected come, at best, in the form of intelligible audio and/or video files. The interaction is then transcribed to a detailed transcript which makes some sort of distinction between the participants speaking (for example P1 is participant 1, P2 is participant 2 etc.) and includes the actual words uttered, while in some cases may include some notes so as to assist in the interpretation of the text (especially if watching/listening to the video/audio recordings is not possible). In order to transform strings of words into data amenable to quantitative analysis two major steps of data transformation are required. First the transcribed data need to be unitised thus creating segments (i.e. units) of interaction amenable to formal quantitative analysis. Second, the unitised interaction need then to be coded utilising meaningful and relevant to the research questions coding schemes (Franco & Rouwette, 2011; McGrath & Altermatt, 2003, pp.532-540;). Poole et al. (2000: 143-145) offer a checklist that if addressed should make for more robust and easier to understand coding schemes. This checklist is about the type of unit, the type of

coding, the latitude of judgement accorded to coders, whether the coding is univocal or multifunctional and what is the domain of meaning to be coded. I shall address each of these checklist elements in the following paragraphs, starting with the type of unit that has been used in this research.

### **3.4.1 From Interaction Records to Interaction Data.**

A number of different unit acts is put forth in the current literature on group communication (Poole et al. 2000: 144), but can be broadly mapped into two categories namely the type of unit act can be either a ‘natural’ or an ‘artificial’ unit. A ‘natural’ unit is a unit “...whose bounds are set in the phenomenon itself, such as the speakers turn, or a quarter’s performance in a firm, or a meeting.” (Poole et al., 2000: 144) and may range from the speaking turn (i.e. one unit starts when a participant starts speaking and ends when another participant starts speaking) to the thought-unit (i.e. the units are delineated by the meaning).

An ‘artificial’ unit is a unit set by the researcher and are useful when real time is the key metric of the analysis since it is easier to delineate. Examples of ‘artificial’ units range from a period of few seconds of discussion to as large as the whole theme of a discussion (Folger et al. 1984).

In the context of this research both types of units have been used; ‘natural’ units were used in the form of ‘thought units’ (Sillars, 1986: 6-7) that acted as the classificatory units for all coding schemes used except for one which used a 30-second artificial unit (i.e. the GWRCs as illustrated in Poole & Roth, 1989a).

While ‘natural’ units, such as the speaking turn, or ‘artificial’ units, such as 30-second time delineated units, are relatively easy to identify and distinguish, the same does not apply for the thought unit, since it requires for the researcher/’unitiser’ to

assign some sort of meaning to the text read (McGrath & Altermatt, 2003, p.532). Thus, and in order to ensure the reproducibility and accuracy (through consistency of coding classifications) of the results, it is important to have a certain degree of confidence that the unitizing method was applied in a reliably consistent manner (Folger et al. 1984). This is termed as unitizing reliability (Guetzkow, 1950) and is calculated by using Guetzkow's  $U$ . Guetzkow's  $U$  essentially calculates the degree of disagreement between two coders. It is calculated by the equation:  $U = (O_1 - O_2) / (O_1 + O_2)$  where  $U * 100$  is the percent disagreement while  $O_1$  is coder one and  $O_2$  is coder two. The percentage agreement can be easily calculated by calculating  $1-U$ . Still, such a calculation offers only a metric for the percent agreement based on pure unit counts and not on a *unit-by-unit* basis which would be the optimal (Folger et al., 1984). For coding schemes that are meant to be used for sequential analysis a *unit-by-unit* measure of agreement is required (Franco & Rouwette, 2011; Folger et al., 1984). This can be achieved by applying Guetzkow's  $U$  whereas the number of agreements or disagreements is counted on a *unit-by-unit* basis. This requires the methodological extension of how is agreement to be judged. Therefore Folger et al. (1984) introduce two different types of units the 'actual' and the 'objective' unit with the 'objective' unit being smaller than the actual. This distinction allows the comparison of the actual units against a benchmark (i.e. the objective unit). The coders then count the number of agreements<sup>29</sup> on a *unit-by-unit* basis and Guetzkow's  $U$  is calculated.

In this research the 'objective' unit has been defined as a number of words, that being two words. The rationale for this choice is that the objective unit had to bear at

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<sup>29</sup> Agreement can be in both that a unit has or has not occurred.

least one word less than what any meaningful expression would bear. Moreover, any meaningful expression will require at least three words to be classified as a ‘thought unit’, for example one of the simplest meaningful utterances can be seen in the question “Are you OK?” (as well as in the corresponding answer “I am fine”), thus fulfilling the most basic requirement of a meaningful utterance of Subject-Verb-Object and its combinations (Verb-Subject-Object, Object-Verb-Subject, etc.) (Tomlin, 1986: 22).

The unitising instructions, indicating how the text was unitised can be seen in appendix 4.

Due to the vast volume of the data generated via micro-coding (i.e. coding each and every thought unit), a sampling technique was employed in order to test for the reliability of the unitising process (Poole et al., 2000: 165). Specifically, three excerpts of about 45 minutes each were randomly chosen and have received preliminary unitisation by the researcher (i.e. myself) generating about 500 units each. The raw un-unitised sample transcripts of 45 minutes were then given, along with the instructions, to a second coder to be unitised. The samples were drawn from the beginning, middle and end of the raw text corpus of all three cases (i.e. one from the beginning of case A, one from the middle of case C and one from the end of case B). This was done in order to ensure that any possible interaction distortions that could introduce bias in the unitisation process (e.g. rapid exchange of messages, high rate of interruptions, abnormally long single-person utterances etc.) would be taken into account and a more objective metric would be calculated. The percentages then were averaged to produce a single *U* metric.

The averaged Guetzkow's *U* over 1500 units was 4%, which translates to an agreement of 96% (100%-4% = 96%); clearly an acceptable percentage to establish that the, transcribed to text, data have been unitised in a reliable manner (Folger et al. 1984, p.121).

No reliability metric was calculated for the 30-second units, since unitisation was a process of counting universally objective time units (i.e. seconds).

For Case A the unitised transcript yielded 2834 usable thought units and 483 30-second units over a net interaction period of 4 hours, 1 minute and 30 seconds.

The per stage thought units and the percentage they accounted for in terms of the net interaction time can be seen for case A in the following table (Table 3.3).

**Table 3:3 Per Stage thought units for Case A**

<b>CASE A</b>		
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>
1	18	0.64%
2	1203	42.45%
3	1386	48.91%
4	227	8.01%
<b>Total</b>	<b>2834</b>	<b>100%</b>

As such the table reads that stage 1 for Case A yielded 18 usable thought units accounting for 0.64% of the net interaction time (always excluding typing), stage 2 yielded, 1203 thought units accounting for 42.45% of the net interaction time and so on.

For Case B the unitised transcript yielded 1930 usable thought units and 279 30-second units over a net interaction period of 2 hours 19 minutes and 30 seconds.

The per stage thought units and the percentage they accounted for in terms of the net interaction time can be seen for case B in the following table (Table 3.4).

**Table 3:4 Per Stage thought units for Case B**

	<b>CASE B</b>	
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>
1	176	9.12%
2	930	48.19%
3	429	22.23%
4	395	20.47%
<b>Total</b>	<b>1930</b>	<b>100%</b>

For Case C the unitised transcript yielded 5427 usable thought units and 751 30-second units over a net interaction period of 6 hours 15 minutes and 30 seconds.

The per stage thought units and the percentage they accounted for in terms of the net interaction time can be seen for case C in the following table (Table 3.5).

**Table 3:5 Per Stage thought units for Case C**

	<b>CASE C</b>	
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>
1	60	1.11%
2	2143	39.49%
3	661	12.18%
4	1880	34.64%
5	683	12.59%
<b>Total</b>	<b>5427</b>	<b>100%</b>

### **3.4.2 Coding**

Coding is essentially the process by which a researcher assigns a specific meaning related code to a corresponding unit. As such coding is a way of displaying the meaning of utterances in a research-relevant manner. Through the application of codes the researcher moves from the specific and content related intricacies of a given utterance to the general meaning that is sought after for the purposes of the

research. Thus, it is important to define the type of coding that has been used in this research as well as the coding schemes that operationalised the constructs of interest.

#### ***3.4.2.1 Type of coding.***

The type of coding employed in this research is one that assigns short letter abbreviations representing a given category of a coding scheme.

Following Poole & Roth (1989a) as well as DeSanctis & Poole (1994) the data were coded using the following coding schemes.

#### ***3.4.2.2 Coding Conflict Management Types and Confrontiveness- GWRCS.***

For the identification of conflict management types, confrontiveness periods and the overall group working relationships the Group Working Relationships Coding System (GWRCS) by Poole & Roth (1989a) was used. It was applied as per the coding manual provided by M.S. Poole <sup>30</sup>.

In short the categories of the GWRCS are

##### **A) Work-Focused Relationships**

Focused Work (FW)<sup>31</sup>: Periods when members are task focused and do not disagree with one another.

Critical Work (CW): Periods when members disagree with each other, but the disagreements are centered on ideas and no opposing sides have been differentiated.

##### **B) Conflict**

(3a) Opposition (OPP): Periods in which disagreements are expressed through the formation of opposing sides

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<sup>30</sup> The coding manual can be found in <http://hdl.handle.net/2142/14543> (last accessed on 03.Sep.2012).

<sup>31</sup> It is useful to note that the shorthand used for each of the coding scheme categories can be seen within the brackets () next to each category.

(3b) Capitulation (CAP): A mode of resolution of opposition in which one side gives in.

(3c) Tabling (TAB): A mode of resolution of opposition in which the subject is tabled or dropped.

(3d) Open discussion (OD): A mode of resolution of opposition that utilizes problem-solving discussions, negotiation, or compromise.

#### C) Integration

Integration (INT): off topic discussion, laughter

### *3.4.2.3 Coding Model Appropriations and Faithfulness of Appropriations - MACS*

For coding Model Appropriations, the coding categories provided by DeSanctis & Poole (1994), were applied according to the coding rules that I have developed. The rules can be seen in appendix 7. This coding scheme shall be further denoted by using the acronym MACS (Model Appropriations Coding Scheme).

In short the categories of the MACS are:

1. Direct Appropriations (DIR): Model appropriations that are made in a direct manner and can be explicit, implicit or bids to appropriate the model (or model elements).
2. Substitution Appropriations (SUB): Model appropriations that intend to relate the model to other models via substitution of existing model (or model elements) with others. Substitution can be observed through part, related or unrelated substitution.
3. Combination Appropriations (COMB): Appropriations that intend to relate the model (or model elements) to other models via combination of existing

model (or model elements) with others. Combination can be observed through composition, paradox and corrective combinations.

4. Enlargement Appropriations (ENL): Model appropriations that intend to relate the model (or model elements) to other models (or model elements) via the enlargement of existing model (or model elements) in relation to others. Enlargement can be observed through either positive or negative enlargements.
5. Contrast Appropriations (CONT): Model appropriations that intend to relate the model (or model elements) to other models (or model elements) via contrasting the existing model (or model elements) with other models (or model elements). Contrast can be observed through contrary, favoured, non-favoured and criticism related contrasts.
6. Constraint Appropriations (CONS): Model appropriations that intend to constraint the model (or model elements). Constraint model appropriations can be observed through definitions, commands, diagnoses, orderings, queries, closures, status reports and status requests that are made in relation to the model (or model elements).
7. Affirmation Appropriations (AFF): Model appropriations that intend to affirm the model (or model elements). Affirmation model appropriations can be observed through agreements with the model (or model elements), bids for others to agree with the model (or model elements), agreement to reject the model (or model elements) and compliments to the model (or model elements).

8. Negation Appropriations (NEG): Model appropriations that intend to negate or dispute the model (or model elements). Negation model appropriations can be observed through direct rejection or criticism to the model (or model elements), bids for others to reject the model (or model elements) and indirect rejection of the model (or model elements).
9. Neutrality (NEUT): Responsive Model appropriations that represent uncertainty, confusion or ambiguity in terms of agreement or disagreement to a given model appropriation.
10. Also the 'null' category has been added to the coding scheme denoting units in which No-Model Appropriation (NMA) is observed.

#### **3.4.3 Phase markers conversion.**

In order to explore RQ's further and for statistical analysis purposes only, the phase markers have been further converted to indicate model visibility and confrontiveness levels. Confrontiveness levels have been derived by Sambamurthy & Poole (1992), while the model visibility levels follow the rationale explicated earlier in the conceptual development part of this thesis (Table 3.6).

**Table 3:6 Model Visibility Levels**

<b>GWRCs: Confrontiveness Level</b>	<b>MACS: Model Visibility</b>
FW: Low CW: Moderate OPP -OD: High OPP -CAP: Moderate - High OPP -TAB: Moderate-High INT: Low	AFF: High COMB: Low CONS: Medium CONT: Low DIR: High NEG: High NEUT: High NMA: NO SUB: Low ENL: Low <sup>32</sup> UNF: Medium

**3.4.3.1 Universal code – Typing.**

It is important to note that since all the workshops employed computers in a typical GDSS fashion, long periods in which the group participants were typing have been observed. These typing periods have been universally coded using the capital letter ‘T’.

**3.4.3.2 Auxiliary Code for ‘Thought Unit’ based coding schemes.**

Contrary to GWRCs that was unitised on a 30-second basis, MACS was unitised by using the ‘thought unit’ as suggested by Sillars (1986). Moreover, following the parsing rules suggested by Poole and Roth (1989a), it is possible to identify periods that no dominant behaviour can be identified and the group interacts in an unfocussed manner. This called for the creation of another code in order to capture periods of unfocussed model appropriation phases, and has been denoted as ‘UNF’.

**3.4.4 Latitude of judgement accorded to coders.**

For each of the coding schemes used a corresponding coding manual has been either obtained and used verbatim or developed. These manuals were then given to

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<sup>32</sup>Periods of Unfocussed interaction were formed by a mixture of the other MACS codes. As such it was decided to assign a Medium level of Model Visibility to Unfocussed periods of model-related interaction.

the coders. Initial trials allowed for the fine tuning of the manuals developed. The coders were then given a 1-hour hands-on training tutorial on how the codes were to be applied (Table 3.7).

**Table 3:7 Coder Training**

<p>Training step 1. Explaining the codes. In this example the GWRCS conflict codes can be seen.</p>	<p>Training step 2. Giving applied examples of assigning codes.</p>

A screen with the unitised transcripts was presented to the coders and video and audio of the workshop interaction was played on a laptop screen (Table 3.8).

**Table 3:8 Actual Coding**

<p>Coder 1</p>	<p>Coder 2</p>

The main view was that obtained from the digital camcorder. Whenever there was doubt about the person speaking or the overall context the web-camera view was reviewed by synchronising the media players into playing the same interaction segment thus offering a front-sideways and back-sideways holistic view of the workshop.

It is inevitable that for most meaning-seeking coding schemes the exercise of some judgement will be required by the coders (Poole et al, 2000: 144). Still, adopting a well documented and systematic coding scheme allows greater confidence in terms of the reliability of the codes applied. The issue of classification reliability will be further explored in the next paragraphs

#### **3.4.5 Reliability of the coding schemes used.**

The rationale for seeking high categorising reliability is similar to the rationale explained in the previous paragraphs about unitising reliability. To swiftly iterate, reliability of coding schemes is necessary, if the research method of coding is to be consistently applied throughout the data, taking care on eliminating any serious sources of bias and eventually allowing for the replication and verification of the results obtained (Folger, et al., 1984).

The most widely used reliability metric for coding schemes is Cohen's Kappa (Cohen, 1960). Cohen's Kappa has been used for obtaining reliability measures for codes that were later used in both sequential and static analyses (Poole & Dobosh, 2010; Poole & Roth, 1989a & 1989b). It is obtained by the following equation:

$$\text{Kappa} = (P' - P_c) / (1 - P_c)$$

where P' is the observed percentage agreement among coders and

where  $P_c$  is the proportion of chance agreement.

In the same spirit as when calculating the unitising reliability, three samples of 500 units each, were drawn from the start, middle and end of workshop across cases..

For the coding schemes employed in this research the following interrater reliabilities for categorising were achieved. For this part of calculating interrater reliabilities two independent coders were used and their coding was compared with the researchers' coding. One needs to remember that the reliability scores were achieved after both coders were given the coding manuals presented in the appendices, and after they received a training tutorial of approximately 1-hour.

For the GWRCS, the Cohen's Kappa calculated averaged .85% for the first coder and 80% for the second.

For the MACS, the Cohen's Kappa calculated averaged 91% for the first and .82% for the second.

For both GWRCS and MACS the differences were discussed and notes were taken so as to allow the coding of the rest of the transcripts.

All the reliability results for all the coding schemes fall well within the region of acceptable degree of reliability (Fleiss, 1981).

Once sufficient levels of interrater reliability have been achieved, the rest of the coding was performed by me. This is an acceptable way for coding data in exploratory research. The justification offered from a related research conducted by Sambamurthy & Poole (1992) is that *"The coding was done by the first author after an adequate level of interrater reliability was attained with an independent coder.[...] In view of the fact that this was an exploratory study with no strong a*

*priory expectations about the results, the first author's service as a coder did not seem to present serious threat to the study's validity" (p. 239).*

In the next section the issue about whether the coding schemes were of a univocal versus a multifunctional nature is explored.

#### **3.4.5.1 Univocal versus multifunctional coding.**

Univocal coding implies that the coding schemes applied contain coding categories that are mutually exclusive. Still, social life and particularly group interaction is much richer than what a meaningful single coding scheme could ever hope to capture. What I observed is that while the freedom to code in a multifunctional manner was given to the coders, the unitisation according to thought units and the strict coding manuals allowed for little differences in interpretation. Therefore the coding scheme that used the thought unit displayed a univocal type of coding. The exception to that was the GWRCs in which multifunctional coding was observed.

The application of the coding schemes used in this research followed the rationale that instead of using one coding scheme that would attempt and grasp multiple dimensions, it would be more fruitful to use a number of coding schemes each intended to capture a single dimension of the interaction. This is the main reason leading me to use two distinct coding schemes in a 'layered' coding fashion, instead of trying to capture the richness of the data in a single coding scheme. Such a process is well documented in the literature and is suggested as a possible avenue of overcoming both increased coding scheme complexity (thus running the risk of encountering lower interrater categorising reliability), and the limitations in

capturing the required level of richness from the data (Poole & Roth, 1989a, Poole et al., 2000:145-147, Franco & Rouwette, 2011).

#### ***3.4.5.2 Domain of meaning to be coded.***

In general, there are two broad domains of meaning capturing for which codes and the process of coding can be applied. These are observer privileged meanings and subject-privileged meanings (Poole et al., 2000). Observer privileged meanings are meanings that an ‘outsider’<sup>33</sup> could access. Subject privileged meanings are meanings that require an ‘insider’s’ knowledge of the details and intricacies surrounding the social status-quo of the group as a whole and for each participant individually, as well as the nature and history of the task that the group is faced with.

The coding schemes adopted or developed for this research, intend to capture only observer privileged meanings.

#### ***3.4.5.3 Validity of the coding schemes used***

In this section the issue about the face and construct validity of the coding schemes used will be explicated.

As important as it is to have confidence that the data have been coded consistently in a reliable manner throughout, equally important is to have a certain degree of confidence in knowing that the codes assigned do capture the phenomena in question (Poole & Folger, 1981; Angoff, 1988:25-27).

Both coding schemes adopted have been validated by previous research and application. Construct validity of the coding schemes has been demonstrated in previous research bearing similar applications of the coding schemes (For MACS:

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<sup>33</sup> An ‘outsider’ being a person with no specific knowledge about the nature and content of the group studied as well as no knowledge in terms of the research questions explored.

DeSanctis & Poole, 1994; Poole & DeSanctis, 1992. For GWRCS: Folger, Hewes & Poole, 1984; Poole & Roth, 1989a & 1989b; Poole & Dobosh, 2010; Sambamurthy & Poole, 1992).

As previously explicated, the coding schemes intend to capture only observer privileged meanings. As such, it can be stated that face validity has been ensured through the high reliability scores for each of the coding schemes (Franco & Rouwette, 2011:173).

Essentially, no coding schemes were developed anew in this research, rules for coding and coding manuals were refined and developed where appropriate but no meaningfully new categories were introduced in any of the coding schemes used.

#### ***3.4.5.4 Colour coding used***

As a visual aid the resulting phases were colour coded in the following manner.

##### **3.4.5.4.1 Universal colour codes:**

Yellow: for complex coded phases displaying more than 2 different behaviours.

Light Blue: for coded phases that display dual equal codes (i.e. both codes of a given phase start with '1'. For example, 1FW-1CW. It should be noted that for dual equal codes the first step is to go back to the raw data and re-read it while also watching the video and audio data, then, if possible, make a decision in terms of code's importance (i.e. examine intensity, tone, body language, overall atmosphere) and assign the colour of the most dominant code. In the cases where no clear decision can be made, assign the light blue colour.

Black: Periods of Typing. It should be noted that for complex coded phases that display more than 2 different behaviours the yellow colour should be assigned even if the complex coded phases start with typing (T).

The rest of the colours used to denote each phase on the phasic timelines can be viewed in table 3.9

#### 3.4.5.4.2 Phasic timelines colour codes

**Table 3:9 Phasic Timelines Colour Coding**

<b>GWRCS:</b>	<b>MACS:</b>
FW: Light Green	AFF: Pink
CW: Dark Violet	COMB: Orange
OPP-OD: Red	CONS: Estoril Blue
OPP-CAP: Red	CONT: Green
OPP-TAB: Red	DIR: Red
INT: White	NEG: Brown
	NEUT: Maroon
	NMA: Grey
	SUB: Dark Green
	UNF: White
	ENL: Purple <sup>34</sup>

So far I have indicated a number of transformations and data manipulations for deriving the phasic timelines (Poole & Dobosh, 2010; Poole et al. 2000:229-262; Poole & Roth, 1989a). Phasic timelines served two purposes. First, they [i.e. the phasic timelines] were utilised as a data reduction technique for data collected at the micro-level being overly rich and detailed. Second, they were utilised as a flexible mapping technique allowing for the assessment of model appropriation complexity, as will be further explicated in the Analysis chapter.

### 3.5 Data Analysis-Statistical Analysis Techniques.

A detailed account of the process and procedures followed for deriving the phases can be found in Poole & Roth, (1989a). In this thesis small deviation from the

<sup>34</sup> As will be seen in the next chapters enlargement was not observed in any cases' stage.

approach of Poole & Roth (1989a) of using thought units for MACS, instead of the linguistic ‘turn’ meant that some adjustments to the procedure used by Poole & Roth (1989a) were required. These can be seen in appendix 5.

As mentioned earlier, once the individual phase markers were parsed and reduced to solid phases unfolding in a timeline, datasets amenable to statistical analysis were formed, ready to be analysed by utilising a number of techniques for statistical analysis.

The choice of the statistical analysis techniques has been made in relation to each Research Question (RQ) it was meant to offer insight for. The statistical analysis techniques are offered on a per RQ basis.

### **3.5.1 RQ1 - - Statistical Analysis Techniques.**

Recall RQ1 is:

**RQ1: What, if any, is the relationship between model appropriations and conflict occurrences, across the stages of FM workshops for the cases observed?**

Answering RQ1 meant that the statistical analysis should be able to identify first of all whether there is any relationship between model visibility levels and the occurrence of conflict and second what this relationship is (positive or negative<sup>35</sup>). As such the *complete*<sup>36</sup> GWRCS and MACS datasets (having the typing periods excluded<sup>37</sup>) would have to be analysed. Analysis progressed in two steps as follows:

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<sup>35</sup> Positive or negative relationship here is not meant in terms of favourable versus unfavourable but rather in terms of increasing versus decreasing.

<sup>36</sup> *Complete* as opposed to *partial* datasets.

<sup>37</sup> Typing periods were excluded from all the statistical data analysis since typing periods were coded similarly in both MACS and GWRCS, thus being treated as constants. While one could have included them, adding a constant variable would increase the degrees of freedom without adding any information value (i.e. without adding variance to the observations - Typing in GWRCS will always coincide with Typing in MACS).

First, the GW RCS data were dichotomised according to whether there was conflict occurrence (be it of any type) or not (Cno<sup>38</sup> or Cyes). MACS data were also dichotomised according to whether the model was appropriated or not (Mno<sup>39</sup> or Myes).

Second, chi-square tests were performed in order to uncover whether any relationship existed between the variables. For statistically significant chi-square values indicating a relationship between the GW RCS and MACS variables, the odds-ratios were calculated in order to assess the likelihood of observing a certain pair of behaviour over another (Agresti, 2007:28-40).

#### ***3.5.1.1 Chi Square Requirements Met.***

An examination of whether the variables met the necessary requirements for applying the chi-square has been conducted throughout and for all the chi-square applications in this research. The requirements of the chi square tests are:

1. **The sampling method is simple random sampling.** There are no reasons to believe that the sample was not derived in a random manner other than the application of the FM process and procedures which are the focus of this study. The groups were free to display any type of model appropriation as well as of conflict management style they wished to.
2. **The variables in the study are categorical.** The process used for coding was not one of directly assigning levels of magnitude. Secondary levels of magnitude (i.e. Model Visibility Levels) have

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<sup>38</sup> Cno denoted a 'Conflict No' observation while Cyes denoted 'Conflict Yes' observation.

<sup>39</sup> Mno denoted a 'Model No' observation while Myes denoted a 'Model Yes' observation.

been conceptualised and not coded in the original datasets, thus making approaches suitable to ordinal data inappropriate for this study.

3. **The crosstabulated data should display an expected frequency count, for each cell of the table, of at least 5.** This condition was seriously violated and has been remedied by applying the Monte Carlo sampling method, suitable for highly unequal contingency tables. Moreover, Kuhn & Poole (2000:587) in a similar application have indicated that such a violation is not too serious in the context of their research. Their argument extends to this thesis's situation.

### 3.5.2 RQ2 - - Statistical Analysis Techniques.

Recall RQ2:

**RQ2: What, if any, is the relationship between the different model visibility levels and conflict management types across the stages of FM workshops for the cases observed?**

Addressing RQ2 meant that the statistical analysis should be able to identify first of all whether there is any relationship between model visibility levels and conflict management types and second what the relationship (if any) amongst the various MVLs and CMTs is (positive or negative). As such the GWRCs and MACS datasets were filtered in order to take into account only the model visibility observations in which CMTs were observed (i.e. situations in which the conflict was observed and the model was either visible at some level or not appropriated at all). The statistical analysis then progressed in two steps as follows.

First, the variables were cross-tabulated and a chi-square test was performed for each stage of every case, in order to uncover whether any relationship existed

between MVL and CMT or whether they were unrelated. If the chi square tests indicated a no relationship between the variables, the analysis was to stop there and the non-relationship was to be reported, otherwise the analysis progressed to the second step. Chi-square has been used in previous similar studies (Kuhn & Poole, 2000).

Similarly to RQ1, the conditions required for conducting a chi-square test were examined and were met for all the variables examined throughout this research.

Second, and provided that the MVL and CMT multinomial<sup>40</sup> variables have been found to be related, multinomial logistic regressions (MLR) for matched pairs were performed across each stage of each case (Agresti, 2007:247-252; Hosmer & Lemeshow, 2000:223-258; Kleinbaum & Klein, 2010:389-414; Tabachnick & Fidell, 2001:550). While this thesis is not a treatment in statistical methods I shall further explicate the reasons for performing a MLR for matched pairs and the corresponding computations.

### ***3.5.2.1 Multinomial Logistic Regression for Matched Pairs.***

#### **3.5.2.1.1 Choosing a statistical analysis technique.**

The first thing to note for choosing a statistical analysis technique is the nature of the data from which the research question is to be assessed. The process of coding produced strings of codes representing certain types of interaction for each coding scheme. Codes were assigned in an observed/non-observed or put differently in an on/off fashion, meaning that the codes did not mean to capture any information in terms of the magnitude of the behaviour observed. Any magnitude classification,

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<sup>40</sup> I.e. both the dependent and independent variables display more than 2 categories.

such as assigning levels of model visibility and confrontiveness took place *in vitro* meaning that the classification was detached from observing the actual interaction and was performed based on theoretically and conceptually sound constructs, as explained in the next chapters.

Such codes can be assessed in a multitude of ways in terms of statistical analysis. These can range from deriving simple percentages for the length that each code appeared and calculating centralisation indices (McGrath & Altermatt, 2001: 542), to applying Markov models (Poole & Dobosh, 2010), optimal matching techniques (Abbott & Tsay, 2000; Poole et al. 2000: 251) and log-linear models (Kuhn & Poole, 2000). Moreover, code categories can be quantized by assigning either time-length or importance related weights to the code categories (Miles & Huberman, 1994:41), thus allowing for the application of either typical mainstream techniques such as correlation analysis via regression (Poole & Roth, 1989b; Sambamurthy & Poole, 1992) and event time series regression analysis using multivariate models (Poole et al., 2000: 263), or more exotic analyses such as event time series nonlinear dynamical analysis (Poole et al., 2000: 307). The choice of the statistical analysis technique is guided by the research question in need of assessment and the research design.

RQ 2 essentially poses a question of relationship across stages. As such, the element of time is to be found by observing stages as they linearly progress from stage 1 to 2 to 3 to....to n. Within, each stage the analysis required is one which would display some sort of relationship between the two variable<sup>41</sup> constructs

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<sup>41</sup> It is helpful for this part of the methodology dealing with the statistical analysis to refer to the research constructs as variables and the individual codes as categories. Doing so allows for adopting a more technically inclined and statistically precise language, thus avoiding any confusion.

(namely model visibility and conflict management types). This relationship can be examined in a number of dimensions. For example, one may choose to examine the order in which each of the categories of each variable appeared and then compare the ordering between the two variables, in which case a gamma analysis would be the most appropriate analytical technique forward (Poole & Roth, 1989a; Poole et al. 2000; 250). Another example would be if one would want to examine the likelihood for a certain sequence unfolding for each variable separately (i.e. separately for GWRCS and separately for MACS) and compare the manner in which the two variable sequences unfolded, in which case an analysis based on Markov Chain models would be the most appropriate (Poole & Dobosh, 2010). Markov Chain analysis allows for assessing the probability of a certain code occurring at a later time (be it  $t+1$ ,  $t+2$  or  $t+n$ ) given a certain code has occurred at time  $t$ .

Within the context of this research and bearing in mind the research question, probably the best way to assess the relationship between two variables is by indicating the correlation between the codes, meaning the likelihood that a certain code X from the GWRCS variable will occur when a certain code Y from the MACS variable also occurs.

Recall that the way the data have been coded, bear for a distinct peculiarity, being that while model visibility codes represent certain visibility levels, the null code is the only code that represents a no model appropriation at all. Thus, the research interest about the relationship between the two variables would be better served if one was to examine the relationship across behaviours by separating the null code, and then use it as the benchmark against which comparisons would be drawn. Doing

so meant that the codes would have to be paired<sup>42</sup> and then compared to the pair bearing the null code. For example, instead of comparing CMT(OD) with all possible MVLs, CMT(OD) was paired with all MVLs thus creating pairs CMT(OD) - MVL(Low), CMT(OD) - MVL(Medium), CMT(OD) - MVL(High) with the benchmark pair set to be CMT(OD) - MVL(NMA). The comparison then was performed by separately comparing the likelihood of observing a given pair when the likelihood of observing the benchmark pair is set to a constant value. As such the likelihood of observing pair CMT(OD) - MVL(Low) was compared to the likelihood of observing pair CMT(OD) - MVL(NMA), then CMT(OD) - MVL(Medium) was also compared to CMT(OD) - MVL(NMA) and so on and so forth. Similarly for CMT(OPP) the benchmark pair would be CMT(OPP) - MVL(NMA) and would be compared against the likelihood of observing CMT(OPP) - MVL(Low) and so forth.

Matching the observations is the recommended procedure for obtaining more accurate likelihood estimates (i.e. odds ratios) when the research design allows for matching (Kleinbaum & Klein, 2010:394). Since a specific focus on non-model appropriations was required, matching the observations was decided as a fruitful way forward<sup>43</sup>.

#### 3.5.2.1.2 The log-odds

The likelihood of co-occurrence was assessed via the odds ratio which was derived by exponentiation of the log-odds ratio obtained from the MLR<sup>44</sup>

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<sup>42</sup> In a cell by cell basis on SPSS

<sup>43</sup> Matched case analysis can be performed only for dependent data variables. Variable dependency has been assessed by the chi-square test of independence, thus allowing for the application of the matched pairs MLR.

<sup>44</sup> As can be seen in the next paragraphs and for practical purposes instead of converting the log-odds to odds ratios they have been directly assessed.

(Tabachnick and Fidell, 2001, pp.550). An odds ratio can be interpreted as ‘the probability of something happening given that the probability of something else happening is held constant’. For example, a hypothetical odds ratio value of 2.8, observed for the pair of CMT(OD) - MVL(High) offers the probability of resolving conflict via open discussion during high model visibility levels versus the probability of resolving conflict via open discussion during no model appropriation MVL(NMA). Since MVL(NMA) is the constant term, the probability of observing a CMTs - MVL(NMA) pair is set to the constant value of 1. In order to make the odds ratio easier to interpret it is useful to subtract the odds-ratio value of the constant (i.e. constant = 1) from the odds-ratio value of the pair examined (Tabachnick and Fidell, 2001, pp.549). In this manner the net odds ratio of the pair examined is calculated, offering an easier interpretation of the results.

As such, for the hypothetical example used above, the probability of observing the pair CMT(OD) - MVL(High) is equal to the odds ratio minus one, resulting in a ‘net’ odds ratio of 1.8 (i.e.  $2.8 - 1$ ). Therefore the probability of observing the pair CMT(OD) - MVL(High) is 1.8 times (or 180%) more than observing the pair CMT(OD) - MVL(NMA). Such a result is to be interpreted as follows: ‘It is 1.8 times more likely to observe conflict resolution type of open discussion when the model visibility level is high than when the model is not appropriated at all’. One needs to exercise caution when reading through the interpretation.

For instances where the odds-ratio is smaller than the constant calculating the net odds ratio results in a negative value. For example, assume an odds ratio for the pair CMT(OPP) - MVL(High) to be 0.45, compared to the odds ratio of the benchmark CMT(OPP) - MVL(NMA) (i.e. odds ratio of 1). This means that observing the pair

CMT(OPP) - MVL(High) is 0.45 times more likely than observing the CMT(OPP) - MVL(NMA) pair. Subtracting the value of the constant results in a net odds ratio value of -0.55, which implies that observing the pair CMT(OPP) - MVL(High) is 0.55 times (or 55%) less likely than observing the pair CMT(OPP) - MVL(NMA) (Tabachnick and Fidell, 2001, pp.549). Such a result is to be interpreted as follows: 'It is 55% less likely to observe opposition when the model visibility levels are high than when the model is not appropriated at all.'

#### 3.5.2.1.3 Classification of the likelihood

In order to be able and further make sense of the results, the odds-ratios were grouped in terms of the magnitude of likelihood displayed, as High-Positive (i.e. highly *more* probable of observing the given pair compared to the benchmark ), Average-Positive (i.e. averagely *more* probable of observing the given pair compared to the benchmark pair), Average-Negative (i.e. averagely *less* probable of observing the given pair compared to the benchmark pair) and High-Negative (i.e. highly *less* probable of observing the given pair compared to the benchmark pair). The values of 2 and 1 for the High-Positive and Average-Positive respectively, as well as the values of -2 and -1 for the High-Negative and Average-Negative respectively, were assigned. To all insignificant or zero values a zero value has been assigned.

In performing the aforementioned classification a **log-odds** value of  $\pm 1.387$  has been set as the cut-off value, since when calculating its exponent [ $\text{EXP}(\pm 1.387)$ ] the resulting odds value is  $\pm 4$ . Subtracting from (or adding to) the value of 4, the benchmark value of 1 resulted in  $(4-1 = 3)$  3 times more (or less if -3) likely for that given pair to be observed in relation to the benchmark pair. Any significant and

positive values less than 1.387 indicated that the likelihood of observing the given pair, while remaining positive, is less than 3 times more than that of observing the benchmark pair (i.e. between 0 and 2.999 times more likely). Following the same reasoning, any significant and negative values higher than -1.387 indicated that the likelihood of observing the given pair, while remaining negative, is more than 3 times less that of observing the benchmark pair (i.e. between 0 and 2.999 times less likely).

Sampling zeros in some of the crosstabulation values meant that some of the log-odds were extraordinarily high and the significance values (column G in table 3:11) would appear as highly distorted. Such situations have been addressed by screening the cross-tabulation tables for sampling zeros (Field, 2009:274). Pairs that presented values of zero and their corresponding pairs presented non-zero values were much less likely to be observed (theoretically the likelihood of observing the pair having the zero value compared to the likelihood of observing the non-zero pair is infinitesimal) and as such were given a  $\pm 2$  depending on whether the zero value was on the benchmark pair or not. Thus, if the zero value was observed on the benchmark pair a +2 was assigned since any comparison pair would be infinite times more likely to be observed, in vice-versa situations a -2 was assigned signifying that a given pair is many times less likely to be observed compared to the benchmark pair.

The following table (Table 3.10) provides a summary of how the values were assigned as explained above.

**Table 3:10 Log-Odds Transformation**

<b>Value of log odds (column G in table 3:11)</b>	<b>How many times more (less) likely?</b>	<b>Value assigned</b>
$\geq 1.387$	$\geq 3$ (i.e. more than 3 times more likely)	2
$> 0$	$< 3$ (i.e. less than 3 times more likely)	1
$= 0$ , or $p > .10$	Insignificant difference	0
$> -1.387$ , and $< 0$	$> -3$ (i.e. less than 3 times less likely)	-1
$\leq -1.387$	$\leq -3$ (i.e. more than 3 times less likely)	-2

#### 3.5.2.1.4 Example of calculations

The following table (Table 3.11) is offered as an example of the calculations performed for deriving the likelihood of observing certain CMT pairs, compared to the likelihood for observing the benchmark pair.

**Table 3:11 Example of MLR Calculations.**

<b>CASE A – STAGE 3</b>									
	<i>CONFLICT MNGT TYPES PAIRED</i>	<i>SPSS OUTPUT</i>					<i>FURTHER COMPUTATIONS</i>		
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>
MODEL_APP_TYPES_CONFLICT		B	Std. Error	Wald	df	Sig.	COPY B	High-Pos. (2), Average-Pos. (1), Average Neg. (-1), High-Neg. (-2)	Further assessment via the crosstabulation table
HIGH*	[CONFLICT_SUBTYPES=CAP ]	18.987	0.428	1,966.392	1	0.000	18.987	2	INCLUDE (HIGH 10, NMA 0)
	[CONFLICT_SUBTYPES=OD ]	19.772	0.367	2,909.037	1	0.000	19.772	2	INCLUDE (HIGH 23, NMA 0)
	[CONFLICT_SUBTYPES=OPP ]	19.208	0.244	6,185.060	1	0.000	19.208	2	INCLUDE (HIGH 38, NMA 0)
	[CONFLICT_SUBTYPES=TAB ]	20.516	9,014.551	0.000	1	0.998	20.516	-2	INCLUDE (HIGH 0, NMA 10)
LOW*	[CONFLICT_SUBTYPES=CAP ]	16.684	1.041	256.956	1	0.000	16.684	2	INCLUDE (LOW 1, NMA 0)
	[CONFLICT_SUBTYPES=OD ]	0.000	4,098.293	0.000	1	1.000	0.000	1	EXCLUDE (BOTH 0)
	[CONFLICT_SUBTYPES=OPP ]	16.669	0.606	757.757	1	0.000	16.669	2	INCLUDE (LOW 3, NMA 0)
	[CONFLICT_SUBTYPES=TAB ]	20.516	9,014.551	0.000	1	0.998	20.516	-2	INCLUDE (HIGH 10, NMA 0)
MED*	[CONFLICT_SUBTYPES=CAP ]	19.169	0.000	.	1	.	19.169	2	INCLUDE (MED 12, NMA 0)
	[CONFLICT_SUBTYPES=OD ]	19.035	0.000	.	1	.	19.035	2	INCLUDE (MED 11, NMA 0)
	[CONFLICT_SUBTYPES=OPP ]	18.971	0.000	.	1	.	18.971	2	INCLUDE (MED 30, NMA 0)
	[CONFLICT_SUBTYPES=TAB ]	-1.609	0.775	4.317	1	0.038	-1.609	-2	INCLUDE

\*The reference (benchmark) category is: NMA

Table 3.11 reads in the following manner: Column A and B indicate the pair of behaviour examined in relation to the benchmark pair. So for example for column A [MVL(High)] and column B [CMT(CAP)] the computations for the MVL(High) - CMT(CAP) pair are given. As such we observe in column C the log-odd of positive value of 18.987 compared to the value of the benchmark pair of MVL(NMA) - CMT(CAP). The fact that column G indicates a significant relationship and column C a rather high log-odds value creates suspicion as to the crosstabulated cell values for the pairs. Examination of the crosstabulation table reveals that the benchmark pair of MVL(NMA) - CMT(CAP) was not observed at all thus having a value of 0. Comparing the value of MVL(High) - CMT(CAP), being 10 and the value of the benchmark pair being 0, caused for the highly inflated log-odds value in column C<sup>45</sup>.

Nevertheless, as previously explained it has been included as indicating high likelihood for the pair to be observed, compared to the benchmark pair, and therefore it has been assigned a likelihood value of positive 2 (column I). The crosstabulation assessment for suspicious cells is indicated in column J.

An example in which a comparison was not possible can be observed when comparing pair MVL(LOW) - CMT(OD) with the benchmark pair MVL(NMA) - CMT(OD). Suspicious log-odds as well as significance values called for further

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<sup>45</sup> While certain literature suggests that it is possible to overcome this deficiency by adding a very small number to the 'offending' crosstabulated cells (Agresti, 2002) it should be noted that values represent observations of pairs and as such they need to be discrete. Thus the smaller possible value that could be assigned was a value of 1. In the vast majority of the 'offending' pairs observed the comparison values (be it from the side of the benchmark pair or from the side of the 'examined' pair) were relatively small and even adding 1 would cause for serious distortions. In the example explicated the benchmark pair value was 0 and the 'examined' pair value was 10. Adding 1 would change the distribution of the pairs by indicating that observing the benchmark pair was equal to 10% of the 'examined' pair. Doing so, would artificially change the compared cell values by a significant proportion and would introduce significant bias. Therefore, adding small values to the offending cells has been abandoned and was replaced by the more laborious, but more accurate, examination of the offending cells (Field, 2009; Tabachnick & Fidell, 2001).

examination of the crosstable. This examination indicated that the cell values for both pairs were 0. Thus, the ‘examined’ pair could not be meaningfully compared to the benchmark pair and was assigned a value of 0 in terms of the likelihood.

A more normal example can be observed for the pair MVL(Medium) - CMT(TAB), when compared to the benchmark pair MVL(NMA) - CMT(TAB), indicating a statistically significant log-odds value of -1.609. This value is lower than the cut-off value of -1.387 indicating that the MVL(Medium) - CMT(TAB) pair is more than 3 times less likely to be observed than the benchmark MVL(NMA) - CMT(TAB) pair, thus assuming a -2 likelihood of being observed, compared to the benchmark.

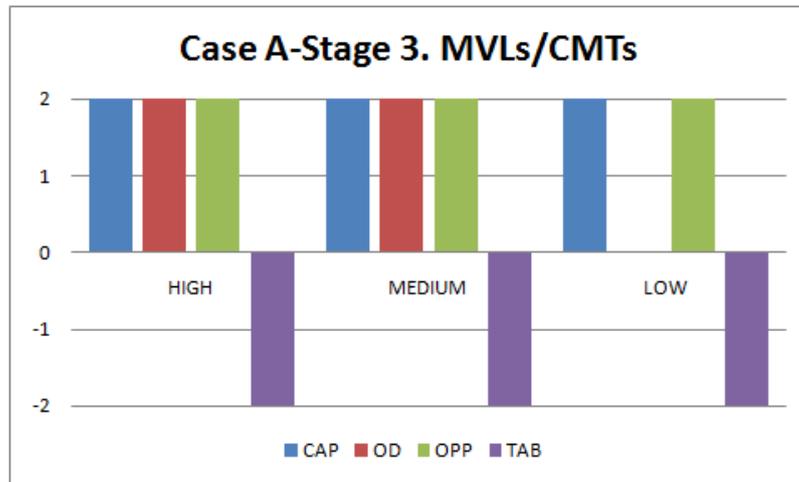
The following table (Table 3.12) indicates the final likelihood table for all the pairs when compared to the benchmark.

**Table 3:12 Example of Final Likelihood Values**

Model Visibility Level	Conflict Management Type Likelihood			
	CAP	OD	OPP	TAB
HIGH	2	2	2	-2
MEDIUM	2	2	2	-2
LOW	2	0	2	-2

Table 3.12 was then plotted in a bar-chart for further inspection. The bar-chart can be seen below (Graph 3.1).

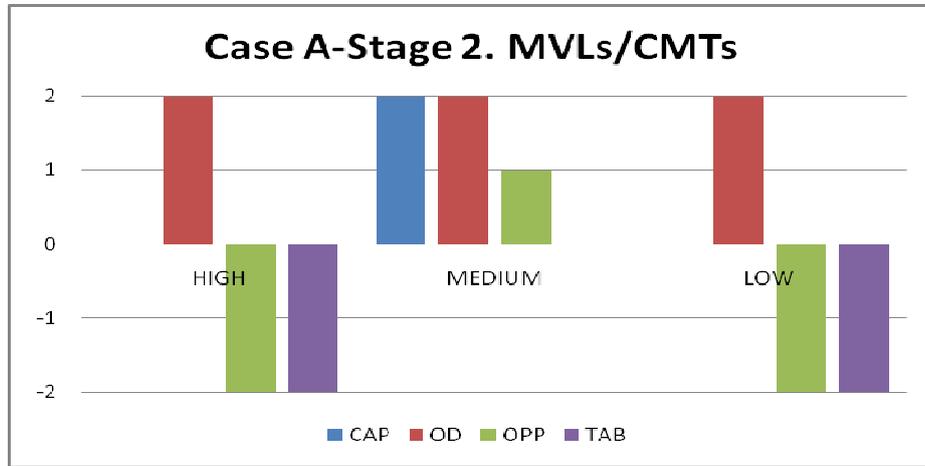
**Graph 3:1 Example of Likelihood of Observation MVL/CMT Case A-Stage 3**



From Graph 3.1 it can be observed that for Case A-stage 3 CMT (CAP), CMT (OD), CMT (OPP) and CMT (TAB), all moved in the same direction for MVL(High), MVL (Medium) and MVL (Low). It should be noted that for MVL(Low) a relationship was either not observed or it did not achieved statistical significance and was thus excluded (as explained earlier the both values were 0 and as such it was excluded altogether).

Graph 3.1 offers for little variance and probably a better example can be viewed when considering the graph produced for Case A-Stage 2 which can be seen below (Graph 3.2)

**Graph 3:2 Example: Likelihood of Observation MVL/CMT Case A-Stage 2**



From graph 3.2 one can observe the following MVL-CMT relationships for case A stage 2:

Comparing MVL(High) to MVL(NMA), MVL(High) presents a high-positive likelihood of observing CMT(OD) and a high-negative likelihood of observing CMT(OPP) and CMT(TAB). CMT(CAP) did not yield any significant differences in terms of likelihood from what would be expected if MVL(NMA) was to be observed.

Comparing MVL (Medium) to MVL(NMA), MVL(Medium) presents high-positive likelihood of observing CMT(CAP) and CMT(OD) while presenting an average-positive likelihood of observing CMT(OPP)

MVL (Low) is interpreted similarly to MVL(High) since the results are the same.

Thus for the specific case and stage observed, it appears that, compared to no model visibility, High, Medium and Low MVLs were beneficial in terms of highly promoting conflict resolution via open discussion. Furthermore, while MVLs High

and Low were beneficial in terms of highly suppressing premature conflict closure [MVL(TAB)], they were un-beneficial in terms of highly hindering the emergence of conflict [MVL(OPP)]. On the other hand and while Medium MVL was averagely beneficial in terms of promoting conflict emergence, it was also un-beneficial in terms of highly promoting conflict resolution via capitulation.

In practical terms, the example above indicates a situation in which if one wanted to surface conflict without running the risk of having that conflict capitulated, he/she should opt for not appropriating the model. Once conflict has surfaced though, he or she should opt for either high or low model appropriations.

In simple terms, the second step allowed for the assessment of how likely it is to observe a given CMT for a given MVL, when the latter is compared to the benchmark MVL [i.e. MVL(NMA)]. This allowed for exploring the likelihood of having certain model visibility levels resulting to certain CMTs.

Cross stage assessment of the likelihood of observing certain MVL-CMT pairs, allowed for identifying key best and worst practices in terms of the MVL-CMT relationships.

The explication of the analysis techniques shall now consider research question 3.

### **3.5.3 RQ3 - Statistical Analysis Techniques.**

#### **Recall RQ3**

**RQ3: What, if any, is the relationship between model visibility levels and confrontiveness levels across the stages of FM workshops for the cases observed?**

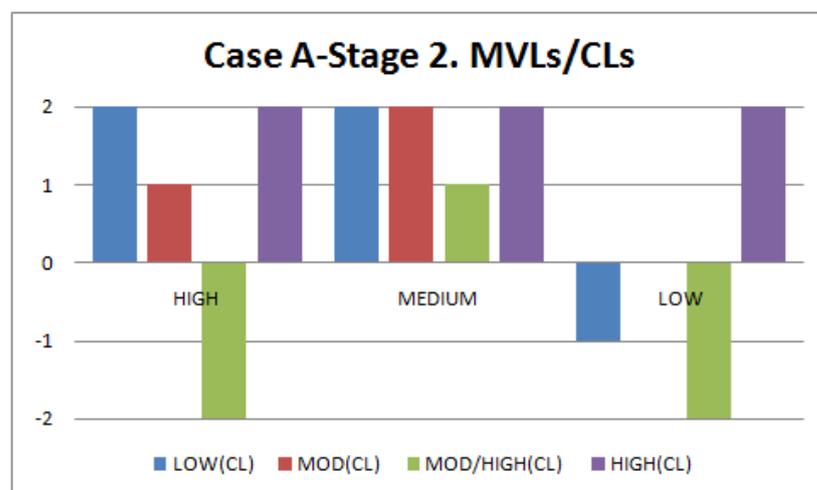
Addressing RQ3 meant that the statistical analysis should be able to identify first of all whether there is any relationship between model visibility levels and

confrontiveness levels and, if related, what the relationship amongst the various MVLs and CLs is (positive or negative). Contrary to CMTs, confrontiveness appears at different levels throughout the whole interaction. This meant that the *complete* GWRCS and MACS datasets had to be used. The analysis then progressed similar to RQ 2 in, two steps. Specifically:

1. Chi-square tests were performed for each stage of every case, in order to reveal whether any relationship existed between MVL and CL or whether they were unrelated.
2. Provided that the chi-square tests indicated a relationship between the variables, multinomial logistic regressions for matched pairs were performed for each stage of each case in order to reveal the relationships amongst the various level-categories of MVL and CL variables.

For example, following the process previously explicated, for stage 2 of case A the following chart has been produced (Graph 3.3):

**Graph 3:3 Example: Likelihood of Observation MVL/CL Case A-Stage 2**



From graph 3.3 one can observe the following MVL-CL relationships for case A stage 2:

Comparing MVL(High) to MVL(NMA), MVL(High) presents a high-positive likelihood of observing CL(Low) and CL(High), an average-positive likelihood of observing CL(Mod)<sup>46</sup> and a high-negative likelihood of observing CL(Mod/High)<sup>47</sup>.

Comparing MVL (Medium) to MVL(NMA), MVL(Medium) presents high-positive likelihood of observing CL(Low) and CL(High) while presenting an average-positive likelihood of observing CL(Mod/High)

Comparing MVL (Low) to MVL(NMA), MVL(Low) presents high-positive likelihood of observing CL(High), while presenting a high-negative likelihood of observing CL(Mod/High) and an average-negative likelihood of observing CL(Low). It is noted that the likelihood of observing CL(Mod) when observing MVL(Low) is not significantly different from that observed for MVL(NMA).

Thus, for the specific case and stage observed, it appears that, compared to no model visibility, High, Medium and Low MVLs were beneficial in terms of highly promoting High levels of confrontiveness. Furthermore, it appears that both MVLs High and Medium promoted Low and Moderate levels of confrontiveness, with the MVL(Medium) promoting Moderate levels of confrontiveness a bit more.

In practical terms, the example above indicates a situation in which if one wanted to promote higher levels of confrontiveness, he/she should opt for medium model visibility. Furthermore, if the only choice for model visibility is between High and

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<sup>46</sup> Recall CL(Mod) stands for a Moderate confrontiveness level.

<sup>47</sup> Recall CL(Mod/High) stands for Moderately High confrontiveness level.

Low, one should opt for MVL(High) unless specifically seeking to suppress CL(Low) and CL(Mod/High), in which case a MVL (Low) should be favoured.

Cross case and cross stage assessment of the likelihood of observing certain MVL-CL pairs allowed for identifying key best and worst practices in terms of the MVL-CL relationships.

#### **3.5.4 RQ4 - Statistical Analysis Techniques.**

Furthering the discussion recall RQ 4:

**RQ4: What, if any, is the relationship between model visibility levels and conflict management types in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

The analysis for addressing RQ 4 built on the two analysis steps conducted for RQ 2 and added two more steps of analysis. The third and fourth steps are briefly explained below:

The third step was to assign desirability weights for each MVL-CMT pair observed. Desirability weights were based on the conflict management effectiveness each CMT displays (Kuhn & Poole, 2000). The desirability weights ranged from the most to the least desirable pair of observation and were assigned following a sequential and discrete (i.e. per unit change) pattern.

The rationale for assigning the values followed the logic that the least beneficiary CMT, coupled with high MVL's, should bear the lowest desirability weights. Bearing in mind that Tabling a conflict is worse than Capitulating it meant that the highest negative scores should be given for the MVL's-CMT(TAB) pairs followed by the MVL's-CMT(CAP) pairs. Albeit one could propose that instead of assigning negative values on the non-desirable behaviours I could simply assign higher values

on the desirable behaviours, such a weight assignment would fail to indicate the overall direction, be it positive or negative, of the final CMES-CMT score.

Similarly, the most desirable behaviour would be the one displaying situations in which the MVL(High) were coupled with the beneficiary CMT's (i.e. OPP, OD). Bearing in mind that resolving conflict via Open Discussion is considered more beneficial than simply having Opposition present (this is since the manifestation of OD sets as a prerequisite the existence of OPP). This meant that the MVL's on CMT(OD) should bear higher desirability weights than MVL's on CMT(OPP) and with the MVL(High) assuming the highest values since it indicates a highly desirable behavior. As in RQ2, MVL(NMA) acted as the benchmark assuming a desirability weight of 0 across all CMT's. The desirability weights can be seen in the following table (Table 3.13).

**Table 3:13 MVL-CMT Desirability Weights.**

MVL-CMT Desirability Weights				
	CAP	OD	OPP	TAB
HIGH	-3	6	3	-6
MEDIUM	-2	5	2	-5
LOW	-1	4	1	-4

As such, it can be observed that the pair of MVL(High)–CMT(OD) is more desirable than the pair MVL(NMA)–CMT(OD) (recall all MVL's NMA assumed the benchmark 0 value), which in turn is more desirable than the pair MVL(High)–CMT(TAB).

The values in the desirability weights matrix were then multiplied with the values in the likelihood matrix, thus resulting in conflict management effectiveness scores that were assigned to each MVL–CMT pair. The resulting matrix was labelled the

*MVL-CMT Conflict Management Effectiveness Matrix*. Summing the values across all cells in the *MVL-CMT Conflict Management Effectiveness Matrix* allowed for the derivation of the *MVL-CMT Conflict Management Effectiveness Score* (CMES-CMT). Thus, in step 3 the *MVL-CMT Conflict Management Effectiveness Score* (CMES-CMT) was obtained. In order to clarify the aforementioned calculations a bit further consider the following illustration in Table 3.14 presenting the CMES-CMT calculations for Case A - Stage 3.

**Table 3:14 Example of CMES-CMT calculations.**

Case A		Stage 3								MVLs/CMTs				
Model Visibility	CMT Likelihood				MVL-CMT Desirability Weights				Conflict Management Effectiveness					
	CAP	OD	OPP	TAB		CAP	OD	OPP	TAB	Model Visibility	CAP	OD	OPP	TAB
HIGH	2	2	2	-2	HIGH	-3	6	3	-6	HIGH	-6	12	6	12
MEDIUM	2	2	2	-2	MEDIUM	-2	5	2	-5	MEDIUM	-4	10	4	10
LOW	2	0	2	-2	LOW	-1	4	1	-4	LOW	-2	0	2	8
										CMES -CMT		SUM		52

Table 3.14 allows us to better grasp the matrix calculations performed. The processes applied as explained in RQ 2 allowed for the derivation of the initial CMT likelihood matrix (i.e. the white matrix). So for example for cell MVL(High)-CMT (CAP) one can observe a likelihood value of 2. The likelihood value of MVL(High)-CMT(CAP) cell has then been multiplied with the corresponding cell in the MVL-CMT Desirability Weights matrix<sup>48</sup> (i.e. the yellow matrix on table) , with the resulting value indicated in the corresponding cell in the Conflict Management Effectiveness matrix (i.e. the red matrix on table). As such for the MVL(High)-CMT(CAP) value of 2, multiplied by -3 resulted to a -6 value on the Conflict Management Effectiveness matrix. Repeating the same process for the rest of the

<sup>48</sup> Albeit easy to understand, it should be unambiguously clarified that the MVL-CMT Desirability Weights remained constant throughout their application on all cases and stages.

cells populated the Conflict Management Effectiveness matrix, which values were summed up to derive the CMES-CMT, which for Case A-Stage 3, assumed a value of 52.

In a nutshell, CMES-CMT indicated how well a given stage in the case observed did, in terms of MVL and CMTs-related conflict management effectiveness.

The fourth step of analysis required for assessing RQ 4 was to calculate the *Model Appropriations Complexity Score* (MACoS). MACoS was calculated by dividing the number of phase transitions observed in the MACS phasic timelines with the number of phase transitions observed in the GWRCs phasic timelines (Poole & Roth, 1989b). It should be noted that for calculating MACoS the model appropriations were not converted to model visibility levels since by doing so the data may be over-smoothed. It is easy to observe that deciding on the level of granularity is detrimental to the transitions that will be observed (for example one could choose to count transitions at the thought unit level). Deciding to assess model appropriations complexity by examination of the phases transitions produced through a well established flexible mapping technique such as phasic analysis allowed for some degree of confidence in that the level of granularity would be neither too fine nor too coarse (Poole & Roth, 1989a: 337-338). Moreover, assessing complexity in this manner has proven a fruitful avenue in previous research (Poole & Roth, 1989b:560&565). To be more specific MACoS was calculated by following the rationale and procedures explicated below:

As can be observed (Appendix 6) different phasic timelines present different phase patterns developing through time. Some closely resemble decision paths that develop in a unitary fashion, and as such various phase types develop one by one

without reoccurring. Others are much more fragmented following more complicated patterns in which the same phase types occur and re-occur. The further away from unitary style a phasic timeline is the more complex interaction it displays.

In order to derive a quantitative measure of phase complexity the number of transitions across phase types were counted. Typing periods reflected interaction break-points (Poole & Roth, 1989b) and thus the typing related transitions were excluded. Also a value of 1 was added to the transition counts throughout all cases and stages in order to try and avoid bias in the calculations (i.e. artificially lower counts since the transition of the last phase is not counted).

Moreover, the total number of transitions has been divided by the total number of distinct phase types observed in a given stage. In this way the computation of the complexity has been sensitive in not making inferences about what phase types the group *should* display, instead it was calculated by taking into account the phase types a group *did* display. The rationale for this calculation nuance is that existence or not of certain phase types may have been influenced by exogenous to the research variables (e.g. group or task contingencies). For example, a group may, perhaps due to group participants' personalities, be conflict averse and thus not displaying any conflict related phases. Assuming that any group *should* display the whole gamut of available phase types would introduce a certain degree of bias and does not offer safe grounds for further reasoning. Computing the complexity based on the phase types observed, instead of the phase types that should be observed, attempted to control for such perilous reasoning.

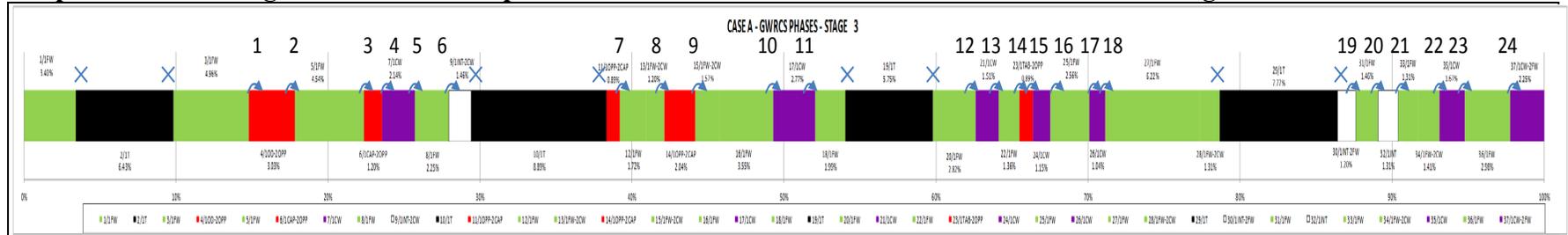
Furthermore, the complexity ratio of Model Appropriation phasic timelines (MACS) has been divided by the complexity ratio of Group Working relations

(GWRCS), thus normalising the MACS on the GWRCS making the MACS complexity ratio comparable across cases and stages. Essentially the complexity observed in the GWRCS phasic timelines acted as a *group and stage specific* ‘complexity benchmark’, against which the complexity of the Model Appropriation phasic timelines could be assessed. As such the complexity ratio has been calculated by dividing the Model Appropriation complexity value by the Group Working Relations complexity value (i.e. MACS complexity value/ GWRCS complexity value). A complexity ratio of, for example, 1.34 meant that the Model Appropriation phasic timeline (i.e. the interaction in terms of appropriating the model) was 34% more complex than the corresponding Group Working Relations phasic timelines (i.e. the interaction in terms of the group working relations).

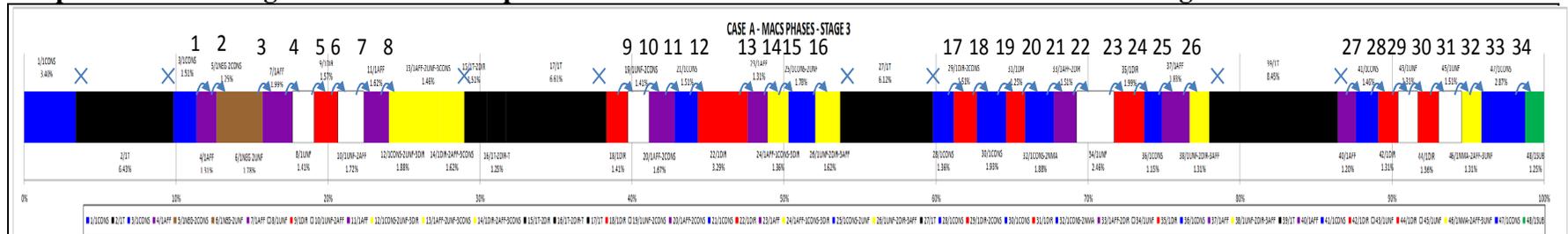
Clearly, the capability of performing such calculations by ‘looking at the bigger picture’ is a clear advantage of using a flexible mapping technique such as phasic analysis.

In the following two graphs (3.4;3.5) the calculation of the complexity ratio is further explicated.

**Graph 3:4 Calculating the MACoS Example: GWRCs Phasic Timeline Transitions for Case A - Stage 3**



**Graph 3:5 Calculating the MACoS Example: MACS Phasic Timeline Transitions for Case A - Stage 3**



In the Graphs 3.4 and 3.5 the number of transitions for each corresponding phasic timeline is counted.

It is observed that for the Group Working Relations (GWRCS) phasic timeline (Graph 3.4) a total of 24 transitions are counted. Adding 1 brings the number of transitions to 25. It is further observed that the GWRCS phasic timeline displays a number of distinct phasic types. Namely the types of (1) Focussed Work (light green), (2) Integrative and off-topic messages (white), (3) Critical Work (violet), (4) Opposition resolved through the integrative conflict resolution style of Open Discussion (red), (5) Opposition resolved through the distributive conflict resolution style of Capitulation (red) and (6) Opposition resolved through the integrative conflict resolution style of Avoidance (red). The complexity ratio for the GWRCS phasic timeline is calculated by dividing the number of transitions by the number of distinct phase types observed, thus being  $25/6 = 4.1666$  or 4.17 (rounding to the nearest second decimal point).

Following the same rationale for the Model Appropriations (MACS) phasic timeline (Graph 3.5), the following is observed: The number of transitions is 35(34+1), the number of distinct phase types is 7<sup>49</sup>. Namely that of: (1) Constraint, (2) Affirmation, (3) Negation, (4) Unfocussed, (5) Direct, (6) No Model Appropriations (observed as the leading phase type in the complex phase numbered 46 in the phasic map<sup>50</sup>) and (7) Substitution. The complexity ratio for the MACS phasic timeline is 5 (i.e. 35/7).

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<sup>49</sup> See the “Colour Coding” section in the Methodology chapter on more about the colour coding used in when constructing both GWRCS and MACS phasic timelines.

<sup>50</sup> It is worth recalling that complex phase types (colour coded as yellow) bear the phase type of their leading phase type, thus if the leading phase type is not observed in any other phases it is included, as in the case of No Model Appropriations.

As such, the complexity score is calculated by dividing the complexity ratio of the MACS timeline by the complexity ratio of the GWRCs timeline. Thus the complexity ratio for Case A – Stage 3 is  $5/4.17 = 1.20$  (1.199 rounded to the nearest second decimal point). The quantitative interpretation of the model appropriations complexity score is that MACS phasic timeline is 20% more complex than its corresponding GWRCs phasic timeline. In the context of this research the complexity score was used as a score for direct comparisons and it has been labelled as the *Model Appropriations Complexity Score* (i.e. MACoS).

Calculating the CMES-CMT and MACoS across cases and stages allowed for the direct comparison of the effect that MACoS had on CMES-CMT.

### **3.5.5 RQ5 - Statistical Analysis Techniques.**

Moreover, recall RQ 5

**RQ5: What, if any, is the relationship between model visibility levels and conflict management types in relation to the level of faithfulness of model appropriations, across the stages of FM workshops for the cases observed?**

Addressing RQ 5 meant that the level of faithfulness of model appropriations (LFMA) needed to be calculated.

LFMA was calculated by summing the percentage duration that ironic phases<sup>51</sup> took up in the phasic timelines. Classification was performed by basing the percentages on the research by Wheeler & Valacich (1996) in which they assessed half of a total of 16 groups (i.e. 8 groups) for the amount of ironic moves they displayed. When assessing level 2 GSS<sup>52</sup> combined with facilitation, Wheeler &

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<sup>51</sup> Indicated with an asterisk (\*) in the phasic timelines..

<sup>52</sup> The Group Explorer workshop can be broadly classified as a level 2 GDSS, for the purposes of this research (DeSanctis & Gallupe, 1987)

Valacich (1996) identified a Mean average of 2.33 ironic appropriation moves over a total average of 20.66. Thus, the average LFMA was rounded to a cumulative duration of 10% of ironic phases<sup>53</sup>. The standard deviation of the ironic appropriations Mean average was rather high at 3.01 or 15%. Since the percentage of ironic model appropriations cannot assume negative values, the above and below the mean values<sup>54</sup> were adjusted in six classification categories of 2.5% increments, with the average category having equal distance around the Mean average of 10% and twice the deviation increments. The ironic appropriation duration and the corresponding LFMA classifications can be seen in the following table (Table 3.15).

**Table 3:15 Duration Based Classification of Level of Faithfulness of Model Appropriations.**

<b>For ironic model appropriations with a total phase duration between.</b>	<b>LFMA</b>
<2.50%	Extremely High
2.50% - 5.00%	Very High
5.01% - 7.5%	High
7.51%-12.50%	Average
12.51% - 15.00 %	Low
15.01% - 17.50%	Very Low
>17.5%	Extremely Low

Moreover, having identified the LFMA and the CMES-CMT (as explicated in RQ

4) allowed for direct comparisons between the two constructs across stages for the cases observed.

<sup>53</sup> It is important to note that while in this research LFMA was measured by assessing the duration of each ironic model appropriation phase, Wheeler & Valacich (1996) assessed faithfulness of appropriations in terms of *number of moves* and within a wider GSS process context without imposing a narrow focus in terms of the source of structure (i.e. as in this thesis's research being only the model). Still, Wheeler & Valacich (1996) research is the only published research I was able to identify, that fitted the context of my research and offered measurable results in terms of faithfulness of appropriations.

<sup>54</sup> So as to assign confidence intervals based on 1 or 2 st. deviations above or below the Mean average.

### **3.5.6 RQ6 - Statistical Analysis Techniques.**

For RQ6:

**RQ6: What, if any, is the relationship between model visibility levels and levels of confrontiveness in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

As the analysis for RQ 4 built on the analysis steps for RQ 2, the analysis for addressing RQ 6 built on the analysis done for RQ 3. As in RQ 4, addressing RQ 6 required two further steps of analysis to be added to the RQ 3 two steps previously mentioned.

The third step entailed assigning desirability weights ranging from the most to the least desirable MVL-CL pair observed. As in RQ 4 desirability weights were assigned following a sequential and discrete (i.e. per unit change) pattern.

The rationale for assigning the values followed the logic that the least beneficiary CL, coupled with high MVL's, should bear the lowest desirability weights. Contrary to the CMTs observed in RQ 4, dealing with CLs required a different approach since most CLs are considered to be beneficial albeit on differing levels. The single CL considered to be unbeneficial is the CL(Low) and has thus been assigned with negative values. As in RQ 4, higher MVLs received higher negative values when paired to CL(Low). The rest of the desirability weights were assigned on a per unit and ascending fashion, moving from desirable to most desirable CL's (i.e. from CL(Mod) to CL(High) ) bearing in mind that higher MVLs presented more desirable behaviours. Similarly to RQ4, MVL(NMA) acted as the benchmark assuming a null value.

The resulting desirability weights matrix can be seen in Table 3:16

**Table 3:16 MVL-CL Desirability Weights.**

MVL-CL Desirability Weights				
	LOW	MOD	MOD/HI	HIGH
HIGH	-3	3	6	9
MEDIUM	-2	2	5	8
LOW	-1	1	4	7

As such, it can be observed that the pair of MVL(High)–CL(Low) is less desirable than MVL(High)-CL(Mod) which in turn is less desirable than MVL(High)-CL(High)

The same process as in RQ 4 of multiplying the desirability weights to the likelihood of occurrence was followed and an effective conflict management matrix, based on CLs, was developed.

The resulting matrix was labelled the *MVL-CL Conflict Management Effectiveness Matrix*. Summing the values across all cells in the *MVL-CMT Conflict Management Effectiveness Matrix* allowed for the derivation of the *MVL-CL Conflict Management Effectiveness Score* (CMES-CL).

Summing the values across all cells in the *MVL-CL Conflict Management Effectiveness Matrix* allowed for the derivation of the *MVL-CL Conflict Management Effectiveness Score* (CMES-CL). CMES-CL indicated how well a given stage in a case observed did, in terms of MVL and CLs-related conflict management effectiveness.

Similarly to RQ 4, consider the following illustration in Table 3.14 presenting the CMES-CL calculations for Case A - Stage 3.

**Table 3:17 Example of CMES-CL calculations.**

Case A	Stage 3									MVLs/CLs				
Model Visibility	CL Likelihood				MVL-CL Desirability Weights					Conflict Management Effectiveness				
	LOW(CL)	MOD(CL)	MOD/HIGH (CL)	HIGH (CL)		LOW	MOD	MOD/HIGH	HIGH	Model Visibility	LOW	MOD	MOD/HIGH	HIGH
HIGH	2	2	1	2	HIGH	-3	3	6	9	HIGH	-6	6	6	18
MEDIUM	2	2	2	2	MEDIUM	-2	2	5	8	MEDIUM	-4	4	10	16
LOW	0	1	0	0	LOW	-1	1	4	7	LOW	0	1	0	0
										CMES- CL			SUM	51

Table 3:17 allows for tracking each step of the aforementioned calculations for Case A - Stage 3. For example, for a MVL(High) - CL(Low) value of 2 (i.e. the white matrix in table 3:17), the desirability weight is -3 (the yellow matrix) and the resulting Conflict Management Effectiveness score is -6. Summing all the values in the the MVL-CL Conflict Management Effectiveness Matrix provided for a CMES-CL value of 51.

The second additional step has also been covered in RQ 4, where the MACoS has been calculated and will not be repeated here.

Having calculated the MACoS in RQ 4 as well as further calculating the CMES-CL (across cases and stages) made possible the direct comparison of the effect that Model Appropriation Complexity (i.e. MACo) had on CMES-CL.

### 3.5.7 RQ7 - Statistical Analysis Techniques.

For RQ 7

**RQ7: What is the relationship between model visibility levels and levels of confrontiveness in relation to the level of faithfulness of model appropriations, across the stages of FM workshops for the cases observed?**

Similar to RQ 5, having identified the LFMA and the CMES-CL, allowed for direct comparisons between the two constructs across the stages of the cases observed.

### 3.6 Statistical Analysis Datasets

In this section the manner in which the phasic timelines were used as a data reduction technique is explicated.

As a data reduction technique, phasic timelines allowed for the further analyses of data using mainstream statistical analysis techniques such as chi-square and logistic regression (Agresti, 1996; DeMaris, 2003; Field, 2009).

The statistical analysis datasets were obtained by assigning next to each final phase type the appropriate duration weight and excluding the typing periods. A note at this point is that for computational purposes all the duration weights were multiplied by 100 so as to express the ratios up to, and including, the second decimal point of phase duration percentage. Furthermore, duration weights were expressed as increased instances in SPSS. For example, assume two phases starting at the same point in time. One being a GWRCS (FW) and the other a MACS (DIR) phase with a duration of 2.21% and 2.5% respectively. These were inputted to SPSS by having a GWRCS column with 221 FW data points (i.e. row observations) and a MACS column with 250 DIR data points of which the first 221 coincided with the GWRCS – FW codes (i.e. being in the same row).

This resulted in two streams of categorical codes that reflected the matched nature of the GWRCS Vs MACS phasic timelines and were taking into account the duration of each phase.

### 3.7 Cases Observed – Brief Description

Data from four cases were collected. Due to the poor quality of the recordings one case was deemed unusable and was excluded from the cases examined in this research.

A brief description of the three cases examined follows:

#### 3.7.1 CASE A

Case A, was a workshop for a private-sector organisation whose major operation is finding employment for underprivileged individuals (for example previously incarcerated persons, drug addicts etc.). The engagement context was that the organisation was looking to re-formulate its strategy for the next 5 to 7 years and was looking to gain a better understanding of the issues and challenges that should be anticipated for the future. Using Jarzabkowski's (2008) classification of strategies, case A appeared to be concerned with making decisions in terms of its size and scope strategy.

The full board committee, including the CEO, participated in the workshop. The board committee consisted of 7 individuals. All the participants were male and of White British<sup>55</sup> ethnic group. 6 of the participants' age ranged from mid-40s to late-50s with one being in his early 30s. Informal discussions revealed that the CEO as well as two of the most senior board members had previous experience with PSMs and specifically with Soft Systems Methodology (Wilson, 2001).

A facilitator was used in order to assist with the process and the content facilitation of the workshop. Three external consultants and the researcher were

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<sup>55</sup> Ethnic classification terminology adopted by the 2011 Census for England and Wales <http://www.ons.gov.uk/ons/rel/census/2011-census/key-statistics-for-local-authorities-in-england-and-wales/rpt-ethnicity.html> (last accessed on 03.Sep.2012).

present in the workshop observing the process and the conversation, with practically no input in the content of the conversation or to the process followed.

The total net interaction time (excluding comfort breaks) was 4 hours 1 minute and 30 seconds.

The workshop took place in Warwick University, UK.

### **3.7.2 CASE B**

Case B, was a workshop for a public-sector organisation that is overlooking the operation of a regional library. The engagement context was that the organisation was looking to identify and address revenue related issues. In terms of Jarzabkowski's (2008) classification of strategies, case B appeared to be concerned with making decisions in terms of its commercial income strategy.

The workshop committee consisted of 10 individuals, including the head of the libraries division. Of the 10 participants 5 were male and 5 female. All were of White British ethnic group, and their age ranged from mid-40s to late-50s. Informal discussions revealed that none of the participants had previous experience with FM using any PSM's, GDSS's or FGPP's in general.

The same facilitator to Case A was used in order to assist with the process and the content facilitation of the workshop. The researcher and two other observers<sup>56</sup> were present in the workshop observing the process and the conversation, with practically no input in the content of the conversation or to the process followed.

The total net interaction time (excluding comfort breaks) was 2 hours 19 minute and 30 seconds.

The workshop took place in Warwick University.

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<sup>56</sup> These observers were not related to the research.

### **3.7.3 CASE C**

Case C, was a workshop for a UK business school. The engagement context was similar to Case B in that the organisation was looking to identify and address revenue related issues, but it also tried to get a grasp of the issues and challenges that the organisation may have had to address. Similar to case B, case C appeared to be concerned with making decisions in terms of its commercial income strategy.

The workshop committee consisted of 7 individuals. Of the 7 participants 5 were male and 2 female. All were of White British ethnic group, and their age ranged from mid-40s to late-50s. Informal discussions revealed that except one, the rest of the participants had previous experience with FM using any PSM's, GDSS's or FGPP's in general. One participant had limited exposure to non-facilitated and non-technology or model based FGPPs such as the Nominal Group Technique (Van de Ven & Delbecq, 1974).

Case C was facilitated by the same facilitator as in cases A and B. The researcher was present in the workshop observing the process and the conversation, with virtually no input in the content of the conversation or in the process followed.

The total net interaction time (excluding comfort breaks) was 6 hours 15 minute and 30 seconds.

The workshop took place in the premises of the UK business school (i.e. the 'client' premises).

## **4 Results and Findings**

This chapter presents the results of the analysis and is organised as follows.

In the Descriptive Statistics section the two main variables of Group Working Relationships and Model Appropriations are presented for each stage of each case in

a descriptive manner offering basic descriptive statistics and graphs displaying the duration of each code type. It should be noted that for the Descriptive Statistics section the raw unparsed data have been used so as to allow for a more detailed presentation of each stage in each case.

The more substantive results of the analysis and their corresponding findings are further presented on a per Research Question basis.

As such in the **Results** section the statistical analysis methods are briefly explained and the statistical analysis results are offered in an as concise as possible manner. The statistical analysis results are then interpreted in the **Interpretative Analysis** sections with the findings indicated as appropriate. In the **Findings Summary** section the findings are appropriately worded and summarised before moving onto exploring the next research questions.

We begin this chapter by statistically describing the two variables of Group Working Relationships and Model Appropriations for each stage of each case.

## 4.1 Descriptive Statistics

### 4.1.1 A note on the raw data used.

Before progressing on reporting the descriptive statistics throughout the cases and stages analysed, a note on the raw data analysed is due.

Recall that the primary data came in the form of codes assigned next to unitised text. Then the Rule of Three (Appendix 5) was applied to eliminate any inherent noise in the data. The datasets produced after the application of the Rule of Three formed the raw data that were to be time-counted, parsed and analysed. Therefore one should not confuse the raw data with the unique coded instances in the text, for it

is after the Rule of Three was applied that the raw datasets were created. This section, reports on the descriptive statistics produced by the raw data.

#### 4.1.2 Case A - Descriptive Statistics.

##### 4.1.2.1 Stage 1 - Group Working Relationships.

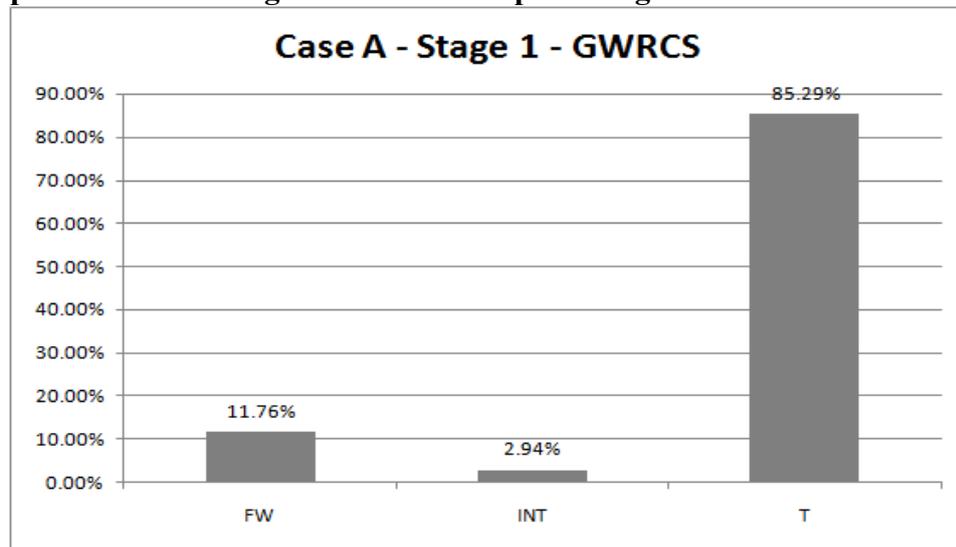
In the following table (Table 4:1), the SPSS produced descriptive statistics can be seen, while in Graph 4:1 the cumulative percentages of the GWRCS codes are presented.

**Table 4:1 Case A / Stage 1 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time secs
N	Valid	4	4
	Missing	0	0
Mean			241.0260
Std. Error of Mean			124.94886
Median			170.1360
Mode			28.36 <sup>a</sup>
Std. Deviation			249.89772
Variance			62448.872
Range			567.12
Minimum			28.36
Maximum			595.48
Sum			964.10

a. Multiple modes exist. The smallest value is shown

**Graph 4:1 Case A/ Stage 1 - Cumulative percentages of GWRCS codes.**



One can readily observe that the mean time spent on the GWRCS codes observed was 241 seconds with a standard deviation of 250 seconds. Moreover, 4 sequential instances (i.e. valid N) of three GWRCS codes (namely FW, INT and T, as can be seen in graph 4:1), have been observed. The total time spent in Stage 1 (i.e. sum) can be observed as being 964 seconds.

As such, it can be safely stated that for Case A - Stage 1 most of the time was spent in Typing while much less so was spent in Focused Work and out-of-focus (i.e. INT) interaction.

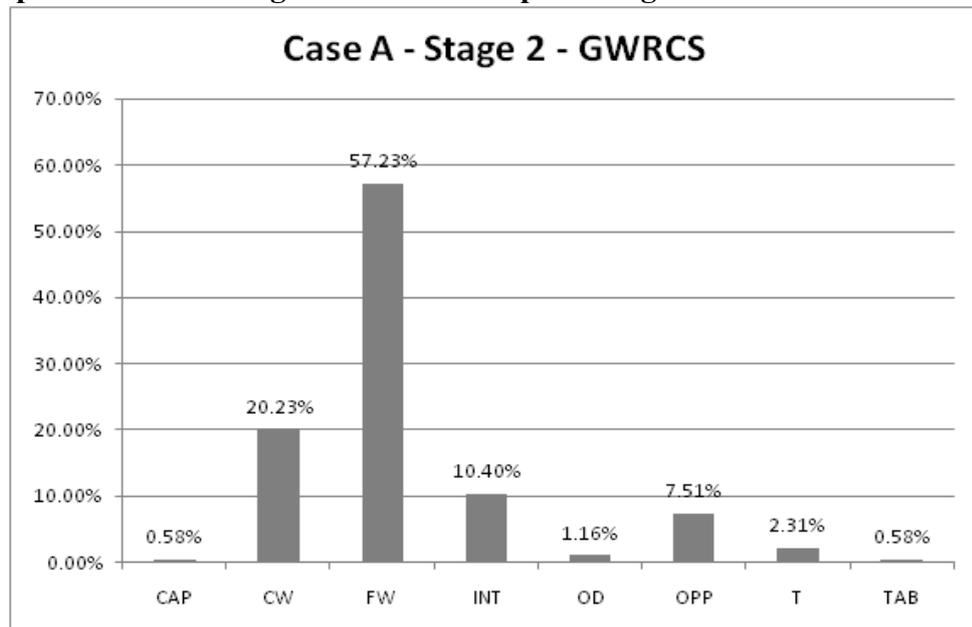
#### ***4.1.2.2 Stage 2 - Group Working Relationships.***

In the following table (Table 4:2), the SPSS produced descriptive statistics can be seen, while in Graph 4:2 the cumulative percentages of the GWRCS codes are presented.

**Table 4:2 Case A / Stage 2 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time secs
N	Valid	67	67
	Missing	0	0
Mean			73.2177
Std. Error of Mean			9.61380
Median			28.3560
Mode			28.36
Std. Deviation			78.69233
Variance			6192.483
Range			368.63
Minimum			28.36
Maximum			396.98
Sum			4905.59

**Graph 4:2 Case A/ Stage 2 - Cumulative percentages of GWRCS codes.**



For Case A - Stage 2, the mean time spent on the GWRCS codes observed was 73 seconds with a st. deviation of 79 seconds. 67 sequential instances (i.e. valid N) of eight GWRCS codes (as can be seen in graph 4:2) have been observed with the total time in Stage 2 summing up to 4905 seconds.

Thus, it can be safely stated that, and contrary to Stage 1, for Case A - Stage 2 most of the time was not spent in Typing but in Focussed and Critical Work.

Time spent on conflict (i.e. OPP, CAP, TAB and OD) was similar to the time spent on out-of-focus (i.e. INT) interaction (i.e. around 10%). Furthermore, it is interesting to note that, albeit in differing proportions, all conflict resolution styles were observed in Stage 2 (i.e. CAP, TAB and OD).

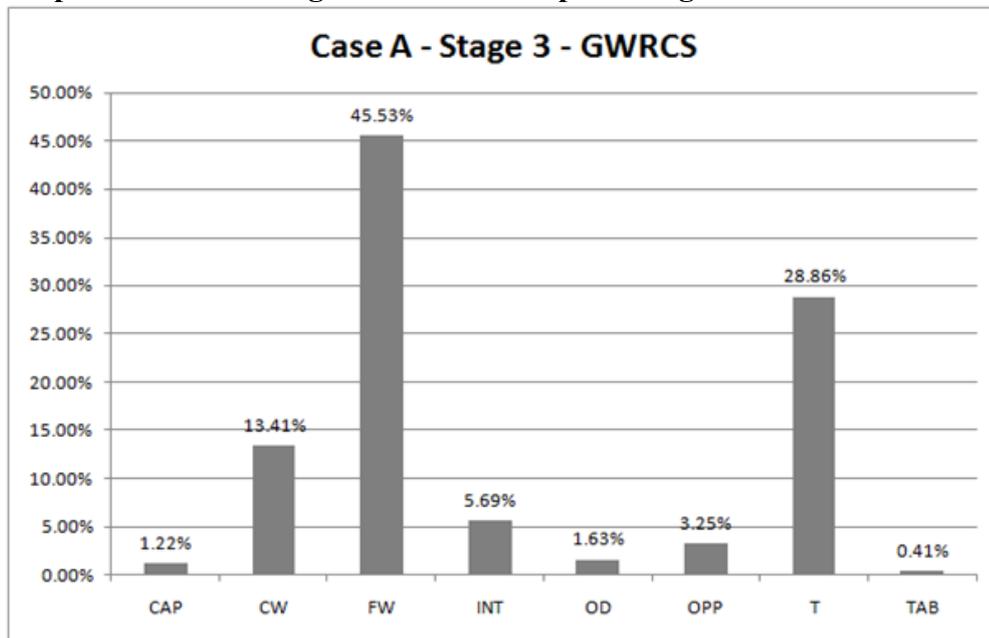
#### **4.1.2.3 Stage 3 - Group Working Relationships.**

As in the previous stages, Table 4:3 and Graph 4:3 present the descriptive statistics and the cumulative percentages of the GWRCS codes respectively.

**Table 4:3 Case A / Stage 3 / GWRCS - Descriptive Statistics.**

<b>Statistics</b>			
		<b>GWRCS</b>	<b>time secs</b>
N	Valid	79	79
	Missing	0	0
Mean			88.2984
Std. Error of Mean			12.38748
Median			56.7120
Mode			28.36
Std. Deviation			110.10237
Variance			12122.531
Range			538.76
Minimum			28.36
Maximum			567.12
Sum			6975.58

**Graph 4:3 Case A/ Stage 3 - Cumulative percentages of GWRCS codes.**



For Case A - Stage 3, the mean time spent on the GWRCS codes observed was 88 seconds, with a st. deviation of 110 seconds for the 79 sequential instances (i.e. valid N) of eight GWRCS codes (Graph 4:3). The total time in Stage 3 summing up to 6975 seconds.

It can be observed that for Case A - Stage 3 most of the time was spent in both Focused Work and Typing, while compared to Stage 2 less time was spent in Critical Work, Conflict and out-of-focus interaction (i.e. INT).

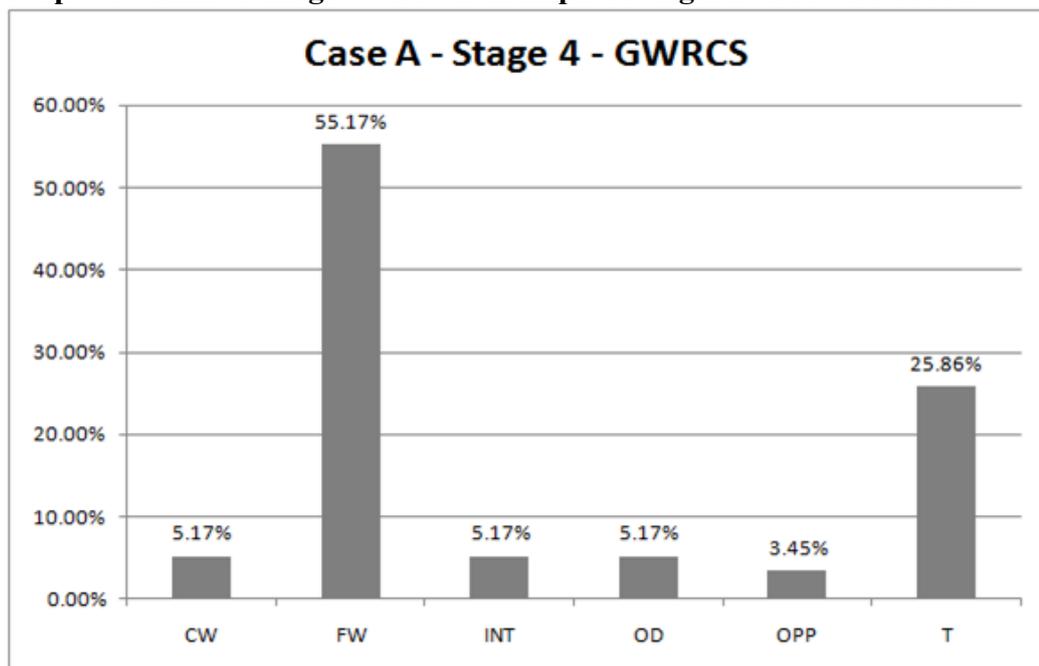
#### **4.1.2.4 Stage 4 - Group Working Relationships.**

Table 4:4 and Graph 4:4 present the descriptive statistics and the cumulative percentages of the GWRCS codes respectively.

**Table 4:4 Case A / Stage 4 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time_secs
N	Valid	20	20
	Missing	0	0
Mean			82.2324
Std. Error of Mean			18.15670
Median			56.7120
Mode			28.36
Std. Deviation			81.19923
Variance			6593.314
Range			340.27
Minimum			28.36
Maximum			368.63
Sum			1644.65

**Graph 4:4 Case A/ Stage 4 - Cumulative percentages of GWRCS codes.**



For Case A - Stage 4, the mean time spent on the GWRCS codes observed was 82 seconds, with a st. deviation of 81 seconds, for the 20 sequential instances (i.e. valid

N) of six GWRCS codes (Graph 4:4). The total time spent in stage 4 was 1665 seconds<sup>57</sup>.

It can be observed that for Case A - Stage 4 most of the time was spent in both Focused Work and Typing, thus resembling behaviour reaching a steady-state, probably indicative of a behavioural norm towards Focused Work forming. Less than half the time was spent in Critical Work when compared to Stage 3. Also, compared to Stage 3, a noticeable increase in terms of Conflict can be observed. Out-of-focus periods remained at similar levels. It is worth noting that in terms the conflict resolution codes of Tabling (TAB) and Capitulation (CAP) were not observed, indicating a group that in its final stage chose to resolve all its conflict via Open Discussion (OD).

#### ***4.1.2.5 Stage 1 - Model Appropriations.***

Table 4:5 and Graph 4:5 present the descriptive statistics and the cumulative percentages for the MACS codes for Case A - Stage 1 respectively.

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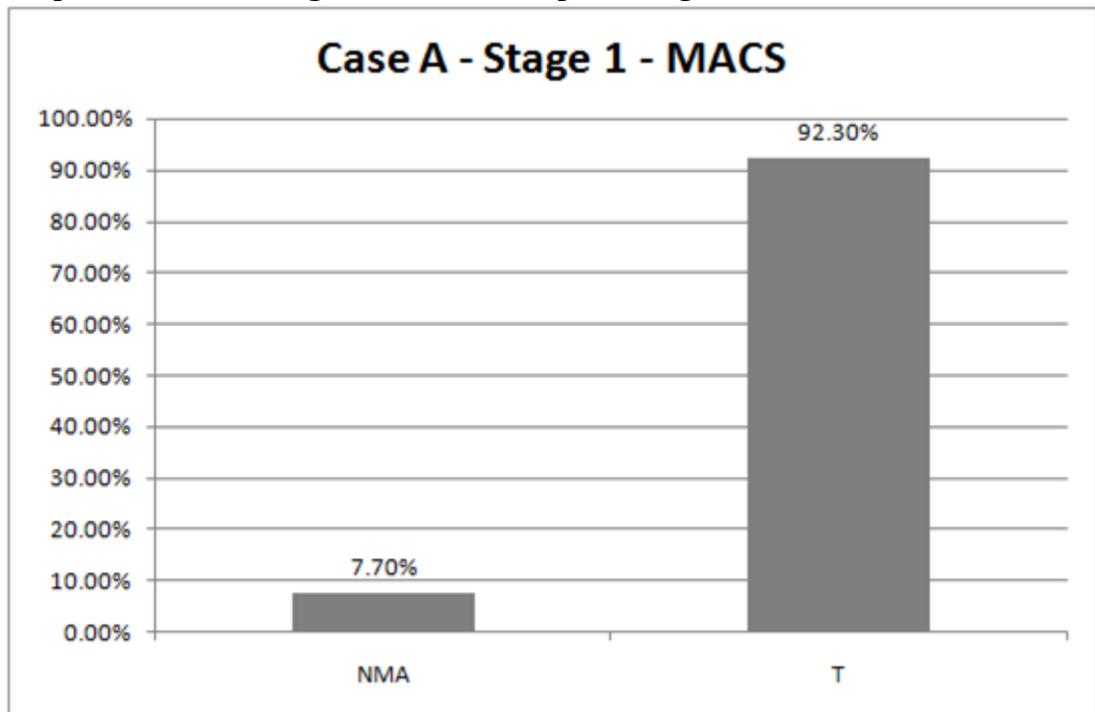
<sup>57</sup> Slight differences between the sums of time across the GWRCS and MACS coded data are addressed in section 4.1.5 “A Clarification Note on Time Delineation”.

**Table 4:5 Case A / Stage 1 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time_seconds
N	Valid	2	2
	Missing	0	0
Mean			455.3450
Std. Error of Mean			385.22500
Median			455.3450
Mode			70.12 <sup>a</sup>
Std. Deviation			544.79042
Variance			296796.601
Range			770.45
Minimum			70.12
Maximum			840.57
Sum			910.69

a. Multiple modes exist. The smallest value is shown

**Graph 4:5 Case A/ Stage 1 - Cumulative percentages of MACS codes.**



For Case A - Stage 1, the mean time spent on the MACS codes observed was 455 seconds, with a st. deviation of 544 seconds, for the 2 sequential instances (i.e. valid

N) of two MACS codes (Graph 4:5). The total time spent in stage 1 can be observed to be 910 seconds<sup>58</sup>.

It can be further observed that for Case A - Stage 1 92% of the time was spent in Typing with the remaining 7.7% of the time being devoted to No Model Appropriation interaction.

#### 4.1.2.6 Stage 2 - Model Appropriations.

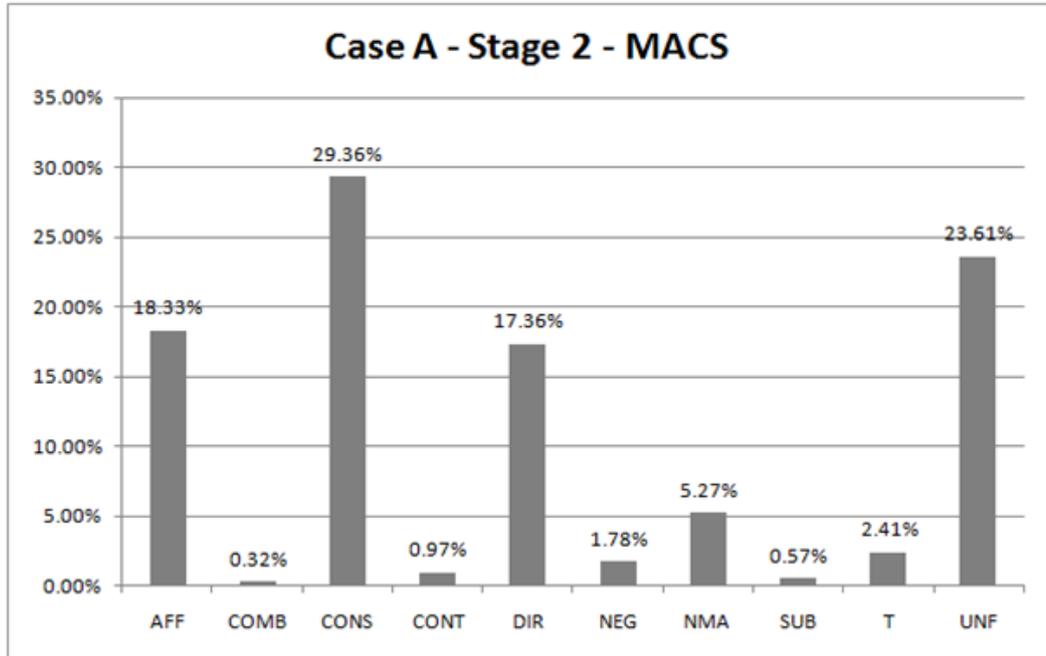
Table 4:6 and Graph 4:6 present the descriptive statistics and the cumulative percentages for the MACS codes for Case A - Stage 2 respectively.

**Table 4:6 Case A / Stage 2 / MACS - Descriptive Statistics.**

Statistics			
		MACS	time seconds
N	Valid	107	107
	Missing	0	0
Mean			44.8841
Std. Error of Mean			3.21744
Median			35.0600
Mode			19.48
Std. Deviation			33.28145
Variance			1107.655
Range			206.48
Minimum			11.69
Maximum			218.17
Sum			4802.60

<sup>58</sup> For an explanation about the slight total time discrepancies between the same stages coded with the GWRCS and the MACS please see section 4.1.5 “A Clarification Note on Time Delineation”.

**Graph 4:6 Case A/ Stage 2 - Cumulative percentages of MACS codes.**



For Case A - Stage 2, the mean time spent on the MACS codes observed was 45 seconds, with a st. deviation of 33 seconds, for the 107 sequential instances (i.e. valid N) of ten MACS codes (Graph 4:6). The total time spent in stage 2 was 4803 seconds.

It can be observed that for Case A - Stage 2 most of the time was spent in Affirmation, Constraint, Direct and Unfocussed MACS codes, with a small amount of time spent on Typing.

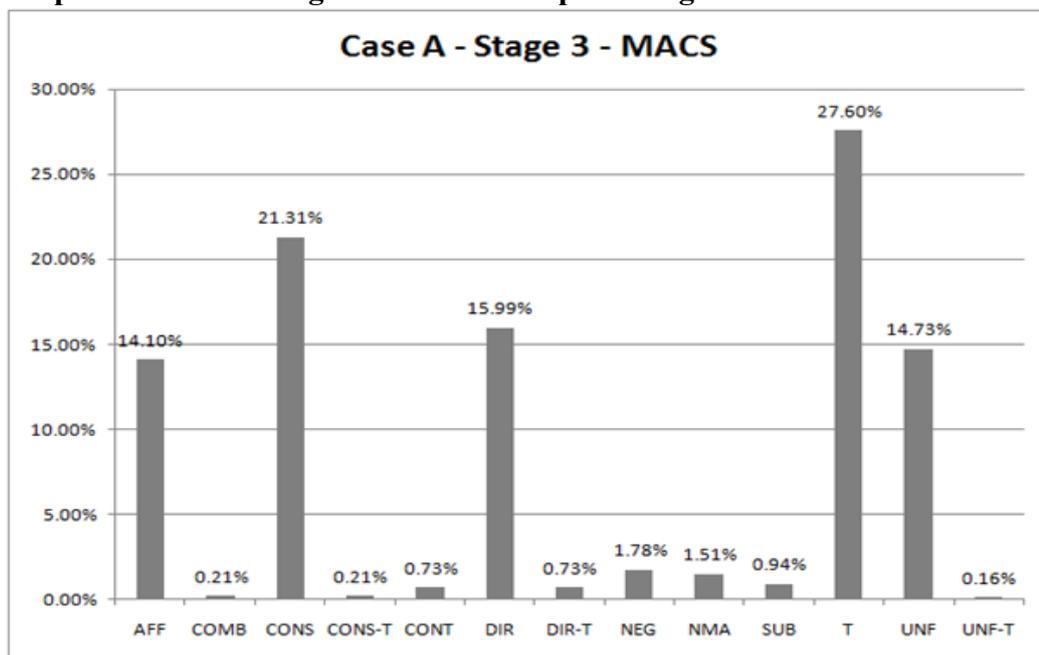
#### ***4.1.2.7 Stage 3 - Model Appropriations.***

Table 4:7 and Graph 4:7 present the descriptive statistics and the cumulative percentages for the MACS codes for Case A - Stage 3 respectively.

**Table 4:7 Case A / Stage 3 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time seconds
N	Valid	137	137
	Missing	0	0
Mean			54.4347
Std. Error of Mean			6.55728
Median			35.0620
Mode			19.48
Std. Deviation			76.75099
Variance			5890.714
Range			568.02
Minimum			11.69
Maximum			579.70
Sum			7457.55

**Graph 4:7 Case A/ Stage 3 - Cumulative percentages of MACS codes.**



For Case A - Stage 3, the mean time spent on the MACS codes observed was 54 seconds, with a st. deviation of 78 seconds, for the 137 sequential instances (i.e. valid N) of thirteen MACS codes (Graph 4:7). The total time spent in stage 3 was 7457 seconds.

It can be observed that for Case A - Stage 3 most of the time was spent in Typing as well as (and similarly to stage 2) in Affirmation, Constraint, Direct and Unfocussed MACS codes, with small amounts of time spent on the rest of MACS codes as well as in the composite codes indicating interaction during Typing [i.e. small Constraint (CONS-T), Direct (DIR-T) and Unfocussed (UNF-T) periods during Typing].

#### 4.1.2.8 Stage 4 - Model Appropriations.

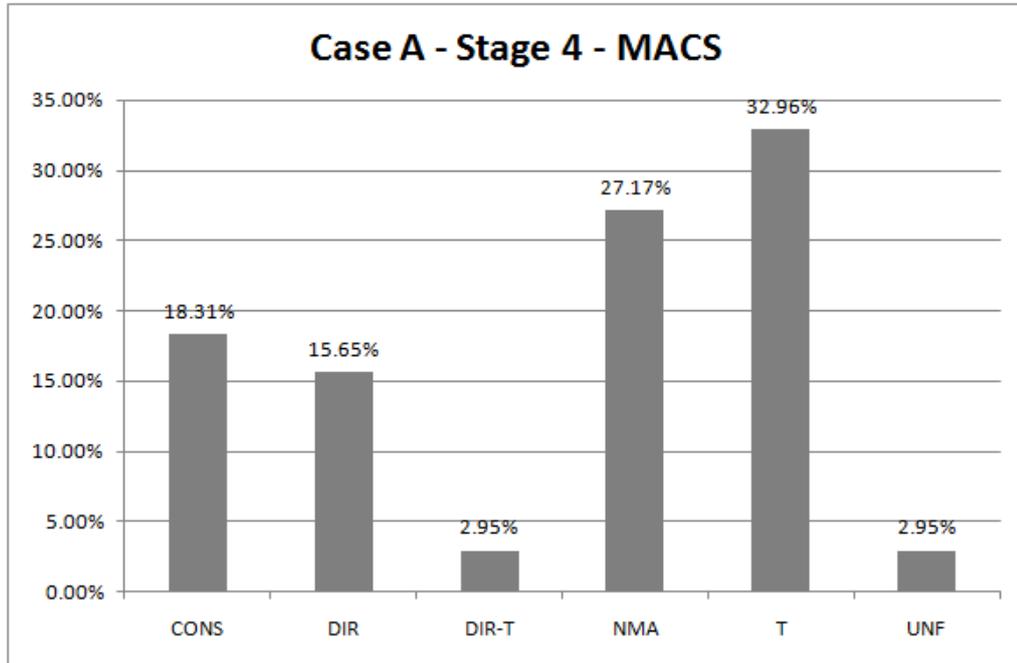
Table 4:8 and Graph 4:8 present the descriptive statistics and the cumulative percentages for the MACS codes for Case A - Stage 4 respectively.

**Table 4:8 Case A / Stage 4 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time seconds
N	Valid	23	23
	Missing	0	0
Mean			57.3534
Std. Error of Mean			11.67360
Median			35.0620
Mode			23.38 <sup>a</sup>
Std. Deviation			55.98461
Variance			3134.277
Range			220.19
Minimum			11.69
Maximum			231.88
Sum			1319.13

a. Multiple modes exist. The smallest value is shown

**Graph 4:8 Case A/ Stage 4 - Cumulative percentages of MACS codes.**



For Case A - Stage 4, the mean time spent on the MACS codes observed was 57 seconds, with a st. deviation of 56 seconds, for the 23 sequential instances (i.e. valid N) of six MACS codes (Graph 4:8). The total time spent in stage 4 was 1319 seconds.

It can be observed that for Case A - Stage 4 most of the time was spent in Typing and No Model Appropriations, with small amounts of time being spent in Unfocussed and Direct during Typing periods of interaction.

### **4.1.3 Case B - Descriptive Statistics.**

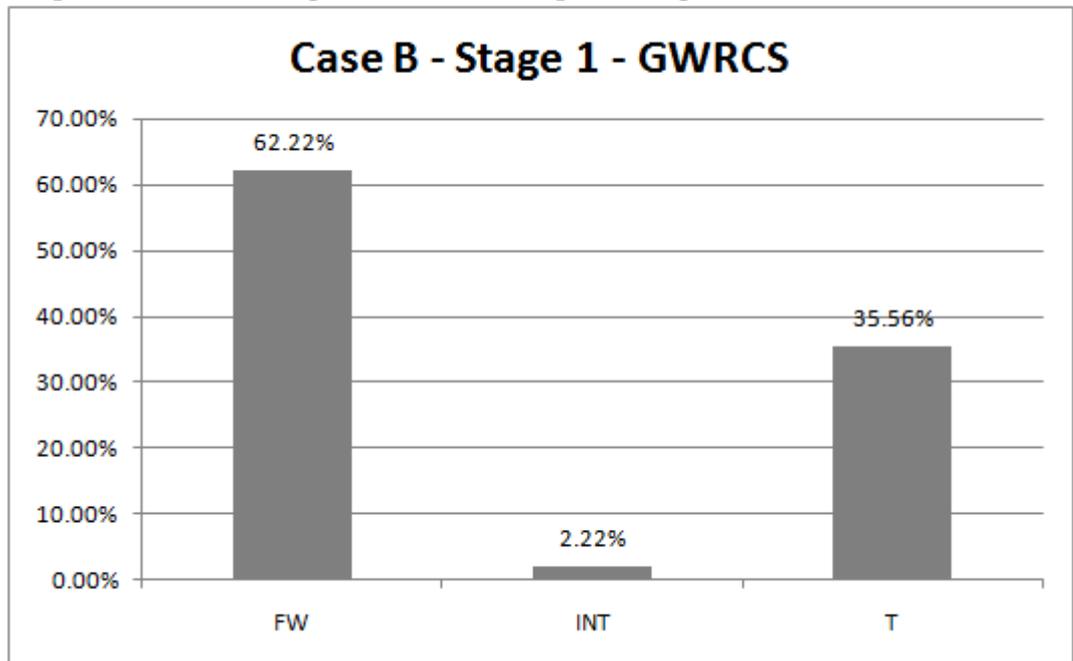
#### ***4.1.3.1 Stage 1 - Group Working Relationships.***

Table 4:9 and Graph 4:9 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case B - Stage 1 respectively.

**Table 4:9 Case B / Stage 1 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time secs
N	Valid	7	7
	Missing	0	0
Mean			179.9357
Std. Error of Mean			59.17345
Median			139.9500
Mode			27.99
Std. Deviation			156.55824
Variance			24510.483
Range			363.87
Minimum			27.99
Maximum			391.86
Sum			1259.55

**Graph 4:9 Case B/ Stage 1 - Cumulative percentages of GWRCS codes.**



For Case B - Stage 1, the mean time spent on the GWRCS codes observed was 180 seconds, with a st. deviation of 157 seconds, for the 7 sequential instances (i.e. valid N) of three GWRCS codes (Graph 4:9). The total time spent in stage 1 was 1260 seconds.

It can be observed that for Case B - Stage 1 most of the time was spent in Focussed Work and Typing, with small amounts of time spent on out-of-focus interaction. No conflict-related interaction was observed in stage 1.

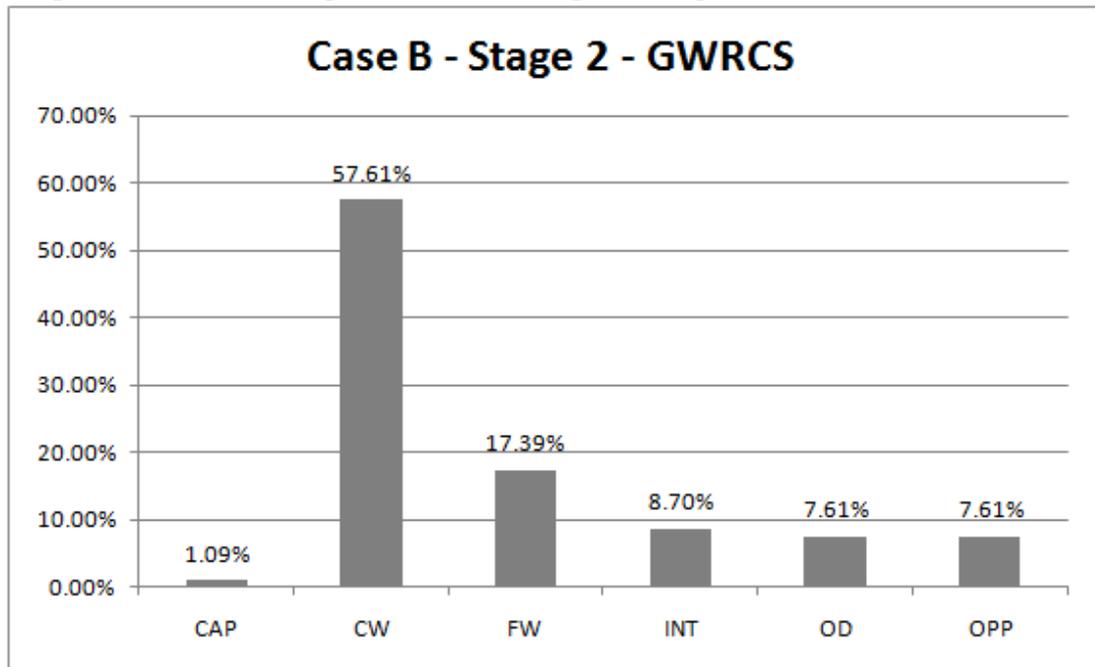
**4.1.3.2 Stage 2 - Group Working Relationships.**

Table 4:10 and Graph 4:10 present the descriptive statistics and the cumulative percentages of the GWRCS codes for Case B - Stage 2 respectively.

**Table 4:10 Case B / Stage 2 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time secs
N	Valid	45	45
	Missing	0	0
Mean			57.2240
Std. Error of Mean			7.27912
Median			27.9900
Mode			27.99
Std. Deviation			48.82979
Variance			2384.349
Range			251.91
Minimum			27.99
Maximum			279.90
Sum			2575.08

**Graph 4:10 Case B/ Stage 2 - Cumulative percentages of GWRCS codes.**



For Case B - Stage 2, the mean time spent on the GWRCS codes observed was 57 seconds, with a st. deviation of 49 seconds, for the 45 sequential instances (i.e. valid N) of six GWRCS codes (Graph 4:10). The total time spent in stage 2 was 2575 seconds.

It can be observed that for Case B - Stage 2 most of the time was spent in Critical and Focussed Work with most of Opposition being resolved through Open Discussion.

Rather interestingly no Typing periods have been observed for stage 2. No typing meant that the group focussed solely on the development and analysis of the model-concepts gathered in stage 1 with no new concepts added in a group fashion. This does not go to say that the model remained the same, it merely presents a situation in which no new distinct concepts were gathered in a group fashion, utilising the technology at hand.

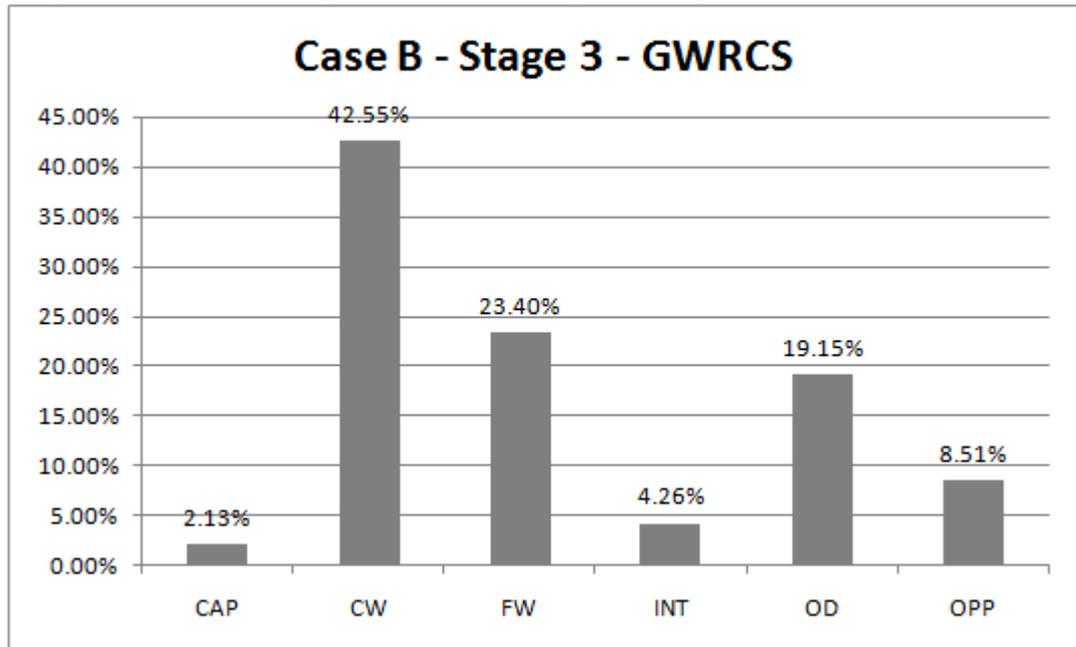
**4.1.3.3 Stage 3 - Group Working Relationships.**

Table 4:11 and Graph 4:11 present the descriptive statistics and the cumulative percentages of the GWRCS codes for Case B - Stage 3 respectively.

**Table 4:11 Case B / Stage 3 / GWRCS - Descriptive Statistics.**

Statistics			
		GWRCS	time secs
N	Valid	18	18
	Missing	0	0
Mean			73.0850
Std. Error of Mean			17.69359
Median			41.9850
Mode			27.99
Std. Deviation			75.06754
Variance			5635.136
Range			251.91
Minimum			27.99
Maximum			279.90
Sum			1315.53

**Graph 4:11 Case B/ Stage 3 - Cumulative percentages of GWRCS codes.**



For Case B - Stage 3, the mean time spent on the GWRCS codes observed was 73 seconds, with a st. deviation of 75 seconds, for the 18 sequential instances (i.e. valid N) of six GWRCS codes (Graph 4:11). The total time spent in stage 3 was 1315 seconds.

It can be observed that for Case B - Stage 3 most of the time was spent in Critical and Focussed Work with most of Opposition being resolved through Open Discussion.

Similarly to stage 2, no time was spent in Typing.

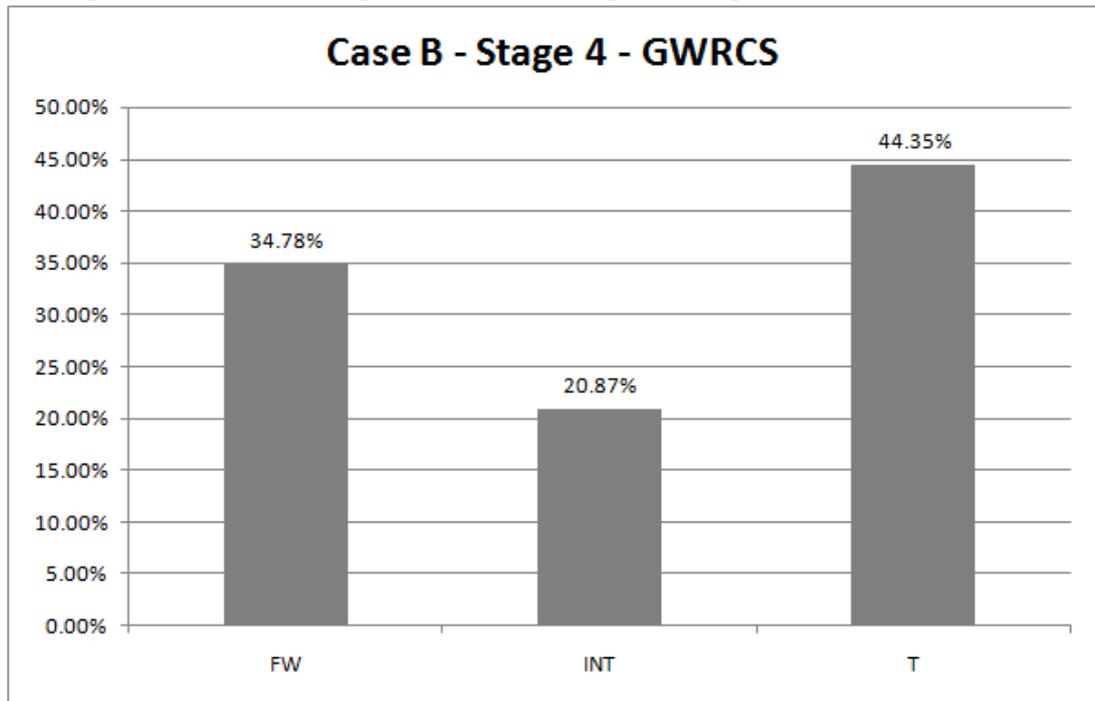
#### **4.1.3.4 Stage 4 - Group Working Relationships.**

Table 4:12 and Graph 4:12 present the descriptive statistics and the cumulative percentages of the GWRCS codes for Case B - Stage 4 respectively.

**Table 4:12 Case B / Stage 4 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time secs
N	Valid	27	27
	Missing	0	0
Mean			119.2167
Std. Error of Mean			25.02577
Median			55.9800
Mode			27.99
Std. Deviation			130.03771
Variance			16909.807
Range			447.84
Minimum			27.99
Maximum			475.83
Sum			3218.85

**Graph 4:12 Case B/ Stage 4 - Cumulative percentages of GWRCS codes.**



For Case B - Stage 4, the mean time spent on the GWRCS codes observed was 119 seconds, with a st. deviation of 130 seconds, for the 27 sequential instances (i.e. valid N) of three GWRCS codes (Graph 4:12). The total time spent in stage 4 was 3218 seconds.

It can be observed that for Case B - Stage 4 most of the time was spent in Typing with fair amounts of time spent on both Focussed and out-of-focus (i.e. INT) interaction. Also, it is interesting to note that no conflict-related codes were observed in stage 4.

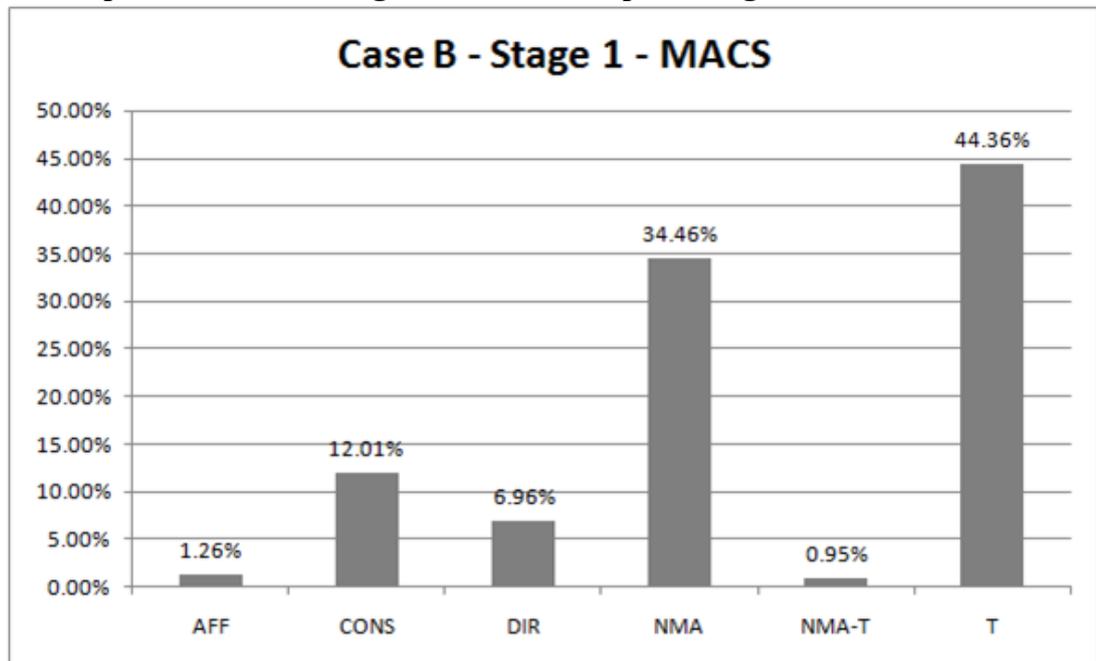
#### ***4.1.3.5 Stage 1 - Model Appropriations.***

Table 4:13 and Graph 4:13 present the descriptive statistics and the cumulative percentages for the MACS codes for Case B - Stage 1 respectively.

**Table 4:13 Case B / Stage 1 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time_seconds
N	Valid	11	11
	Missing	0	0
Mean			95.6027
Std. Error of Mean			36.60090
Median			58.3100
Mode			13.30
Std. Deviation			121.39147
Variance			14735.889
Range			398.22
Minimum			9.97
Maximum			408.19
Sum			1051.63

**Graph 4:13 Case B/ Stage 1 - Cumulative percentages of MACS codes.**



For Case B - Stage 1, the mean time spent on the MACS codes observed was 97 seconds, with a st. deviation of 121 seconds, for the 11 sequential instances (i.e. valid N) of six MACS codes (Graph 4:13). The total time spent in stage 1 was 1052 seconds.

It can be observed that for Case B - Stage 1 most of the time was spent in Typing and No Model Appropriations, with small amounts of time being spent in Affirmation and Direct periods of interaction.

**4.1.3.6 Stage 2 - Model Appropriations.**

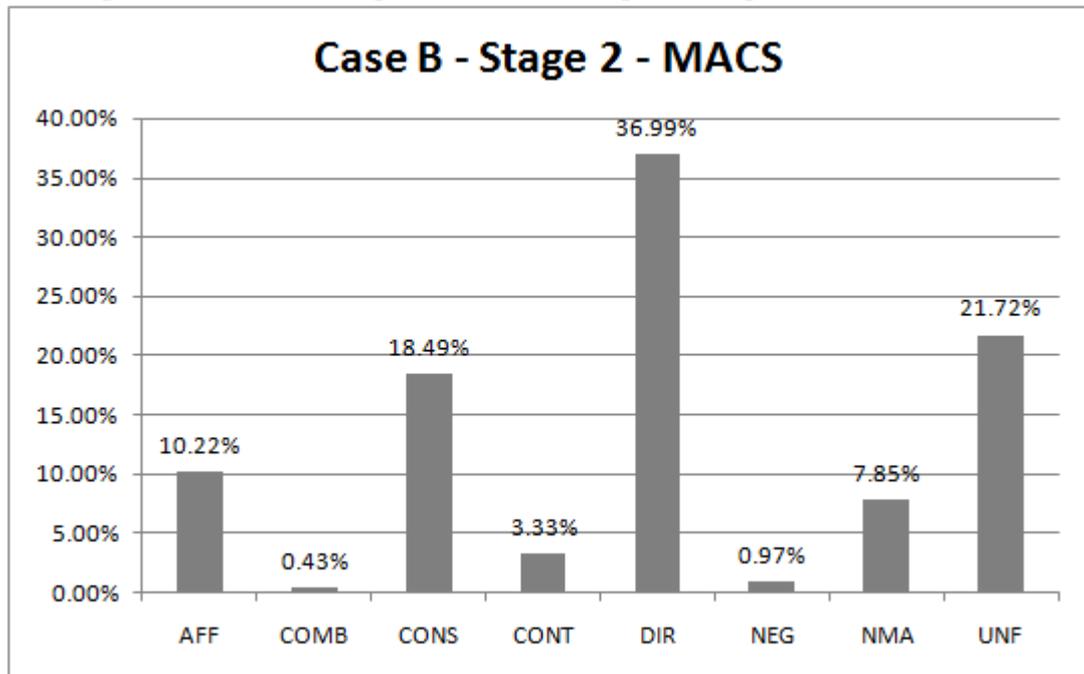
Table 4:14 and Graph 4:14 present the descriptive statistics and the cumulative percentages for the MACS codes for Case B - Stage 2 respectively.

**Table 4:14 Case B / Stage 2 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time_seconds
N	Valid	70	70
	Missing	0	0
Mean			44.1700
Std. Error of Mean			4.52926
Median			29.9220
Mode			13.30 <sup>a</sup>
Std. Deviation			37.89450
Variance			1435.993
Range			182.85
Minimum			9.97
Maximum			192.83
Sum			3091.90

a. Multiple modes exist. The smallest value is shown

**Graph 4:14 Case B/ Stage 2 - Cumulative percentages of MACS codes.**



For Case B - Stage 2, the mean time spent on the MACS codes observed was 44 seconds, with a st. deviation of 38 seconds, for the 70 sequential instances (i.e. valid N) of eight MACS codes (Graph 4:14). The total time spent in stage 2 was 3092 seconds.

It can be observed that for Case B - Stage 2 most of the time was spent in Direct, Unfocussed and Constraint interaction. Extremely small amounts of time were spent in Combination and Negative periods of interaction.

As previously noted, when presenting the GWRCs descriptive statistics for Case B - Stage 2, no time was spent in Typing.

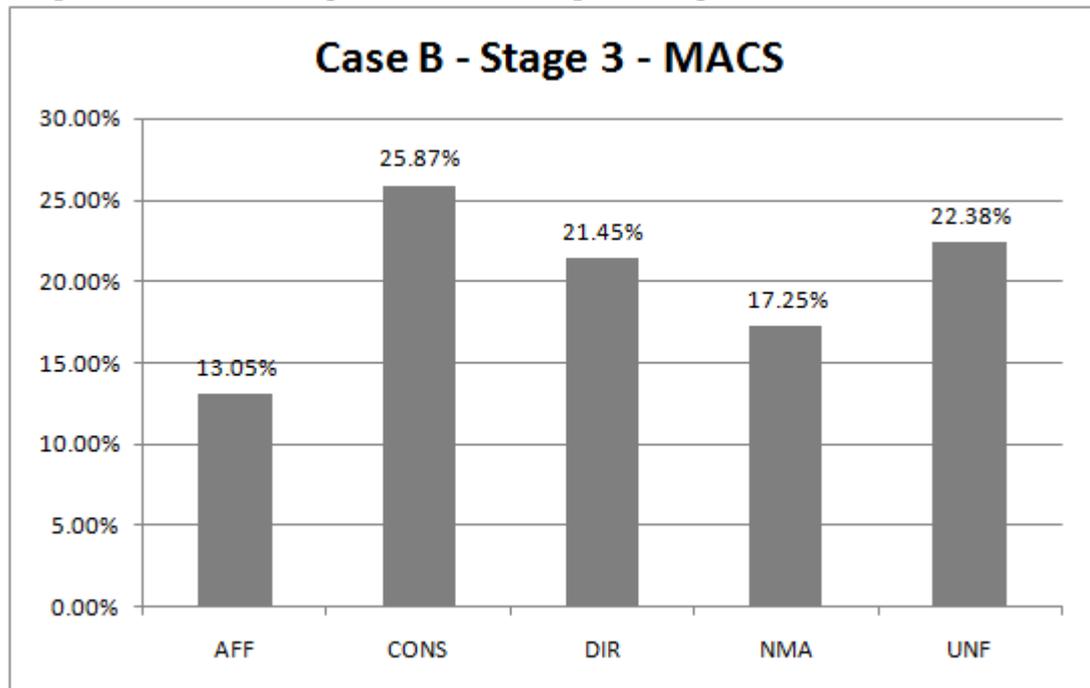
#### ***4.1.3.7 Stage 3 - Model Appropriations.***

Table 4:15 and Graph 4:15 present the descriptive statistics and the cumulative percentages for the MACS codes for Case B - Stage 3 respectively.

**Table 4:15 Case B / Stage 3 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time_seconds
N	Valid	24	24
	Missing	0	0
Mean			59.4275
Std. Error of Mean			8.69610
Median			53.1940
Mode			13.30
Std. Deviation			42.60201
Variance			1814.931
Range			152.93
Minimum			9.97
Maximum			162.91
Sum			1426.26

**Graph 4:15 Case B/ Stage 3 - Cumulative percentages of MACS codes.**



For Case B - Stage 3, the mean time spent on the MACS codes observed was 59 seconds, with a st. deviation of 43 seconds, for the 24 sequential instances (i.e. valid N) of five MACS codes (Graph 4:15). The total time spent in stage 3 was 1426 seconds.

It can be observed that for Case B - Stage 3 the time was well spread in Constraint, Direct, No Model and Unfocussed interaction with only Affirmation having a lower than 15% value. As previously noted when presenting the GWRCS descriptive statistics for Case B - Stage 3, no time was spent in Typing.

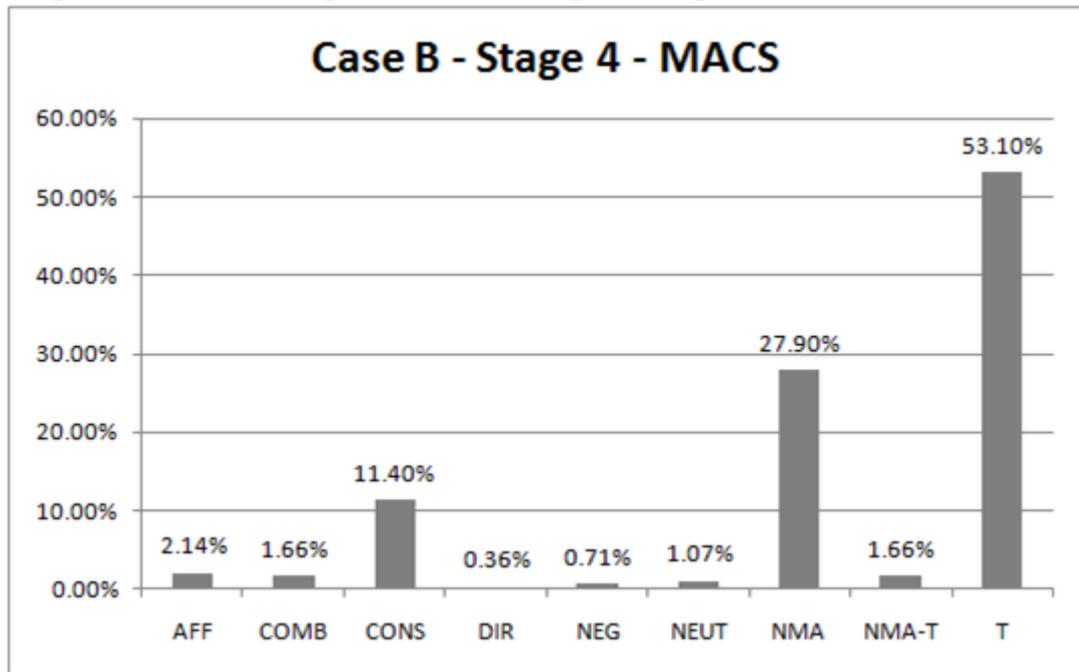
#### **4.1.3.8 Stage 4 - Model Appropriations.**

Table 4:16 and Graph 4:16 present the descriptive statistics and the cumulative percentages for the MACS codes for Case B - Stage 4 respectively.

**Table 4:16 Case B / Stage 4 / MACS - Descriptive Statistics.**

<b>Statistics</b>			
		<b>MACS</b>	<b>time_seconds</b>
N	Valid	32	32
	Missing	0	0
Mean			87.5063
Std. Error of Mean			22.47404
Median			41.5575
Mode			13.30
Std. Deviation			127.13239
Variance			16162.645
Range			544.00
Minimum			9.97
Maximum			553.97
Sum			2800.20

**Graph 4:16 Case B/ Stage 4 - Cumulative percentages of MACS codes.**



For Case B - Stage 4, the mean time spent on the MACS codes observed was 87 seconds, with a st. deviation of 127 seconds, for the 32 sequential instances (i.e. valid N) of nine MACS codes (Graph 4:16). The total time spent in stage 4 was 2800 seconds.

It can be observed that for Case B - Stage 4 most of the time was spent in Typing and No Model Appropriation with 11% of the time spent in Constraining the model. The rest 6 MACS codes presented very low duration values ranging from 0.36% to 2.14%.

#### **4.1.4 Case C - Descriptive Statistics..**

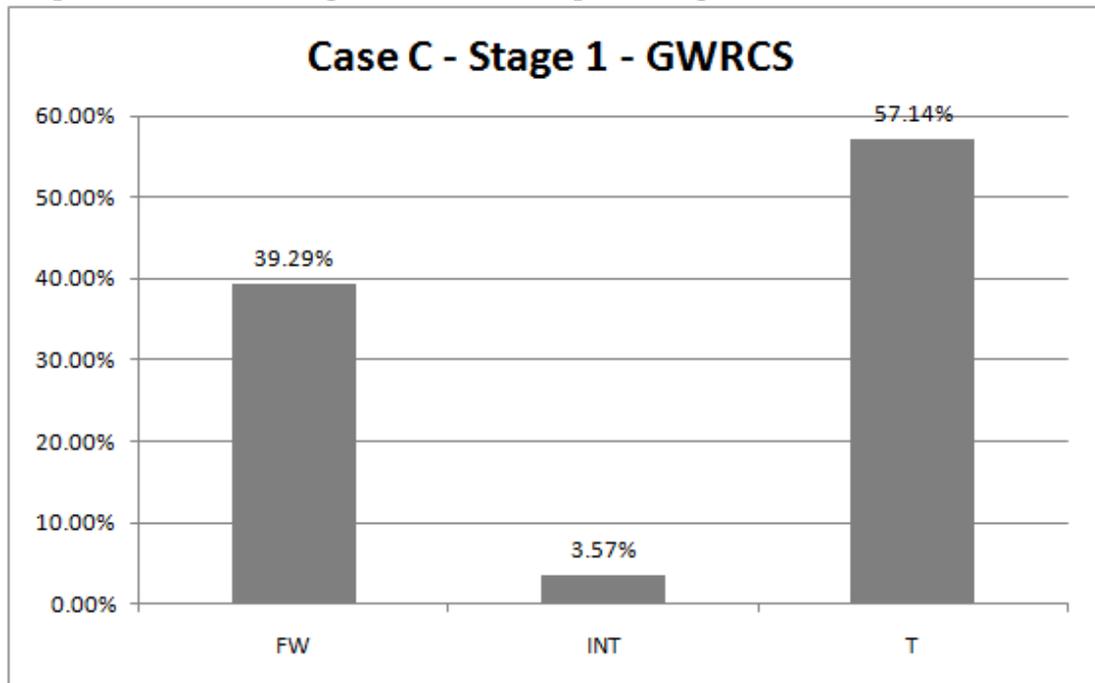
##### ***4.1.4.1 Stage 1 - Group Working Relationships.***

Table 4:17 and Graph 4:17 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case C - Stage 1 respectively.

**Table 4:17 Case C / Stage 1 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time_secs
N	Valid	5	5
	Missing	0	0
Mean			157.5280
Std. Error of Mean			81.81914
Median			56.2600
Mode			28.13
Std. Deviation			182.95316
Variance			33471.859
Range			421.95
Minimum			28.13
Maximum			450.08
Sum			787.64

**Graph 4:17 Case C/ Stage 1 - Cumulative percentages of GWRCS codes.**



For Case C - Stage 1, the mean time spent on the GWRCS codes observed was 157 seconds, with a st. deviation of 183 seconds, for the 5 sequential instances (i.e. valid N) of three GWRCS codes (Graph 4:17). The total time spent in stage 1 was 787 seconds.

Similarly to that of Case B - Stage 2, in Case C - Stage 1 most of the time was spent in Focussed Work and Typing, with small amounts of time spent on out-of-focus interaction. No conflict-related interaction was observed in stage 1.

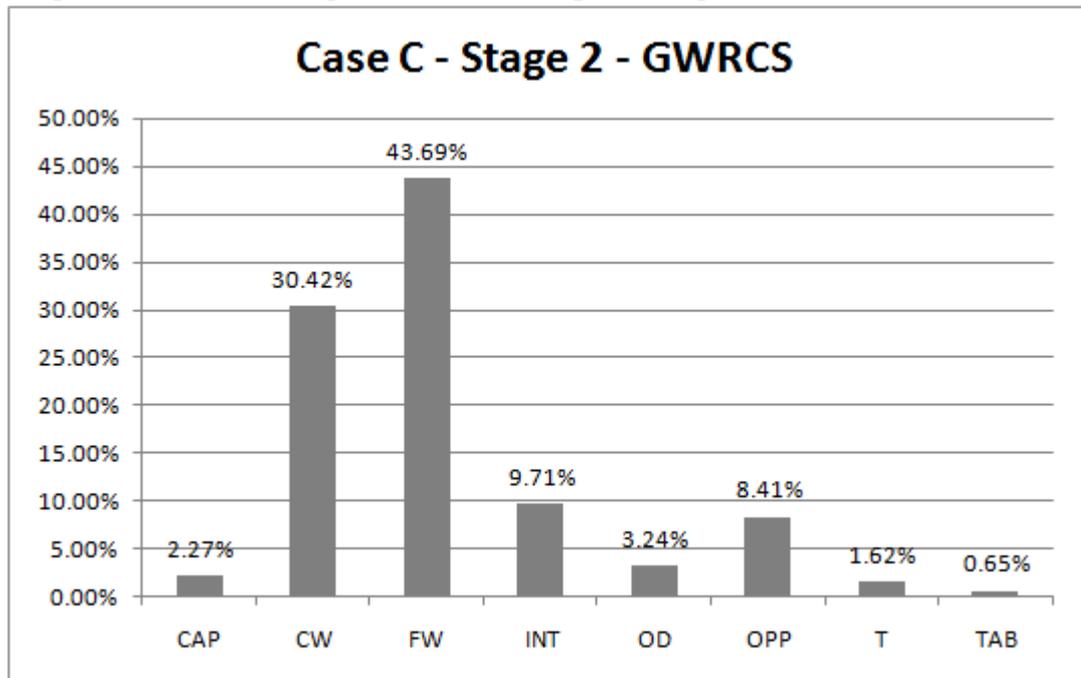
**4.1.4.2 Stage 2 - Group Working Relationships.**

Table 4:18 and Graph 4:18 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case C - Stage 2 respectively.

**Table 4:18 Case C / Stage 2 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time_secs
N	Valid	117	117
	Missing	0	0
Mean			74.2921
Std. Error of Mean			7.46941
Median			56.2600
Mode			28.13
Std. Deviation			80.79403
Variance			6527.675
Range			562.60
Minimum			28.13
Maximum			590.73
Sum			8692.17

**Graph 4:18 Case C/ Stage 2 - Cumulative percentages of GWRCS codes.**



For Case C - Stage 2, the mean time spent on the GWRCS codes observed was 74 seconds, with a st. deviation of 81 seconds, for the 117 sequential instances (i.e. valid N) of eight GWRCS codes (Graph 4:18). The total time spent in stage 2 was 8692 seconds.

Most of the time in Case C - Stage 2 was spent in Focused and Critical Work with a combined percentage of 74%. Relative to stage 1, a significant amount of time (9.71%) was spent in out-of-focus interaction with a very small amount of time spent in Typing (1.62%). It is interesting to note that very small amount of time was devoted when conflict was resolved via Tabling of the conflict (0.65%).

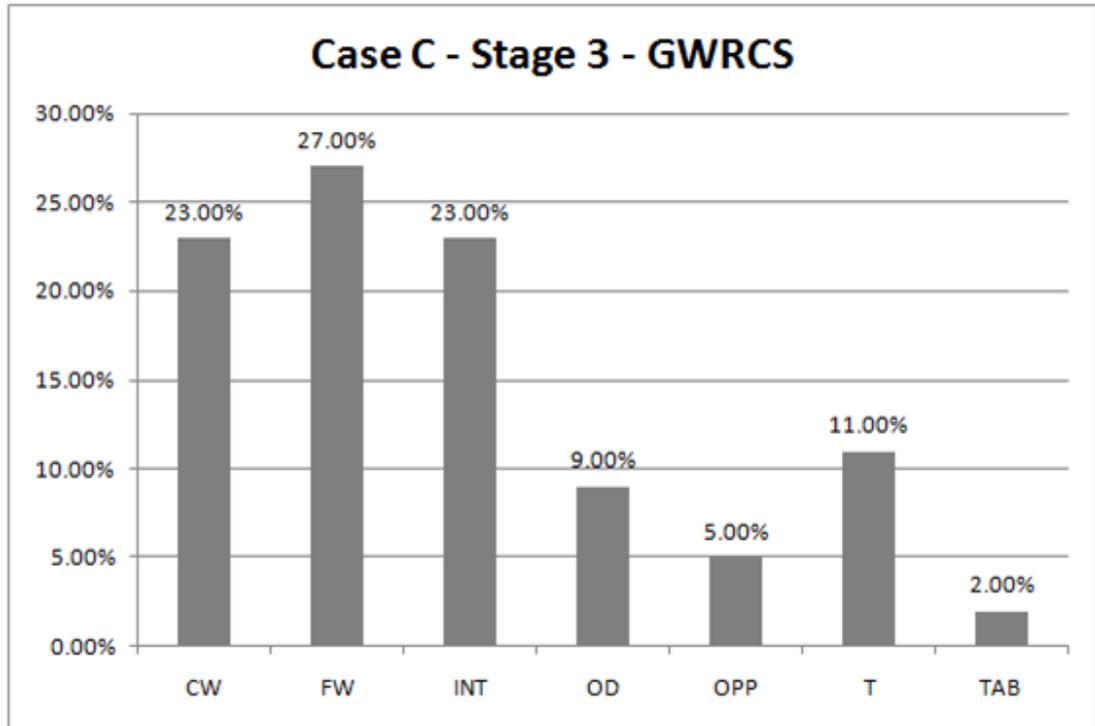
#### ***4.1.4.3 Stage 3 - Group Working Relationships.***

Table 4:19 and Graph 4:19 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case C - Stage 3 respectively.

**Table 4:19 Case C / Stage 3 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time_secs
N	Valid	31	31
	Missing	0	0
Mean			90.7419
Std. Error of Mean			14.85694
Median			56.2600
Mode			28.13
Std. Deviation			82.71996
Variance			6842.591
Range			337.56
Minimum			28.13
Maximum			365.69
Sum			2813.00

**Graph 4:19 Case C/ Stage 3 - Cumulative percentages of GWRCS codes.**



For Case C - Stage 3, the mean time spent on the GWRCS codes observed was 91 seconds, with a st. deviation of 83 seconds, for the 31 sequential instances (i.e. valid

N) of seven GWRCS codes (Graph 4:19). The total time spent in stage 3 was 2813 seconds.

Most of the time in Case C - Stage 3 was spent in Focused and Critical Work (combined of 50%) with surprisingly high amounts of time being spent in out-of-focus work (23%). 16% of the time was spent in conflict related interaction while the conflict resolution style code of Capitulation was not observed at all.

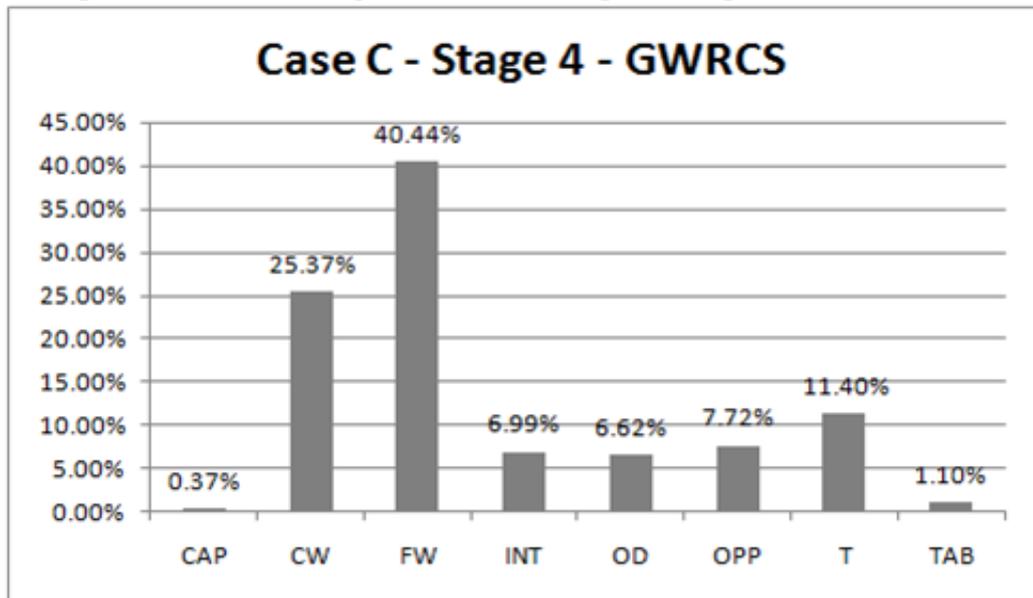
#### **4.1.4.4 Stage 4 - Group Working Relationships.**

Table 4:20 and Graph 4:20 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case C - Stage 4 respectively.

**Table 4:20 Case C / Stage 4 / GWRCS - Descriptive Statistics.**

<b>Statistics</b>			
		<b>GWRCS</b>	<b>time_secs</b>
N	Valid	96	96
	Missing	0	0
Mean			79.7017
Std. Error of Mean			8.09546
Median			56.2600
Mode			28.13
Std. Deviation			79.31900
Variance			6291.504
Range			618.86
Minimum			28.13
Maximum			646.99
Sum			7651.36

**Graph 4:20 Case C/ Stage 4 - Cumulative percentages of GWRCS codes.**



For Case C - Stage 4, the mean time spent on the GWRCS codes observed was 80 seconds, with a st. deviation of 79 seconds, for the 96 sequential instances (i.e. valid N) of eight GWRCS codes (Graph 4:20). The total time spent in stage 4 was 7651 seconds.

As in the previous stages most of the time in Case C - Stage 4 was spent in Focused and Critical Work (combined of 66%). Around 17% of the time was spent in conflict related interaction with the conflict resolution style code of Capitulation taking up a mere 0.37% of the overall time.

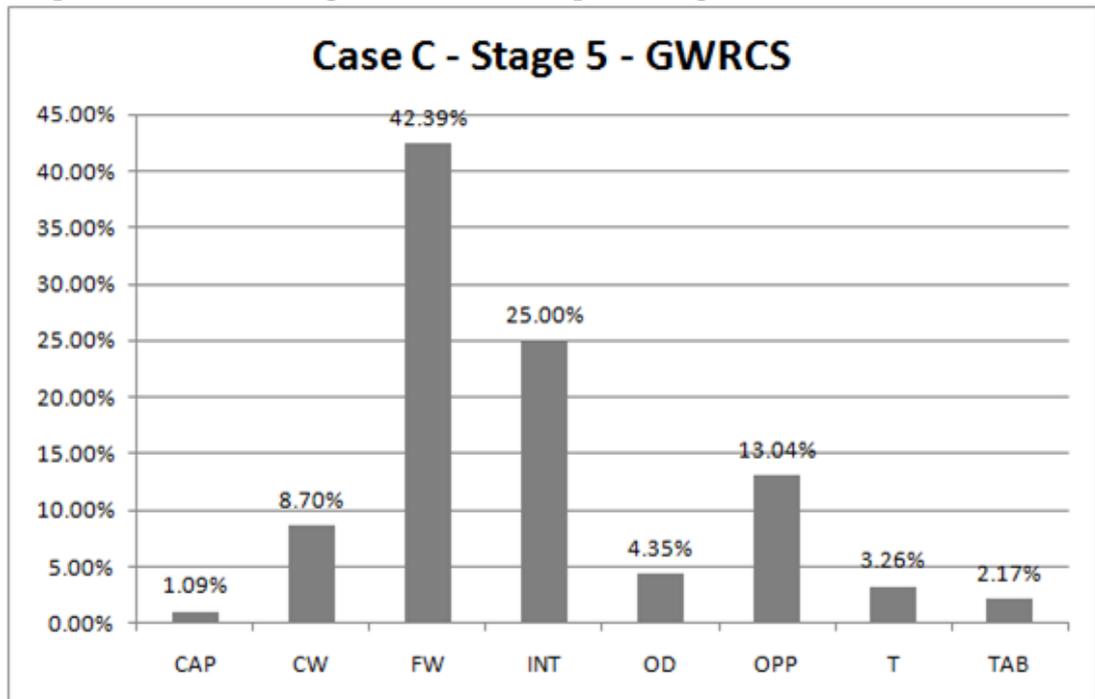
#### ***4.1.4.5 Stage 5- Group Working Relationships.***

Table 4:21 and Graph 4:21 present the descriptive statistics and the cumulative percentages for the GWRCS codes for Case C - Stage 5 respectively.

**Table 4:21 Case C / Stage 5 / GWRCS - Descriptive Statistics.**

		Statistics	
		GWRCS	time_secs
N	Valid	44	44
	Missing	0	0
Mean			58.8173
Std. Error of Mean			6.39021
Median			56.2600
Mode			28.13
Std. Deviation			42.38784
Variance			1796.729
Range			168.78
Minimum			28.13
Maximum			196.91
Sum			2587.96

**Graph 4:21 Case C/ Stage 5 - Cumulative percentages of GWRCS codes.**



For Case C - Stage 5, the mean time spent on the GWRCS codes observed was 59 seconds, with a st. deviation of 42 seconds, for the 44 sequential instances (i.e. valid N) of eight GWRCS codes (Graph 4:21). The total time spent in stage 5 was 2588 seconds.

Around 51% of the time in Case C - Stage 5 was spent in Focused and Critical Work. Compared to the other stages, and similarly only to stage 3, surprisingly high amounts of time were spent in out-of-focus interaction (25%). A mere 3.26% of the time was spent in Typing. The time spent in conflict related interaction was slightly increased in relation to the rest of the stages but nevertheless offered for no surprises being around 20%.

Interestingly enough, when examined on a stage by stage manner, a switch in terms of the non-beneficiary conflict resolution styles can be observed. This is since while in stage 2 Capitulation took up more time than Tabling, in stages 3, 4 and 5 Tabling is observed to take up more time than Capitulation. It further appears that while the beneficiary conflict resolution style of Open Discussion constantly took up more time than Capitulation and Tabling, it kicked-off with small amounts of time spent to it. The time spent in Open Discussion then climaxed in stage 3 with constantly retracting (in terms of time duration) in stages 4 and 5.

Therefore, it appears that the group in Case C experimented with different styles of conflict resolution before seemingly reaching to steady-state behaviour. This view is further supported as will be evidenced throughout the rest of the analysis chapter.

#### ***4.1.4.6 Stage 1 - Model Appropriations.***

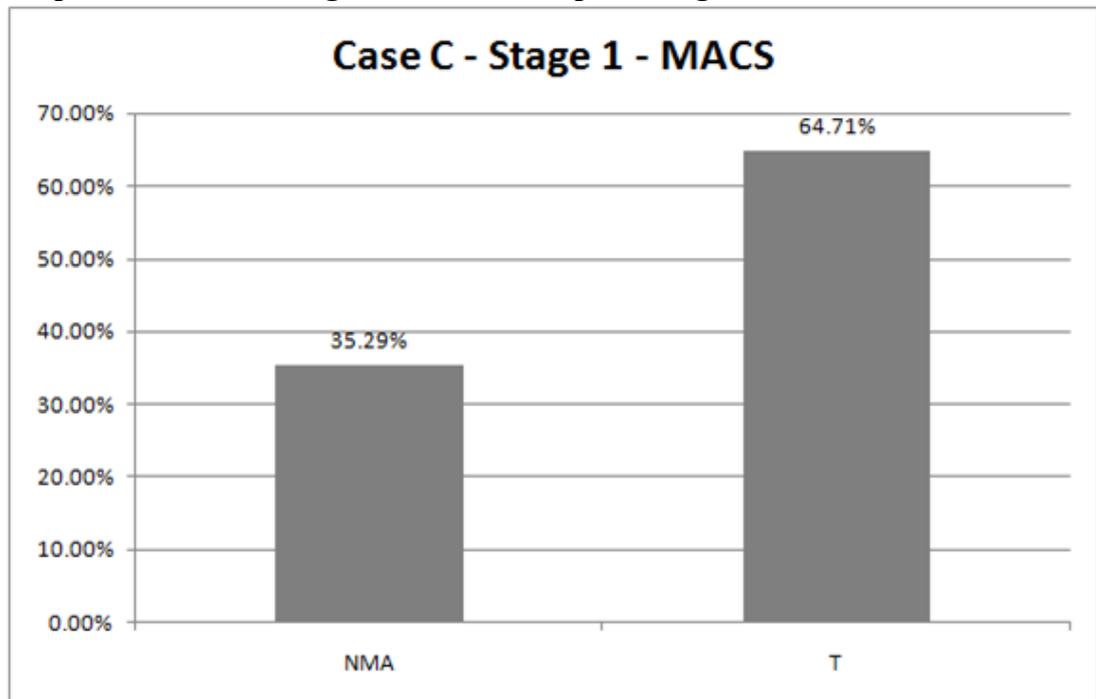
Table 4:22 and Graph 4:22 present the descriptive statistics and the cumulative percentages for the MACS codes for Case C - Stage 1 respectively.

**Table 4:22 Case C / Stage 1 / MACS - Descriptive Statistics.**

		Statistics	
		MACS	time_seconds
N	Valid	3	3
	Missing	0	0
Mean			217.1200
Std. Error of Mean			106.15376
Median			164.7400
Mode			65.13 <sup>a</sup>
Std. Deviation			183.86370
Variance			33805.861
Range			356.36
Minimum			65.13
Maximum			421.49
Sum			651.36

a. Multiple modes exist. The smallest value is shown

**Graph 4:22 Case C/ Stage 1 - Cumulative percentages of MACS codes.**



For Case C - Stage 1, the mean time spent on the MACS codes observed was 217 seconds, with a st. deviation of 184 seconds, for the 3 sequential instances (i.e. valid

N) of two MACS codes (Graph 4:22). The total time spent in stage 1 was 651 seconds.

It can be observed that for Case C - Stage 1 most of the time was spent in Typing (65%) with the remaining time spent in No Model Appropriation interaction (35%).

#### **4.1.4.7 Stage 2 - Model Appropriations.**

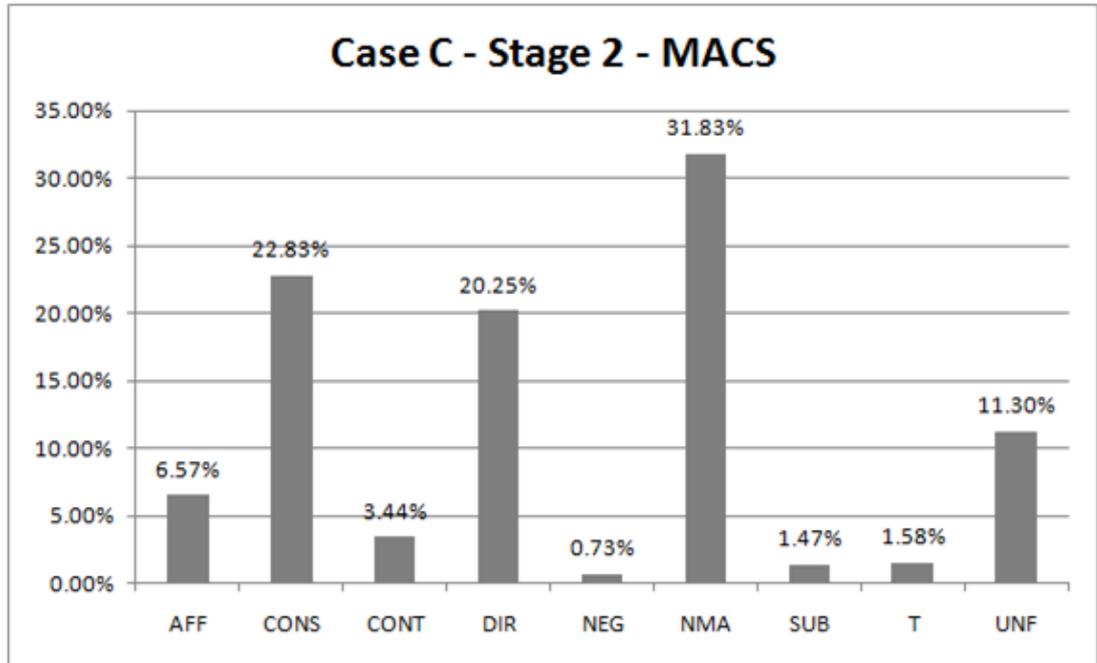
Table 4:23 and Graph 4:23 present the descriptive statistics and the cumulative percentages for the MACS codes for Case C - Stage 2 respectively.

**Table 4:23 Case C / Stage 2 / MACS - Descriptive Statistics.**

		<b>Statistics</b>	
		MACS	time_seconds
N	Valid	156	156
	Missing	0	0
Mean			53.4730
Std. Error of Mean			3.45066
Median			42.1400
Mode			11.49 <sup>a</sup>
Std. Deviation			43.09877
Variance			1857.504
Range			264.35
Minimum			11.49
Maximum			275.84
Sum			8341.79

a. Multiple modes exist. The smallest value is shown

**Graph 4:23 Case C/ Stage 2 - Cumulative percentages of MACS codes.**



For Case C - Stage 2, the mean time spent on the MACS codes observed was 53 seconds, with a st. deviation of 43 seconds, for the 156 sequential instances (i.e. valid N) of nine MACS codes (Graph 4:23). The total time spent in stage 2 was 8342 seconds.

It can be observed that for Case C - Stage 2 most of the time was spent in No Model Appropriation, Constraint and Direct interaction (75%). A mere 0.73% of the time was spent in Negation model appropriations while Typing took up only 1.58% of the total time of stage 2.

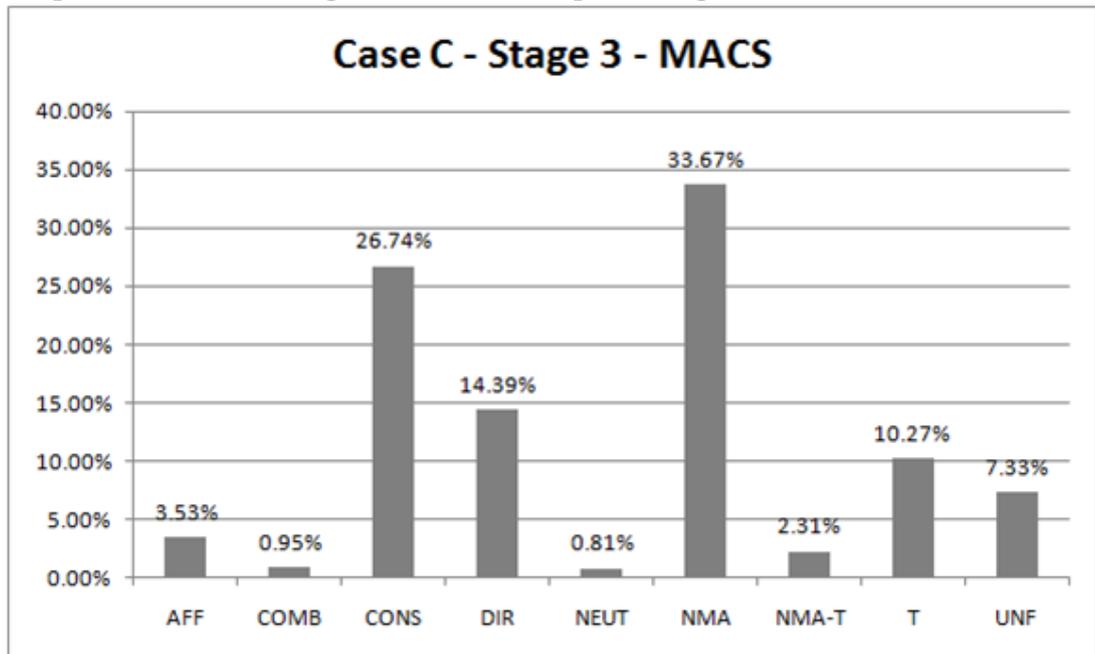
**4.1.4.8 Stage 3 - Model Appropriations.**

Table 4:24 and Graph 4:24 present the descriptive statistics and the cumulative percentages for the MACS codes for Case C - Stage 3 respectively.

**Table 4:24 Case C / Stage 3 / MACS - Descriptive Statistics.**

Statistics		
	MACS	time_seconds
N	Valid	51
	Missing	0
Mean		55.3365
Std. Error of Mean		5.97456
Median		45.9700
Mode		22.99
Std. Deviation		42.66691
Variance		1820.465
Range		172.91
Minimum		11.49
Maximum		184.40
Sum		2822.16

**Graph 4:24 Case C/ Stage 3 - Cumulative percentages of MACS codes.**



For Case C - Stage 3, the mean time spent on the MACS codes observed was 55 seconds, with a st. deviation of 43 seconds, for the 51 sequential instances (i.e. valid N) of nine MACS codes (Graph 4:24). The total time spent in stage 3 was 2822 seconds.

Similarly to stage 2, it can be observed that for Case C - Stage 3 most of the time was spent in No Model Appropriation, Constraint and Direct interaction (75%). Each of the Combination and Neutral MACS codes took up no more than 1% of the time in stage 3. Interestingly enough it appears that there was a non-negligible amount of No Model Appropriation interaction spent while Typing (as side conversations). Typing took up 10.27% of the total time, clearly a significant increase compared to stage 2.

Furthermore, compared to stage 2, Unfocused model appropriations took up slightly less time (11.3% for stage 2 Vs 7.33% for stage 3). MACS codes of Affirmation in stage 3 took up almost half of the time observed in stage 2 (6.57% for stage 2 Vs 3.53% for stage 3).

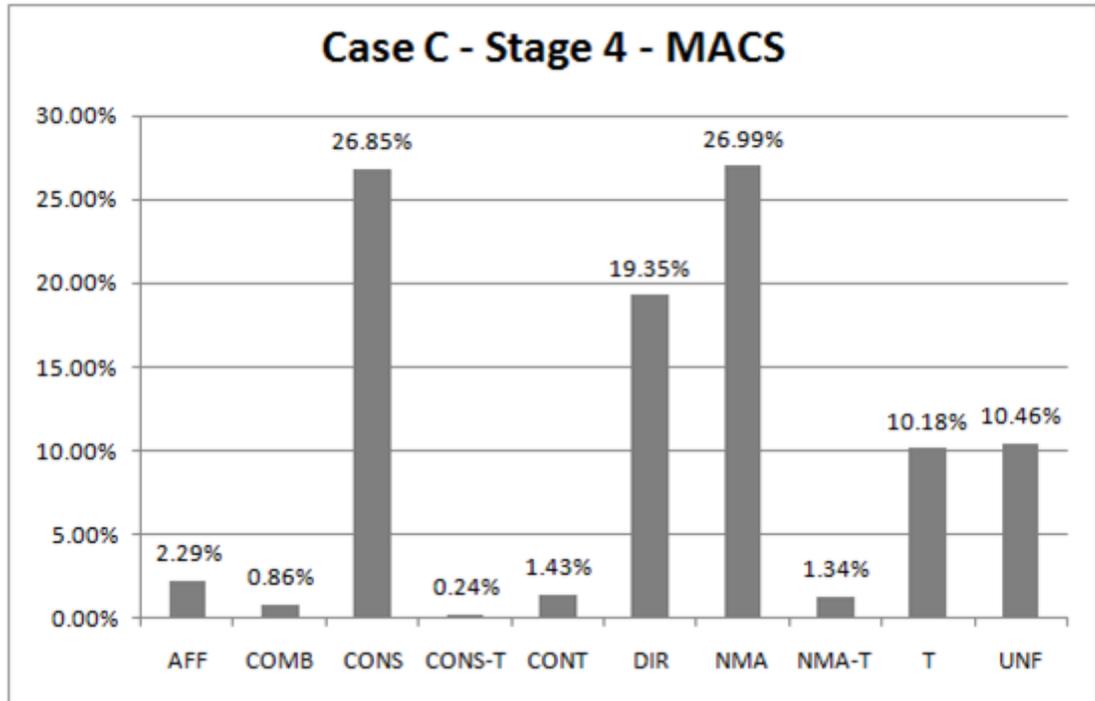
#### 4.1.4.9 Stage 4 - Model Appropriations.

Table 4:25 and Graph 4:25 present the descriptive statistics and the cumulative percentages for the MACS codes for Case C - Stage 4 respectively.

**Table 4:25 Case C / Stage 4 / MACS - Descriptive Statistics.**

Statistics		
	MACS	time_seconds
N	Valid	164
	Missing	0
Mean		48.8974
Std. Error of Mean		3.55775
Median		34.4800
Mode		26.82
Std. Deviation		45.56146
Variance		2075.846
Range		383.66
Minimum		11.49
Maximum		395.15
Sum		8019.18

**Graph 4:25 Case C/ Stage 4 - Cumulative percentages of MACS codes.**



For Case C - Stage 4, the mean time spent on the MACS codes observed was 49 seconds, with a st. deviation of 45 seconds, for the 164 sequential instances (i.e. valid N) of ten MACS codes (Graph 4:25). The total time spent in stage 4 was 8019 seconds.

Similarly to stages 2 and 3, it can be observed that for Case C - Stage 4 most of the time was spent in No Model Appropriation, Constraint and Direct interaction (74%).

It is worth noting the % similarity between stages 2, 3 and 4 with the % value being the three quarters of the time spent. Clearly, No Model Appropriation, Constraint and Direct interaction MACS codes have been consistently observed as the dominant interaction behaviours for Case C (stage 5 results further support this notion).

Similarly to stage 3 Typing took up 10% of stage 4 time, while, and this time similarly to stage 2, Unfocused interaction took up 10% of stage 4 time.

During Typing interaction displayed relatively low time percentages with No Model Appropriation during Typing (NMA-T) taking up 1.34%, while Constraint of the model during Typing took up a mere 0.24% of the total time in stage 4.

Model appropriations of Affirmation maintained their declining duration percentage, albeit at a lower rate when compared to stages 2 and 3.

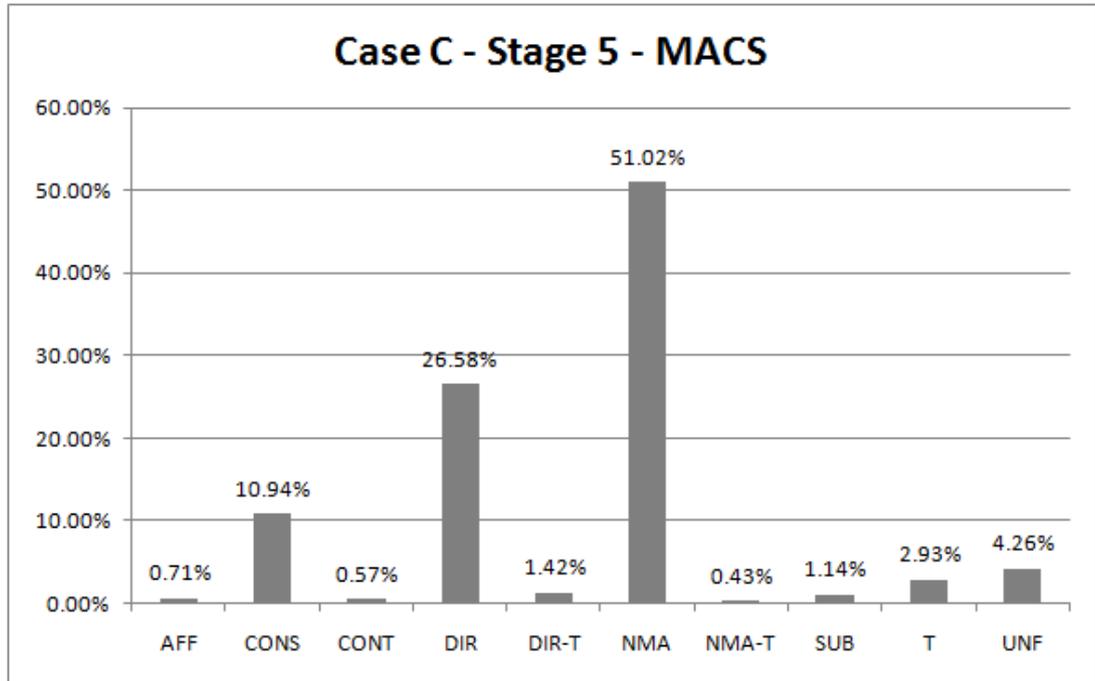
#### ***4.1.4.10 Stage 5 - Model Appropriations.***

Table 4:26 and Graph 4:26 present the descriptive statistics and the cumulative percentages for the MACS codes for Case C - Stage 5 respectively.

**Table 4:26 Case C / Stage 5 / MACS - Descriptive Statistics.**

<b>Statistics</b>			
		<b>MACS</b>	<b>time_seconds</b>
N	Valid	50	50
	Missing	0	0
Mean			53.9138
Std. Error of Mean			7.68835
Median			30.6500
Mode			30.65
Std. Deviation			54.36485
Variance			2955.537
Range			252.86
Minimum			11.49
Maximum			264.35
Sum			2695.69

**Graph 4:26 Case C/ Stage 5 - Cumulative percentages of MACS codes.**



For Case C - Stage 5, the mean time spent on the MACS codes observed was 54 seconds, with a st. deviation of 54 seconds, for the 50 sequential instances (i.e. valid N) of ten MACS codes (Graph 4:26). The total time spent in stage 5 was 2696 seconds.

Similarly to stages 2, 3 and 4 No Model Appropriation, Direct and Constraint codes took up most of the time in stage 5 (nearly 87% of the time). Nevertheless, it is interesting to note the distinct decline of Constraint from around the 25% levels found in stages 2, 3 and 4 to the 11% levels in stage 5. Furthermore, the distinct increase in No Model Appropriation codes (totalling a of 51% for stage 5) compared to the percentages found in stages 2, 3 and 4 as well as the relatively low cross-stage fluctuations of the time spent in Direct MACS codes (with stage 3 presenting the highest deviation compared to the rest of the stages), leads one to consider the possibility that the case C - Stage 5 presented a situation in which as the group

worked through the stages, it preferred one dominant type of MACS interaction over the other.

#### **4.1.5 A Clarification Note on Time Delineation.**

The interested reader may have spotted that depending on the coding scheme used (i.e. GWRCS or MACS) differences on the same stage, in terms of the sums of time, are to be found. How is this possible since stages were clearly delineated? Shouldn't Case A - Stage 3 when coded with the GWRCS display the same total duration with Case A - Stage 3 when coded with the MACS?

The answer is offered by considering some of the intricate details on how time was calculated in order for the data to be analysed based on their duration. The methodological objective was to derive a general average for the thought units as well as for the GWRCS coded units (i.e. 30 seconds) so as to apply it throughout each case observed.

The reason for a per-unit general time was so as to allow the handling of double codes. Recalling that group face-to-face interaction is a very rich form of communication meant that the GWRCS should (and does) allow for double codes to be assigned by segmenting the original 30-second unit into smaller units. Moreover, recall that MACS allows for the assignment of double codes as well as the assignment of codes during Typing (i.e. very small instances of interaction during Typing that nevertheless needed to be captured) [See Appendix 4 'Possible Limitations' and Appendix 5 (point 6)].

The above meant that in order to be able and consistently analyse the data throughout all the stages of a given case a per-case average time duration was necessary. The per-case average time duration was calculated by taking into account

the whole primary codes of a given case, counting the instances of codes be it thought unit or 30-second unit, and then dividing the total time (as clock counted) with the total number of units. In order to offer some consistency and normalisation of the unitised data double codes meant that the 30-second units were actually slightly less than 30 seconds.

For example, in Case A a total of 483 30-second delineations were observed meaning that 14490 seconds were spent in total. Still, the number of GWRCS codes assigned was counted to be 511. This meant that the total time of 14400 needed to be divided by 511 in order to derive the ‘true’ duration of the 30-second units, it being 28.35 seconds.

Depending on the amount of joint codes on a per-case (instead on a per-stage) basis created for the slight time discrepancies observed depending on the coding scheme observed.

This can be further cross-checked by adding up the total times throughout all the stages for both coding schemes employed. As indicated in the following table (Table 4:27, all durations expressed in seconds), albeit slight discrepancies occur on a per-stage basis, on a per-case basis the time totals to the same figure (extremely small differences are due to rounding errors).

**Table 4:27 Per Stage Total Time Durations.**

<b><u>CASE A</u></b>	<b>GWRCS Total Duration</b>	<b>MACS Total Duration</b>
<b>Stage 1</b>	964.10	910.69
<b>Stage 2</b>	4905.59	4802.60
<b>Stage 3</b>	6975.58	7457.55
<b>Stage 4</b>	1644.65	1319.13
<b>CASE A Sum</b>	<b>14489.92</b>	<b>14489.97</b>
<b><u>CASE B</u></b>	<b>GWRCS Total Duration</b>	<b>MACS Total Duration</b>
<b>Stage 1</b>	1259.55	1051.63
<b>Stage 2</b>	2575.08	3091.90
<b>Stage 3</b>	1315.53	1426.26
<b>Stage 4</b>	3218.85	2800.20
<b>CASE B Sum</b>	<b>8369.01</b>	<b>8369.99</b>
<b><u>CASE C</u></b>	<b>GWRCS Total Duration</b>	<b>MACS Total Duration</b>
<b>Stage 1</b>	787.64	651.36
<b>Stage 2</b>	8692.17	8341.79
<b>Stage 3</b>	2813.00	2822.16
<b>Stage 4</b>	7651.36	8019.18
<b>Stage 5</b>	2587.96	2695.69
<b>CASE C Sum</b>	<b>22532.13</b>	<b>22530.18</b>

Having clarified the slight discrepancies in the totals of the time spent on each stage, the following section offers a summary of the key descriptive statistics being the mean and the standard deviation.

#### 4.1.6 Summary of Key Descriptive Statistics.

In the following table (Table 4:28) a summary of means and st. deviations, across all cases and stages, can be seen.

**Table 4:28 Summary of Descriptive Statistics.**

	<u><b>GWRCs</b></u>		<u><b>MACs</b></u>	
	<b>Mean (seconds)</b>	<b>S.D. (seconds)</b>	<b>Mean (seconds)</b>	<b>S.D. (seconds)</b>
<u><b>CASE A</b></u>				
<b>Stage 1</b>	241	250	455	544
<b>Stage 2</b>	73	79	45	33
<b>Stage 3</b>	88	110	54	78
<b>Stage 4</b>	82	81	57	56
<u><b>CASE B</b></u>				
<b>Stage 1</b>	180	157	97	121
<b>Stage 2</b>	57	49	44	38
<b>Stage 3</b>	73	75	59	43
<b>Stage 4</b>	119	130	87	127
<u><b>CASE C</b></u>				
<b>Stage 1</b>	157	183	217	184
<b>Stage 2</b>	74	81	53	43

<b>Stage 3</b>	91	83	55	43
<b>Stage 4</b>	80	79	49	45
<b>Stage 5</b>	59	42	54	54

What can be readily observed from the above table is that, consistently and throughout all the cases, stage 1 presented considerably higher mean values than the rest of the stages. This result is not unexpected considering the fact that stage 1 was the very first stage in which most of the time was usually spent in typing for gathering the concepts, so as to allow for the further formulation of the model. This meant that the time was spread out in ‘chunkier’ instances of interaction.

Moreover, it is interesting to note that, with few exceptions, the rest of the stages throughout the three cases displayed a relative consistency in their mean values of time spent on each instance.

This offer for increased confidence that the data did presented considerable consistency in terms of the average time spent on the interaction codes of each stage. Furthermore and as can be seen in the following sections, the subsequent analyses performed took extensive measures for identifying and dealing with outlier values.

In the following sections the analysis progresses on a per Research Question basis, starting with RQ 1.

## **4.2 RQ1: Statistical Analysis Results**

Recall RQ 1:

**RQ1: What, if any, is the relationship between model appropriations and conflict occurrences, across the stages of FM workshops for the cases observed?**

The results of the chi square and the odds ratio for all the stages across cases are presented in the following tables. Since this is an exploratory research a more liberal  $p < .10$  was used. Still, both  $p < .05$  and  $p < .10$  significance levels are reported. The results for cases A, B and C can be seen in Tables 4.29, 4.30, 4.31

**Table 4:29 RQ1-- Case A- Cross stage Chi-Square tests and odds-ratios.**

Case A	Stages	$\chi^2$ (df <sup>59</sup> )	Odds ratio	Notes.
Variables: Cno/Cyes Vs Mno/Myes	Stage 1	NA <sup>60</sup>	.	Perfect association of the variables. No model appropriation and no conflict are the only phases observed. No further interpretation is possible since there is no variance in both model appropriations and conflict observations.
Variables: Cno/Cyes Vs Mno/Myes	Stage 2	118.13** (1)	.082	Observing conflict when the model is appropriated has 8% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 3	18.39** (1)	.208	Observing conflict when the model is appropriated has 21% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 4	25.82** (1)	.073	Observing conflict when the model is appropriated has 7% chance compared to when the model is not appropriated.
** $p < .05$ , * $p < .10$				

<sup>59</sup> df: degrees of freedom.

<sup>60</sup> No variance observed.

**Table 4:30 RQ1-- Case B- Cross stage Chi-Square tests and odds-ratios.**

<b>Case B</b>	<b>Stages</b>	<b><math>\chi^2</math> (df)</b>	<b>Odds ratio</b>	<b>Notes.</b>
Variables: Cno/Cyes Vs Mno/Myes	Stage 1	NA <sup>61</sup>	.	No conflict is observed in all model and no model appropriation cases. No further interpretation is possible since there is no variance in conflict observations.
Variables: Cno/Cyes Vs Mno/Myes	Stage 2	195.11** (1)	.043	Observing conflict when the model is appropriated has 4% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 3	57.37** (1)	.144	Observing conflict when the model is appropriated has 14% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 4	NA <sup>62</sup>	.	No conflict is observed in all model and no model appropriation cases. No further interpretation is possible since there is no variance in conflict observations.
**p<.05, *p<.10				

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<sup>61</sup> No variance observed.

<sup>62</sup> No variance observed.

**Table 4:31 RQ1-- Case C- Cross stage Chi-Square tests and odds-ratios.**

Case C	Stages	$\chi^2$ (df)	Odds ratio	Notes.
Variables: Cno/Cyes Vs Mno/Myes	Stage 1	NA <sup>63</sup>	.	Perfect association of the variables. No model appropriation and no conflict are the only cases observed. No further interpretation is possible since there is no variance in both model appropriations and conflict observations.
Variables: Cno/Cyes Vs Mno/Myes	Stage 2	49** (1)	.438	Observing conflict when the model is appropriated has 44% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 3	.09 (1)	(1.064)	The chi-square test indicates that there is no association between observing the model being appropriated and conflict occurring. The odds ratio returns a non-significant difference between the odds of observing the one over the other variables.
Variables: Cno/Cyes Vs Mno/Myes	Stage 4	98.41** (1)	.296	Observing conflict when the model is appropriated has 30% chance compared to when the model is not appropriated.
Variables: Cno/Cyes Vs Mno/Myes	Stage 5	31.19** (1)	.326	Observing conflict when the model is appropriated has 33% chance compared to when the model is not appropriated.
** p<.05, *p<.10				

Moreover, averaging the odds-ratios across cases offers for the following:

The average odds-ratio across stages for case A is 12.1% (0.363/3) with a standard deviation of 7.54%.

The average odds-ratio across stages for case B is 9.35% (0.187/2) with a standard deviation of 7.14%.

The average odds-ratio across stages for case C is 35.33% (1.06/3) with a standard deviation of 7.48%.

The average odds-ratio calculated from all 8 valid stages is 20.12% (1.61/8) with a standard deviation of 14.12%.

<sup>63</sup> No variance observed.

### 4.3 RQ 1: Interpretative Analysis

It can be observed that throughout all cases, stage-1 either displayed perfect association between the variables or constant values in either the model occurrences or the conflict occurrences variables.

All 8 observed stages with valid results, suggest that it is less likely to observe any type of conflict when the model is visible at any level, compared to when the model is not appropriated at all.

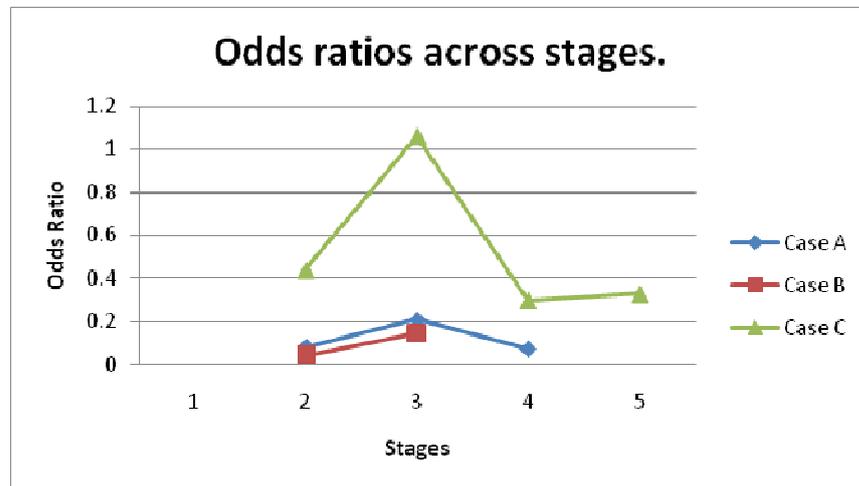
It appears that cases A and B performed similarly in terms of the odds-ratios for observing conflict when the model was appropriated. Case C, while still positing a negative relationship between model appropriations and conflict, performed better than cases A and B, in terms of the odds-ratios. This implies that in case C it was more likely to observe conflict when the model was appropriated compared to cases A and B.

The analysis of the stages of cases A through C offers strong evidence in observing that:

*An increase in model appropriations appears to relate with an overall decrease in the probability of observing conflict occurrences.*

Plotting the odds ratios for the valid observations of cases A, B and C on a per stage basis (Graph 4.27), allows for observing the noticeable increase of the odds ratio from stage 2 to stage 3 and the then decrease in stage 4.

**Graph 4:27 RQ1-- Plotting Cross-Stages Odds Ratio Along Cases.**



Cross stage odds ratios of observing conflict when the model is appropriated.

Case C stage 3 displayed the only instance in which model appropriation was (even as little) positively related to appearance of conflict, thus presenting itself as an outlier to the rest of the cases. Nevertheless, as previously mentioned, the non-significant chi-square value indicates that there is no clear association between the two data sets. As such, safe inference cannot be drawn.

While non-significant for case C, the marked increase of the odds ratio for stage 3 is not inconsistent with the results from cases A and B since for stage 3 both A and B cases presented higher odds ratio value compared to the other stages.

From the above follow up analysis an added comment that can be made is that: While stages 2, 4 and 5 demonstrate similar odds-ratio scores, stage 3 displays a marked increase in both cases examined. Thus:

It appears that stage 3, *in comparison to the other stages*, bears the highest probability for observing conflict when the model is appropriated.

The findings, across all the stages of the cases observed, suggest that observing conflict when the model is appropriated is less likely than when the model is not appropriated.. If an opposite relationship was to be observed, it would more probably be observed in stage 3.

#### **4.3.1 RQ 1: Findings Summary**

Recall RQ 1:

**RQ1: What, if any, is the relationship between model appropriations and conflict occurrences, across the stages of FM workshops for the cases observed?**

##### *4.3.1.1 RQ1 - Finding F1.1.*

*Model appropriation occurrences and conflict occurrences display a consistent and statistically significant negative association.*

##### *4.3.1.2 RQ1 - Finding F1.2.*

*Compared to the rest of the stages, stage 3 appears to offer the lowest negative probability for observing conflict occurrences when the model is appropriated. Stages 2 and 4 had similar scores in terms of the likelihood of conflict being observed when the model is appropriated*

Reporting the findings for research question 1 concludes RQ1 analysis. In the next section the analysis of research question 2 attempts to further our understanding of the model-related processes that take place during a FM workshop by examining the cross case and cross stage relationship between model visibility levels and conflict management types.

#### 4.4 RQ2: Statistical Analysis Results

Recall RQ 2:

**RQ2: What, if any, is the relationship between the different model visibility levels and conflict management types across the stages of FM workshops for the cases observed?**

As previously explicated in the Methodology chapter, the analysis for RQ 2 progressed in two steps. The first step was to conduct two sided chi-square tests in order to identify whether the MVL-CMT variables were related or not. For stages in which 2x2 tables were observed the Fisher's exact test was used (Field, 2009:690). For stages in which 20% of cells did not have an expected count higher than 5 or had a minimum expected count less than 1, thus making an exact test not possible), the chi-square value and significance was obtained by utilising Monte Carlo simulated samples (Field, 2009:547). In the cases where the Monte Carlo sampling technique was used 10.000 samples were generated (as the default for SPSS 15).

The chi-square tests for the stages of cases A, B and C can be seen in tables 4.32, 4.33, and 4.34 respectively. Since this is an exploratory research a more liberal  $p < .10$  was used. Still, both  $p < .05$  and  $p < .10$  significance levels are reported

**Table 4:32 RQ2 -- Case A - Cross Stage Chi Square tests.**

Case A	Stages	$\chi^2$ (df <sup>64</sup> )	Notes.
Variables: MVLs Vs CMTs	Stage 1	NA <sup>65</sup>	Perfect association of the variables. No-model appropriation and no-conflict are the only behaviours observed. No further interpretation is possible since there is no variance in both model appropriations and conflict observations.
Variables: MVLs Vs CMTs	Stage 2	46.49** (9)	MVLs and CMTs appear to be related, thus Case A- Stage 2 is a suitable candidate for further analysing the MVLs-CMTs relationship
Variables: MVLs Vs CMTs	Stage 3	120.09** (9)	Same as Case A-Stage2
Variables: MVLs Vs CMTs	Stage 4	4.21* (1)	MVLs and CMTs appear to be related albeit with a .05<p<.10 confidence. Since this is an exploratory research Case A- Stage 4 has been chosen as a suitable candidate for further analysing the MVLs-CMTs relationship.
** p<.05, *p<.10			

<sup>64</sup> df: degrees of freedom.

<sup>65</sup> No variance observed.

**Table 4:33 RQ2 -- Case B - Cross Stage Chi Square tests.**

Case B	Stages	$\chi^2$ (df)	Notes.
Variables: MVLs Vs CMTs	Stage 1	NA <sup>66</sup>	No conflict is observed. No further interpretation is possible since there is no variance in terms of CMT observations.
Variables: MVLs Vs CMTs	Stage 2	38.54** (6)	MVLs and CMTs appear to be related, thus Case B- Stage 2 is a suitable candidate for further analysing the MVLs-CMTs relationship
Variables: MVLs Vs CMTs	Stage 3	19.19** (4)	Same as Case B-Stage2
Variables: MVLs Vs CMTs	Stage 4	NA <sup>67</sup>	No CMTs observed
**p<.05, *p<.10			

**Table 4:34 RQ2 -- Case C - Cross Stage Chi Square tests.**

Case C	Stages	$\chi^2$ (df)	Notes.
Variables: MVLs Vs CMTs	Stage 1	NA <sup>68</sup>	No conflict is observed. No further interpretation is possible since there is no variance in terms of CMT observations.
Variables: MVLs Vs CMTs	Stage 2	78.71** (9)	MVLs and CMTs appear to be related, thus Case B- Stage 2 is a suitable candidate for further analysing the MVLs-CMTs relationship
Variables: MVLs Vs CMTs	Stage 3	47.51** (4)	Same as Case C-Stage2
Variables: MVLs Vs CMTs	Stage 4	94.09** (9)	Same as Case C-Stage2
Variables: MVLs Vs CMTs	Stage 5	131.24** (9)	Same as Case C-Stage2
** p<.05, *p<.10			

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<sup>66</sup> No variance observed.

<sup>67</sup> No variance observed.

<sup>68</sup> No variance observed.

The chi square analysis indicated that a relationship between MVL and CMT variables exists in all of cases stages except for Case A-Stage 1, Case B-Stages 1&4 and Case C-Stage 1.

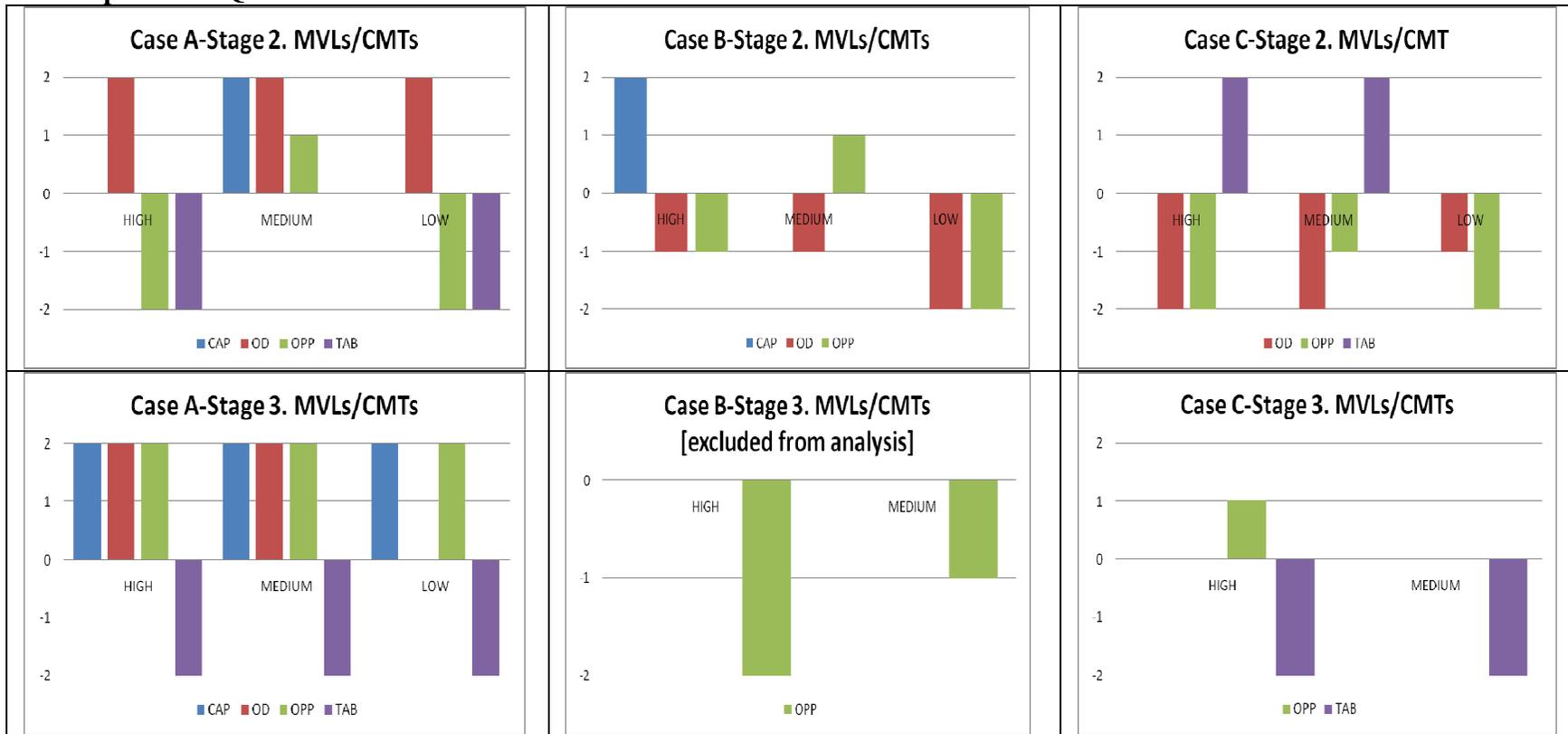
Having established the stages which are amenable to further analysis, the second step of analysis was performed.

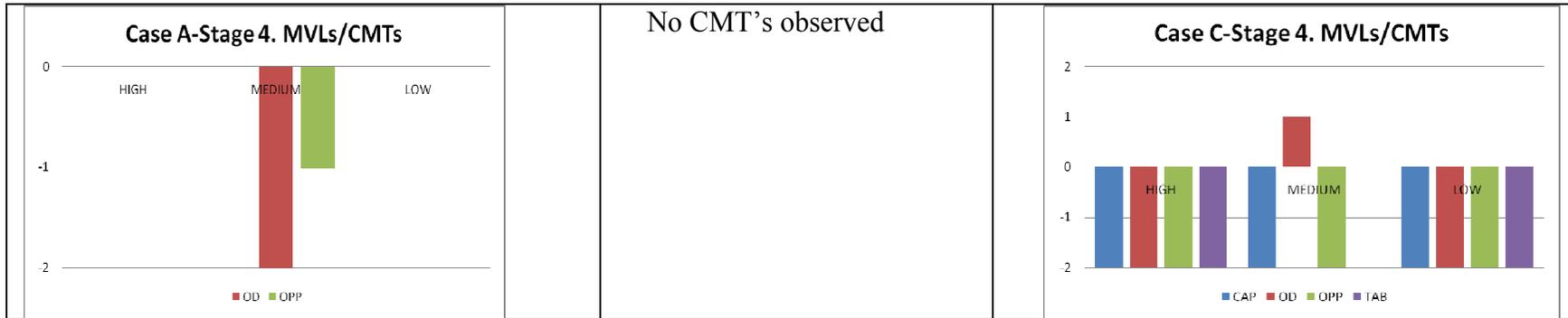
The second step in the analysis entailed performing multinomial regression models for assessing the likelihood of observing a given pair of interaction between the MVLs and CMTs compared to the benchmark pairs [i.e MVL(NMA)-CMTs].

For every stage, the number of pairs observed has been compared to the number of pairs bearing statistically significant differences from the benchmark pairs. A  $p < .10$  was used as the level of acceptance for reporting. Dependent on the behaviours observed, the number of pairs varied across case and stages. Any stage in which the statistically significant pairs were less than 50% of the total number of pairs was excluded from further analysis since the data points were extremely low in order to draw any inference about the behaviour the stage presented. This is not to say that the variables MVL-CMT were not related, it merely suggests that the MVLs-CMTs pairs bearing statistically significant differences from the benchmark pairs [MVL(NMA)-CMTs] were not enough to allow for safe inference. For example, Stage 3 of Case B while presenting a statistically significant chi-square value, it merely offers 2 pairs out of a total of 6 observed, as presenting statistically significant differences from the benchmark pairs. Thus stage 3 for case B has been excluded from any further analysis altogether.

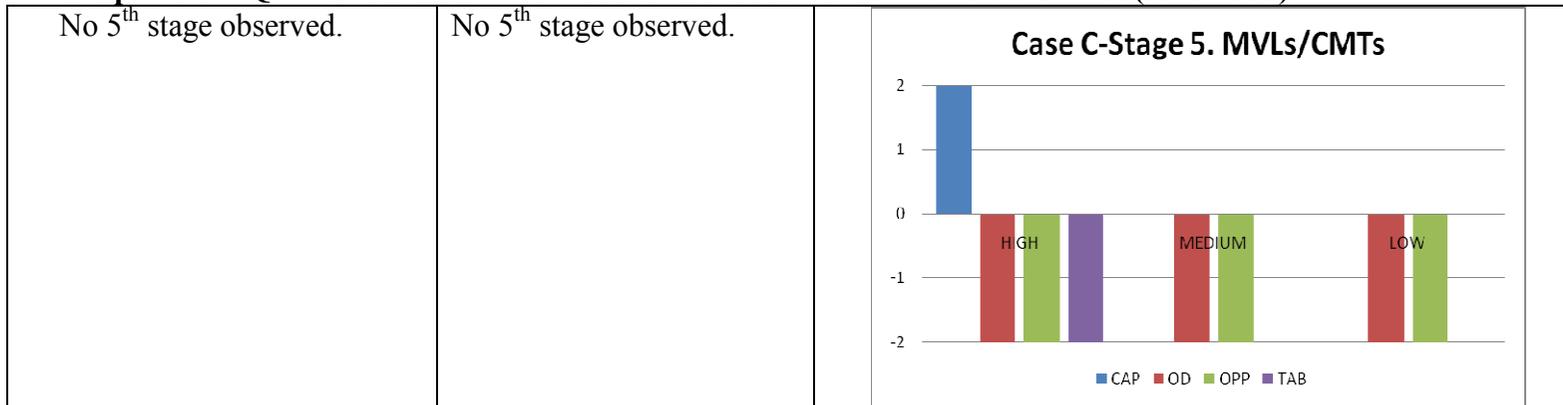
The cross-case and cross-stage results for all three cases can be viewed in the following graphs (Graph 4.28 and 4.29).

**Graph 4:28 RQ2 -- Cross Case Likelihood of Co-Occurrence MVLs Vs CMTs.**





**Graph 4:29 RQ2 -- Cross Case Likelihood of Co-Occurrence MVLs Vs CMTs. (continued).**



## 4.5 RQ2: Interpretative Analysis.

Before interpreting the results it must be reminded that the bar-charts indicate the likelihood of a given pair of behaviour to be observed against the likelihood of observing the benchmark pair MVL(NMA)-CMTs. So for example, in Case B-Stage 2 we notice a high-positive likelihood of observing CMT(CAP) when MVL(High) *compared to* the likelihood of observing (for the same case and stage) the benchmark pair CMT(CAP)-MVL(NMA). Similarly for Case C-Stage 2 we notice a high-positive likelihood of observing CMT(TAB) when MVL(Medium) *when compared to* the likelihood of the benchmark CMT(TAB)-MVL(NMA).

It must be further reminded that, drawing from the literature, effective conflict management is meant to occur when a) conflict is surfaced and b) it is resolved via open discussion. Conflict that is resolved via either tabling or capitulation represents ineffective conflict management (Sambamurthy & Poole, 1992; Kuhn & Poole, 2000; Poole & Dobosh, 2010).

Interpreting the results produced for the stages across the cases allows for a number of findings to emerge and are reported below.

### 4.5.1 RQ2: Stage 2 - Cross Case Interpretative Analysis.

Cross case observation of stage 2 evidences that for 2/3 of the stages observed MVL(Medium) resulted in high-positive likelihood of observing CMT(OPP) than did MVL(NMA).

While in terms of CMT(CAP) and CMT(TAB) the analysis provides for inconsistent results, grouping the two CMTs together allows for some interesting inference to be made. Thus, in 2/3 of stages 2 a high-positive likelihood for either CMT(CAP) or CMT(TAB) is observed when MVL(High) or MVL(Medium) are

compared to MVL(NMA). An average to high-negative likelihood for CMT(OPP) and CMT(OD) is further observed when comparing MVL(High) to MVL(NMA).

Throughout all three stages MVL(Low), closely followed by MVL(High), present a high-negative likelihood for observing CMT(OPP).

For 2/3 of the stages MVL(NMA) presents an average to high positive likelihood for observing CMT(OD) when compared to the rest of CMTs.

From the above the picture drawn in terms of MVLs against CMTs is the following:

#### *4.5.1.1 RQ2: Stage 2 – Cross Case Findings*

1: In terms of surfacing conflict, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(Medium) → MVL(NMA) → MVL(High) → MVL(Low). This implies that there is a higher likelihood for conflict to surface when the model visibility levels are either medium or non-visible at all, than when model visibility levels are either high or low.

As such it appears that for the cases observed and across the valid second stages a **medium** level of model visibility played a **beneficial role**, in terms of effective conflict management, by assisting in **surfacing conflict**, when compared to no model visibility. On the other hand **high or low** levels of model visibility played a **hindering role**, in terms of effective conflict management, by discouraging the **surfacing of conflict**, when compared to no model visibility.<sup>69</sup>

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<sup>69</sup> A note at this point is that the statistical analyses performed does not try and explore relationships of causality, but rather in this research the likelihood of co-occurrence is observed. Causality (i.e. model is causing conflict behaviours) is assumed drawing from the AST model (DeSanctis & Poole, 1994).

2: In terms of conflict resolution via open discussion, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(NMA) → MVL(Medium)→MVL(High), MVL(Low) [tie].

As such it appears that for the cases observed and across the valid second stages **no-model** visibility played a **beneficial role**, in terms of effective conflict management, by assisting in conflict resolution via **open discussion**. On the other hand **high, medium or low** levels of model visibility play a **hindering role**, in terms of effective conflict management, by encouraging resolving conflict via **open discussion**.

3: In terms of conflict resolution via capitulation or tabling, the results allow for limited inference to be drawn. To ease interpretation, the results for CMT(CAP) and CMT(TAB) have been grouped for MVL(High) and MVL(Medium). Thus, it is indicated that MVL(High) and MVL(Medium) bear a positive likelihood for observing either CMT(CAP) or CMT(TAB), when the former are compared to MVL(NMA). CMT(TAB) is observed only in one instance for MVL(Low), bearing a high-negative likelihood of occurrence. Thus the following “soft” finding is reported:

It appears that for the cases observed and across the valid second stages, a **low** model visibility played a **beneficial role**, in terms of effective conflict management, by discouraging conflict resolution via **tabling**. A **high or medium** model visibility level played a hindering role, in terms of effective conflict management, by encouraging either the **tabling or capitulation** of the conflict

#### 4.5.2 RQ2: Stage 3 - Cross Case Interpretative Analysis

For case B the third stage needs to be excluded on the grounds of presenting a low number of statistically significant pairs observed with only 2 out of the 6 pairs

observed as achieving statistical significance. Cross case observation of stage 3 in cases A and C offers for the following findings: For 2/2 of the stages observed, MVL(High) resulted in an average to high positive likelihood of observing CMT(OPP) compared to MVL(NMA). Furthermore, single stage results (Case A-Stage 3) indicated that all MVLs present a high positive likelihood for observing CMT(OPP). Both MVL(High) and MVL(Medium) present a high negative likelihood of observing CMT(TAB) compared to MVL(NMA).

Case A-Stage 3 in which CMT(OD) has been observed, indicates a high-positive likelihood for resolving conflict via open discussion when MVL(High) or when MVL(Medium).

Case A-Stage 3, in which CMT(CAP) has been observed, indicates a high positive likelihood for resolving conflict via capitulation when the model is visible at any level than when the model is not visible at all.

Moreover, for stage 3, low levels of model visibility have been observed only in one case and as such drawing inference in terms of MVL(Low) is limited to that case alone (namely case A). Nevertheless, when exploring MVL(Low) a high-negative likelihood for observing CMT(TAB) and a high-positive likelihood for observing CMT(OPP) compared to MVL(NMA) can be seen.

While single stage observations offer for limited inference they still present half of all the available results for stage 3 (since case B-stage 3 has been excluded altogether). Given the exploratory nature of this research, findings drawn from a 50% of all the available results are considered as valid for reporting.

From the above, the picture drawn in terms of MVLs against CMTs is the following:

#### 4.5.2.1 RQ2: Stage 3 – Cross Case Findings

1: In terms of surfacing conflict, model visibility levels arranged from highest-positive to highest-negative likelihood are, MVL(High) → MVL(Medium), MVL(Low) [tie] → MVL(NMA).

As such it appears that for the cases observed and across the valid two stages a **high** level of model visibility played a **beneficial role**, in terms of effective conflict management, by assisting in **surfacing conflict**, when compared to no model visibility.

Single stage observations further offer support in that model visibility at **medium and low** levels played a **beneficial** role, in terms of effective conflict management, by assisting in **surfacing conflict**, when compared to no model visibility.

2: In terms of conflict resolution via open discussion, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(High), MVL(Medium) [tie] → MVL(Low), MVL(NMA) [tie].

Single stage observations offer support in that model visibility at **high and medium** levels play a **beneficial** role, in terms of effective conflict management, by assisting in conflict resolution via **open discussion**, when compared to **low or no** model visibility levels.

3: In terms of conflict resolution via tabling, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(NMA) → MVL(Low) → MVL(High), MVL(Medium) [tie].

As such it appears that for the cases observed and across the valid two stages **high and medium** levels of model visibility played a **beneficial role**, in terms of effective

conflict management, by discouraging conflict resolution via **tabling**, when compared to **no** model visibility levels.

Single stage observations, further support that model visibility at **low** levels played a **beneficial** role, in terms of effective conflict management, by discouraging conflict resolution via **tabling**, when compared to no model visibility.

4: In terms of conflict resolution via capitulation, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order (since only one case displayed capitulation, the following single stage observation is reported):

Single stage observations offer support in that model visibility at **high, medium and low** levels play a **hindering** role, in terms of effective conflict management, by assisting in conflict resolution via **capitulation**, when compared to **no** model visibility levels.

#### **4.5.3 RQ2: Stage 4 - Cross Case Interpretative Analysis**

It is important to note that for stage 4 of case B, no CMTs (i.e. no conflict), was observed. As such case B- stage 4 has been excluded from any further MVL-CMT analysis. Cross case observation of stage 4 in cases A and C offers for the following findings: For 2/2 of the stages observed, MVL(Medium) resulted in an average to high negative likelihood of observing CMT(OPP) compared to MVL(NMA). Furthermore, the two stages observed offer for conflicting findings in terms of MVL(Medium) and CMT(OD). It appears that when MVL(Medium) is observed CMT(OD) may go both ways in terms of the likelihood of occurrence. The results for case A, being that a high-negative effect is displayed, coupled with the results for case C, being that an average-positive effect is displayed, leads us to err on reporting

the negative effect side. Nevertheless, it will be reported as an average negative effect in order to take into account the cancelling-each-other-out effect from case C. Other than CMT(OD) and CMT (OPP), case A does not offer any more useful information for further inference, thus calling for focussing upon single stage results (case C-stage 4). Single stage results further indicate that MVL(High) and MVL(Low) behaved in exactly the same manner in relation to the likelihood of observing any CMT. Comparing MVL(High) and MVL(Low) to MVL(NMA) indicates a high-negative likelihood for observing any CMT. Thus it appears that all conflict related interaction was focussed during MVL(Medium) and MVL(NMA) periods. For MVL(High) and MVL(Low) no further inference can be drawn in terms of their impact to specific CMTs.

Seeking further confirmation for the somehow unusual findings indicating very little variance for MVL(High) and MVL(Low), the phasic timelines of case C stage 4 were inspected trying to uncover and identify any intricacies or details that may have been overlooked or missed from the statistical analysis (Appendix 6). This led in observing that for all capitulation and tabling phases the corresponding model appropriation was that of no model appropriation (i.e. NMA). Specifically observing the GWRCS and MACS phasic timelines, it can be seen that tabling phases numbered 5 and 23 as well as capitulation phases numbered 7, corresponded to NMA phases numbered 6, 26 and 7 respectively. It can be further observed that for 3 of the 4 periods of integrative phases (GWRCS phases numbered: 2, 20, 36, 38) a strong element of unfocussed model appropriations is to be found (MACS phases numbered: 2, 22, 43), with the last integrative phase (GWRCS phase numbered: 38) corresponding (for the largest part) to an NMA phase (MACS phase numbered: 46).

Given that unfocussed model appropriations indicate medium levels of model visibility, it should not come as a surprise that most of the OD should come from MVL(Medium) and the likelihood of occurrence, while remaining positive, should not indicate a too high value (due to the one integrative phase corresponding to NMA). As such, and for this case and stage, the statistical analysis results appear to withstand a closer scrutiny performed via analyzing the phasic timelines. Having verified the results of case C-stage 4 with the phasic timelines, the reporting can confidently proceed to directly stating the following.

#### *4.5.3.1 RQ2: Stage 4 – Cross Case Findings*

It appears that, for the cases observed and across the valid two stages, **medium** levels of model visibility played a **hindering role**, in terms of effective conflict management, by discouraging **conflict surfacing**. Combining the two contradictory cases in which conflict resolution via **open discussion** was observed during **medium** levels of model visibility, made the case to err on the **hindering** side.

Single stage observations further support that: Model visibility at **high** and **low** levels played a **hindering** role, in terms of effective conflict management, by discouraging **conflict surfacing** and conflict resolution via **open discussion**. Furthermore, **high**, and **low** levels played a **beneficial** role, in terms of effective conflict management, by discouraging conflict resolution via **tabling** Moreover, model visibility at **high, low and medium** levels played a beneficial role, in terms of effective conflict management, by discouraging conflict resolution via **capitulation**.

#### 4.5.4 Stage 5 – Single Case Interpretative Analysis

Stage 5 was observed only in case C. As such all reporting is for a *single stage observation*.

It is observed that throughout all the MVLs almost all available CMTs have high-negative likelihood for being observed. The only exception being the case of MVL(High) and CMT(CAP), in which it can be seen that MVL(High) present a high-positive likelihood for the pair to occur. As such the following can be stated:

##### 4.5.4.1 RQ2: Stage 5 – Single Case Findings

It appears that **high, low and medium** levels of model visibility played a **hindering** role, in terms of effective conflict management, by discouraging both **conflict surfacing** and conflict being resolved via **open discussion**. **High** levels of model visibility further played a **hindering** role, in terms of effective conflict management, by encouraging conflict resolution via **capitulation**. Moreover, **high** levels of model visibility played a **beneficial** role, in terms of effective conflict management, by discouraging conflict resolution via **tabling**.

#### 4.5.5 RQ2: Cross Stage Results

The cross-case findings can be summarized in the following table (Table 4.35).

**Table 4:35 RQ2 -- Cross-Stage MVLs Vs CMTs Results Summary.**

Stages	Conflict Management Types			
	CMT(OPP)	CMT(OD)	CMT(CAP)	CMT(TAB)
Stage 1	N/A	N/A	N/A	N/A
Stage 2	Medium ++ NMA High - - Low - -	NMA High - - Medium - - Low - -	NMA High - Medium - Low (N/A)	Low + NMA High - Medium -
Stage 3	High ++ Medium + Low + NMA	High + Medium + NMA Low (N/A)	NMA High - Medium - Low -	High ++ Medium ++ Low + NMA
Stage 4	NMA High - Low - Medium - -	NMA High - Medium - Low -	High + Medium + Low + NMA	High + Low + NMA Medium (N/A)
Stage 5	NMA High - Medium - Low -	NMA High - Medium - Low -	NMA High - Medium (N/A) Low (N/A)	High + NMA Medium (N/A) Low (N/A)

Within table 4.35, one can observe plus or minus signs next to each MVL, some MVLs having an (N/A) next to them, as well as some of the MVLs being highlighted. The signs are meant to convey a sense of *benefit towards conflict management effectiveness* (CME) and not the likelihood of occurrence. As such one should be vigilant in not assuming that a plus (+) observed in a TAB cell means that it is more likely for TAB to be observed for that given stage. On the contrary, what it means is that TAB is **less** likely to be observed in that cell and as such the benefit towards CME is greater. Thus across all CMTs a plus (+) next to a MVL means a benefit towards CME while a minus (-) means a hindrance towards CME. Double plusses (+ +) or double minuses (- -), indicate the degree of confidence these summary results display in terms of the data that they were drawn from. For example if a certain summary result is based on valid but reduced number of (or even single) stage observations then a single sign (be it + or -) has been assigned. If a given

summary result for a given cell is observed in the majority, or all, of the stages then a double sign has been assigned. The N/A inside parenthesis means that the MVL was not observed for the specific cell and as such no further comment can be made. Moreover the best, or the least worst (as in the case of NMA), MVLs have been highlighted (i.e. green highlight). In the cases of ties, all tied MVLs have been highlighted.

From table 4.35 a number of useful observations can be made in terms of model visibility levels and effective conflict management types. The aim of table 4.35 is to allow for cross stage findings at the **prescriptive** level to emerge, thus it is of interest in making analysis-based recommendations on how model appropriations may assist in effective conflict management (CME).

Prescribing the desirable MVLs for effective conflict management (CME) cannot take place without referring to the stage in which a specific MVL is more likely to result to a desirable CMT. For example, if one seeks to enhance **conflict surfacing** during **stage 2**, he/she should opt for a **medium level** of model visibility while trying to avoid high or low levels of model visibility. If on the other hand one seeks to suppress conflict resolution via **capitulation** during **stage 3**, one should opt for **not appropriating the model** at all. Detailed prescriptions for the rest of the stages and CMTs can be obtained by following the summary results of table 4.35 above<sup>70</sup>.

#### **4.5.6 RQ2: Cross Stage Interpretative Analysis**

Bearing in mind the results of RQ1 it must be reminded that the findings of this analysis are for when the model **was** visible during situations of conflict.

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<sup>70</sup> Table 4.35 and the process for deriving the prescriptions being self-explanatory do not require any further explication.

The first observation that can be made is that there appears to be a relationship between MVLs and CMTs resulting to increased CME. As such it can be stated that: *drawing from RQ1, a FM model has a low overall likelihood to be appropriated when conflict occurs*. Nevertheless, for the instances in which conflict does occur and the model does get appropriated, then certain MVLs have been found to be beneficial in terms of CME by encouraging or discouraging certain CMTs.

Further observations can be made when each CMT is observed across the various stages while taking into account the dominant beneficial MVLs.

Observing stage 2 to stage 5, it appears that the most beneficial MVLs towards **surfacing opposition** moved from Medium → High → NMA → NMA. Thus, it appears that Medium and High MVLs played a beneficial role for surfacing conflict, in the relatively early to mid-point stages of a workshop. After that and towards the final stages the most beneficial mode for surfacing conflict appears to be that of no model visibility, with MVLs actually resulting in less beneficial conflict surfacing.

Two plausible and opposing interpretations for the **conflict surfacing** finding are that a) either the model was appropriated early on in a ‘testing the waters’ fashion and it was later abandoned, or b) the early appropriation of the model assisted in forming norms for surfacing conflict in the later stages, and thus making it redundant later on. This research tends to err on the first interpretation by elimination of the second. The second interpretation, while plausible, seems less likely since it implicitly posits that high, medium and low MVLs, while not being seen as the most beneficial way for increasing opposition, should not be seen as hindering it either. This does not seem to be the case since in stages 4 and 5 high, medium and low MVLs appear to hinder conflict from surfacing. Furthermore, in a ‘testing the waters’

situation one would expect to observe a slow start with an increasing pace. That pace increase is demonstrated in stage 2 and 3 where MVL(Medium) in stage 2, is followed in stage 3, by an MVL(High), MVL(Medium) and MVL(Low), before defaulting back to the ‘business as usual’ MVL(NMA) in stages 4 and 5.

Observing stage 2 to stage 5, it appears that the most beneficial MVLs towards conflict resolution via **open discussion** moved from NMA → High/Medium → NMA → NMA. Moreover, for resolving conflict via **open discussion** it appears that the dominant behavior towards the model was that of not appropriating it at all, thus resulting to no model visibility levels. Stage 3 is noticeable since high and medium model visibility levels appear to have resulted in more conflict resolution based on open discussion than not. Taking into account the hindering effect towards effective conflict management of all MVLs across the rest of the stages (i.e. stages 2, 4 and 5), the initial view adopted here about what took place in stage 3 in terms of CMT(OD), would have been that it was another example of ‘testing the waters’ and then abandoning the model, **if** the next paragraph indicating an adaptive behavior did not hold.

Observing conflict resolution via **capitulation**, a different to the previous picture is painted. In an almost contrary to opposition fashion, in the early stages MVLs appear to have played a hindering role towards CME by promoting conflict resolution via capitulation, while in the latest stage all MVLs appear to have benefited CME. Stage 5 further indicates that the single MVL(High) observed was not beneficial towards CME. Two plausible interpretations for such a behavior are that: either a) another type of ‘testing the waters’ occurred only at a latter phase than opposition and open discussion and then the model was abandoned, or b) taking into

account the results from open discussion, and after various MVLs were tested for promoting open discussion, they were further adapted to be appropriated into hindering conflict resolution via capitulation. Continuing in b), the main difference here is that while in the first stages it appears that the model was successful in promoting CME via promoting the effective (or ‘good’) CMTs, in a later stage it appears that the model was successful in hindering the ineffective (or ‘bad’) CMTs. If b) was the case it would bring the open discussion results under new light in that the model was not abandoned, but instead it was adapted.

In order to gain a better understanding on which of the two interpretations was the most probable, open discussion and capitulation conflict instances were reviewed by going back to the raw data and watching the videos, bearing in mind the enquiry about the two possible interpretations, namely whether the progression has been a case of testing the waters and then abandoning the model or whether it was a case of model adaptation. All cases offered for inconclusive evidence in this exploration, since I was not able to discern whether there was some form of model adaptation or abandonment. Nevertheless, what remains as evident is that there was some form of experimentation with the model appropriations, the outcomes of which I was unable to discern.

The above analysis does not imply that the model was appropriated to its claimed full potential. The claimed full potential would have been realized if the model was highly visible for CMT(OPP) and CMT(OD) as well as not appropriated at all for any CMT(CAP) and CMT(TAB) instances, consistently throughout stages. Resolving conflict via **tabling** appears to be the only CMT in which certain MVLs would result in CME across all stages. Specifically, it appears that in stage 2, low

MVLs will prove beneficial by hindering the occurrence of tabling CMT. From that point onwards high MVLs appear to be beneficial in reducing the likelihood of observing tabling and thus increasing CME. This analysis appears to be in line with the claims made in the literature concerning avoidance of premature closure of conflict when appropriating FM models (Eden & Ackermann, 2010).

#### *4.5.6.1 RQ2: Cross Stage Findings:*

Moreover drawing from analysis points 1-5 allows for stating the following findings:

- e) There is a relationship between the different MVLs and CMT, as observed across stages and the specific relationships can be viewed in table 4:35. The relationship does not follow a single unitary pattern across all stages and conflict management types, but should be viewed as being stage and conflict management type specific.
- f) Observing each CMT across the stages it becomes evident that, except for CMT(TAB), no one MVL has been consistently appropriated throughout the rest of CMTs. Thus, MVL norms in terms of CMTs do not appear to have formed. CMT(TAB) appears to be an exception in which a norm of MVL(High) has formed.
- g) MVLs appear to have been adapted moving from CMT(OD) to CMT(CAP) across stages 3 and 4, thus offering some support towards the propositions put forth by AST.

A useful and straightforward calculation was to count the number of cells in which MVLs resulted in beneficial behaviors towards CMTs and then identify which

beneficial types of MVL occurred more often. Since in all cases MVL(NMA) has been used as a benchmark (and thus always included without a sign), it has only been counted for cells in which MVL(NMA) offered the best improvement in terms of CME [i.e. only for cells in which MVL(NMA) has been highlighted green]. Thus the following can be further observed:

- h) For **conflict surfacing** (i.e. opposition) MVL(High) has been observed for 1/4 times, MVL(Medium) for 2/4 times, MVL(Low) for 1/4 times and MVL(NMA) for 2/4 times. Thus, the order of frequency for observing, beneficial to CME, CMT is the following (from most to least frequent): **MVL(Medium), MVL(NMA) [tie] → MVL(High), MVL(Low) [tie]**.
- i) For conflict resolution via **open discussion** MVL(High) has been observed for 1/4 times, MVL(Medium) has been observed for 1/4 times, MVL(Low) for 0/4 times and MVL(NMA) for 3/4 times. Thus, the order of frequency for observing, beneficial to CME, CMT is the following (from most to least frequent): **MVL(NMA) → MVL(Medium), MVL(High) [tie] → MVL(Low) [tie]**
- j) For conflict resolution via **capitulation** MVL(High) has been observed for 1/4 times, MVL(Medium) has been observed for 1/4 times, MVL(Low) for 1/4 times and MVL(NMA) for 3/4 times. Thus, the order of frequency for observing, beneficial to CME, CMT is the following (from most to least frequent): **MVL(NMA) → MVL(Medium), MVL(High), MVL(Low) [tie]**
- k) For conflict resolution via **tabling** MVL(High) has been observed for 3/4 times, MVL(Medium) has been observed for 1/4 times, MVL(Low) for 3/4 times and MVL(NMA) for 0/4 times. Thus, the order of frequency for

observing, beneficial to CME, CMT is the following (from most to least frequent): **MVL(High), MVL(Low) [tie]→ MVL(Medium)→ MVL(NMA).**

The above observations make, amongst others, evident that FM model appropriations impact, in terms of increasing CME, is the highest in *consistently*<sup>71</sup> reducing the likelihood of **tabling**. Furthermore, FM model appropriations appear to have no significant CME impact over no model appropriations in terms of increasing or decreasing the likelihood of **surfacing conflict**. FM models appear to have had a significantly negative impact in terms of decreasing CME, by either increasing the likelihood of **capitulation**, or by decreasing the likelihood for **open discussion**.

The final step, in terms of reporting the findings, involved constructing a typology of the various MVLs and the corresponding CMTs observed. The typology is offered in the following section.

#### **4.5.7 RQ2: Typology developed.**

From the analysis performed on Table 4.35 it is possible to derive a generic typology of model visibility levels and CME benefits, based on CMTs

Depending on how one approaches and segments the results, a number of typologies can be produced. Bearing in mind the context of this research the typology has been decided to revolve predominantly around the observed stages. The following typology has been derived by taking into account only the key benefiting model visibility levels. As such any situations displaying no model appropriations have been excluded.

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<sup>71</sup> i.e. throughout most stages

In constructing the typology, CMTs have been classified according to the benefit they produced in terms of conflict management effectiveness (CME). The classification is the following:

1. CMT(OPP) would increase CME by allowing for the conflict to surface at the first place. As such it has been indicated to improve CME by **surfacing** the conflict.
2. A benefit observed in terms of CMT(TAB) would be realised by reducing the likelihood of tabling, and as such attending to, the conflict. It has been indicated to improve CME by **attending** to the conflict surfaced.
3. In terms of CMT(CAP) the benefit would be realised by reducing the likelihood of resolving the conflict via capitulation. As such it has been indicated to improve CME by promoting an **egalitarian** conflict management approach.
4. In terms of CMT(OD) the benefit would be realised by increasing the likelihood of resolving conflict via open discussion. As such it would improve CME by promoting a **dialogic** approach towards conflict management.

The resulting typology can be seen in the following table (Table 4.36)

**Table 4:36 RQ2 -- Stage specific Typology MVL--CME (CMT)**

Stages	MVL	CME related benefit
Stage 2	Medium	Surfacing
	Low	Attending
Stage 3	High/Medium	Surfacing/ Dialogic/ Attending
Stage 4	High/Low	Egalitarian /Attending
Stage 5	High	Attending

Since MVLs directly relate to model appropriations, this typology is meant to convey a meaning of *cross stage best model appropriation* practices resulting in

certain CMT related benefits towards CME. As previously explicated the type derived for stage 5 is based on a single case observed and is thus offered with a word of caution.

#### **4.5.8 RQ 2: Findings Summary.**

Recall Research Question 2:

*RQ2: What, if any, is the relationship between the different model visibility levels and conflict management types across the stages of FM workshops for the cases observed?*

In answering RQ 2 the following findings have been unearthed:

##### **4.5.8.1 RQ 2 -Finding - F2.1**

*Drawing from the data available and the analysis performed, there appears to be a stage-specific relationship between different MVLs and CMTs across stages. A stage specific typology of best practices has been developed and can be seen in Table 4:36*

##### **4.5.8.2 RQ 2 -Finding - F2.2**

*Drawing from the data available and the analysis performed, there appears to be a beneficial impact of MVL(High) which was consistently observed across stages to reduce the likelihood of occurrence for CMT(TAB). No other MVL-CMT appears to have been consistently developed across stages.*

##### **4.5.8.3 RQ 2 -Finding - F2.3**

*Drawing from the data available and the analysis performed, it appears that the findings offer support in that the group experimented with the model appropriations.*

#### 4.5.8.4 RQ 2 -Finding - F2.4.1

*Drawing from the data available and the analysis performed, it appears that appropriating the FM model will have an overall beneficial impact towards CME, predominantly by reducing the likelihood of tabling the conflict.*

#### 4.5.8.5 RQ 2 -Finding - F2.4.2

*Drawing from the data available and the analysis performed, it appears that the appropriation of FM models will have an overall insignificant impact in terms of encouraging or hindering the surfacing of conflict.*

#### 4.5.8.6 RQ 2 -Finding - F2.4.3

*Drawing from the data available and the analysis performed, it appears that the appropriation of FM models, when compared to non-appropriation, will have an overall negative impact towards CME, by increasing the likelihood of capitulation and by decreasing the likelihood of open discussion.*

Reporting the findings for research question 2 concludes RQ2 analysis. In the next section the analysis of research question 3 attempts to further our understanding of the model related processes that undergo during a FM workshop by examining the cross case and cross stage relationship between model visibility levels and levels of confrontiveness.

## 4.6 RQ 3: Statistical Analysis Results

Recall RQ 3:

**RQ3: What, if any, is the relationship between model visibility levels and confrontiveness levels across the stages of FM workshops for the cases observed?**

Similar to RQ 2, RQ 3 progressed in the same two steps. Specifically, the first step was to conduct two sided chi-square tests in order to identify whether the MVL-CL variables were related or not. For stages in which 2x2 tables were observed the Fisher's exact test was used (Field, 2009:690). For stages in which 20% of cells did not have an expected count higher than 5 or had a minimum expected count less than 1 (and an exact test was not possible), the chi-square significance was assessed by conducting Monte-Carlo simulations (Field, 2009:547). The chi-square tests for the stages of cases A, B and C can be seen in tables 4.37, 4.38 and 4.39 respectively. Since this is an exploratory research a more liberal  $p < .10$  was used. Notwithstanding the above, both  $p < .05$  and  $p < .10$  significance levels are reported.

**Table 4:37 RQ3 -- Case A - Cross Stage Chi Square tests.**

Case A	Stages	$\chi^2$ (df <sup>72</sup> )	Notes.
Variables: MVLs Vs CLs	Stage 1	NA <sup>73</sup>	Perfect association of MVL-CL variables. Only CL(Low) and MVL(NMA) observed. No further analysis is possible.
Variables: MVLs Vs CLs	Stage 2	279.55** (9)	MVLs and CLs appear to be related, thus case A- stage 2 is a suitable candidate for further analysing the MVLs-CLs relationship.
Variables: MVLs Vs CLs	Stage 3	120.10** (9)	Same as in case A- stage 2
Variables: MVLs Vs CLs	Stage 4	33.01** (4)	Same as in case A- stage 2
** $p < .05$ , * $p < .10$			

<sup>72</sup> df: degrees of freedom.

<sup>73</sup> No variance observed.

**Table 4:38 RQ3 -- Case B - Cross Stage Chi Square tests.**

Case B	Stages	$\chi^2$ (df)	Notes.
Variables: MVLs Vs CLs	Stage 1	NA <sup>74</sup>	Low CL for all MVLs observed. Chi square computation is not possible since CL variable is constant. Reporting is limited to CL(Low).
Variables: MVLs Vs CLs	Stage 2	294.43** (9)	MVLs and CLs appear to be related, thus case B- stage 2 is a suitable candidate for further analysing the MVLs-CLs relationship.
Variables: MVLs Vs CLs	Stage 3	108.89** (6)	Same as in case B- stage 2
Variables: MVLs Vs CLs	Stage 4	NA <sup>75</sup>	Low CL for all MVLs observed. Chi square computation is not possible since CL variable is constant. Reporting is limited to CL(Low).
**p<.05, *p<.10			

**Table 4:39 RQ3 -- Case C - Cross Stage Chi Square tests.**

Case C	Stages	$\chi^2$ (df)	Notes.
Variables: MVLs Vs CLs	Stage 1	NA <sup>76</sup>	Perfect association of MVL-CL variables. Only CL(Low) and MVL(NMA) observed. No further analysis is possible.
Variables: MVLs Vs CLs	Stage 2	207.13** (9)	MVLs and CLs appear to be related, thus case C- stage 2 is a suitable candidate for further analysing the MVLs-CLs relationship.
Variables: MVLs Vs CLs	Stage 3	190.18** (9)	Same as in case C- stage 2
Variables: MVLs Vs CLs	Stage 4	222.16** (9)	Same as in case C- stage 2
Variables: MVLs Vs CLs	Stage 5	133.19** (9)	Same as in case C- stage 2
** p<.05, *p<.10			

<sup>74</sup> No variance observed.<sup>75</sup> No variance observed.<sup>76</sup> No variance observed.

The chi square analysis indicated that a relationship between MVL and CL variables exists in all cases stages, except for stage 1 in cases A and C which displayed no variance for both variables. Moreover, in stages 1 and 4 for case B, low CL for all MVLs was a constant calling for cautious interpretation of the results. It should be further reminded that a fifth stage was observed only for case C.

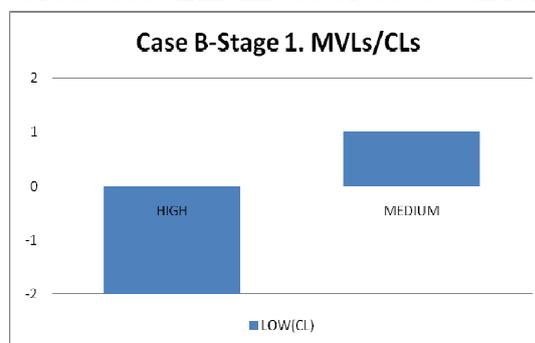
Having established the stages which are amenable to further analysis, the second step of analysis was performed.

The second step in the analysis entailed performing multinomial regression models for assessing the likelihood of observing a given pair of interaction between the MVLs and CLs, compared to the benchmark pairs [i.e MVL(NMA)-CLs].

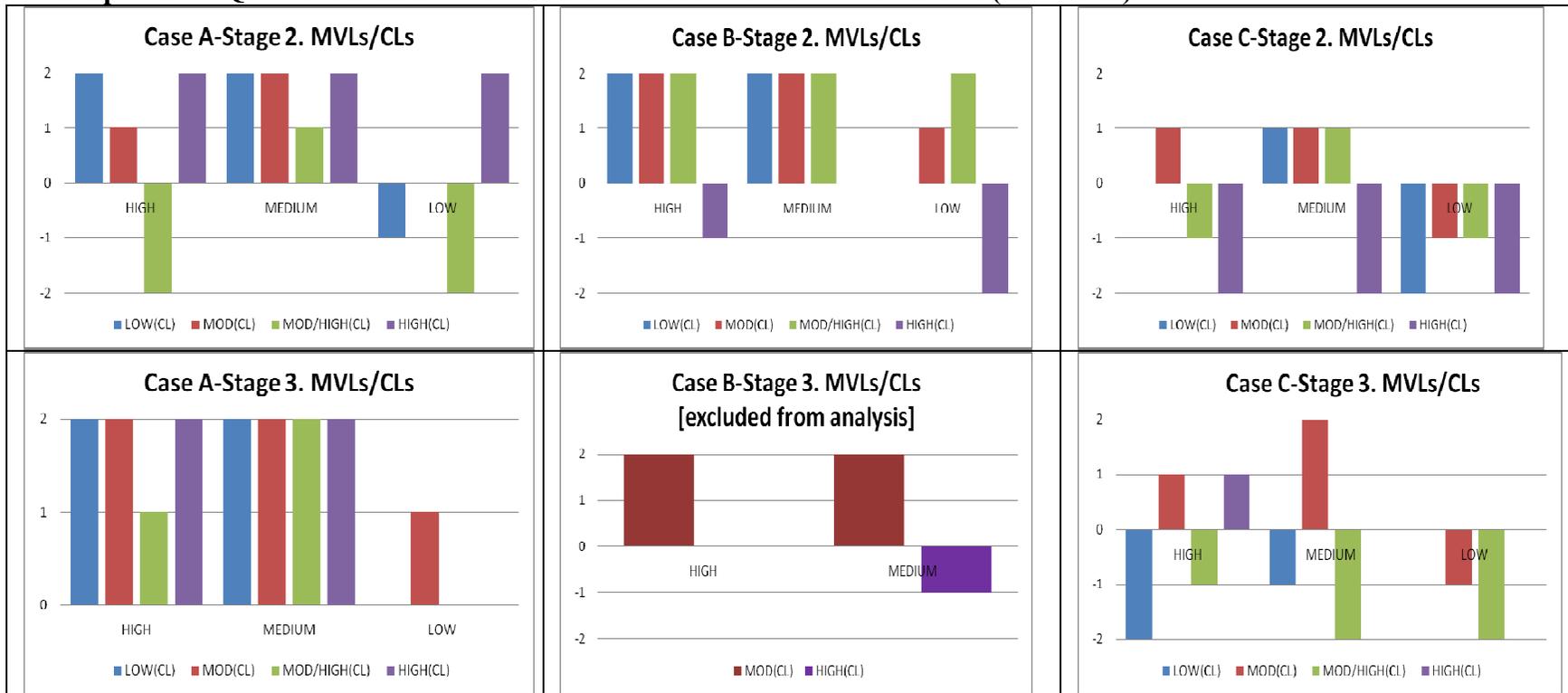
Similar to RQ 2, for every stage, the number of pairs observed has been compared to the number of pairs bearing statistically significant differences from the benchmark pairs. A  $p < .10$  was used as the level of acceptance for reporting. Any stage in which the statistically significant pairs were less than 50% of the total number of pairs was excluded altogether from further analysis.

The cross-stage results for all three cases can be viewed in the following graphs (4.30, 4.31 and 4.32).

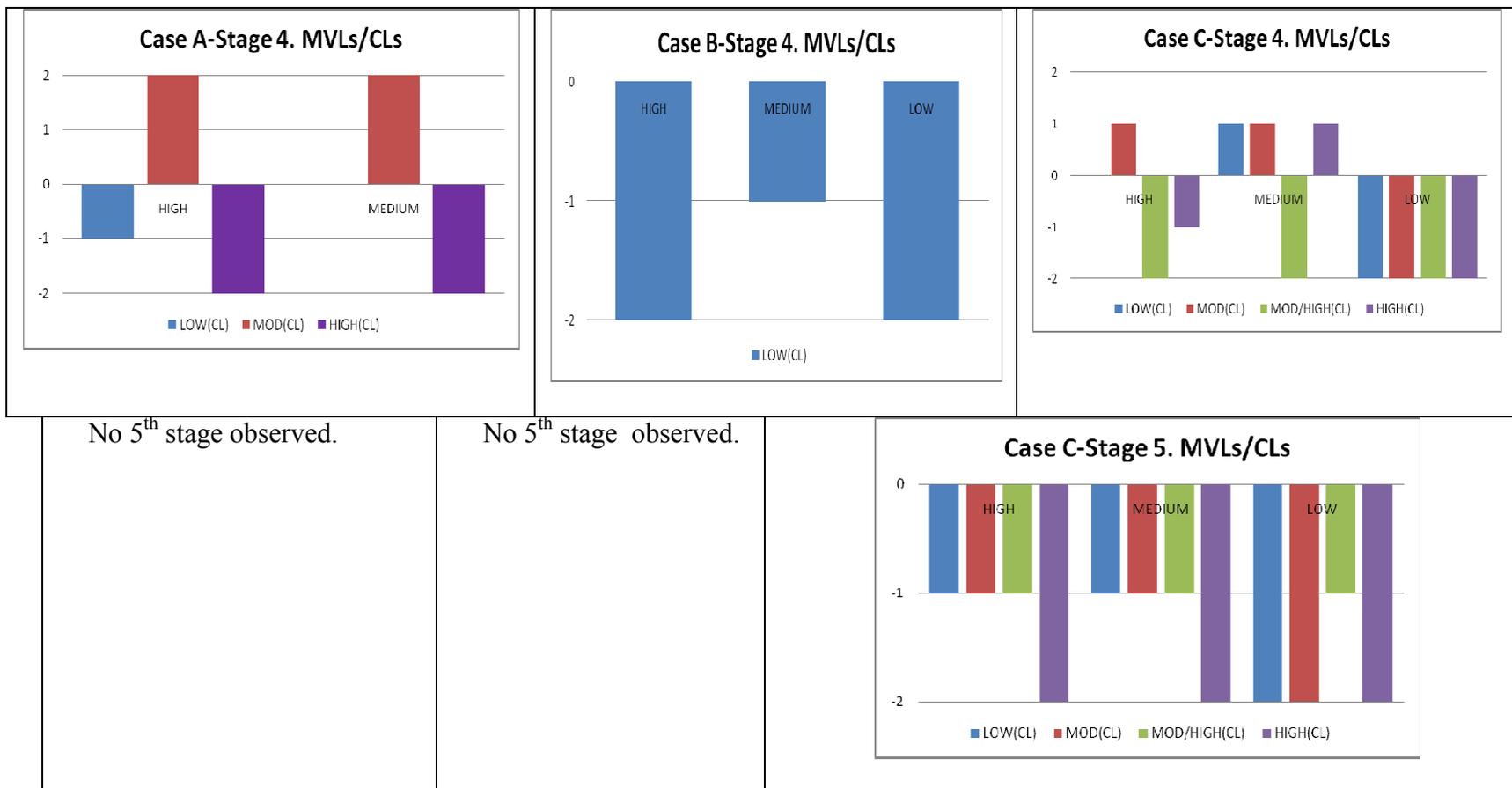
**Graph 4:30 RQ3 -- Cross Case Likelihood of Co-Occurrence MVLs Vs CLs.**



**Graph 4:31 RQ3 -- Cross Case Likelihood of Co-Occurrence MVLs Vs CLs (continued).**



**Graph 4:32 RQ3 -- Cross Case Likelihood of Co-Occurrence MVLs Vs CLs (continued).**



## 4.7 RQ3: Interpretative Analysis

Before interpreting the results it must be reminded that the bar-charts indicate the likelihood of a given pair of behaviour to be observed against the likelihood of observing the benchmark pair MVL(NMA)-CLs. So for example, in case C-Stage 3 we notice a high-negative likelihood of observing CL(Low) when MVL(High) is observed, *when compared to* the likelihood of observing (for the same case and stage) the benchmark pair CL(Low)-MVL(NMA). Similarly for case A-Stage 2 we notice a high-positive likelihood of observing CL(High) when MVL(Medium) is observed, *when compared to* the likelihood of the benchmark CL(High)-MVL(NMA).

It must be further reminded that previous research offers evidence in that effective conflict management will be assisted by increased levels of confrontiveness (Sambamurthy & Poole, 1992).

Interpreting the results produced for stages across the cases allows for a number of findings to emerge as follows:

### 4.7.1 RQ3: Stage 1 – Single Case Analysis.

For cases A and C, stage 1 presents both MVL and CL variables as constant. On the other hand for case B, the only the CL variable had a constant low value against the three MVL values observed, namely MVL(NMA), MVL(High) and MVL(Medium). As such computation of the likelihood for observing any of the two MVLs (i.e. High and Medium), over the benchmark, for observing CL(Low) was possible. Nevertheless, these results represent a single case and a single CL category and as such, for this part of the analysis, no further interpretation is possible.

#### **4.7.1.1 RQ3: Stage 1 – Single Case Findings.**

Case B stage 1 indicates that MVL(Medium) is more likely to result to CL(Low) when compared to MVL(NMA) or MVL(High), with the latter being the least likely to be observed. In terms of likelihood of appearance for CL(Low) the order is (from most to least likely): MVL(Low) → MVL(NMA) → MVL(High).

#### **4.7.2 RQ3: Stage 2 - Cross Case Analysis.**

The rationale followed for interpreting the results is similar to the one explicated in RQ2, essentially seeking to uncover any patterns or intricacies amongst MVLs and CLs that could otherwise go unnoticed.

Cross case examination of the results obtained for stage 2 indicates that MVL(Medium) offered for an overall consistent high-positive likelihood for observing CL(Low), CL(Mod.<sup>77</sup>) as well as CL(Mod/High<sup>78</sup>), compared to their respective benchmark pairs of MVL(NMA) [namely the pairs being: MVL(NMA)-CL(Low), MVL(NMA)-CL(Mod.), MVL(NMA)- CL(Mod/High)].

In terms of CL(High), MVL (Medium) offered inconclusive evidence since of the two MVL(Medium) observations that had statistically significant [compared to MVL(NMA) pairs] CL(High) differences, one indicated a high-positive likelihood while the other indicated a high-negative likelihood. As such the pair MVL(Med)-CL(High) has been omitted from any further analysis since no safe inference can be drawn.

MVL(High) offered for average to high positive likelihood of observing CL(Low), and CL(Mod.). Furthermore, MVL(High) displayed valid differences in

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<sup>77</sup> Recall that CL(Mod) stands for Moderate levels of confrontiveness.

<sup>78</sup> Recall that CL(Mod/High) stands for Moderately high levels of confrontiveness.

the CL(Mod/High), throughout all of the cases examined. Still, the fact that high-positive and high-negative likelihoods are observed in cases A and B brings the analysis to a stalemate. Examining case C, an average-negative likelihood for observing CL(Mod/High) when MVL(High) is observed, thus allowing us to ‘softly’ err on the average-negative likelihood side for observing CL(Mod/High) when observing MVL(High). Similarly, when observing MVL(High) in relation to CL(High) the evidence in 2/3 stages also appear to contradict each other by having a high-positive likelihood in case A and a high-negative likelihood in case C. Thus, and drawing from case B, I shall also ‘softly’ err on the average-negative likelihood for observing CL(High) when MVL(High) is observed, compared to MVL(NMA)-CL(High).

Similar behaviour to MVL(High) is encountered when observing MVL(Low) in relation to CL(Mod/High). Thus, I shall also ‘softly’ err on the average-negative likelihood side of observing CL(Mod/High) when observing MVL(Low), compared to the benchmark likelihood of observing CL(Mod/High) when observing MVL(NMA). Further examining MVL(Low), for all the stage 2 in the cases observed, an average to high-negative likelihood for CL(Low) can be seen.

CL(Mod) results are also contradictory with case B offering exactly the opposite result than case C in terms of likelihood of CL(Mod) to be observed when MVL(Low) is observed. Thus it is considered an inconclusive result and will be omitted from any further analysis since no safe inference can be drawn for pair MVL(Low)-CL(Mod) when compared to pair MVL(NMA) –CL(Mod).

#### 4.7.2.1 RQ3: Stage 2 – Cross Case Findings

In terms of achieving low levels of confrontiveness, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(Medium) → MVL(High) → MVL(NMA) → MVL(Low). This implies that there is a higher likelihood for achieving lower levels of confrontiveness when the model visibility is medium or high than when non-visible at all. The highest-negative likelihood for observing CL(Low) comes from observing MVL(Low), meaning that it is highly unlikely to observe low levels of confrontiveness when low levels of model visibility are observed.

*As such it appears that for the cases observed and across the valid second stages, **medium and high** levels of model visibility played a **hindering role**, in terms of effective conflict management, by **encouraging low levels of confrontiveness**, when compared to no model visibility. On the other hand, **low** levels of model visibility played a **beneficial role**, in terms of effective conflict management, by **discouraging low levels of confrontiveness**, when compared to no model visibility.<sup>79</sup>*

In terms of achieving moderate levels of confrontiveness, model visibility levels arranged from highest-positive to benchmark likelihood come in the following order: MVL(Medium) → MVL(High) → MVL(NMA)<sup>80</sup>.

*As such it appears that for the cases observed and across the valid second stages, **medium and high** levels of model visibility played a **beneficial role**,*

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<sup>79</sup> Again it should be noted that this statistical analyses cannot make inferences about the causal relationships of the variables. Instead causality is implied by assuming the theoretical stance offered by AST (DeSanctis & Poole, 1994)

<sup>80</sup> Recall that MVL(Low) results were inconclusive and it was thus decided to omit MVL(Low) from further reporting for this specific stage and CL.

*in terms of effective conflict management, by **encouraging moderate levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving moderately high levels of confrontiveness, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(Medium) → MVL(NMA) → MVL(High), MVL(Low) [tie].

*As such it appears that for the cases observed and across the valid second stages, **medium** levels of model visibility played a **beneficial role**, in terms of effective conflict management, by **encouraging moderately high levels of confrontiveness**, when compared to no model visibility. On the other hand, **high and low** levels of model visibility played a **hindering role**, in terms of effective conflict management, by **discouraging moderately high levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving high levels of confrontiveness, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(NMA) → MVL(High) → MVL(Low)<sup>81</sup>.

*As such it appears that for the cases observed and across the valid second stages, **medium** levels of model visibility played a **beneficial role**, in terms of effective conflict management, by **encouraging high levels of confrontiveness**, when compared to no model visibility. On the other hand, **high and low** levels of model visibility played a **hindering role**, in terms of effective conflict management, by **discouraging high levels of confrontiveness**, when compared to no model visibility.*

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<sup>81</sup> Recall that MVL(Medium) results were inconclusive and it was thus decided to omit MVL(Low) from further reporting for this specific stage and CL.

#### **4.7.3 RQ3: Stage 3 - Cross Case Analysis.**

First thing to note while cross examination of the stage 3 results is that, similarly to RQ 2, stage 3 for case B presented a very low number of statistically significant pairs differing from the benchmark MVL(NMA). Specifically of the 8 pairs observed only 3 were significantly different from the benchmark. As such, stage 3 for case B has been excluded from further analysis.

Cross case examination of the results obtained for stage 3 indicates that MVL(Medium) offered for an overall consistent average to high positive likelihood for observing CL(Low), CL(Mod.) and CL(High), compared to their respective benchmark pairs of MVL(NMA) [namely MVL(NMA)-CL(Low), MVL(NMA)-CL(Mod.), MVL(NMA)- CL(High)]. MVL (Medium) offered inconclusive evidence in terms of observing CL(Mod/High), since of the two MVL(Medium) observations that had statistically significant [to MVL(NMA)] CL(Mod/High)] differences, one indicated a high-positive likelihood while the other indicated a high-negative likelihood. As such the pair MVL(Med)- CL(Mod/High) has been omitted from any further analysis since no safe inference can be drawn for pair MVL(Med)-CL(Mod/High) when compared to pair MVL(NMA) –CL(Mod/High).

MVL(High) offered for an overall consistent average to high positive likelihood for observing CL(Mod) and CL(High), while offering inconclusive evidence in terms of observing CL(Low) and CL(Mod/High).

MVL(Low) offered for highly inconsistent results by either not being observed [as for CL(Low) and CL(High)] or by offering contradictory results [as for CL(Mod)]. For CL(Mod/High), MVL(Low) was observed only in one case, namely case C. As such the inference drawn for MVL(Low) is limited only for a single stage and only

for CL(Mod/High). Clearly, limited inference can be drawn by examining MVL(Low) across cases for stage 3.

#### **4.7.3.1 RQ3: Stage 3 – Cross Case Findings**

In terms of achieving low levels of confrontiveness, the highest-positive likelihood was obtained by MVL(Medium) thus causing the order of MVLS, in terms of likelihood of observation, to be as follows: MVL(Medium) → MVL(NMA). This implies that there is a higher likelihood for confrontiveness levels to be low when the model visibility is medium than when non-visible at all.

*As such, it appears that for the cases observed and across the valid third stages, **medium** levels of model visibility played a **hindering** role, in terms of effective conflict management, by **encouraging low levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving moderate levels of confrontiveness, model visibility levels arranged from highest-positive to benchmark likelihood come in the following order: MVL(Medium) → MVL(High) → MVL(NMA).

*As such, it appears that for the cases observed and across the valid third stages, **medium** and **high** levels of model visibility played a **beneficial** role, in terms of effective conflict management, by **encouraging moderate levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving moderately high levels of confrontiveness, model visibility levels arranged from benchmark to highest-negative likelihood come in the following order: MVL(NMA) → MVL(Low).

*Single stage observations offer support in that, for the single case observed and across the valid third stage, **low** levels of model visibility played a **hindering** role, in terms of effective conflict management, by **discouraging moderately high levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving high levels of confrontiveness, model visibility levels arranged from highest-positive to benchmark likelihood come in the following order: MVL(High)→ MVL(Medium)→ MVL(NMA).

*As such, it appears that for the cases observed and across the valid third stages, **high and medium** levels of model visibility played a **beneficial** role, in terms of effective conflict management, by **encouraging high levels of confrontiveness**, when compared to no model visibility.*

#### **4.7.4 RQ3: Stage 4 - Cross Case Analysis.**

When examining stage 4 across cases a number of observations can be immediately made. First of all it can be observed that case A and case B have not been very active while this inactivity is not due to many pairs having insignificant differences to the benchmark. Specifically 5/6 pairs observed for case A and all 3 pairs observed in case B have achieved statistically significant differences, compared to the benchmark, and have thus been included. Furthermore, it can be seen that all CL(Mod/High) observations presented a highly negative likelihood and are offered only from case C, thus any findings in terms of CL(Mod/High) are based on a single case and should be interpreted with caution.

Moreover, recall that case B presented only low levels of confrontiveness along all MVLs. This also brings a word of caution, especially if only the results from case

B were to be interpreted. Collecting data from more than one case as well as conducting the cross case analysis attempts to guard against the shortcomings of the possible contingencies single cases may display.

Cross case examination of the results obtained for stage 4 indicates that MVL(Medium) offered for an overall average to high positive likelihood for observing CL(Low) and CL(Mod) compared to their respective benchmark pairs. CL(High) demonstrated a high negative likelihood for case A and an average positive for case C. As such I erred on the average negative side in terms of the likelihood for observing CL (High) when MVL(Medium) is observed, compared to the benchmark pair of CL(High) MVL(NMA). Moreover, CL(Mod/High) was observed only for case C, as previously mentioned, and it displayed a highly negative likelihood of occurrence, compared to the benchmark pair.

MVL(High) offered an overall consistent average negative likelihood for observing CL(Low) and CL(High). The single case CL(Mod/High) also presented, as previously explained, a high negative likelihood when paired with MVL(High). CL(Mod) was the only confrontiveness level observed for MVL(High) that bore a consistently average positive likelihood, when compared to its benchmark pair.

As previously noted, MVL(Low) was only observed for case C, having all corresponding CLs presenting high-negative likelihoods, compared to the benchmark pairs.

#### ***4.7.4.1 RQ3: Stage 4 – Cross Case Findings***

In terms of achieving low levels of confrontiveness, the highest-negative likelihood was obtained by MVL(High), followed by MVL(Low), thus causing the

order of MVLs, in terms of likelihood of observation, to be as follows: MVL(NMA) → MVL(Low) → MVL(High). This implies that there is a higher likelihood for confrontiveness levels to be low when the model is not visible at all than when otherwise.

*As such it appears that for the cases observed and across the valid fourth stages, **high and low** levels of model visibility played a **beneficial role**, in terms of effective conflict management, by **discouraging low levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving moderate levels of confrontiveness, model visibility levels arranged from highest-positive to highest-negative likelihood come in the following order: MVL(High), MVL(Medium) [tie] → MVL(NMA) → MVL(Low).

*As such it appears that for the cases observed and across the valid fourth stages, **medium and high** levels of model visibility played a **beneficial role**, in terms of effective conflict management, by **encouraging moderate levels of confrontiveness**, when compared to no model visibility. On the other hand, **low** levels of model visibility played a **hindering** role, in terms of effective conflict management, by **discouraging moderate levels of confrontiveness**, when compared to no model visibility.*

In terms of achieving moderately high levels of confrontiveness, model visibility levels arranged from benchmark to highest-negative likelihood come in the following order: MVL(NMA) → MVL(High), MVL(Medium), MVL(Low) [tied].

*Single stage observations offer support in that, for the single case observed and across the valid fourth stage, **all** levels of model visibility played a **hindering** role, in terms of effective conflict management, by **discouraging***

*moderately high levels of confrontiveness, when compared to no model visibility.*

In terms of achieving high levels of confrontiveness, model visibility levels arranged from highest-positive to benchmark likelihood come in the following order: MVL(NMA)→ MVL(High)→ MVL(Low)→ MVL(Medium).

*As such it appears that for the cases observed and across the valid fourth stages, **all** model visibility played a **hindering** role, in terms of effective conflict management, by **discouraging high levels of confrontiveness**, when compared to no model visibility.*

#### **4.7.5 RQ3: Stage 5 – Single Case Analysis.**

Stage 5 has been observed only for case C. As such all results come from a single case and appropriate caution should be exercised when interpreting them. As such it can be observed that CL(Mod/High) presented an average negative likelihood throughout all MVL's, when compared to the benchmark MVL(NMA).

Similarly, CL(High) presented a high negative likelihood throughout all MVL's, when compared to the benchmark MVL(NMA).

In terms of CL(Low) and CL(Mod), MVL(High) and MVL(Medium) behaved similarly, displaying average-negative likelihoods in terms of the pairs co-occurring.

Slightly differentiated, MVL(Low) displayed high-negative likelihoods for observing CL(Low) and CL(Mod).

##### **4.7.5.1 RQ3: Stage 5 – Single Case Findings.**

Bearing in mind the above analysis, the findings can be summarized in the following statements.

*Single case observations* offer support in that, for the single valid fifth stage observed, **high and medium** levels of model visibility exhibited exactly the **same results** indicating a **hindering** role, in terms of effective conflict management.

**Low** level of model visibility, while at a different intensity, further displayed a **hindering** role in terms of effective conflict management.

This was done by having **all** model visibility levels hindering **all**, and especially **high**, levels of confrontiveness when compared to no model visibility.

In the following section, stage specific analysis and findings are integrated for reporting the cross stage results and performing the cross stage analysis.

#### **4.7.6 RQ3: Cross Stage Results**

The stage specific analysis made possible to integrate the case and stage specific findings and report them across stages. The cross-case findings can be summarized in the following table according to the stage in which they have been observed (Table 4.40).

**Table 4:40 RQ3 -- Cross-Stage MVLs Vs CLs Results Summary.**

Stages	Confrontiveness Levels			
	CL(LOW)	CL(MOD)	CL(MOD/HIGH)	CL(HIGH)
Stage 1	High + NMA Med -	N/A	N/A	N/A
Stage 2	Low ++ NMA High - - Medium - -	Medium ++ High + NMA Low (N/A)	Medium ++ NMA High - Low -	NMA High - Low - Medium (N/A)
Stage 3	NMA Medium - High (N/A) Low (N/A)	Medium ++ High ++ NMA Low (N/A)	NMA Low - High (N/A) Medium (N/A)	High ++ Med + NMA Low (N/A)
Stage 4	High ++ Low ++ NMA Medium (N/A)	High ++ Medium ++ NMA Low	NMA High - Medium - Low -	NMA Low - - High - - Medium -
Stage 5	High + Medium + Low + NMA	NMA High - Medium - Low -	NMA High - Medium - Low -	NMA High - Medium - Low -

As for RQ2, within table 4.40, one can observe plus or minus signs next to each MVL, some MVLs having an (N/A) next to them, as well as some of the MVLs being highlighted. As previously mentioned the signs are meant to convey a sense of *benefit towards conflict management effectiveness (CME)* and not the likelihood of occurrence. As such one should be vigilant in not assuming that a plus (+) observed next to an MVL in a CL(Low) cell means that it is more likely for the CL(Low) to be observed for that given stage. What it means but only for CL(Low) cells, is that CL(Low) is **less** likely to be observed in that cell and as such the benefit towards CME is greater. Thus across all CLs a plus (+) next to a MVL means a benefit towards CME while a minus (-) means a hindrance towards CME. Recall that, double plusses (+ +) or double minuses (- -), indicate the degree of confidence these summary results display in terms of the data that they were drawn from. For

example, if a certain summary result is based on valid but reduced number of (or even single) stage observations then a single sign (be it + or -) has been assigned. If a given summary result for a given cell is observed in the majority, or all, of the stages then a double sign has been assigned. The N/A inside parenthesis means that the MVL was not observed for the specific cell and as such no further comment can be made. Moreover the best, or the least worst (as in the case of NMA), MVLs have been highlighted (i.e. green highlight). In the cases of ties, all tied MVLs have been highlighted.

From table 4.40 a number of useful observations can be made in terms of model visibility levels and effective conflict management types. The aim of table 4.40 is to allow for cross stage findings at the prescriptive level to emerge, thus it is of interest in making analysis-based recommendations on how model appropriations may assist in effective conflict management (CME).

Prescribing the desirable MVLs for effective conflict management (CME) cannot take place without referring to the stage in which a specific MVL is more likely to result to a desirable CL. For example, if one seeks to observe **moderate or high** levels of confrontiveness during **stage 3**, he/she should opt for a **high level** of model visibility while trying to avoid no model appropriations. If on the other hand one seeks to avoid having **low** levels of confrontiveness during **stage 4**, one should opt for **high** or **low** model visibility levels. Prescriptions for the rest of the stages and CLs can be obtained by following the summary results of table 4.40 above<sup>82</sup>.

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<sup>82</sup> Table 4.40 and the process for deriving the prescriptions being self-explanatory do not require any further explication.

#### 4.7.7 RQ3: Cross Stage Interpretative Analysis

The first observation that can be made is that *there appears to be a stage dependent relationship between MVLs and CMTs that may result to increased CME.*

Further observations can be made when each CL is observed across the various stages while taking into account the dominant beneficial MVLs.

1. Observing stages 1-5 for **CL(Low)** it appears that the most beneficial MVLs towards suppressing low levels of confrontiveness moved from High → Low → NMA → High, Low [tied] → High. An initial observation is that Medium levels of model visibility have either not been observed or they have constantly played a hindering role in terms of discouraging low levels of confrontiveness (stage 5 being a single-case stage allows for such an interpretation leeway). If single stage observations (i.e. stages 1 and 5) are included, it can be observed that the spread between High and Low MVLs is fairly equally distributed, with the mid stage (stage 3) being the only one in which the model was not appropriated at all. As such *it appears that while the model kicked-off by being appropriated in a beneficial manner, in stage 3 it 'disengaged' and then in stage 4 it 'reengaged' in terms of discouraging CL(Low).*

2. Observing stages 2-4 for **CL(Mod)**, it appears that the most beneficial MVLs towards increasing moderate levels of confrontiveness *were of the high and medium visibility levels and were constantly observed throughout.*

3. Benefit in terms of observing increase in **CL(Mod/High)** has been obtained only when the model was appropriated in stage 2, thus moving, across stages 2 to 5, MVLs moved from Medium → NMA → NMA → NMA. This gives a strong indication that while initially the model was appropriated for moderately high

confrontiveness levels it was then abandoned for this specific CL. As it will become evident, this observation relates to the next point about CL(High)

4. Observing **CL(High)** across stages 2-5 progressed in the following manner: NMA → High → NMA → NMA. As such it appears that while initially the model was not appropriated at all for high levels of confrontiveness, in stage 3 there was a distinct increase in the level of model visibility in relation to CL(High). Recall that for stage 3, CL(Low) and CL(Mod/High) obtained no benefit from any levels of model visibility while CL(Mod) appeared to have a norm created across all stages (thus bearing no significant variance). As such it is plausible that there was a switch in terms of the model visibility levels and the confrontiveness levels, moving from **stage 2** MVLs (Low and Medium) that corresponded to CL(Low and Mod/High) to **stage 3** MVL(High) corresponding to CL(High), and then for CL(High) defaulting back to MVL(NMA) for stages 4 and 5, while CL(Low) picking up again.

Thus it appears that in the first few stages there was experimentation with various MVLs and CLs that did not progress to stage 4 and 5 and instead it appeared to have defaulted back to **discouraging** low levels of confrontiveness.

#### **4.7.7.1 RQ3: Cross Stage Findings.**

Points 1 to 4 offer for the following findings:

1. Excluding single case stages (1 and 5), it appears that the most active CL in terms of MVL was CL(Mod). That was followed by CL(Low) and then by CL(High) and CL(Mod/High). As such the following can be stated: It appears that the model being appropriated was beneficial towards CME, predominantly by **encouraging moderate** levels as well as by **discouraging**

**low** levels of confrontiveness compared to when the model was not appropriated at all.

2. It appears that for observing **CL(Mod/High)** and **CL(High)**, MVLs performed overall worse when the model was visible than when the model was not visible at all. The slight deviations offered from stages 2 and 3 are further touched upon in the next *stage specific* point.
3. Commenting specifically for stages it is of interest to note that, stages 2 and 3 that appear to present MVLs (Medium and High) as being beneficial in terms of encouraging CL(Mod./High) or CL(High), are also the same stages that present either MVL(Low) or no model visibility levels as being the most beneficial in terms of discouraging CL(Low). The opposite appears to happen for stage 4 in which the benefit of MVLs was predominantly focused to either discouraging CL(Low) or encouraging CL(Mod). Single case observations (i.e. stages 1 and 5) tend to display behaviors closer to stage 4. A useful conceptualization of this observation is to think about that correlation between higher levels of model visibility and confrontiveness levels displaying a ‘climb and descend’ behavior through time, peaking at stage 3. Thus, while there appeared to be a negative overall effect in terms of confrontiveness levels when the model was appropriated, stage specific analysis offered further insight in that: for stages 1, 4 and 5, MVL(High) and MVL(Low) have been beneficial towards the lower levels of confrontiveness, while when stages 2 and 3 were observed MVL(High) and MVL(Medium) have seen an increase in benefit in terms of the higher levels of confrontiveness.

The above can be summarized in the following statements:

- a) *High model visibility has been observed to have an overall strong beneficial effect towards conflict management by encouraging moderate and discouraging low levels of confrontiveness.*
- b) *The lowest overall benefit has been observed for moderately high and high levels of confrontiveness when the model was visible.*
- c) *There appears to have been a process of adaptation between earlier, middle and later stages, with middle stages more closely indicating a positive relationship between levels of model visibility and confrontiveness levels.*

The final step involved, in terms of reporting the findings, involved constructing a typology of the various MVLs and the corresponding CLs observed. The typology is offered in the following section.

#### **4.7.8 RQ3: Typology developed.**

Similarly to RQ2 and from the analysis performed on Table 4.40 it is possible to derive a generic typology of model visibility levels and CME benefits based on CLs

Again, bearing in mind the context of this research the typology has been decided to revolve predominantly around the observed stages and it has been derived by taking into account only the key benefiting model visibility levels. As such any situations displaying no model appropriations have been excluded.

In constructing the typology, the CME related benefit remained the same as the corresponding CLs. For example, a given MVL would improve CME by decreasing the likelihood of observing a CL(Low). To avoid confusion, and for CL(Low) only, a capital 'D' has been added indicating a decrease in the likelihood (i.e. 'CL(Low)D'). For all other CLs, the benefit of MVLs, towards CME, would be realised by

increasing the likelihood of observing a given CL, be it CL(Mod), CL(Mod/High) or CL(High). The typology can be seen in the following table (Table 4.41)

**Table 4:41 RQ3 -- Stage specific Typology MVL--CME(CL)**

Stages	MVL	CME related benefit
Stage 1	High	CL(Low)D
Stage 2	Medium	CL(Mod), CL(Mod/High)
	Low	CL(Low)D
Stage 3	High/Medium	CL(Mod)
	High	CL(High)
Stage 4	High/Low	CL(Low)D
	High/Medium	CL(Mod)
Stage 5	High/Medium/Low	CL(Low)D

Since MVLs directly relate to model appropriations, this typology is meant to convey a meaning of *cross stage best model appropriation* practices resulting in certain CL related benefits towards CME. As previously explicated the types derived for stages 1 and 5 are based on single case observations and are thus offered with a word of caution.

The typology further clarifies the aforementioned findings since it can be readily observed that of the 8 possible types across stages, 4 of them have been observed to relate directly to CME related benefit by reducing the likelihood of observing low levels of confrontiveness. Furthermore, only one type has been observed to directly relate to CME-related benefits by displaying either moderately high or high levels of confrontiveness. Bearing in mind that there are 4 possible CLs, an equal spread would mean that each level would be observed across stages around two times.

As such the aforementioned finding that the major impact of FM models was not in directly promoting higher levels of confrontiveness but in hindering low levels of confrontiveness, can be easily discerned from the typology.

Bearing in mind that moderately-high and high levels of confrontiveness represent situations of conflict (Sambamurthy & Poole, 1992), this finding offers an additional view towards the benefit of model appropriations in that it appears that appropriating FM models has been more beneficial when dealing with no-conflict than when dealing with conflict. As such the following can be stated.

- d) *FM models appeared to have a minor impact in terms of increasing the likelihood of observing conflict, compared to when the model was not appropriated.*

Moreover, by noticing that, in terms of beneficial MVLs, MVL(High) was observed in 6 /8 of the types, MVL(Medium) was observed in 4/8 of the types and MVL(Low) has been observed in 3/8 of the times, the following can be stated: It appears reasonable to indicate that most of the benefit, in terms of CME, came from high levels of model visibility. It mostly related to benefit derived by either discouraging low levels or by encouraging moderate levels of confrontiveness.

- e) *Combining findings a) and b), it appears that an inverse relationship between levels of model visibility and levels of confrontiveness has been observed.*

Recalling that moderately high and high levels of confrontiveness directly relate to observing conflict, the above three findings combined shed further light into RQ1. Specifically, by drilling down into the confrontiveness levels, and exploring the relationship between model appropriations and conflict-indicating confrontiveness levels it became apparent that it is indeed, as RQ1 analysis has shown, less likely for model appropriations to be observed when conflict is observed.

The above analysis provided a detailed and in-depth view on the intricate relationships between observed model visibility levels and levels of confrontiveness across stages. The key findings have been summarized in the following section.

#### **4.7.9 RQ3: Findings Summary.**

Recall Research Question 3:

***RQ3: What, if any, is the relationship between model visibility levels and confrontiveness levels across the stages of FM workshops for the cases observed?***

In answering RQ 3 the following findings have been unearthed:

##### ***4.7.9.1 RQ3 - Finding - F3.1***

***Drawing from the data available and the analysis performed, there appears to be a stage specific relationship between model visibility levels and confrontiveness levels. The exact relationship can be seen in the typology table (Table 4.40) produced in the previous section.***

##### ***4.7.9.2 RQ3 - Finding - F3.2***

***Drawing from the data available and the analysis performed, it appears that, High model visibility has been observed to have an overall strong beneficial effect towards conflict management by encouraging moderate and discouraging low levels of confrontiveness.***

##### ***4.7.9.3 RQ3 - Finding - F3.3***

***Drawing from the data available and the analysis performed, it appears that, the lowest overall benefit has been observed for moderately high and high levels of confrontiveness when the model was visible.***

#### 4.7.9.4 RQ3 - Finding - F3.4

*Drawing from the data available and the analysis performed, it appears that, an overall negative relationship between model visibility levels and levels of confrontiveness exists.*

#### 4.7.9.5 RQ3 - Finding - F3.5

*Drawing from the data available and the analysis performed, there appears to have been a process of adaptation between earlier, middle and later stages, with middle stages approaching a positive relationship between levels of model visibility and confrontiveness levels.*

#### 4.7.9.6 RQ3 - Finding - F3.6

*Drawing from the data available and the analysis performed, it appears that appropriating FM models has been more beneficial when dealing with no-conflict than when dealing with conflict.*

Reporting the findings for research question 3 concludes RQ3 analysis. In the next section the analysis of research question 4 attempts to further our understanding of the model related processes that take place during a FM workshop by examining the cross case and cross stage relationship between model visibility levels and conflict management types in relation to model appropriations complexity.

## 4.8 RQ 4: Statistical Analysis Results

Recall RQ 4:

**RQ4: What, if any, is the relationship between model visibility levels and conflict management types in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

Further, and as previously explained in the Methodology chapter, recall that desirability weights for the likelihood of each MVL-CMT pair observed have been assigned. Then by multiplying the desirability matrix with the MVL-CMT likelihood of occurrence matrix, the *MVL-CMT Conflict Management Effectiveness Matrix* was obtained. Summing all the values across the cells of the *MVL-CMT Conflict Management Effectiveness Matrix* allowed for the derivation of the *MVL-CMT Conflict Management Effectiveness Score* (CMES-CMT) for each stage.

Repeating this procedure across the stages for all the cases resulted in the following CMES-CMTs table (Table 4.42).

**Table 4:42 RQ4 -- Model Related CMES-CMT Table**

CASES	STAGES					<i>Average/Case</i>
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	
<i>A</i>	N/C	40	52	-12	N/O	26.6
<i>B</i>	N/C	-28	-8	N/C	N/O	Single stage
<i>C</i>	N/C	-58	25	5	-36	-16
<i>Average/Stage</i>		-15.3	38.5	-3.5	-36	

In Table 4.42 the best performing case across a give stage has been highlighted green, with the worst performing case across a given stage highlighted red. It is worth noting that stage 3 for case B which has been excluded from the previous analysis has been highlighted blue and has been also excluded from this analysis since in the likelihood matrix only 2 out of a possible 6 pairs have been found to be significant (for more on the computational procedures followed see the Methodology chapter). Stages in which no CMTs were observed have been indicated as N/C for No Conflict. Stages that have not been observed per se have been indicated as N/O for Not Observed. When calculating the averages across cases, case B offered only

one stage and thus has not been included in the averaging computations and has been indicated as a single case.

Recall that the next step of computations entailed the derivation of the Model Appropriations Complexity Score (MACoS). This was achieved by calculating the normalised<sup>83</sup> transitions across the phasic timelines of both GWRCS and MACS and then the MACS complexity score was further normalised by dividing it with the GWRCS complexity score. This process resulted in a unique MACoS for each stage of each case. The across cases and stages scores can be seen in the following table (Table 4.43).

**Table 4:43 RQ4 -- Model Appropriations Complexity Scores (MACoS)**

CASES	STAGES				
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>A</i>	1/1 = <b>1</b>	7/5.2 = <b>1.34</b>	5/4 = <b>1.20</b>	3/2.75 = <b>1.09</b>	N/O
<i>B</i>	1.25/1.5 = <b>0.83</b>	5.42/4.6 = <b>1.18</b>	3.8/3.25 = <b>1.17</b>	2/1 = <b>2</b>	N/O
<i>C</i>	1/1.5 = <b>0.66</b>	6.85/6.33 = <b>1.08</b>	4.16/3.6 = <b>1.16</b>	9/6.33 = <b>1.42</b>	6/4.33 = <b>1.38</b>

Table 4.43 has been colour coded in a similar rationale as the CMES-CMT table mentioned earlier. As such the stages that demonstrated the highest MACoS across cases have been highlighted green, while the ones demonstrating the lowest MACoS have been highlighted red.

Blue highlight was used for stages that have either been excluded from the CMES-CMT table (i.e. stage 3 - case B), or for stages in which no conflict was

<sup>83</sup> Recall that the transitions number for each phasic timeline was divided by the number of phase types observed (for more see the Methodology chapter).

observed as indicated in CMES-CMT table (i.e. stage 4 - case B, and stages 1 for all cases).

Unfortunately for this related RQ 4 analysis, no conflict was observed in case B stage 4 (this can be further observed by examination of the GWRCS phasic timeline for case B-stage 4 in Appendix 6). As such case B-stage 4 MACoS has been excluded from any further consideration for this analysis (in the following examination of RQ 6, case B -stage 4 has been included).

In the table above the MACoSs have been calculated by dividing the model appropriation complexity ratio with the group working relations complexity ratio thus normalising, to a certain extent, for group specific contingencies (for more on how the MACoS was calculated please see the Methodology chapter). Thus, the numerator in the division is the model appropriations complexity ratio while the denominator is the group working relations complexity ratio.

Numerator and denominator values higher than one indicate the degree of deviation from a unitary sequence (Poole & Roth, 1989a) if the phasic timelines of the constructs were to be individually assessed on their own (i.e. MACS and GWRCS phasic timelines assessed for complexity each on their own). Still and while useful for future exploration, within the context of this research, the MACS and GWRCS values have not been considered separately. They are merely offered here so that the reader can, if he/she chooses to do so, readily examine the phasic timelines in appendix 6 and replicate the derivation of the MACoS.

#### **4.9 RQ 4: Interpretative Analysis**

By examining CMES-CMT (table 4.42) it can be observed that case A was the best performing case in terms of the likelihood of having desirable MVL-CMT pairs

occurring, with stages 2 and 3 being the best when compared to those from the rest of the cases. On the other hand, case C performed worse across the cases examined for stages 2 and 3. In stage 4 the relationship between the two cases was reversed for case C being the best performing case and case A being the worst performing case. Single stage 5 has been also included predominantly for completeness purposes. Consistent with the findings in RQ 2, stage 3 appears to have been the best performing stage throughout all cases examined, in terms of the CMES-CMT with an average score of 38.5 and both case A- stage 3 and case C-stage 3 CMESs-CMT being positive. While stages 2 and 4 offer for a negative average CMES-CMT, the inconsistency across the two cases examined does not allow for any safe further inference for stages 2 and 4 to be drawn.

Further referring to the phasic timelines in appendix 6, one can readily observe that throughout the whole duration of stage 1 for case A both or one of the GWRCS - MACS variables were constant while for case C the MACS was constant. Limited inference can be drawn in terms of stage 1 for these two cases, perhaps none other than noting that case C demonstrated a slightly more complex path when GWRCS phasic timeline is compared to the MACS timeline. Moreover, the duration and order of the non-constant GWRCS phase for stage 1-case C can be viewed in the phasic timelines (Appendix 6), and while reported as findings, the research design of this thesis does not allow for any further analysis for this specific stage. These findings can be easily explained by recalling that stage 1 were the 'gathering contributions' stages and as such no model had been formed yet or appeared on the screen.

Stage 1- case B is slightly more interesting in terms of the complexity of the MACS phasic timelines and it is probably the only valid stage observed that offers

some MACoS. This means that a model appeared on the screen and the participants were appropriating it. Reviewing the videos revealed that a ‘jump-start’ was performed by the facilitator after an initial typing period in order to allow for novice participants to get a better understanding of the model mechanics. These model appropriations were led by the facilitator offering examples. The stage identification was reconfirmed by observing that the facilitator allowed for participants to be able and ‘take control’ of the model after stage 1. I view this inconsistency in the data as a contingency and not something that, given the research design of this thesis here, could contribute to a better appreciation of cross case-stage analysis. Case B will be of further concern when RQ 6 is addressed.

It is important at this point to indicate that the following separate examination of MACoS applies throughout all MACoS related RQ’s (i.e. RQ 6).

Examining MACoS table (4.43), it can be observed that while case A performed overall better than the rest of the cases, the MACoS steadily **decreased**. On the other hand MACoS for case C (i.e. the worst performing case in terms of the stage) steadily increased. Case A presented highest MACoS scores in the two earlier stages and the lowest in the last one while on the other hand case C moved in the opposite direction. It appears that case B performed consistently average for stages 2 and 3 while for stage 4 it presented the highest MACoS throughout all stages for all cases observed. Overall case A did better in terms of CMES-CMT with a positive average of 26.6, with case C doing worse with a negative average of -16.

It should be noted that since only 3 cases were observed, very few cross stage points were offered for performing any meaningful further statistical analysis. This should not be considered as a major disadvantage since the cross tabulation of the

datapoints across stages and cases allows for stage specific comment to be readily made. Thus, *it appears that no consistent behaviour is observed when **individually** examining the MACoS results on a **per stage basis** throughout the cases.*

In order to attempt and gain a better appreciation of what may have caused the increasing-decreasing difference across cases A and C, I went back to the video recordings, with the foci of my enquiry being specifically about model appropriations complexity and conflict.

For case A, I observed that a previously salient conflict came to play by one of the less vocal participants. This caused the conversation to move away from the model. Furthermore, as the group was working through conflict episodes it appears that it [i.e. the group] ceased to appropriate the model as much. It appears that the group felt that the task was accomplished and they did not want to be bothered any more. This is reasonable bearing in mind that case A was the case in which the participants with higher status were the ones that had most experience through participation to previous model building exercises in which the least experienced members were absent.

The group in case C on the other hand appears to have started with some disbelief as well as curiosity towards the model. As they started exploring the model they appear to become more confident in using it. It further appears to be the case that at some point the 'task' of interest became the model and how it should be appropriated instead of the real issue at hand. The conflict observed in stage 4 for case C was a precursor of a more intense conflict that was observed in stage 5 and was about assigning individual roles to tasks for implementation. As such while the group

attempted to appropriate the model in a complex manner in stage 5 the nature of the conflict appears to not have allowed for effective conflict resolution.

Taking into account the deficiencies presented by a very small number of datapoints as well as the variance these datapoints present (specifically for the case of CMES-CMT), one cannot fail to observe the similarity of the behaviour observed across cases and stages in terms of the CMES-CMT and the MACoS. Indeed the data indicate that when the best stages across cases in terms of CMES-CMT were observed they consistently displayed the highest MACoS. The same behaviour is observed when examining the worst stages across cases, i.e. the worst stages across cases, in terms of CMES-CMT, would present the lowest MACoS.

As such, and while bounded by the datapoint limitations, the consistency of the cross case results offer for some degree of confidence when stating the following:

*There appears to be a positive relationship between the model related conflict management effectiveness observed and the model appropriation complexity score, when the former is assessed in terms of the desirable conflict management types more likely to be observed for certain model visibility levels.*

In simpler terms what the above means is that when the complexity of model appropriations rise, it will be more likely to observe conflict management types that are beneficial towards increasing the conflict management effectiveness.

Linking the findings of RQ 1 with the aforementioned observations here in RQ 4, it is interesting to note that stage 3 which was found to consistently have more chances for conflict to occur when the model was appropriated (compared to the other stages), is also the stage in which the consistent findings about model related

CMES-CMT indicate that model appropriations would more likely result in more beneficial CMTs.

It is important to clarify that expecting a high correlation between the constructs appearing in RQ1 and RQ4 does not hold as an argument against the validity of the RQ1 Vs RQ4 comparison findings as I explain below.

Recall that in examining RQ1 the *complete* datasets were used. Also, both conflict and model appropriation variables were *transformed* (i.e. dichotomised). Thus, all conflict occurrences in RQ1 were derived by declaring all CMT observations as conflict occurring instances while all model appropriations were derived by declaring all model appropriations as model appropriation occurring instances. On the other hand for RQ4 only the datasets in which CMT's were observed were used, thus causing the datasets to be *partial*. Furthermore, in RQ4, the model appropriation variable categories were transformed by assigning different model visibility levels, while the CMTs were retained as they were. As such two differing datasets derived from the same pool of observations were analysed in RQ1 and RQ4 (i.e. *complete transformed Vs partial*). Finally, it should be reminded that the CMES-CMT did not simply measure the likelihood of occurrence of model appropriations but the likelihood of occurrence of **desirable** model appropriations in terms of the beneficial (towards CME) CMTs.

In simpler terms what the comparison between RQ1 and RQ4 suggest is that while overall it was unlikely to observe conflict when the model was appropriated, *the stage that presented the lowest negative probability for observing conflict and model appropriations occurrences also offered the highest probability that, when conflict occurred, the CMTs would be beneficial towards CME.*

A summary of the key findings for RQ 4 is offered in the next section.

#### **4.9.1 RQ4: Findings Summary.**

Recall Research Question 4:

***RQ4: What, if any, is the relationship between model visibility levels and conflict management types in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?***

In answering RQ 4 the following findings have been unearthed:

##### ***4.9.1.1 RQ4 - Finding - F4.1***

***Drawing from the data available and the analysis performed, it appears that a positive relationship between desirable model visibility-related conflict management types and higher model appropriation complexity score exists.***

It is interesting to note that this finding offers a similar understanding, coming from a different viewpoint, on the nature of conflict and how it develops.

In their seminal work, Poole & Roth (1989a) examined the nature of conflict paths in relation to the decision development paths. They identified that, conflict tended to occur more frequently when groups displayed more complex cyclic patterns. This thesis adds to that finding by suggesting that when groups do tend to display conflict, increased complexity of model appropriation paths will have a positive effect on the effectiveness of the manner in which the conflict is managed. This point is further explored in the Directions for Future Research section of the Discussion chapter.

The analysis also offered for the following additional findings:

#### **4.9.1.2 RQ4 - Finding - F4.2**

*Drawing from the data available and the analysis performed, it appears that no consistent behaviour is observed when individually examining model appropriation complexity score results on a per stage basis, throughout the cases.*

#### **4.9.1.3 RQ4 - Finding - F4.3**

*Drawing from the data available and the analysis performed, it appears that a consistent behaviour is observed for stage 3 when individually examining the beneficial model visibility-related conflict management types on a per stage basis. The rest of the stages offered for no consistent cross case results.*

#### **4.9.1.4 RQ4 - Finding - F4.4**

*Comparison between RQ1 findings (F1.1 and F1.2) and F4.3 suggest that while overall it was unlikely to observe conflict when the model was appropriated, the stage that presented the lowest negative probability for observing model appropriations and conflict occurrences also offered for the highest probability that, when conflict occurred, the model visibility-related conflict management types would be beneficial towards conflict management effectiveness.*

Reporting the findings for research question 4 concludes RQ4 analysis. Research questions 5 and 7 presented special results and as such will be addressed together later in the Results chapter, with research question 6 being addressed in the immediately next section.

## **4.10 RQ 6: Statistical Analysis Results**

Recall RQ 6:

**RQ6: What, if any, is the relationship between model visibility levels and levels of confrontiveness in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

Similarly to RQ4, desirability weights for the likelihood of each MVL-CL pair observed have been assigned. Then by multiplying the desirability matrix with the MVL-CL likelihood of occurrence matrix, the *MVL-CL Conflict Management Effectiveness Matrix* was obtained. Summing all the values across the cells of the *MVL-CL Conflict Management Effectiveness Matrix* allowed for the derivation of the *MVL-CL Conflict Management Effectiveness Score* (CMES-CL) for each stage.

Repeating this procedure across the stages for all the cases resulted in the following CMES-CLs table (Table 4.44).

**Table 4:44 RQ6 -- Model Related CMES-CL Table.**

CASES	STAGES					Average/ Case
	1	2	3	4	5	
<i>A</i>	N/A	31	51	-21	N/O	20.33
<i>B</i>	4	8	2	10	N/O	7.33
<i>C</i>	N/A	-49	-1	-42	-63	-38.75
<i>Average/Stage</i>		-3.33	25	-17.6		

The colour coding conventions have been the same as in RQ 4 and essentially they are that green highlight indicates best case when examining a specific stage, red highlight indicates worst case when examining a specific stage and blue indicates case specific-stages that have not been taken into account into the analysis.

Similarly to RQ4 the MACoS was used in order to make cross stage and cross case comparisons and is replicated in the following table (4.45).

**Table 4:45 RQ6 -- Model Appropriations Complexity Scores (MACoS)**

STAGES					
CASES	1	2	3	4	5
<i>A</i>	1/1 = <b>1</b>	7/5.2 = <b>1.34</b>	5/4 = <b>1.20</b>	3/2.75 = <b>1.09</b>	N/O
<i>B</i>	1.25/1.5 = <b>0.83</b>	5.42/4.6 = <b>1.18</b>	3.8/3.25 = <b>1.17</b>	2/1 = <b>2</b>	N/O
<i>C</i>	1/1.5 = <b>0.66</b>	6.85/6.33 = <b>1.08</b>	4.16/3.6 = <b>1.16</b>	9/6.33 = <b>1.42</b>	6/4.33 = <b>1.38</b>

The colour coding and value reporting conventions used for MACoS are the same as explicated in RQ 4 and follow the aforementioned rationale of CMES-CL table (4.44) in that green, red, and blue highlights have been used to denote best, worst and not included stages.

The differences to the MACoS table seen in RQ 4 is that stages 1 and 4 for case B offered for valid results and have been included in this analysis. Stage 1 for case B has been covered in RQ 3 and RQ4 analysis, where I identified its differences and I further indicated that these differences have most likely been derived by contingencies of the workshop mechanics and not by differences that are inside the scope of this research.

The peculiar behaviour observed for stage 4-case B is worth mentioning at this point. As can be observed in the phasic timelines in appendix 6, stage 4-case B demonstrated a rather stable behaviour in terms of the GWRCS related phases. Most of the fragmentation of the GWRCS timeline came from interplay between typing and focussed work periods, thus not taken into account when computing complexity (since transitions to Typing phases have not been considered as indicative of the model appropriations complexity) . Only near the end of the GWRSC phasic timeline

a period of integration interjected. Still, the MACS phasic timeline is observed to have been more active in terms of the transitions it presented. As such, and as the analysis performed in RQ3 indicated, while it has been possible to calculate a MACoS and CMES-CL score the results for stage 4 case B are to be interpreted with caution.

In the following section the interpretive analysis of the results for RQ 6 is further elaborated.

#### **4.11 RQ 6: Interpretative Analysis**

Since the values in MACoS table have been the same as in RQ 4, in this analysis MACoS shall not be examined as a whole since the analysis can be seen in RQ4. Instead the implications of including the two previously excluded cells of case B as valid cells for analysis will be briefly reported.

The key observation that can be made is that both stages 1 and 4 in - case B indicate a behaviour in which the MACoS has been increasing as the discussion moved across stages, with stages 2 and 3 scoring very closely<sup>84</sup>. As such it could be classified as closer approximating the behaviour observed in case C than that observed in case A. While cautiously interpreted as will be seen in the next few paragraphs, stage 4- case B offers for the highest MACoS observed throughout all stages and cases. Unfortunately, stage 1-case B is a single stage and similarly to stage 5-case C cannot offer for cross-case comparative analysis. Single stage 5 has been also included predominantly for completeness purposes.

Next I shall examine the CMES-CL results.

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<sup>84</sup> Recall that stage 3 has not been included in the analysis due to the fact that the very few MVL-CL likelihood pairs have been found to be significant as has been indicated in RQ 3.

When examining the CMES-CL results it should be noted that some artificial bias (correlation) between the CMES-CL and CMES-CMT is expected since the CL(High) corresponds directly to all the CMT(OD). Still the fact that CL(High) also corresponds to the CMT(OD)-related CMT(OPP)<sup>85</sup> (Sambamurthy & Poole, 1992: 238) guards to some extent for the artificial bias introduced when CMES-CMT results are compared to CMES-CL results. Furthermore, forget not that the values assigned in the desirability weights matrix differed across CMES-CMT and CMES-CL computations, thus adding a degree of variance that again reduces the probability of introducing bias to the results obtained. The aforementioned reasons offer for some degree of confidence when comparing the findings from RQ4 with those from RQ6.

In stages 2 and 3 similar to RQ 4 results are observed. As such case A was the best performing case in terms of the likelihood of having desirable MVL-CL pairs occurring, with stages 2 and 3 being the best when compared to those from the rest of the cases. On the other hand, case C performed worse across the cases examined for stages 2 and 3. Case B hovered in the middle of cases A and C for stages 2 and 3.

When examining stage 4 the relationship between cases A and C was reversed with case C being a better performing case than case A (case A being the worst performing case). Still, the best performing case for stage 4 was that of case B with the only positive value in terms of CMES-CL observed.

Consistent with the findings in RQ 2, stage 3 appears to have been the best performing stage throughout all cases examined, in terms of the CMES-CL with an

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<sup>85</sup> It should be noted that when OPP-OD is sequentially combined it has been labelled as an Integrative style of conflict management (Kuhn & Poole, 2000: 560&570)

average score of 25. While both case A- stage 3 and case C-stage 3 CMESs-CL have not been found to be positive (as in the case of RQ 4), the small negative value observed in stage 3-case C, when compared to the other case C stages allows for some degree of confidence in overall classifying stage 3 as a better performing stage than the rest. While stages 2 and 4 offer for a negative average CMES-CL, the inconsistency across the two cases examined does not allow for any safe further inference for stages 2 and 4 to be drawn.

Overall case A did better in terms of CMES-CL, with a positive average of 20.33, while case C did worse with a negative average of -38.75. Case B stages have been consistently found to be positive in terms of the CMES-CL, albeit with lesser scores than that of case A. As such, it appears that case B suffered less variance in terms of the CMES-CL while still maintaining positive CMES-CL.

Juxtaposing MACoS and CMES-CL it is interesting to observe that, similarly to RQ4, a positive relationship between the two variables seems to exist for stages 2 and 3. As such it can be stated that: *It appears that for stages 2 and 3 a positive relationship exists between the model related conflict management effectiveness observed and the model appropriation complexity score, when the former is assessed in terms of the desirable confrontiveness levels more likely to be observed for certain model visibility levels.*

Observing stage 4 offers for a two key observations to be made. First, the fact that MACoS also had an increasing pattern across case B stages, **combined** with the fact that the best performing stage 4 has been observed for case B, offers additional support to the analysis conducted in RQ4 that identified that while the overall best performing stage, in terms of CMES-CMT, had a decreasing MACoS score the case

that performed better in terms of stage 4 was the one that had a stably increasing MACoS score. From the RQ6 results presented here, it is also indicated that the above observation also holds for when CMES-CL in relation to MACoS is examined. As such, and drawing from the analysis in RQ4 this finding can be extended to include CMES of both types (i.e. CMES-CMT and CMES-CL). Thus, the results and the analysis offer some confidence in stating that the *cases displaying an overall increasing MACoS will tend to outperform those with a decreasing MACoS in stage 4 in terms of **overall** model-related conflict management effectiveness.*

How can this finding be explained? Given that the facilitator was the same and the tasks the groups were faced with were of similar importance to the group, it seems likely that the difference in MACoS and stage 4 between case A and cases B and C can be attributed to the different level of prior experience case A group had with similar formal group process procedures (FGPPs). Indeed informal discussion with case A participants indicated that they were more experienced in using this type of procedures for structuring their conversation. As such, in the duration of the workshop case A group initially appropriated the model in a manner that allowed them to “break free” from the model both in terms of the way that conflict is resolved as well as in terms of the model-spurred confrontiveness levels. On the other hand groups in cases B and C appeared to approach the model as the key foci of their workshop. In simpler terms groups in case B and C seemed to approach the model as something they *had to use*. The point made in RQ4 about the type of conflict case A group was faced with (i.e. more salient that surfaced later in the conversation) could be a strong explanatory factor if the analysis in terms of the CL had indicated that CMES-CL and MACoS moved differently from CMES-CMT and MACoS. The

close resemblance between the findings of RQ4 and RQ6 weaken the plausibility of a “conflict type based only” explanation (as is for example the case when observing the worst case in terms of CMES-Cl and MACoS for stage 4).

Poole, Shannon and DeSanctis (1992), indicated that the teams did not, in their majority, use a GDSS to manage their conflict. They further indicated that the nature of negotiation is such that requires the full attention of the participants in face to face interaction, thus making it unlikely to use the GDSS. Extending this line of argument it can be suggested that groups that have relatively little experience with facilitated modelling as well as with FGPPs may allow themselves to digress in considering the model to be the task itself instead of an aid towards effectively completing the Task (the Task in the context of this research being that of addressing and make decisions around issues of strategic importance).

As such, the following additional “soft”<sup>86</sup> observation can be stated with a certain degree of confidence. *More experienced groups will rely less on the model for effective conflict management than will inexperienced groups.*

Observing the worst case in terms of CMES-CL for stage 4 allows for additional observations to be made. It appears that case C that achieved the worst CMES-CL did not achieve the highest MACoS. As such the observations made for stages 2 and 3 cannot be also extended to stage 4. Nevertheless, what stage 4 does offer is the element of variance in the results further offering support in my confidence that the findings made in RQ4 do not artificially correlate with the findings made here in RQ6.

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<sup>86</sup> By “soft” the intention here is to explicitly allow for, more than usual, room for doubt since the level of experience was not measured in a systematic manner. The level of experience has been derived from informal conversations between me, the group participants from all the cases, and the facilitator.

#### 4.11.1 RQ 6: Findings Summary

Recall RQ 6:

**RQ6: What, if any, is the relationship between model visibility levels and levels of confrontiveness in relation to model appropriations complexity, across the stages of FM workshops for the cases observed?**

In answering RQ 6 the following findings have been unearthed:

##### 4.11.1.1 RQ 6 - Finding - F6.1

*It appears that for stages 2 and 3 a positive relationship exists between the model related conflict management effectiveness observed and the model appropriation complexity score, when the former is assessed in terms of the desirable confrontiveness levels more likely to be observed for certain model visibility levels. The rest of the stages do not offer consistent evidence*

##### 4.11.1.2 RQ 6 - Finding - F6.2

*It appears that the cases displaying an overall increasing MACoS will tend to outperform those with a decreasing MACoS in stage 4 in terms of overall model-related conflict management effectiveness.*

##### 4.11.1.3 Proposition - P6.1

*More experienced groups will rely less on the model for effective conflict management than will inexperienced groups.*

Reporting the findings for research question 6 concludes RQ6 analysis. Research questions 5 and 7 are addressed together in the next section.

#### 4.12 RQs 5+7: Statistical Analysis Results

Research questions 5 and 7 are concerned about the relationship between model visibility levels, conflict management types and confrontiveness levels in relation to the level of faithfulness of model appropriations. The tables in the following paragraphs indicate the number of ironic appropriations across cases and stages (Tables 4.46, 4.47 & 4.48).

**Table 4:46 RQs 5+7: Case A - Per Stage Duration Ironic Model**

#### Appropriations

	<b>CASE A</b>			
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>	<b>Ironic Apps</b>	<b>%/ stage</b>
1	18	0.64%	0	0.00%
2	1203	42.45%	3	0.25%
3	1386	48.91%	13	0.94%
4	227	8.01%	0	0.00%
<b>Total</b>	<b>2834</b>	<b>100%</b>	<b>16</b>	<b>0.56%</b>

As such and for case A it can be observed that of the total of 16 ironic appropriations, 3 took place during stage 2, making up 0.25% of all the thought units of case A-stage 2. For stage 3 the 13 ironic appropriations took up 0.94% of the thought units. It should be noted that in the ‘Total’ cell of the %/stages column the total number of ironic appropriations is divided by the total number of the thought units. Moreover, by looking at the thought unit numbers sequence for stage 3 it can be observed that some ironic appropriations did take place in a sequential fashion for more than 3 times (i.e. thus being within the rule of three for phasic analysis) but they have been subsumed into larger phases due to parsing and percentage cut-off point rules. The other stages displayed no ironic appropriations.

In a similar fashion for case B:

**Table 4:47 RQs 5+7: Case B - Per Stage Duration Ironic Model**

**Appropriations**

	<b>CASE B</b>			
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>	<b>Ironic Apps</b>	<b>%/ stage</b>
1	176	9.12%	0	0.00%
2	930	48.19%	1	0.11%
3	429	22.23%	0	0.00%
4	395	20.47%	8	2.03%
<b>Total</b>	<b>1930</b>	<b>100%</b>	<b>9</b>	<b>0.47%</b>

For case B it can be observed that of the total of 8 ironic appropriations, 1 took place during stage 2, making up 0.11% of all the thought units of case B-stage 2. For stage 4 the 13 ironic appropriations took up 2.03% of the thought units. Moreover, while stage 4 offered a relatively respectable percentage of ironic appropriations in its totality, observing the sequential ordering of the thought units indicates that they did not took place in a sequential fashion for more than 3 times (i.e. thus being within the rule of three for phasic analysis) and as such the rule of three did not allow them to be identified as solid phases of respectable duration (i.e. they have been subsumed by larger phases).

Moreover, the per stage calculations for case C can be seen in the following table 4.48.

**Table 4:48 RQs 5+7: Case C - Per Stage Duration Ironic Model**

**Appropriations**

	<b>CASE C</b>			
<b>Stage</b>	<b>Thought Units</b>	<b>% of total net duration</b>	<b>Ironic Apps</b>	<b>%/ stage</b>
1	60	1.11%	0	0.00%
2	2143	39.49%	9	0.42%
3	661	12.18%	0	0.00%
4	1880	34.64%	1	0.05%
5	683	12.59%	6	0.88%
<b>Total</b>	<b>5427</b>	<b>100%</b>	<b>16</b>	<b>0.29%</b>

For case C it can be observed that of the total of 16 ironic appropriations, 9 took place during stage 2, making up 0.11% of all the thought units of case B-stage 2. For stage 4 the 13 ironic appropriations took up 2.03% of the thought units. Moreover, while for stage 4 offered a relatively respectable percentage of ironic appropriations in its totality, observing the sequential ordering of the thought units indicates that they did not took place in a sequential fashion for more than 3 times (i.e. thus being within the rule of three for phasic analysis) and as such the rule of three did not allow them to be identified as solid phases of respectable duration (i.e. they have been subsumed by larger phases).

**4.12.1 RQs 5+7: Interpretative Analysis**

Surprisingly enough the level of faithfulness of model appropriations was consistently found to be near 100% faithful throughout all cases and stages.

Nevertheless, and since on the smoothed-out phasic timelines no ironic phases were observed, to further confirm the results I went back to the data and examined the transcripts in the unfiltered unitised form on a thought-unit basis, thus examining the ironic appropriations at the finest degree of granularity available in this thesis.

Due to the unexpected results, the ironic appropriation as well as 10 neighbouring codes (i.e. 10 codes before and 10 codes after each ironic appropriation thought unit) were reviewed and one of the coders that had previously assisted in obtaining the interrater reliability score was called in to have a second glance on the data and see whether the unexpected results may have been a matter of my coding. Minor differences were spotted with interrater agreement being 95.12%. Resolution of the disagreement about the two MACS codes was resolved through discussion and consensus between me and the other coder, with the other coder agreeing with my coding. The original coding was decided to be maintained.

As such no cross stage variance has been observed when assessing the relationship between model visibility levels, CMES-CMT or CMES-CL, and the level of faithfulness of model appropriations (LFMA). The only direct finding in terms of RQ's 5 and 7 that can be drawn is the following:

#### ***4.12.1.1 RQ 5 + 7 - Finding - F5+7***

***It appears that the level of faithfulness of model appropriation has been extremely high throughout all the cases and stages observed.***

#### **4.12.2 RQs 5+7: Additional Analysis**

Drawing from the proposition developed in RQ6, I was interested in finding out if there are any indications about links between the experience of the participants, the types of model appropriation and the conflict management types. In order to do so, the following basic calculations have been performed. Initially, I assessed the experience of each participant in terms of experienced/non-experienced. The

facilitator was not assigned an experience level since he was the specialist and as such his experience level has been assumed to be incomparable to the rest of the participants. I then observed the corresponding MACS and GWRCs codes for each of the ironic appropriations across stages. It is important to note that in order to gain a richer appreciation of the nature of ironic appropriations these codes have not been parsed in any way (i.e. before applying the phasic analysis algorithm). The results of these computations can be seen in the following tables.

For case A the table produced is the following (Table 4.49).

**Table 4:49 RQs 5+7: Case A - Per Thought Unit Ironic Model**

**Appropriations.**

<b>Case A</b>							
<b>Line Number</b>	<b>Stage</b>	<b>Thought Unit</b>	<b>Participant</b>	<b>Experienced Yes/No</b>	<b>MACS Code</b>	<b>GWRCs Code</b>	<b>MVL(CL)</b>
1	2	909	CEO	Yes	2C	FW	Low
2	2	910	CEO	Yes	2C	FW	Low
3	2	912	CEO	Yes	2C	FW	Low
4	3	2979	CEO	Yes	2C	CW	Mod.
5	3	3068	CEO	Yes	2C	CW	Mod.
6	3	3069	CEO	Yes	2C	CW	Mod.
7	3	3070	CEO	Yes	2C	CW	Mod.
8	3	3073	CEO	Yes	2C	CW	Mod.
9	3	3076	Top Manage	Yes	2C	CW	Mod.
10	3	3077	CEO	Yes	2C	CW	Mod.
11	3	3078	CEO	Yes	2C	CW	Mod.
12	3	3079	Technology	No	2C	CW	Mod.
13	3	3080	CEO	Yes	2C	CW	Mod.
14	3	3084	CEO	Yes	2C	FW	Low
15	3	3086	CEO	Yes	2C	FW	Low
16	3	3088	CEO	Yes	2C	FW	Low

In the following paragraphs I explicate the manner in which the tables need to be read and the information contained in them.

The first table column offers a serial counting of the line just to assist in the identification of each line throughout the rest of the thesis. The second column identifies the stage in which each of the thought unit has been observed in. The third column identifies the exact thought unit number corresponding to the transcript. It is important to note that the third column offers the raw unfiltered thought unit number as found in the transcript. As such it is possible to observe thought units that seemingly exceed the total number of thought units observed in one case.

For example in case A the total number of usable thought units was earlier identified to be 2834, while in the following table one can observe thought units numbered beyond the 2834 mark. This is because the 2834 number indicates the net thought unit number after filtering for unusable passage (such as time delineations, unintelligible units, units made by unidentified participants as well as interaction taking place during comfort breaks). Thought unit numbers in the third column have been included predominantly for reasons of completeness rather than serving any crucial function. The fourth column identifies the participant by role or by order of seating, depending on the requests made by the participants. For example in case A participants gave consent to be identified by role. The same consent was not obtained for cases B and C and as such they are identified by an artificial indicator being P1 for participant 1, P2 for participant 2 sitting next to P1, P3 for participant 3 sitting next to P2 etc. The facilitator has been denoted as 'FC'. Moreover, the fifth column answers the question of whether the participants were experienced or not. No inference was made as to the **level** of experience since it was assessed through information collected via informal conversations and not in a systematic manner. The fifth column offers the corresponding MACS code coded at a thought unit micro-

level. The sixth column offers the corresponding GWRCS code, derived by observing the GWRCS 30-sec unit a given thought unit fell into. The seventh, and last, column transforms the GWRCS code into the corresponding level of confrontiveness. It should be noted at this point that in terms of model visibility levels both 2C and 3B have been argued in the Methodology chapter as to indicate Low levels of model visibility. Assigning a MVL in this analysis would prove unfruitful since it would group the MACS codes into one (namely MVL(Low)) thus offering no explanatory variance.

From the above table (4.49) what can be observed is that, the more experienced group of case A displayed throughout all the ironic thought units only Unrelated Substitution (coded as 2C) type of ironic model appropriation and only for non-conflict units. Moreover, the level of confrontiveness predominantly displayed was moderate (coded as CW for Critical Work).

In the following table the same process used in case A has been replicated for case B in table 4.50.

**Table 4:50 RQs 5+7: Case B - Per Thought Unit Ironic Model**

**Appropriations.**

<b>Case B</b>							
<b>Line Number</b>	<b>Stage</b>	<b>Thought Unit</b>	<b>Participant</b>	<b>Experienced Yes/No</b>	<b>MACS Code</b>	<b>GWRCs Code</b>	<b>CL</b>
1	2	425	FC	FC	2C	CW	Mod.
2	4	1854	P9	No	3B	FW	Low
3	4	1855	P8	No	3B	FW	Low
4	4	1857	P9	No	3B	FW	Low
5	4	1858	P8	No	3B	FW	Low
6	4	1870	P9	No	3B	FW	Low
7	4	1871	P9	No	3B	FW	Low
8	4	1872	P5	No	3B	FW	Low
9	4	1876	P9	No	3B	FW	Low

It appears that the least experienced group of case B displayed only one Unrelated Substitution (coded as 2C) type of ironic model appropriation for non-conflict units with a moderate confrontiveness level while the dominant ironic model appropriations were those of Paradoxical Combination (coded as 3B). The Paradoxical Combination type of model appropriations being observed only for non-conflict units and were being solely used during low levels of confrontiveness (coded as FW for Focussed Work).

Similarly to cases A and B, the results for case C can be seen in table 4.51.

**Table 4:51 RQs 5+7: Case C - Per Thought Unit Ironic Model**

**Appropriations.**

<b>Case C</b>							
<b>Line Number</b>	<b>Stage</b>	<b>Thought Unit</b>	<b>Participant</b>	<b>Experienced Yes/No</b>	<b>MACS Code</b>	<b>GWRCs Code</b>	<b>CL</b>
1	2	975	FC	FC	2C	CW	Mod.
2	2	977	FC	FC	2C	CW	Mod.
3	2	978	P2	No	2C	CW	Mod.
4	2	979	P6	No	2C	CW	Mod.
5	2	1276	P4	Yes	2C	OPP	High
6	2	1278	P4	Yes	2C	CAP	Mod./High
7	2	1280	P4	Yes	2C	CAP	Mod./High
8	2	1311	P3	No	2C	CW	Mod.
9	2	1314	P3	No	2C	CW	Mod.
10	4	5424	FC	FC	2C	FW	Low
11	5	5902	P1	No	2C	OPP	High
12	5	5904	P5	No	2C	OPP	High
13	5	5905	P3	No	2C	OPP	High
14	5	5906	P1	No	2C	OPP	High
15	5	5907	P5	No	2C	OPP	High
16	5	5909	P5	No	2C	OPP	High

Examining the table it becomes evident that the averagely inexperienced group in case C displayed only Unrelated Substitution (coded as 2C) type of ironic model appropriation throughout all the ironic thought units. Moreover it appears case C group initially used ironic appropriations for non-conflict interaction. It then progressed to use ironic model appropriations for undesirable CMT and moderately-high CL conflict interaction. In the later stages it appears that group C used ironic appropriations for desirable CMTs [i.e. CMT(OPP)] while gradually moving from moderately/high to high confrontiveness levels.

On a different note, it can be observed that the more experienced group found in case A developed most of the ironic appropriations during stage 3. On the other hand the less experienced groups found in cases B and C developed most of the ironic

appropriations during stages 2 and 4 and 5 (for case C). This indicates that ironic appropriations in less experience groups will tend to appear near the later stages, compared to the middle stage observed for the case with the more experienced group.

What this additional analysis offers is that:

1. It confirms that extremely few ironic appropriations have been observed throughout all cases and all stages.
2. It indicates that on a micro-level, there appears to be a relationship between the type of ironic model appropriation, the conflict management types (CMT), the confrontiveness level (CL) and the experience of the participants expressing the ironic appropriations.
3. In terms of the type of ironic model appropriation, CMT and the experience of the participants expressing the ironic appropriations it has been observed that (a-d):
  - a) When **more experienced** participants ironically appropriate the model via **Unrelated Substitution (2C)**, either no or **capitulation** CMTs have been observed (this can be seen in case A all line numbers except line number 12, while in case C for lines numbered 6 and 7<sup>87</sup>).
  - b) When **less experienced** participants ironically appropriate the model via **Unrelated Substitution (2C)**, either no or **opposition** CMTs have been observed (this can be seen in case C for lines numbered 3 and 4 as well as for lines numbered 11 to 16).

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<sup>87</sup> Line number 5 being a singular observation was not taken into account.

- c) When **less experienced** participants ironically appropriate the model via **Paradoxical Combination (3B)**, no CMTs have been observed (this can be seen in case B for lines numbered 2 to 9).
- d) **More experienced** participants did **not** appear to ironically appropriate the model via **Paradoxical Combination (3B) at all**.

Maintaining the focus on the CMTs, the above can be neatly summarised in the following table (4.54).

**Table 4:52 RQs 5+7: Experience Vs CMT's and Types of Ironic Model**

**Appropriations.**

<b>CMT's</b>		
	<i>Type of Ironic Model Appropriations</i>	
<i>Experience of Participants</i>	<b>2C</b>	<b>3B</b>
<b>Higher</b>	Capitulation	N/O
<b>Lesser</b>	Opposition	No CMTs

The observations from point 3 suggest that even when the model was ironically appropriated the less experienced participants tended to result in more beneficial CMTs than the more experienced participants.

This can possibly be attributed to the fact that the facilitator being aware of the participants lesser experience did not allow them to deviate from beneficial CMTs even when the model was ironically appropriated. Also it may be the case that the less experienced participants, feeling less confident about how to appropriate the model were more susceptible to facilitator's guidance. On the other hand the more

experienced participants may have felt confident in appropriating the model thus challenging facilitator's guidance and resulting in non-beneficial CMTs.

It can be further noted that not all ironic model appropriations have been found to relate to CMTs. Thus, only the Unrelated Substitution (2C) type of ironic model appropriation has been found to relate to CMTs, with Paradoxical Combination either not being observed at all or not having an effect on CMTs.

4. In terms of the type of ironic model appropriation, CL and the experience of the participants expressing the ironic appropriations it has been observed that (a-d):
  - a) When **more experienced** participants ironically appropriate the model via **Unrelated Substitution (2C)**, either **Low, Moderate or Moderately High** confrontiveness levels have been observed (this can be seen in case A all line numbers except line number 12, while in case C for lines numbered 1 to 7<sup>88</sup>).
  - b) When **less experienced** participants ironically appropriate the model via **Unrelated Substitution (2C)**, either **Moderate or High** confrontiveness levels have been observed (this can be seen in case A for line numbered 12 as well as in case C for lines numbered 3, 4, 8, 9 and 11 to 16).
  - c) When **less experienced** participants ironically appropriate the model via **Paradoxical Combination (3B)**, only **Low** confrontiveness levels have been observed (this can be seen in case B for lines numbered 2 to 9).
  - d) This point is exactly the same as the CMT-related point d) and has been included only for purposes of completeness. As such, **more experienced**

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<sup>88</sup> Line number 5 being a singular observation was not taken into account.

participants did **not** appear to ironically appropriate the model via **Paradoxical Combination (3B) at all**

Maintaining the focus on the CMTs, the above can be neatly summarised in the following table (4.53).

**Table 4:53 RQs 5+7: Experience Vs CL's and Types of Ironic Model**

**Appropriations.**

<b>CL's</b>		
	<i>Type of Ironic Model Appropriations</i>	
<i>Experience of Participants</i>	2C	3B
<b>Higher</b>	Low Mod Mod./High	N/O
<b>Lesser</b>	Mod. High	Low

From the table it can be discerned that the best situation of ironic model appropriations has been observed when less experience participants ironically appropriated the model via Unrelated Substitution (2C). The worst possible situation was also observed for less experienced participants when they ironically appropriated the model via Paradoxical Combination. An average situation is identified when more experienced participants ironically appropriated the model via Unrelated Substitution (2C) with the resulting confrontiveness levels ranging from Low to Moderately High.

In terms of confrontiveness levels the results may be attributed in that when the confrontiveness levels were low both experienced and inexperienced participants

seemed to be in a relaxed state, feeling free to experiment with the model suggesting novice ways of appropriating it. Thus, it may well have been the case that low confrontiveness levels caused the ironic appropriations and not vice versa. The main support for that notion stems from observing the CL(Low) for less experienced participants in 3B. Paradoxical Combination (3B) has a stronger element of experimentation with the existing model (since it is the model that is being combined) than does Unrelated Substitution (in which case a model element is substituted with another model's element(s)). Thus, 3B observation implies higher experimentation with the model. How does this explanation then accounts for the CL(Low) observed for the more experienced participants? I interpret this inconsistency to be due to the fact that observing CL(Low) when 2C is also observed was expressed only in case A and from only one participant, thus making this observation susceptible to personality and contingency biases. On the other hand, while 3B was only observed in case B, thus having no more data to draw inference upon, the variance of participants displaying similar behaviour leads me to have relatively higher confidence in that the 3B observations in case B are valid in terms of explanatory power.

As such this analysis tends to err more on the explanation indicating that it may have been the case that during low levels of confrontiveness the inexperienced group participants felt more relaxed and experimented with the model and the manners in which it can be appropriated, thus observing some ironic appropriations.

While the data for the aforementioned analysis performed have not been collected in a systematic manner, the observations were derived by following a systematic process of analysis. Bearing in mind the data limitations the findings are offered as

something more than mere propositions but also something less than solid findings. Therefore, the next section summarising this analysis findings has been labelled as “soft” findings.

#### **4.12.3 RQ’s 5+7: “Soft” Findings Summary.**

Thus far the analysis has unearthed some additional findings that while not directly answering RQ’s 5 and 7, they offer further insight as to the role that ironic model appropriations have in relation to conflict management types and levels of confrontiveness. The findings can be summarised as follows:

##### **4.12.3.1 RQ’s 5+7 - “Soft” Finding - SF 5.1**

From the additional analysis performed on the available data, it appears that ***the dominant conflict management type observed when experienced participants of a FM workshop ironically appropriate the model by Unrelated Substitution, will be that of Capitulation of the conflict.***

##### **4.12.3.2 RQ’s 5+7 - “Soft” Finding - SF 5.2**

From the additional analysis performed on the available data, it appears that ***the dominant conflict management type observed when inexperienced participants of a FM workshop ironically appropriate the model by Unrelated Substitution, will be that of Opposition of the conflict.***

##### **4.12.3.3 RQ’s 5+7 - “Soft” Finding - SF 5.3**

From the additional analysis performed on the available data, it appears that ***no dominant conflict management type will be observed when inexperienced participants of a FM workshop ironically appropriate the model by Paradoxical Combination.***

#### **4.12.3.4 RQ's 5+7 - "Soft" Finding - SF 7.1**

From the additional analysis performed on the available data, it appears that *the dominant Confrontiveness Levels observed when experienced participants of a FM workshop ironically appropriate the model by Unrelated Substitution, will be those of Moderate or Moderately/High levels.*

#### **4.12.3.5 RQ's 5+7 - "Soft" Finding - SF 7.2**

From the additional analysis performed on the available data, it appears that *the dominant Confrontiveness Levels observed when inexperienced participants of a FM workshop ironically appropriate the model by Unrelated Substitution, will be those of Moderate or High levels.*

#### **4.12.3.6 RQ's 5+7 - "Soft" Finding - SF 7.3**

From the additional analysis performed on the available data, it appears that *the dominant Confrontiveness Levels observed when inexperienced participants of a FM workshop ironically appropriate the model by Paradoxical Combination, will be that of Low levels.*

#### **4.12.3.7 RQ's 5+7 - "Soft" Finding - SF 5.4 and 7.4**

From the additional analysis performed on the available data, it appears that *experienced participants of a FM workshop will ironically appropriate the model only by Unrelated Substitution.*

Reporting the soft findings for research questions 5 and 7 concludes RQ5 and RQ7 analysis as well as the whole analysis chapter.

In the following chapter I will be concerned with discussing the implications of the key findings in terms of theory and practice.

## 5 Discussion.

The discussion chapter attempts to link the key findings of this thesis to both theory and practice, thus highlighting its contribution.

The way this chapter is organised is by first discussing the theoretical implications of this thesis and explicating links to earlier relevant research.

The limitations of the thesis as well as directions for future research are also explicated.

### 5.1 Theory Development

#### 5.1.1 Contribution to Facilitated Modelling Theory.

The main research lacuna I try to fill in this section has been clearly delineated in Ackermann (2012), Franco & Rouwette (2011) and Franco & Montibeller (2010), urging for more systematic research on the processes of facilitated modelling allowing for the assessment of its impact. Moreover, I attempt to contribute to the debate by Eden (1995) and Finlay (1998), by evaluating the usefulness of models in the context of strategic decision making.

As has been indicated in the literature review chapter the lenses used for answering this question is via exploring the specific impact that the appropriations of models will have on conflict processes.

First recall F1.1 that sets the scene for further exploration:

*F1.1. Model appropriation occurrences and conflict occurrences display a consistent and statistically significant negative association.*

Then recall findings F2.4.1 and F2.4.3

F2.4.1 *Drawing from the data available and the analysis performed, it appears that appropriating the FM model will have an overall beneficial impact towards CME, predominantly by reducing the likelihood of tabling the conflict.*

F2.4.3 *Drawing from the data available and the analysis performed, it appears that the appropriation of FM models, when compared to non-appropriation, will have an overall negative impact towards CME, by increasing the likelihood of capitulation and by decreasing the likelihood of open discussion.*

These findings directly address the lacuna observed in the literature by having been derived through a rigorous and systematic research approach. What they indicate is that while the model will not be appropriated during conflict episodes, *when the model does get appropriated* it will have a positive impact resulting in more effective conflict management by attenuating conflict avoidance. At the same time model appropriations can also have a negative impact towards effective conflict management by amplifying capitulation and by attenuating open discussion.

#### **5.1.1.1 FM Claims Tested.**

A claim made by Eden & Ackermann (2010:249) is that, for a number of reasons (for example the anonymity of the issues on the map), the model should allow for more contentious issues to surface.

Limited support to this claim is offered when considering findings F3.4 and F3.6 stating that:

F3.4 *Drawing from the data available and the analysis performed, it appears that, an overall negative relationship between model visibility levels and levels of confrontiveness exists.*

F3.6: *Drawing from the data available and the analysis performed, it appears that appropriating FM models has been more beneficial when dealing with no-conflict than when dealing with conflict.*

Still, it appears that not all model appropriations are destructive in terms of effective conflict management. In building this argument recall findings F2.2, F3.2 and supporting finding F3.3

F2.2 *Drawing from the data available and the analysis performed, there appears to be a beneficial impact of MVL(High)which was consistently observed across stages to reduce the likelihood of occurrence for CMT(TAB). No other MVL-CMT appears to have been consistently developed across stages.*

F3.2. *Drawing from the data available and the analysis performed, it appears that, High model visibility has been observed to have an overall strong beneficial effect towards conflict management by encouraging moderate and discouraging low levels of confrontiveness.*

F3.3 *Drawing from the data available and the analysis performed, it appears that, the lowest overall benefit has been observed for moderately high and high levels of confrontiveness when the model was visible.*

Alas, findings F2.2 and F3.2, supported by F3.3, make for the case that when the model is highly visible more benefit towards effective conflict management is expected to accrue.

As such it appears that when the focus of the participants is placed directly on the model the participants will in a sense *have* to address their issues. Therefore it appears that Eden & Ackermann's (2010:249-250) claim that the model being a visible common repository shall hinder issue abandonment, appear to hold.

The above findings in conjunction with the aforementioned F1.1, F2.4.1 and F2.4.3 findings offer limited support to the claim made by Eden & Ackermann (2010:240) where they stress that because the model attends to multiple perspectives the resulting benefit will be to allow for discussing ideas without suppressing dissent. In the context of this research the resulting claimed benefit would be indicated to materialize if the model-related conflict management effectiveness benefits observed related to a decrease in both avoidance and capitulation types of conflict management.

Nevertheless, partial support is offered by observing that appropriating the model limited the possibility of conflict avoidance. Reducing conflict avoidance is claimed to be a resulting benefit of the model being a visible common repository of ideas and issues (Eden & Ackermann, 2010:249-250).

The picture painted from the above is that, while unlikely to be observed, model appropriations that result in High model visibility levels will increase the likelihood for observing increased levels of confrontiveness as well as more effective conflict resolutions.

## 5.1.2 The Role of Model Appropriations Complexity.

### 5.1.2.1 -in Facilitated Modelling

A claim made by FM scholars in relation to strategic decision making is that the model will allow for the complexity of the task to be managed thus resulting to more effective strategic decisions (Eden & Ackermann, 2010: 253-262. This thesis has found supportive evidence to that claim..

Recall, findings, F4.1, F4.2, F6.1 and F6.2,

*F4.1: Drawing from the data available and the analysis performed, it appears that a positive relationship between desirable model visibility-related conflict management types and higher model appropriation complexity score exists.*

*F4.2: Drawing from the data available and the analysis performed, it appears that no consistent behaviour is observed when individually examining model appropriation complexity score results on a per stage basis, throughout the cases.*

*F6.1: It appears that for stages 2 and 3 a positive relationship exists between the model related conflict management effectiveness observed and the model appropriation complexity score, when the former is assessed in terms of the desirable confrontiveness levels more likely to be observed for certain model visibility levels. The rest of the stages do not offer consistent evidence*

*F6.2: It appears that the cases displaying an overall increasing MACoS will tend to outperform those with a decreasing MACoS in stage 4 in terms of overall model-related conflict management effectiveness.*

Finding F4.1, F6.2 and F6.1 stress (albeit F6.1. to a lesser extent) that higher model appropriation complexity will result to higher conflict management effectiveness.

F4.2 offers a degree of confidence to the results by indicating that the behaviour observed was not consistent thus reassuring the findings in terms of explanatory variance.

As such it appears that when assessing decision effectiveness in terms of conflict management effectiveness, the findings of this research add another dimension to the claim made by Eden & Ackermann (2010) in stating that, when model is appropriated in more complex manners it will result to increased decision making effectiveness.

As such and while Eden & Ackermann (2010) build on Ashby's law to indicate that for complex tasks the models produced would also bear some degree of complexity, I extend this reasoning by arguing that more complex models, if they are to be managed effectively, they will need to be appropriated in complex manners.

#### ***5.1.2.2 -in Adaptive Structuration Theory***

DeSanctis & Poole, (1994) in their seminal work introducing Adaptive Structuration Theory, indicated that the nature of the appropriations of an Advanced Information Technology (AIT) will vary depending on the group's internal system (pp.131). Furthermore, they went on to describe the properties constituting an idealised profile of appropriation by the group. These are [*italics added for emphasis*] “(a) appropriations are faithful to the system's spirit, rather than unfaithful; (b) *the number of technology appropriation moves is high, rather than low*; (c) the

instrumental uses of the technology are more task or process-oriented, rather than power or exploratory-oriented; and (d) attitudes toward appropriation are positive rather than negative.” (131). Moreover, they stress that if all these properties are to be exhibited by a group beneficial decision processes will occur (pp.131). They suggest that an element of the decision processes is conflict management, ergo beneficial decision processes would be also constituted by effective conflict management (pp. 130).

As such, this thesis adds to AST by offering empirical evidence suggesting that using the *number* of technology appropriations as an indicator for assessing the likelihood of effective conflict management, offers for worse results when compared to the model appropriations *complexity* score (MACoS - as defined and calculated earlier in this thesis). Preliminary comparative analysis has been conducted to further support the above and the results can be viewed in Appendix 2.

### **5.1.3 Contribution to Adaptive Structuration Theory**

To further the discussion about AST, albeit to a different direction, I need to invoke findings F1.2, F2.3, F4.3 and F4.4 that have been copied below.

*F1.2 Compared to the rest of the stages, stage 3 appears to offer the lowest negative probability for observing conflict occurrences when the model is appropriated. Stages 2 and 4 had similar scores in terms of the likelihood of conflict being observed when the model is appropriated.*

*F2.3 Drawing from the data available and the analysis performed, it appears that the findings offer support in that the group experimented with the model appropriations.*

*F4.3 Drawing from the data available and the analysis performed, it appears that a consistent behaviour is observed for stage 3 when individually examining the beneficial model visibility-related conflict management types on a per stage basis. The rest of the stages offered for no consistent cross case results.*

*F4.4 Comparison between RQ1 findings (F1.1 and F1.2) and F4.3 suggest that while overall it was unlikely to observe conflict when the model was appropriated, the stage that presented the lowest negative probability for observing model appropriations and conflict occurrences also offered for the highest probability that, when conflict occurred, the model visibility-related conflict management types would be beneficial towards conflict management effectiveness.*

What the above findings indicate is that there was a process of experimentation and regression in terms of the model appropriation behaviors. The groups appear to have initially familiarized themselves with the model (stage 2) and then experimented in appropriating it more (stage 3). After the experimentation the groups appear to have regressed back to their last known comfortable configuration (stage 4).

In terms of the manner in which model appropriations are being structured, the findings offer quantitatively derived (except F2.3) support to the comment made by Denis & Garfield (2003) where they indicate that the appropriation process was experimental in nature and

*“ [...] it felt more like ongoing improvisation enacted by organizational actors trying to make sense of and act coherently in the world” (Orlikowski, 1996:65),*

*instead of the seemingly rational process suggested by DeSanctis & Poole, (1994)*” [Quote as found in Dennis & Garfield, 2003:314<sup>89</sup>]

Additional to supporting the above comment of Dennis & Garfield (2003), this thesis’s findings attempt to further it offering clues on the order in which these experimentations happened throughout the workshops examined. As such, and even though the model helped the groups in having more effective conflict management when they experimented more actively with it [i.e. the model], it appears that the groups consistently decided to regress in appropriating the model less for dealing with their conflicts. From the discussion it follows that the effect of additional variables, for example such as the group’s internal system the task and the organization environment (DeSanctis & Poole, 1994), lying outside the scope of this thesis, was significant.

In the following paragraphs I seek to explore the only solid finding both research questions 5 and 7 produced in terms of whether the model appropriations observed were faithful or ironic towards the spirit of the FM model.

To do so I need invoke F5+7 stating:

F5+7: It appears that the *level of faithfulness of model appropriation has been extremely high throughout all the cases and stages observed.*

In drawing this finding it was surprising to find, out of a total of 10.191 valid thought units coded, only 41 as to display ironic appropriations of the model, making up for 0.40% of the total interaction.

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<sup>89</sup> The reference of Orlikowski’s paper in Dennis & Garfield (2003) indicates the publication journal to be *Organization Science*. It should be noted that the correct journal is *Information Systems Research*.

It needs to be reminded that the groups appropriated the model in different manners, producing different phasic timelines as well as different MACoS across all cases. Moreover, the task, while sharing similar characteristics, was not exactly the same throughout all cases observed. Also, both experienced and inexperienced groups produced a very small number of ironic appropriations, albeit of a different nature as indicated in SF5.1 to SF 7.4.

The only variables<sup>90</sup> being relatively constant across the groups observed was the FM technique used, namely Group Explorer utilising SODA as the FGPP (Ackermann & Eden, 2011; Eden & Ackermann, 2001:21-41) and the facilitator (i.e. the same experienced facilitator was employed throughout all the cases examined). Since the frequency of ironic appropriations has been found to be constantly low throughout cases, I err into interpreting this finding as the result of facilitation.

Other than the logical argument presented above, Dennis & Garfield (2003) go further in stating that: *“The facilitator is the living embodiment of the participative spirit and can significantly affect use (Batenburg and Bongers, 2001; Schuman and Rohrbaugh, 1991) (pp. 293) [reference in Dennis & Garfield, 2003].*

In the next section the main contributions of the findings to the relevant GDSS literature have been explicated.

#### **5.1.4 Contribution to GDSS**

Most relevant prior research in GDSS utilized strongly experimental designs (Chidambaram, Bostrom & Wynne, 1990-91; DeSanctis, Sambamurthy & Watson, 1988; Dickson, Partridge & Robinson, 1993; Gallupe, DeSanctis & Dickson, 1988;

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<sup>90</sup> By “The only variables” used here I mean the only relevant to this research variables since one could argue for constant elements observed throughout the groups that fall outside the scope of this research (e.g. that the cultural background of the participants, the language used, the age range etc.)

Miranda & Bostrom, 1993-4; Poole & Holmes, 1995; Poole, Holmes & DeSanctis, 1991; Sambamurthy & Poole, 1992; Watson et al., 1988; Zigurs et al., 1989).

Thus, any comparison between the findings of this thesis and that of prior research is prone to the deficiencies observed when assessing research results that were derived from different research design and methodological applications (Ackermann & Eden, 2011; Eden, 1995).

Furthermore it cannot be stressed strongly enough that this research adopted the model as the source of structure

Bearing into account the above word of caution the aforementioned findings F3.4, F3.6, F2.2, F3.2 and F3.3 further allow for refining earlier research conducted by Sambamurthy & Poole (1992) in which they indicated that *'Observation of level 2 GDSS groups indicated that members used the graphical display to identify key assumptions they agreed on, paving the way for integrative solutions'* (pp. 246). This thesis's finding stress that **when** the graphical display (i.e. a model) is used it is more likely that *the realized conflict management effectiveness benefit will not be due to an increase in the dialogical (i.e. integrative) approaches towards conflict, but due to a decrease in the conflict avoidance approaches.*

As earlier mentioned, this comparison is riddled with the following weakness. This thesis research and the research by Sambamurthy & Poole (1992), differed significantly in terms of the research design adopted with the latter being experimental, utilizing large samples composed from undergraduate students with no active facilitation and examining a different Advanced Information Technology (AIT) (DeSanctis & Poole, 1994), namely SAMM (DeSanctis, Sambamurthy & Watson, 1988; Gallupe, DeSanctis & Dickson, 1988; Sambamurthy & Poole, 1992).

Moreover, in earlier research about the effect communication media have on negotiation, Poole, Shannon & DeSanctis (1992) indicated that, during negotiation and conflict episodes people tend to opt for face-to-face discussion instead of a face-to-model discussion. This thesis further refines Poole. et. al. (1992) comment by stressing that while it appears their suggestion appears to hold for most situations it does not appear to hold for cases in which the model visibility level is high and either avoidance conflict management types or low and moderate confrontiveness levels are examined. Again for this case, differences in research design need to be taken into consideration.

In their experimental research in GDSS<sup>91</sup> Wheeler & Valacich (1996) assessed the relationship between facilitation and faithfulness of appropriations as well as faithfulness of appropriation and decision quality in the context of a GDSS application. The structural features of the GDSS were assessed in terms of the restrictiveness and guidance offered to the group. To explore their hypotheses Wheeler and Valacich (1996) utilized a custom made FGPP to guide the GDSS process that followed a divergence-convergence approach (Sambamurthy & Poole, 1992) and included the mainstream GDSS capabilities of voting, ranking, rating and scoring (Wheeler & Valacich, 1996:438). F5+7 finding of this thesis extends the successfully hypothesised notion that facilitated groups will appropriate the GDSS more faithfully (Wheeler & Valacich, 1996:435&441) by including model appropriations as another structure that if supported via facilitation it will probably be faithfully appropriated (see earlier point in Discussion about the effect of facilitation to the faithfulness of model appropriations). Moreover, in their research

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<sup>91</sup> Referred to as GSS in the original publication.

Wheeler & Valacich (1994) successfully hypothesised that faithful appropriation of the structures will be positively related to decision quality, when the latter was assessed in terms of objective measures (i.e. correctness of solution). This thesis findings F3.4, F3.6 and F5+7 further extend the work of Wheeler & Valacich (1996) by indicating that such a hypothesis would probably not hold if the model appropriations and conflict management effectiveness were to be used as structures and decision quality measures respectively

Probably the GDSS<sup>92</sup> research closer related to finding F2.2, is the one conducted by Miranda & Bostrom (1993). In their research, they used an experimental design, utilizing 12 trained groups as the baseline and 13 trained groups as the GDSS groups, assessed through time in 4 meetings each. What they identified was that groups using the GDSS compared to the baseline groups: had no differences in terms of integrative conflict management behavior, performed slightly better in terms of displaying slightly less frequent distributive behavior and no differences in terms of avoidance behavior. Miranda & Bostrom, (1993) examined the whole GDSS as a system without focusing into the manners in which any of the systems dimensions were appropriated. Especially in terms of their avoidance findings, they attributed these findings to possible misappropriation of the GDSS. Combining finding F2.2 and F5+7 refines and extends their research by indicating that if a GDSS was to incorporate the capability of building diagrammatical models **and** these models were faithfully appropriated then a reduced likelihood for conflict avoidance could be expected during model appropriation periods. Throughout all the GDSS-related discussion I constantly keep cautioning the comparability limitations stemming from

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<sup>92</sup> Referred to as GSS in the original publication.

differences in research designs. The research by Miranda & Bostrom (1993) is susceptible to the same limitations.

In the following section I will attempt and position the findings of this research within a practice-based strategic decision making context.

#### **5.1.5 Contribution to SDM in Practice.**

In terms of strategic decision making literature, the realized benefit of appropriating the model appears to relate more on avoiding groupthink (Janis, 1972) and on attending to procedural justice (Kim & Mauborgne, 1995) by discouraging tabling of an issue, thus attempting to focus attention more equally across issues and considerations.

Recall that strategic decision making research urged for more research on the prescriptive level (Bowman, Singh & Thomas, 2002:44; Nutt & Wilson, 2010:12-13; Nutt, 2010:581-582 & 589; Pettigrew, 1997; Pettigrew, Woodman & Cameron, 2001; Wright, Van der Heijden, Bradfield, Burt & Caims, 2004).

Findings F2.1 and F3.1, developed in the process of addressing RQ2 and RQ3, unearthed two stage-specific typologies offering a ‘most likely best-practice’ guide drawn from the data analysed in this thesis<sup>93</sup>. Recall that the typologies do not present best practices per se, they mean to indicate the likelihood of observing conflict management related benefits in relation to certain model visibility levels. It is important to note that while the typologies only display the possible conflict management-related benefits certain model visibility levels may produce, extended tables that also include the stage specific negative impacts have been produced

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<sup>93</sup> For economy of space the findings and the related typologies are not replicated here. The typologies can be viewed in the Results chapter.

allowing for the interested practitioner to gain a better appreciation of how to safeguard against possible pitfalls<sup>94</sup> when appropriating the model.

Stage specific findings (F1.2, F4.3 and F4.4) have highlighted stage 3 as being the most promising stage for a practitioner to seek future improvements in terms of the beneficial model appropriations-related conflict management effectiveness.

#### **5.1.6 Methodological Implications.**

Most previous research applications have explored the relationship between groups that did not use an AIT (labeled as baseline groups using flipcharts, paper and pencils), and groups using computerized AITs with different capabilities (labeled as level 1, level 2 and level 3 GDSS) (Chidambaram, Bostrom & Wynne, 1990-91; Dickson, Partridge & Robinson, 1993; Miranda & Bostrom, 1993-4; Poole & Holmes, 1995; Watson et al., 1988; Zigurs et al., 1989). Others scholars extended their comparative base by also comparing groups that were using simple non-computerized FGPPs. For example Poole, Holmes & DeSanctis, (1991) interjected in their exploration a manual application of the Software Aided Meeting Management (SAMM) (DeSanctis, Sambamurthy & Watson, 1988; Gallupe, DeSanctis & Dickson, 1988; Sambamurthy & Poole, 1992).

An issue arising from such strongly experimental designs is that if tried to be directly applied in non-experimental settings controlling for contingencies and important external factors, such as group size, group composition, culture, task complexity as well as previous training and experience of the group participants (DeSanctis & Poole, 1994), is extremely difficult (Ackermann & Eden, 2011; Eden, 1995).

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<sup>94</sup> Also the extended tables have not been reproduced here for economy of space.

I tried to partially overcome this issue by comparing group interaction ‘with itself’ across phases drawn from different constructs (e.g. GWRCS and MACS). Identifying phases in which the model was not appropriated at all allowed me to ‘benchmark’ the model-related enquiry within the specific stage and for the specific group examined. As such I believe that the ability to dissect the interaction into phases, which some may also act as benchmarks, is a powerful advantage offered when utilizing the phasic analysis technique. While indeed not a panacea, it is unfortunate that to date this dimension of phasic analysis has received little attention (Poole & Roth, 1989a).

By comparing the transitions amongst phases of different constructs (namely MACS and GWRCS) throughout the phasic timelines, phasic analysis allowed me to assess the phase development complexity of a construct while benchmarking it to the phase development complexity of another construct acting as the baseline.

The Discussion chapter progresses into identifying potential areas of improvement for the facilitated modeling workshop and offers a consideration on its more pragmatic aspects.

## **5.2 Areas for Improvement of the Facilitated Modeling Workshop.**

A number of possible ways exist in structuring this section. Depending on whether one wishes to classify the areas of improvement on the basis of area to be improved (i.e. the workshop design, facilitation, technology used etc.) or on the basis of the actual stages on which improvement may take place.

I believe it is more useful to directly indicate the areas of improvement based on whether these can take place before or during the workshop. This is because it may prove more useful knowing if an improvement can take place before the workshop,

thus allowing for appropriate before-hand planning, or whether the improvement can take place during the workshop, thus requiring a vigilant eye while the workshop unfolds.

This classification explicitly adopts the view that there is little to no areas of improvement for after the workshop is finished.

Therefore, this section begins the discussion by offering the potential areas of improvement that should be taken into account prior to the workshop.

### **5.2.1 Pre-workshop Areas of Improvement.**

This thesis identified that group participants seemed to experiment with the practicalities of appropriating the model. This may have the potential effect of causing the model to be utilised in a suboptimal fashion due to the familiarisation time required by the participants as well as due to potential misunderstandings about the various model appropriations.

A potential remedy to the above issue may be found in administering the modelling rules and procedures to the group participants a few days (or even weeks) beforehand. Coupled with appropriate documentation and visual aids (e.g. examples of other FM workshop models and step-by-step explanation of the stages) could result in participants having a better understanding of the process they are about to follow on the day(s) of the workshop. An edited and reworded version of the guidelines offered in Appendix 1, coupled with some visual aids (i.e. photos, map development steps, etc) could prove as a starting point for the development of the aforementioned documentation. Moreover, developing a better sense of the FM workshop elements as well as processes should allow for the participants to become more accustomed and appropriate the model in a more complex manner, something

which this research identified as being beneficial towards effective conflict management.

Observing the phasic timelines as well as the videos, one can notice that significant amount of time is spent in the initial stages of gathering of information. Albeit some group participants, once presented with the 'opening question', displayed high productivity (i.e. number of concepts per minute), other participants appeared to require more time in thinking the question through. This might as well have caused a discrepancy of overexposing the ideas of some while under-representing the ideas of others. A remedy to the aforementioned issue could be to administer the opening question to the group participants a few days prior to the workshop, thus allowing them time to think and perhaps note down some of the key items that they would like to see on the initial model view.

Another finding was that the more experienced group participants tended to more often appropriate the model in unfaithful manners. Also considering the finding that, when the model was appropriated, it resulted in attenuating conflict tabling whilst failing to attenuate conflict capitulation (i.e. the model manages to remedy for conflict avoidance but not for conflict related power-plays) gives rise into considering the role of the model in relation to the experience and background of each group participant. Indeed it has thus far been the case that in most FM applications the group participants are approached on an equal-standing basis meaning that no information about them is systematically gathered prior to the workshop. It could prove useful to administer questionnaires and conduct interviews on the group participants prior to the workshop so as to allow for the facilitator

and/or workshop designers to have a better understanding of the participant's prior experience as well as role in the organisation and plan accordingly.

It is further possible to have group participants which may be challenged on the application of the technology. For example, visually impaired or keyboard unfamiliar individuals may find it hard to express their ideas as well as view the on-screen models. To my knowledge this is a situation that has not been thus far encountered. Nevertheless such contingencies need to be taken into account before the commencement of the workshop. The administration of a pre-workshop questionnaire should include one or two questions that would allow the group participants to surface such issues.

The real-world requirements of time minimisation dictate that workshops should consume as less time as possible and field practitioners may be reluctant to apply pre-workshop time-consuming actions. Nevertheless, it is my belief that the aforementioned actions should compensate by offering a smoother, more condensed as well as more contingency-robust workshops, essentially allowing for a net time reduction.

In the following section the areas of improvement that could be taken into account during the workshop are offered.

### **5.2.2 During workshop Areas of Improvement.**

This thesis identified that it is more probable to observe no model appropriations during conflict, and that for those instances in which the model does get appropriated during conflict the main benefit is on attenuating conflict tabling messages, thus allowing for conflict to surface. Furthermore, when the model was appropriated

during conflict it has been found to be the case that Capitulation messages were amplified while Open Discussion messages were attenuated.

Unfortunately, during the workshop, little remedy to the above issues can be expected by the model (i.e. the diagrammatical depiction) per-se and it is on the hands of the facilitator and the overall technological design to attempt and address such issues.

A possible remedy to the aforementioned issues could be to devise and administer to group participants a form of secret ‘importance button’. Recall that Capitulation messages are messages which intend to impose a view over another without adequate justification or discussion. The application of an ‘importance button’ could allow for each participant to express their agreement or disagreement to the premature closure of a given idea. The facilitator-controlled laptop could gather these anonymous importance messages allowing for the facilitator to better appreciate whether a certain idea/concept is truly of low importance or if a number of participants feel that it should be further explored.

A potential danger with the application of such a device would be that it, as all technology, could be misappropriated with some of the group participants sabotaging the workshop by consistently ‘flooding’ each and every concept with ‘importance’ hits, thus taking time out of the really important concepts. Such limitation could be remedied by imposing a quota on the number of times any participant can press the button on any given stage of the FM workshop.

To the best of my knowledge, the majority of real world applications of FM workshops limit their duration into one or two days. Albeit it is easily understood that this short workshop duration is predominantly due to limitations in time, space

and funding resources it should be noted that short spanned workshops may not allow for enough time for the participants to digest and work through the jointly formed (and potentially new) information presented to them. Such short timed applications may result in final models that act more as ‘current-state’ of thinking repositories. Allowing more time between the stages of the workshop could allow for more ideas being sprung into the minds of the participants while at the same time allowing for more time to think through the importance weights each participant has assigned to concepts developed in earlier stages.

Therefore, and taking into account the aforementioned real world limitations, it may prove useful to expand a one-day four or five stage FM workshop into shorter per-stage FM workshops over the period of four/five days. I believe that by skilfully doing so would require approximately the same hours in total whilst at the same time allowing the participants to more carefully consider their jointly formed models before progressing onto the next stage.

The Discussion chapter proceeds by presenting in the following section the limitations of this study.

### **5.3 Limitations of this Study.**

Any study attempting to explore fundamentally complex relationships in the social world is deemed to suffer from a number of weaknesses. This section attempts to illustrate the main weaknesses of this thesis. These can be coarsely categorised as philosophical, theoretical, conceptual and methodological weaknesses.

### **5.3.1 Philosophical Considerations**

This thesis has essentially adopted the philosophical standpoint of post-positivism, basing its ontological and epistemological assumptions in critical realism and modified objectivism viewing the phenomena in the social world as being ‘out-there’ independent of the researcher’s perceptions (Deetz, 1994; Guba, 1990; Guba & Lincoln, 1994). These assumptions are the guiding forces behind theoretical, conceptual and methodological choices a researcher can make. Other philosophical traditions, such as interpretivism and hermeneutics bear different assumptions to that of postpositivism. An overarching weakness can thus be conceived to be the ontological and epistemological boundaries imposed by choosing a certain philosophical tradition.

### **5.3.2 Theoretical Considerations**

This thesis build on the theoretical framework advanced by DeSanctis & Poole (1994) termed as adaptive structuration theory (AST). AST can be broadly classified as belonging to the family of pragmatic approaches to communication incorporating both the linguistic form and the communicative context of discourse (Putnam & Fairhurst, 2001:89). A different theoretical approach to group communication and interaction, for example semiotics (Putnam & Fairhurst, 2001:101) would dictate a totally different approach to the human interaction analysis by including non-verbal codes, images, actions and objects as the characteristics of the phenomenon in study (Stewart, 1986).

### **5.3.3 Conceptual Weaknesses.**

The AST framework offered by DeSanctis & Poole (1994) is a detailed and rich conceptualisation of structuration processes. Unfortunately, in this thesis only few of

the variables and relationships were examined. A relaxation to this weakness can be found in the literature. Since AST is essentially concerned with the emergent processes of AIT's appropriations, Deetz (1994:595) stresses that insight is to be gained even if by examining a situated slice of the total research processes theory suggests.

#### **5.3.4 Methodological Weaknesses.**

The issue of internal Vs external validity of most research will remain a trade-off choice between research designs trading research findings generalisability for relevance and vice versa (Eisenhardt, 1989). In this research by choosing field studies instead of experiments I sacrificed some of the internal validity for the sake of increased external validity. Drawing the findings of this research from only three cases does limit their generalisability. Thus, if these findings are to be generalised, specific replicability studies need to be conducted.

Probably the most serious limitation of this research is the action-research design I adopted in favour of conducting research that is argued to be more insightful due to increased relevance to the real world. The key benefit of approaching a research setting in an action-research approach is that it is relatively easy to overcome issues of access to the data. Albeit not acting as the consultant myself, I was offered access to place a couple of cameras and microphones on the table. The group participants seemed genuine in their interaction, since they were facing real issues in need of 'solutions' and it seemed that after some time they forgot about the cameras.

The weakness of action research stems from the fact that the researcher has no control over the observation period of the phenomenon. For example it would be interesting if I could get access to explore how group model appropriations

progressed to further influence the organisational practices. This was not an option since all cases were one-off consulting interventions. Another issue with action research is that it allows no control over the participants and the tasks they are interested in. This meant that I could not control for the task complexity or even devise an experiment that would 'force' the group participants to display ironic appropriations. Another issue with action research is that the groups one deals with are busy professionals with very limited amount of time and an even more limited interest in my research endeavours. For example I administered questionnaires with Likert scales of -3 to +3 throughout all the groups in an attempt to also assess the decision effectiveness of the group work. The responses from all the groups' participants were +3. The time each participant devoted in answering more than 20 questions was less than 3 minutes. It appeared to me that they didn't wanted to be bothered and, so that they would not 'disappoint' me, they gave full marks to all the questions asked in the questionnaire. Moreover, I tried to conduct interviews with the participants. I wanted these interviews to be as soon as possible after the workshop had ended so that the workshop details would be still 'fresh' in their memory. The participants' busy lifestyle meant they had very limited time to devote and availability slots spanned from 2 months to never (for case B). As such I had to drop two important sources of data for the research. Still, the video recordings were of good quality and the workshop discussions were very interesting. Given the conditions of the engagements I was more than happy that I even got intelligible data which I could further analyse.

The initial plan was to have four cases of which one would have been a baseline case using only pen and paper and no external facilitation. Unfortunately the baseline

case had to be dropped due to the data being of very poor quality requiring more than 20 minutes per minute of interaction transcribed (the usual being 10 minutes per minute of interaction transcribed). Indeed, transcription and coding of the data was a very painful experience that if not first-hand experienced it cannot be easily conveyed. This eliminated the possibility of applying more than two coding schemes in order to explore other constructs as well (for example I have developed two coding schemes for content and process influence that I did not had the time to apply). My kudos goes to all the researchers out there that have devoted their careers in research conducted by micro-coding interaction data.

It should be noted that while using rich and detailed coding schemes allowed for high interrater reliabilities it also resulted in some categories not being observed at all thus creating empty cells in the statistical analysis. While collapsing the codes and combining them in coarser categories offered a remedy it did not cured this problem, since some categories were observed by their very nature few times while simultaneously being important to the research (for example the code of ‘capitulation’ in GW RCS and that of ‘enlargement’ in the MACS).

#### **5.4 Directions for Future Research.**

Other than answering the “so what?” question no study can be considered complete without answering the “what’s next?” question. This section addresses that question by offering directions for future research that could be considered relevant to this thesis.

Other than the findings reported, recall that this thesis identified a number of ‘soft’ findings (SF5.1 to SF7.4). These soft findings relate to the previous experience

the group participants have with FGPP's, the types of ironic appropriations, the conflict management types and as well as the level of confrontiveness the participants of the three cases displayed. The assessment of the participants experience was not included in the research plan of this thesis and as such it was not conducted in a rigorous enough manner that could offer sufficient confidence in the findings. I therefore believe that it is better to view these soft findings as preliminary research indications that can inform and spark future research into exploring the relationships between the aforementioned constructs.

This thesis explored only one type of FM, namely facilitated problem structuring (Franco & Montibeller, 2010). Similar to this thesis study can be performed in the other two types of FM, namely facilitated system dynamics and facilitated decision analysis with the hope to explore similarities, differences and complementarities that could ultimately lead to improvement of the existing FM methods (Franco & Montibeller, 2010)

In the process of conducting this research I found that the GDSS literature has concerned itself with similar questions that FM scholars seek to answer. GDSS research is clearly at a more advanced stage than FM research, and future FM research should be informed by GDSS scholarship.

Moreover, a number of fruitful directions for future research emerge when viewing the findings of this thesis in light of other research conducted in the area of GDSS. Some of the directions for future research stem from the differences and similarities of methodological applications, while others stem from findings in related areas.

An avenue for future research stemming from this thesis is on exploring the relationships between model appropriations and facilitation. Relevant questions asked can be of the kind: How do facilitators appropriate the model? For what purposes? Under which circumstances facilitation can be termed to be ‘good’ or ‘bad’ in relation to conflict management? (Franco & Montibeller, 2010:494). A rich literature on facilitation exists in the closely related area of GDSS (Anson, Bostrom & Wynne, 1995; Bostrom, Anson & Clawson, 1993; Clawson & Bostrom, 1996; Clawson, Bostrom & Anson, 1993; Dean, Orwig & Vogel, 2000; Griffith, Fuller & Northcraft, 1998; Kwok, Ma & Vogel, 2003; Miller, 2011; Miranda & Bostrom, 1999; Wheeler & Valacich, 1996). Clearly FM research would be wise to be informed from that research corpus both in terms of methodological applications and findings. As the name of FM indicates, overlooking the effects of facilitation would be a hindrance in developing theory, improving as well as further exploring FM processes.

Poole & Roth (1989b) identified that more complex decision paths occurred for lower complexity tasks and vice versa. Also, Kuhn & Poole (2000) identified that groups with high task complexity would be more likely to effectively manage conflict by developing integrative conflict management styles. This research identified that more complex model appropriation paths led to higher conflict management effectiveness. As such it would be interesting to further examine the relationship between model appropriation complexity and task complexity.

It is reasonable to say that influence exerted by group participants and facilitators will have an effect on the types of model appropriations and the resulting conflict management patterns. FM scholarship claims that the models being anonymous can

help in reducing dysfunctional pressures on group participants (Eden & Ackermann, 2010:249). Therefore, exploring the relationships between influence and model appropriations seems to be another promising avenue for future research. Again a lot of work has been done in the GDSS field and FM scholars would be benefitted by informing their influence-related research endeavours by that literature (Huang & Wei, 2000; Niederman & Bryson, 1998; Rains, 2005; Wilson & Ziguers, 2001; Ziguers, Poole & DeSanctis, 1988).

Related, but conceptually distinct, to influence is the concept of participation. FM claims that the anonymity as well as the capability for simultaneous input of ideas offered by the technology should allow for more equal participation (Eden & Ackermann, 2010: 243-244; Franco & Montibeller, 2010:492&494). In light of model appropriations it would be interesting to identify if and how participation differs across phases of model appropriations. Are there any pattern or key characteristics of model appropriations that could enhance participation equality? For example, do participants that prefer appropriating the model at high levels of model visibility also participate more or less? What are the characteristics of the participant that initiates model appropriations and for what purposes? Are initiations followed through by the rest of the group or do they die out? Previous work on participation equality (albeit a bit outdated) can further inform future research endeavours (Berdahl, & Craig, 1996; Hiltz & Turoff, 1993; Hiltz, Turoff & Johnson, 1989; Howell-Richardson & Mellar, 1996; Kiesler, Siegel & McGuire, 1984; Ruberg, Moore & Taylor, 1996; Strauss, 1996).

## 6 Conclusion.

This thesis attempts to address the lack of systematic and rigorous research in evaluating the usefulness of Facilitated Modelling during strategic group decision making. It has been argued that the key differentiating element between FM and other formal group process procedures is the focus on building diagrammatical qualitative models acting as transitional objects. An acclaimed benefit for having models is that when appropriated they should allow for more effective group decision making.

Group decision making processes are better studied when the stakes are real and the decisions are of high importance to the group participants. In organisational life real, risky and of high importance group decisions are to be found into the realms of strategic group decision making.

Probably the most important characteristic of strategic group decision making is the process of negotiation. Real life negotiation is almost synonymous to conflict management. Thus, any research seeking to understand strategic group decision making effectiveness must first understand group conflict processes and the ways they are managed.

Group conflict related processes are fundamentally communicative processes and the study of group interaction has been proven to be a fruitful avenue for exploring them.

Therefore, a specific to group strategic decision making lens for exploring the FM claims is through the exploration model appropriations in relation to conflict management processes.

A number of findings and insight have been unearthed throughout this thesis. If I had to summarise it all in one ‘answer-like’ sentence to the question of whether FM models are beneficial to strategic group decision making that sentence would be:

Overall, FM models will not be appropriated for managing group conflict, but when they do get appropriated in intense and complex manners, superior conflict management, and thus group decision making can be expected.

## **6.1 Personal Remarks**

In this research I have indicated the importance of studying the various manners in which models constructed during facilitated modelling workshops relate to conflict management behaviours.

By exploring research question 1, I started with a very broad question, trying to answer whether one should expect the model to be appropriated during conflict episodes. The findings indicated that one stands little chance of observing model appropriations during conflict episodes.

I furthered my enquiry into trying to explore whether at least for the instances in which the model was appropriated during conflict a benefit would accrue. In doing so I observed that the model was beneficial for specific types of conflict behaviour while for others not appropriating the model yielded superior chances of managing the conflict more effectively. The findings indicated that while certain levels of model visibility would have an overall negative or indifferent result in most indicators of conflict management effectiveness, others would appear to perform better for certain indicators of conflict management effectiveness. Also I observed that the main benefit of appropriating the model was not derived in terms of

amplifying certain desirable behaviours, but instead through attenuating certain undesirable behaviours.

Furthermore, I was interested in examining previously unexplored elements that may account for the differences observed. Thus, seeking for possible candidates as explanatory variables for these differences, and by starring for countless hours more phasic timelines that I care to remember, I stumbled upon the idea of model appropriation complexity which I further developed in this thesis. I observed that, on average, groups that appropriated the model in a more complex manner throughout the duration of the workshop had better chances to appropriate the model in a beneficial way.

Examining the degree to which the model appropriations followed the commonly accepted as *intent* or spirit of the models befuddled me. My first thought was that I must have done something wrong. Further, exploration of my disbelief confirmed the unusual results and also revealed another possible explanatory variable that I have previously not thought about.

While the writing of this research makes the process appear as linear, it was not. It has been a constant interplay between altering and refining, to the extent possible, the constructs of this research.

I submit this thesis having more questions as well as being more intrigued about the field, than what I was when I started this research many years ago.

This is just the beginning...

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## 8 Appendix 1

### Twelve Guidelines to Cognitive Mapping

It has been suggested by Eden, Ackermann and Cropper (1992) that twelve guidelines for successful cognitive mapping can be introduced. In order to gain a better understanding of how to actually build cognitive maps these guidelines are provided below. Still, one must bear in mind that these are only what they claim to be: guidelines and not definite and authoritative steps that need to be followed in order to reach an outcome. The fact that a cognitive map is a tool for exploring the individual's way of seeing things is what makes it an "inexact science" (Eden, Ackermann and Cropper, 1992).

The guidelines are as follow:

1. Separate the sentences into distinct phrases of no more than 10-12 words long.
2. In order to get the hierarchy right, place the goals at the top of the map and support these with strategic direction type concepts as well as with other potential options.
3. It can be helpful to mark the goals so as to remember when tidying up the map.
4. Strategic issues with characteristics such as: long term implications, high cost and/or irreversibility need to be noted and afterwards linked to Goals (above) and Potential Options (below).
5. Look for opposite poles which clarify the meaning of the concepts. In cases where the meaning of a concept is not immediately obvious try asking the problem owner for the opposite pole by beginning your question with the phrase "rather than"

6. Place the concepts in the imperative form and where possible include the actors and their actions so as to add meaning to the concept. This will further lead the model to become more dynamic.

7. Keep and use the words and phrases the problem owner uses. Identify and then incorporate into the concept text the name of the actors according to the problem owner's perception.

8. Think of the concepts as the means leading to a desired end. Each concept therefore can be seen as an option leading to the superordinate concept which in turn is the desired outcome of the subordinate concept. The previous sentence might remind the reader of SSM's way of looking at things through higher-systems, systems and subsystems.

9. Concepts for which there may be more than one specific means of achieving it are generic concepts and it must be ensured that these are superordinate to specific items that contribute to it.

10. "Code the first pole as that which the problem owner sees as the primary idea (usually the first idea stated). The first poles of a concept tend to stand out on reading a map. A consequence is that links may be negative even though it would be possible to transpose the two poles in order to keep links positive" (copied from Eden, Ackermann and Cropper, 1992).

11. Tidy up the map and ask clarification about unlinked concepts. It may reveal important clues to the problem owner's thinking about the issues involved.

12. Some practical tips: Start with an A4 paper upwards and not on the side. Start mapping about two thirds of the way up the paper and try to keep concepts in small

rectangles. Use soft, fairly fine (5mm) propelling pencils (better have two of them with you).

As proposed by Eden, Ackermann and Cropper (1992) it is practice which will make somebody an expert in cognitive mapping. They suggest practicing with little groups or even individuals so that a failure would not bear any significant cost (friends, family, even colleagues in an informal meeting) before going out and applying it. This will provide the practitioner with the confidence and speed (in writing, linking and thinking) that building good cognitive maps requires.

1. Eden, C.L., Ackermann, F. and Cropper S., (1992). The analysis of cause maps. **Journal of Management Studies**, 29 (3), 309-324.

## 9 Appendix 2

Comparing the number of appropriations with MACoS.

The number of model appropriations across the stages was calculated in a similar fashion to calculating MACoS, by utilizing the phasic timelines. The total number of model appropriation phases were counted and then the non-model appropriations and typing phases (i.e. grey and black in the timelines) were subtracted. In constructing the tables, the color coding conventions explicated in the core of the thesis have been maintained.

This process produced the following table for the **number** of model appropriations (*NOMA* for short) across the stages and cases observed.

	Stages			
	1	2	3	4
Case A	0	49	44	18
Case B	4	36	16	9
Case C	0	43	19	40

Number of model appropriations table (NOMA)

Then recall the MACoS table as seen in the core of the thesis

STAGES					
CASES	1	2	3	4	5
<b>A</b>	1/1 = <b>1</b>	7/5.2 = <b>1.34</b>	5/4 = <b>1.20</b>	3/2.7 5 = <b>1.09</b>	N/O
<b>B</b>	1.25/1. 5 = <b>0.83</b>	5.42/4. 6 = <b>1.18</b>	3.8/3. 25 = <b>1.17</b>	2/1 = <b>2</b>	N/O
<b>C</b>	1/1.5 = <b>0.66</b>	6.85/6. 33 = <b>1.08</b>	4.16/3 .6 = <b>1.16</b>	9/6.3 3 = <b>1.42</b>	6/4. 33 = 1.3 8

MACoS table

Also recall CMES-CMT table as seen in the core of the thesis.

CASES	STAGES					Average/ Case
	1	2	3	4	5	
<i>A</i>	N/C	40	52	-12	N/O	26.6
<i>B</i>	N/C	-28	-8	N/C	N/O	Single stage
<i>C</i>	N/C	-58	25	5	-36	-16
<i>Average / Stage</i>		-15.3	38.5	-3.5	-36	

CMES-CMT table

Also recall CMES-CL table as seen in the core of the thesis.

CASES	STAGES					Average/ Case
	1	2	3	4	5	
<i>A</i>	N/A	31	51	-21	N/O	20.33
<i>B</i>	4	8	2	10	N/O	7.33
<i>C</i>	N/A	-49	-1	-42	-63	-38.75
<i>Average/Stage</i>		-3.33	25	-17.6		

CMES-CL table

Assessing the NOMA in terms of CMES-CMT meant excluding Case B- Stage 4 cell and having cell Case A - Stage 4 as the worst (not color coded). Moreover it becomes apparent that NOMA offers exact matching in 6/7 of the valid and comparable cells (i.e. it misidentifies CMES-CMT cell for case B-Stage 2 as being the worst). On the other hand MACoS offers exact matching in 7/7 valid and comparable cells.

In similar vein assessing NOMA in terms of CMES-CL results in NOMA offered an exact match in 2/8 valid and comparable cells, when at the same time MACoS offered exact matching in 7/8 valid and comparable cells.

From the above analysis and for the data analyzed MACoS offers superior predictive power.

## 10 Appendix 3

### Consent for Participation in Research

I volunteer to participate in a research project conducted by Orestis Afordakos from

Warwick Business School hereby identified as WBS. I understand that the project is designed to gather information about group decisions and meetings processes in the organisation I work being XXXX.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one on my organisation will be told.

2. I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

3. Participation involves being videotaped and interviewed by Orestis Afordakos from WBS. The videotapes that will be generated will be videotapes of the XXXX senior staff making strategy and strategic decisions as a group. The interview will last approximately 45-60 minutes. Notes will be written during the interview. An audio tape of the interview and subsequent dialogue will be made. If I don't want to be taped, I will not be able to participate in the study.

4. I understand that the researcher will not identify me by name in any reports using information obtained from the video recordings and/or this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

5. Management (be it senior, middle or lower) as well as employees of XXXX will neither be present at the interview nor have access to raw notes or transcripts of either the interview or the video recordings. This precaution will prevent my individual comments from having any negative repercussions.

6. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

7. I have been given a copy of this Consent Form.

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My Signature

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Date

---

My Printed Name

Signature of the Investigator

For further information, please contact:  
Orestis Afordakos

[Orestis.Afordakos05@phd.wbs.ac.uk](mailto:Orestis.Afordakos05@phd.wbs.ac.uk)  
0044 (0) 77 8989 6989

## 11 Appendix 4

### Instructions for identifying thought units in group interaction.

#### 11.1 Introduction

In this research the unit of analysis is the “thought unit”. Adopting Sillars (1986) definition, a thought unit is defined as: “...an autonomous segment of discourse, which is not dependent on contiguous segments for meaning”.

The choice of the thought unit over the speaking turn as unit of analysis was based on the grounds of the unitizing problems when faced with long speaking turns (Sillars, 1986). Using the thought unit as the unit of analysis allows for separation of meaning within long or confusing speaking turns.

Unitizing rules are provided in order to increase reliability when unitizing the data (Sillars, 1986), as well as enhancing external validity through greater replicability (Dunn, 2009; pp 241-242).

#### 11.2 Unitizing Rules

The following instructions present a modified version of the instructions provided in Sillars (1986, pp. 5- 6) VTCS manual, for the identification and separation of thought units within speaking turns.

Sillars (1986) puts forward that “In operational terms, a thought unit includes a main clause (subject-verb-predicate combination) plus dependent and coordinate clauses.”

**Rule A)** Subordinate (dependent) clauses are marked by subordinating conventions, such as the words “whereas”, “although” and “because”

**Rule B)** Coordinating clauses are marked by coordinating conventions, such as the terms “and”, “or” and “but” ONLY in the cases where the coordinating clause is used to add detail and elements to the same thought unit and not to mark the beginning of another thought unit. A robust way of knowing whether the coordinating clause marks the beginning of another thought unit is by replacing the coordinate clause with a coma or full stop, read the rest of the sentence and assess whether it makes sense on its own or not. If it does make sense on its own then this is another thought unit.

For example consider the following two sentences, “Doing X is an important part of financing the project **and** its successful implementation” and “Doing X is an important part of financing the project **and** we need to start it without delays”. In the first sentence, substituting the ‘**and**’ with a comma or full-stop results in the second part of the sentence to sound nonsensical (“Doing X is an important part of financing the project, **its successful implementation**”), while in the second sentence substituting the ‘**and**’ with a comma or full-stop still allows for the second part to stand on its own (“Doing X is an important part of financing the project, **we need to start it without delays**”). So in the first sentence the thought unit is whole and includes the part after the end, while in the second sentence there are two thought units, one about the importance of the project (“Doing X is an important part of financing the project and/<sup>95,96</sup> )and one about the initiation of the project (“We need to start it without delays/”).

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<sup>95</sup> As a convention when identifying thought units in text we use the ‘/’ sign to signify the end of a thought unit. While with the advent of modern text processing capabilities and software it is just as easy to simply start in the next line, we maintain that having clearly notated boundaries is a good research practice and should be maintained. In this way the end of the previous thought unit marks the beginning of the present while the end of the present marks the beginning of the next.

**Rule C)** Rules “A” and “B” are not applied when these conventions appear to be used as idiosyncrasies of the speaker’s style, for example, when the speaker repeatedly begins a new phrase with the word “but”, although the subsequent phrase is not otherwise linked to the preceding phrase.

**Rule D)** If one segment of discourse repeats or paraphrases an adjoining segment, the two segments are considered part of the same unit. In applying this rule the coder needs to pay special attention to Rule G which makes clear that when a speaking turn takes place it automatically signifies a different thought unit.

**Rule E)** If a segment of discourse uses pro-forms (e.g. “it”, “this”) which substitute for a phrase in the adjoining discourse, the two segments are considered part of the same unit EXCEPT in the cases where the qualifier (‘it’, ‘this’) bearing sentences can stand on their own. This is an indication that there are separate thought units. For example: “Warwick is an awesome place but it has a number of disadvantages” is to be split in two thought units “Warwick is an awesome place but/ it has a number of disadvantages”. In the second thought unit the word “it” substitutes for the word “Warwick”.

**Rule F)** If a segment or discourse is unintelligible, consists only of simple agreement or disagreement, or is incomplete in the sense that part of the subject-verb-predicate is missing and is not implied, then the segment is considered part of the same unit as the adjoining discourse. Again in this rule special attention to Rule G must be given so as to avoid mistakes.

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<sup>96</sup> Another convention is that we assign the coordinating clause to the first part of the sentence, so in this case the ‘and’ goes to (bolded) “Doing X is an important part of financing the project **and**”.

**Rule G)** A unit is terminated whenever there is a change of speakers. In the case of interruptions, the initial speaker's unit is not terminated until that speaker discontinues his or her utterance. The only exception to this rule is when speakers talking idiosyncrasies result in the speaker uttering simple agreement without intent but for the sake of denoting his/her attendance to the other speaker's utterances. By that is meant that a simple "yeah...", "I see...", "alright", "mmmhmm ((affirmative))". Usually these phrases are spoken silently and at the same time as the main speaker's utterances. These context based distinctions make watching the videos and listening to the audio as imperative when a coder is assigning thought units.

**Rule H)** The fact that in this research none of the coding schemes used are interpretation free gives rise to the ultimate rule for unitizing which is: Always exercise judgment in defining thought units. Take into account the context as well as the whole speaking turn. Before reaching to a definitive conclusion read two (2) speaking turns ahead and the two (2) previous speaking turns.

### **11.3 Possible Limitations**

A possible limitation of unitizing using the thought unit is that the units may become too fine grained for use with the current coding schemes.

For example, in the case of coding with the Model Appropriations Coding Scheme (MACS), it is likely that a string of Affirmation or Direct codes will each be presented as separate thought units. In such cases the coders are to make notes of the instance, group the thought units together as per code and code as appropriate. This

is to be done anew for each coding scheme applied; taking as a starting point the original text unitized using thought units.

While this may result in some discrepancy between the units across coding schemes it is believed that it will be much less than the discrepancy resulting by allowing more than one codes to be entered in long or confusing speaking turns. This belief stems from the rationale that in long turns multiple meanings will be apparent, and that it is easier to group together simpler meanings to create more complex one's than trying to disentangle a complex meaning into its constituents, especially when in the process of coding. Thus, in the process of unitizing, the basic meanings are identified into thought units and then the coder is grouping together the appropriate thought units that would make up the code at interest<sup>97</sup>.

#### 11.4 Reference

Dunn, D., S. (2009) *Research Methods for Social Psychology*. John Willey & Sons Ltd, Chichester, UK

Sillars, A.,L. (1986) Procedures for coding interpersonal conflict: The Verbal Tactics Coding Scheme (VTCS). *Manual, Department of communication studies, University of Montana*

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<sup>97</sup> For example, assume that in a long speaking turn we observe 16 thought units. The first 10 constitute the content influence code of multiple choice question, then there is a gap of 3 thought units that are not captured by any code and then there are 2 thought units that constitute the content influence code of begging reflection and the last thought unit which is a content influence code of closed question. We believe that by having more fine grained units it is easier to efficiently and reliably identify coarser units, with less stress for the coder.

## 12 Appendix 5

### TIMELINES PARSING RULES

*In this manual the parsing rules used to develop the timelines will be explicated.*

*These rules have been adapted from Poole and Roth (1989a) as well as from Poole, Van de Ven et al (2000). They are to be applied after a given transcript has been coded using the initial and detailed phase codes (i.e. the codes in the coding schemes).*

*Even though two different coding units are used, one coding scheme is based on a 30 second segment units (i.e. GWRCS) and one coding scheme is based on the thought unit (i.e. MACS<sup>98</sup>), the parsing rules are unit sensitive (i.e. based on the number of units alone) thus not requiring any further modifications.*

- 1. Rule of Three: When three or more consecutive phase types occur then delineate the start of a phase. A phase ends when another one begins. If three consecutive codes of different phase types are observed delineate the beginning of an Unfocussed phase. The codes were applied on a thought unit basis and as such they indicate a less coarse unitisation process. Specifically for the case of no model appropriations in MACS it has been observed that the rule of three was overly sensitive to identifying NMA phases. As such and only for the case of NMA a coarser rule was used being that an NMA phase was delineated when five or more NMA codes were observed. This should not*

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<sup>98</sup> MACS: Model Appropriation Coding Scheme

*bear any significant difference to the coding (Poole & Roth, 1989a) but nevertheless it felt that it was capturing the NMA phases more accurately.*

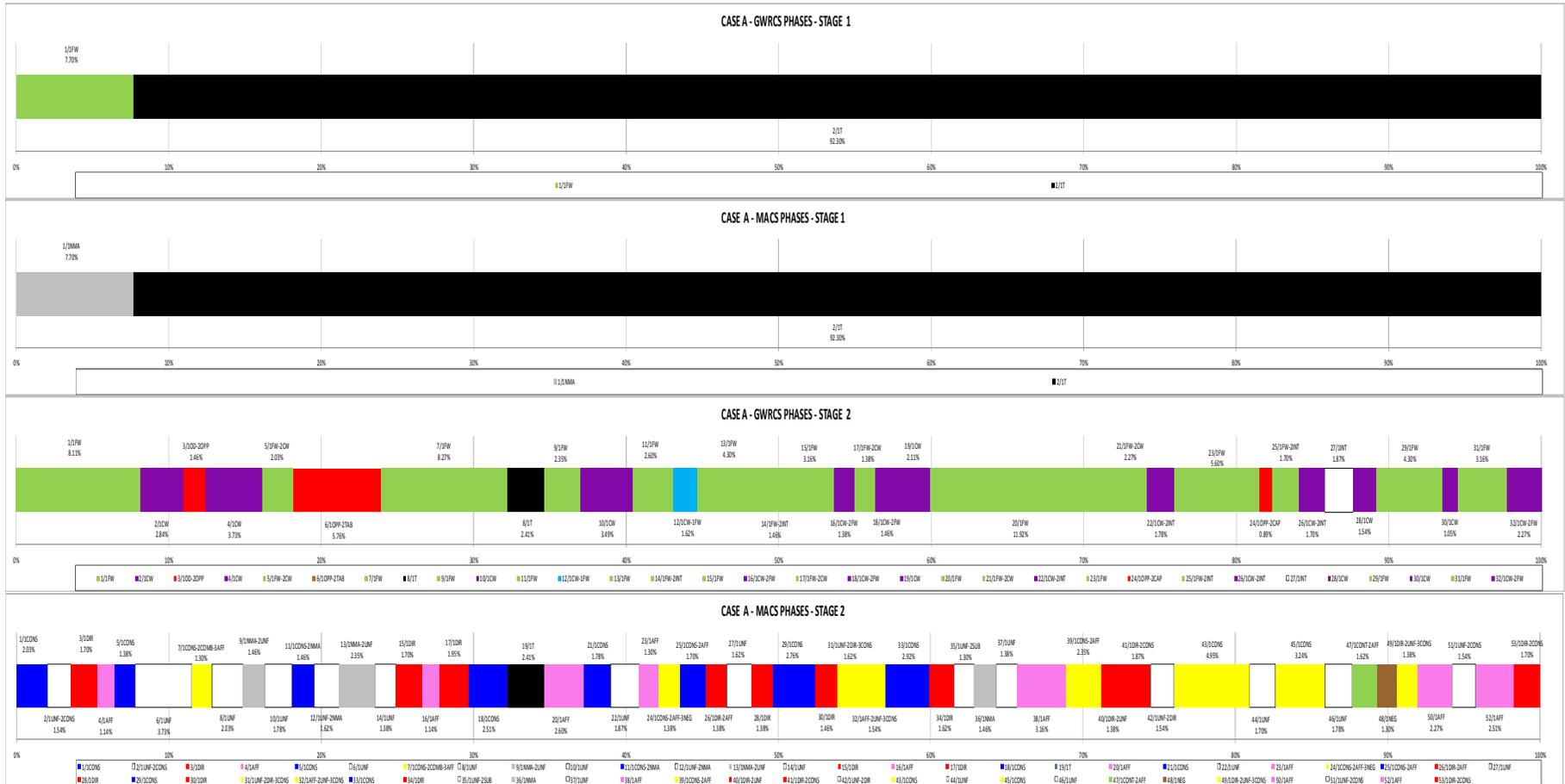
- 2. Apply parsing rules after the phase codes (i.e. coded units) have been converted to phase markers (i.e. same phase indicated by more than one phase code<sup>99</sup>) and phases are identified using the 'rule of three' (Poole and Roth, 1989, pp. 337; Poole et al, 2000)*
- 3. Count overall number of active coded units. Active coded units are units that are not comments, blank lines or otherwise unusable units. Count the total active time of the workshop. Active time of a workshop is interaction time or time of non-interaction but of interest and not time spent in eating or breaks. Subtract time spent in non-interaction of interest (i.e. typing). Divide interaction time by coded units to obtain the per coded unit interaction time. Divide non-interaction time by coded non-interaction units to obtain the per coded unit non-interaction time.*
- 4. For each interaction phase identified count the number of coded units of interaction and multiply by the per unit interaction time. For each non-interaction phase count the number of coded units of non-interaction and multiply by the per unit non-interaction time. Check at the end that the sum of all times is equal to the total active time of the workshop.*
- 5. If coded units are less than 500 parse the phases within a stage timeline using a 2.5% cut-off. If more than 500 parse the phases within a stage timeline using a 1.25% cut-off.*

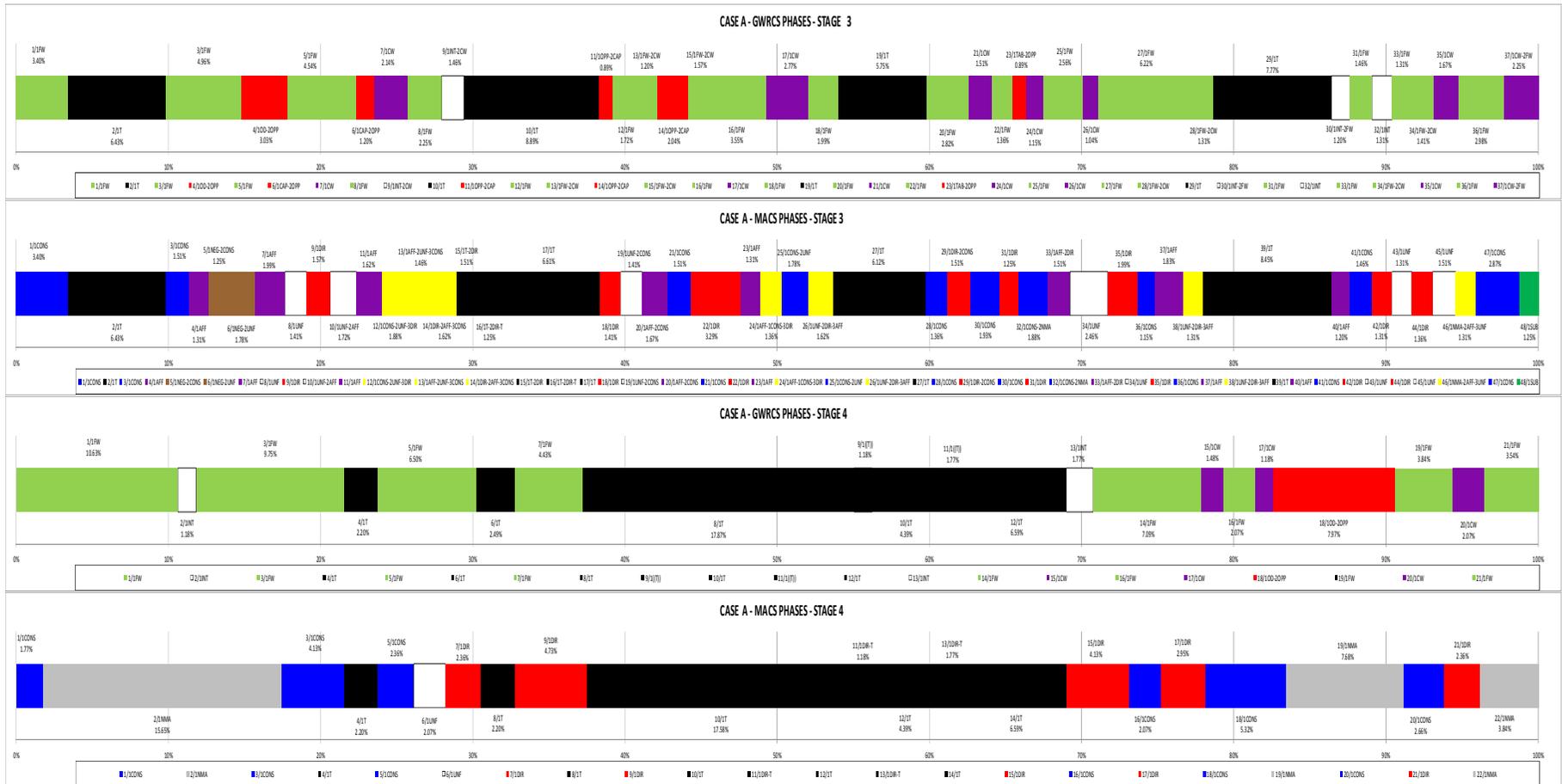
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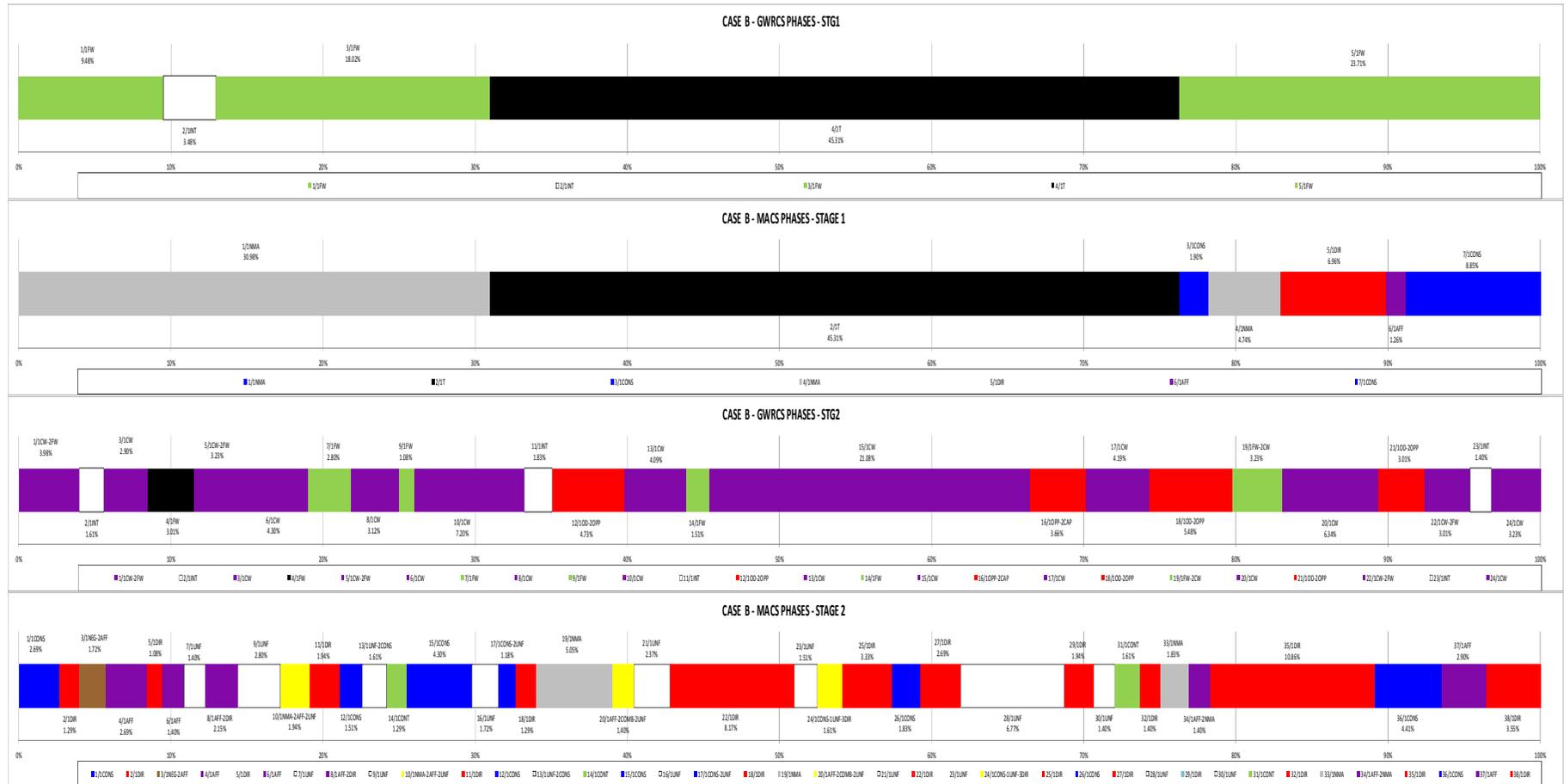
<sup>99</sup> For example in the case of MACS codes 6a-6g indicate a 'Constraint of the Model' phase and are given the phase marker of CONS.

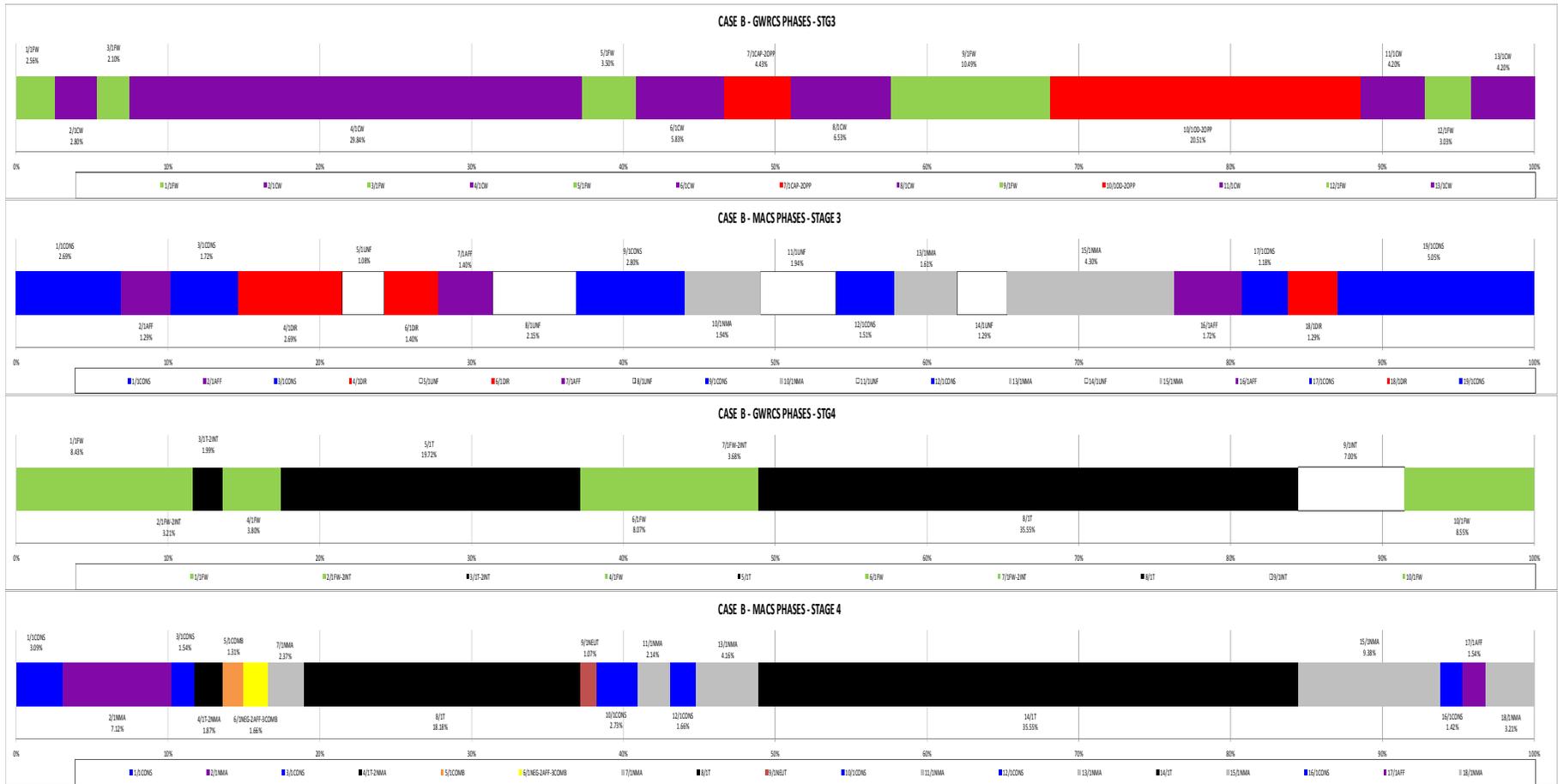
6. *Non interaction (i.e. typing) phases are to be parsed only with interaction phases that occur within the overall non interaction phase and are denoted by  $-T$  or  $((T))$ . As such if the group is typing and a participant asks for a process clarification question this should be coded (for example using GWRCS) as  $FW-T$ .  $FW-T$  is then allowed to be parsed with  $T$  if required. Interaction phases outside the wider non-interaction phase are to be kept separate.*
7. *If there is a phase of particular theoretical interest (i.e. conflict phases) do not parse it with the rest.*
8. *If when parsing, smaller phases within a parsing cluster (i.e. within a 1.25% or 2.5% cluster) are 5 times or more smaller than the largest phase in that parsing cluster, then omit the smaller phases.*
9. *In the case where composite phases occur when parsing write the composite phase with its component phases in descending order from the phases with the largest percentage to the phases with the smaller percentage.*

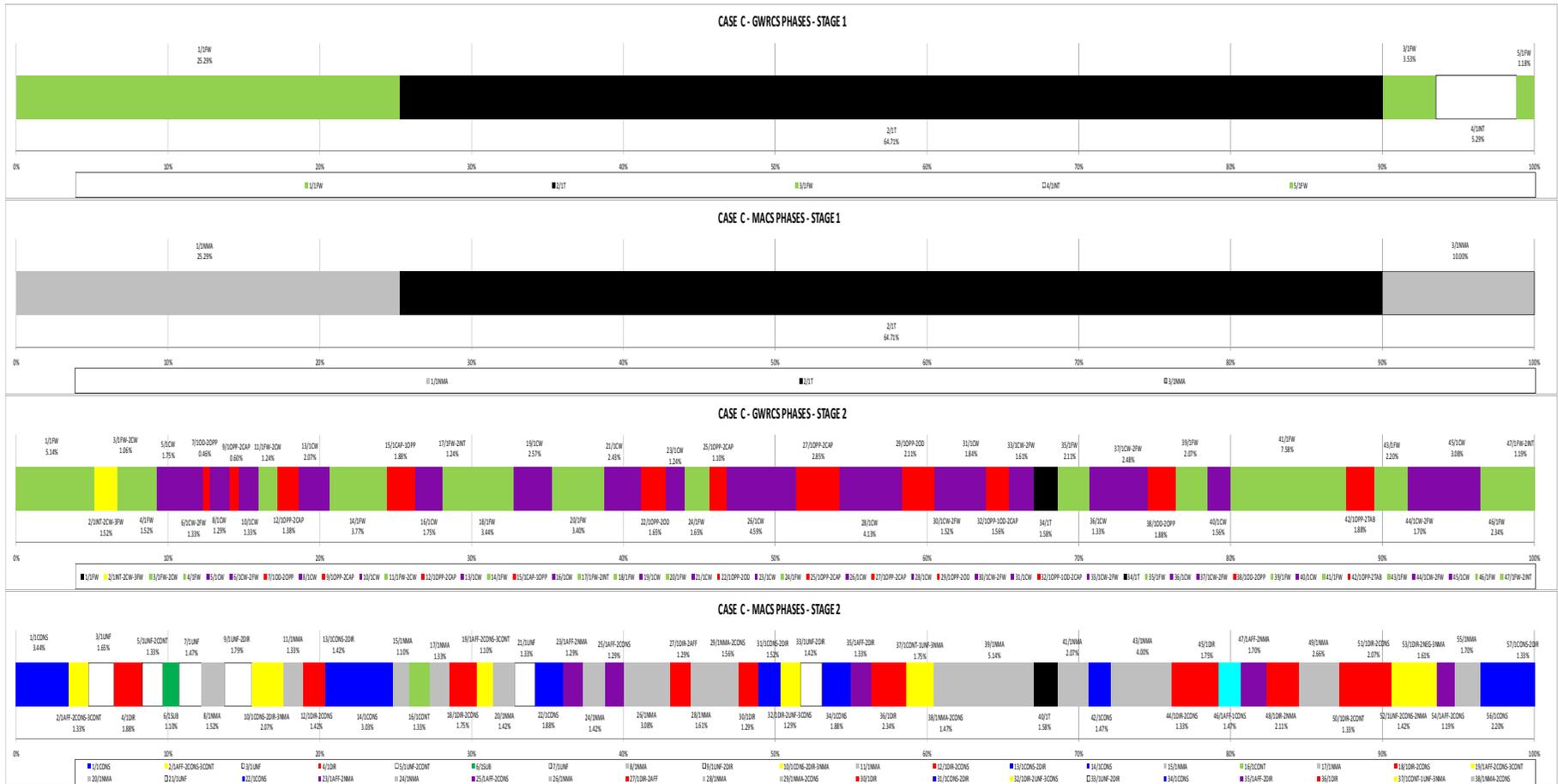
# 13 Appendix 6

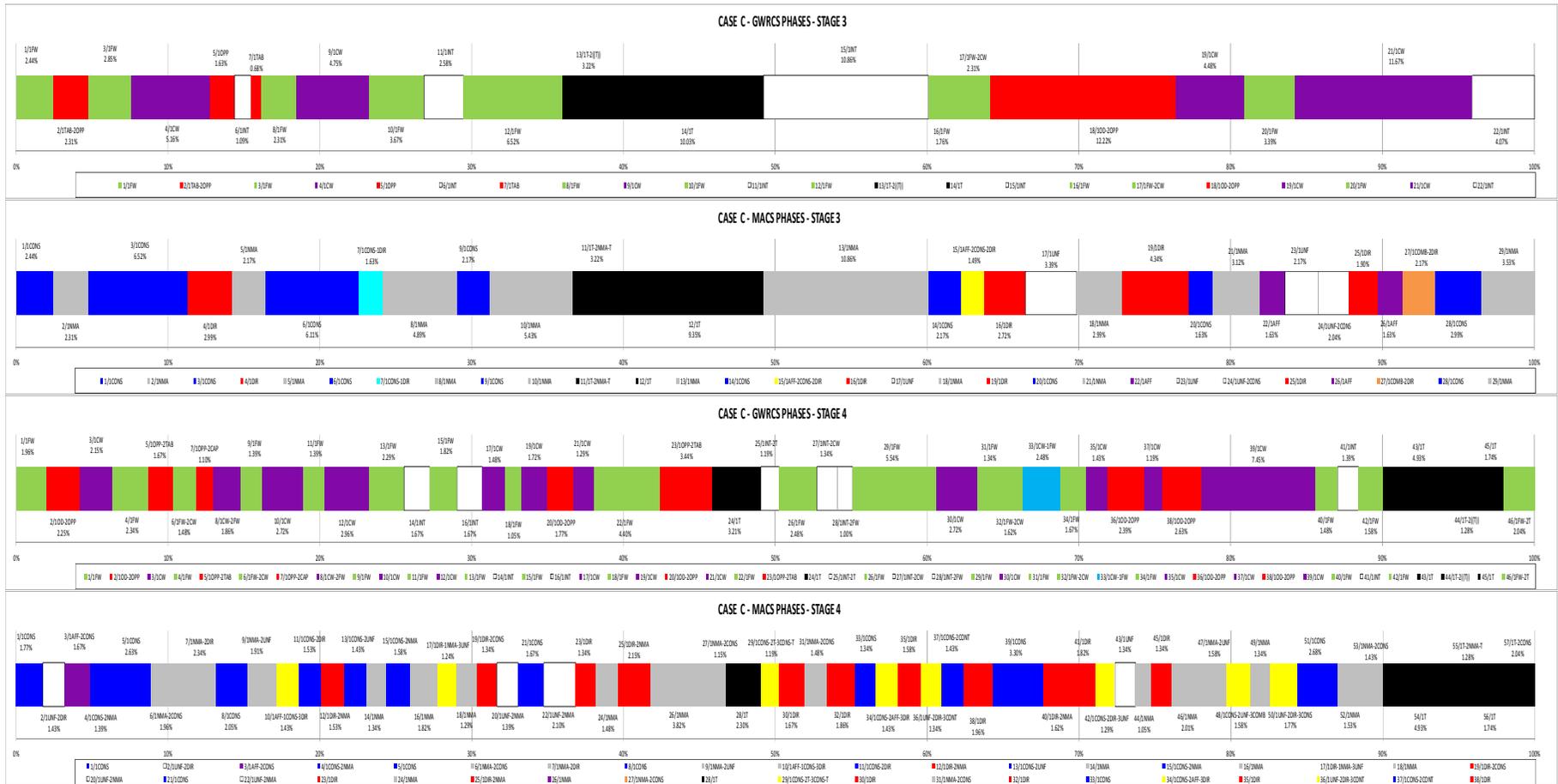


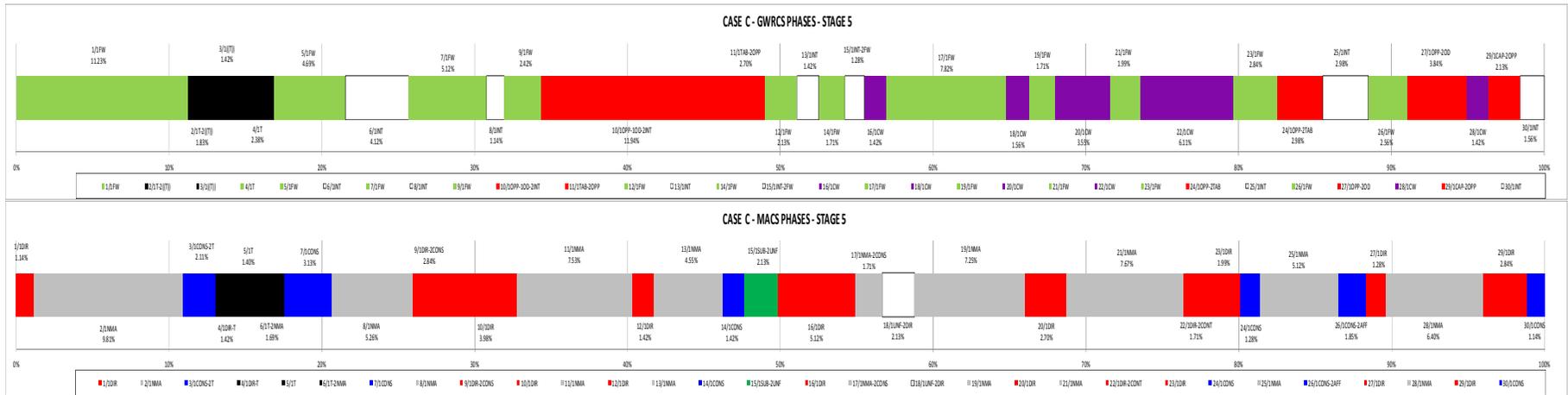














## APPENDIX 7

### Model Appropriations Coding System (MACS)

Warwick Business School, Gibbet Hill Road, Coventry CV4 7AL, UK

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## Introduction

This coding scheme is based on the work by Poole & DeSanctis (1992) and DeSanctis & Poole (1994) in the field of Group Decision Support Systems (GDSS) research.

Their work builds upon and furthers the theory of structuration in the social world (Giddens, 1979 & 1984; Bordieu, 1978 and Berger & Luckmann, 1966) which portrays the viewpoint of how structures are defined, acted, redefined and reacted within a social context. While in Giddens theory the term 'structure' can take a variety of definitions depended on the theory operationalisation context in this research context we shall adopt the definition of structures as individual and subjective social constructions of technology using resources, interpretive schemes, and norms embedded in the larger institutional context (Orlikowski, 1992).

DeSanctis & Poole (1994) suggest that technology can bring about organizational change through the ways that the technology recursively structures and is being structured within an organization. This adaptively evolving process of technology structuring and being structured by social processes is termed as Adaptive Structuration Theory (AST).

Empirically studying structuration meant that analytical methods for identifying structures-in-use were required. DeSanctis & Poole (1994) put forward the notion that to identify the structures-in-use one needs to look at the appropriations of a given structure as a proxy. A detailed interpretive scheme was produced in order to study the appropriations of a technology. This categorisation has been adapted here

in the context of a *facilitated modelling* session. Facilitated modelling is defined as “...the process by which formal models are jointly developed with a client group, in real time, and with or without the assistance of computer support” (Franco & Montibeller, 2010). During the process of facilitated modelling, group participants offer ideas in forms of statements<sup>1</sup>, these statements are then linked, structured and systematically analysed. The facilitator’s role is to ensure that the process is followed in an appropriate manner. In the cases of computer supported facilitated modelling a *modeller* is sometimes employed for dealing with the mechanics of the technology (e.g. moving concepts around, merging concepts, changing names and colours of concepts, assigning labels etc.). More often than not in computer supported facilitated modelling a facilitator familiar with the technology also assumes the role of the modeller.

In the following chapters the dimension of the source of structure is examined and the different types and subtypes of appropriations are explained and explicated.

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<sup>1</sup> In the modeling terminology these statements are also referred to as ‘contributions’ (e.g. ‘a participant’s contribution’, ‘gathering the group contributions’ or ‘can you tell us more about your contribution’).

## Source of Structure

The coding focus is on exploring the appropriations of the resulting model of a facilitative modelling session, thus only one source of structure is concerned in this coding scheme. More specifically, we are concerned only with the output (i.e. the model) of a facilitative modelling session and how this model<sup>2</sup> is appropriated by the group in the duration of the workshop<sup>3</sup>. In the classification of DeSanctis & Poole (1994), we are concerned with the output of the advanced information technology (i.e. the model derived through facilitative modelling in our case).

We define the output models of a facilitative modelling session as the output screens, reports and data presented by the technology on private user terminals, on the system's large public screen, or on paper. When group members are discussing comments, ideas, or quantitative data displayed on their terminals or on the large public screen, they are invoking facilitated modelling output structures.

An important clarification that needs be made is that, when individual concepts are discussed, the cognitive focus of a participant is on one concept at a time (i.e. the

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<sup>2</sup> From this point onwards the word 'model' is used to signify the source of structure of interest for this research.

<sup>3</sup> DeSanctis & Poole (1994) include a number of structure sources related to the advanced information technology (i.e. the facilitated modelling in this case), the task and the task output as well as the environment and the environment output. Adhering to the research scope we decided not to explore the other sources of structure except the resulting output of the facilitative modelling structure. Facilitative modelling as structure per se would mean that the interest is on the hardware, software and procedures. In this research we are interested in exploring the effects of the model to the group as the model is being constructed. Doing so requires assessing the model appropriation through time. We view the model as the output of an advanced information technology such as facilitative modelling. Furthermore, task outputs (i.e. tasks steps or using procedures recommended in task instructions) were dealt with by the facilitator, thus allowing little room for identification of appropriations made by the group. Exploring larger structures (i.e. general knowledge and rules of action drawn from the environment – be it the organization or the world at large –, organizational norms, structures other than the facilitative modelling such as flipcharts and general norms, knowledge and social principles from the world at large) was felt that would not serve the purpose of this study on exploring the model appropriation effects.

participant first processes the meaning of concept A and then processes the meaning of concept B). As such and for the instances where individual concepts are discussed the structure in focus is that individual concept.

In a nutshell, the source of structure is the output models presented to the participants while the structure per se is the model components making up the whole.

In the following chapter the different types and subtype of model appropriation are explained and explicated with examples so as to allow for clearer understanding and more accurate application.

## Appropriation Types

In the following paragraphs the types and subtypes of appropriation moves are explicated and examples are provided.

### Direct Use

#### Direct Appropriation

In the context of facilitative modelling direct appropriation of the model is generally defined as the active use of the structure. Three subcategories further explore the potential variations of direct appropriation

##### *Explicit Direct Appropriation*

Explicit direct appropriation is when a participant is openly using the model and referring to it (e.g “I am entering my comments into the system”)

##### Example 1

[Context: The group is engaged in the process of eliminating any duplicate statement contributions, merging closely related statements as well as clarifying any ambiguity. Four group members are participating. In this example statement contributions are referred to by a reference number. In the following exchange P1 directly appropriates the model by replacing ‘high quality services’ for ‘high quality learning’, as well as speaking out a statement’s number.]

P1: *if... ((statement number)) 5...5, which is just on the left of where you are now..no...below...5: 'high quality learning' rather than 'high quality services'.*

P2: *are you OK with that?*

P1: *yeah if you're gonna subsume into...*

P2: *I don't know*

P3: *((interrupting)) or is it that just...*

P2: *((over talking)) I would keep*

P3: *one aspect of it*

P1: *It is, yes.*

P4: *yes, ((inaudible)) it has to do...*

P2: *I think you should keep that one.*

P1: *Ok*

P4: *with the kinds of services that we provide*

P2: *I think you should keep that one for now.*

P3: *So shall we say that 5 leads into ((statement number)) 9 then? So it's just ...you know...*

P2: *yeah, yeah*

In the bolded area we observe a direct appropriation of the model. The participant is explicitly working with the model.

### *Implicit Direct Appropriation*

Implicit direct appropriation is when a participant is using the model but without referring to it (e.g. pointing to the screen)

Example:

An example of an implicit appropriation cannot be given in terms of verbatim representation of spoken language since it is about body language. To be able and depict implicit direct appropriation the coders will have to make notes of the behaviour that is observed in double brackets. For example ((pointing)). Using the previously mentioned example and in the same setting, one may observe the following implicit appropriation.

*P1: if... ((statement number)) 5...5, which is just on the left of where you are now..no...below...5: 'high quality learning' rather than 'high quality services'.*

*P2: are you OK with that?*

*P1: yeah if you're gonna subsume into ((pointing to the model-screen))...*

*P2: I don't know*

*P3: ((interrupting)) or is it that just...*

*P2: ((over talking)) I would keep*

*P3: one aspect of it*

*P1: It is, yes.*

*P4: yes, ((inaudible)) it has to do...*

*P2: I think you should keep that one.*

*P1: Ok*

*P4: with the kinds of services that we provide*

*P2: I think you should keep that one for now.*

*P3: So shall we say that 5 leads into ((statement number)) 9 then? So it's just ...you know...*

*P2: yeah, yeah*

In this example we observe that the direct implicit appropriation is conducted through body language by pointing. The coder is to make note of the body language and code only that as implicit instead of the whole sentence.

### ***Direct Bids for Appropriation***

A direct bid is when a participant explicitly asks others to use the structure (e.g. "where is that on the map?")

Example

[Context: The group is at the point of clarifying the meaning of contributions. One contribution revolves around 'professional reputation'. Two participants exchange ideas about what this means and at some point the facilitator requests one of the participants to identify another contribution.]

*P2: (interrupting) I think that's right but to me that's part of the professional reputation in that people, if if... the Warwickshire Council reckoned of for the reputation of delivering leading edge the reputation of the Warwickshire County record office would be higher as a result. I think that's the...*

*P1: I suppose I have a difficulty with the term professional in that context*

*P2: (over) yeah yeah*

*P1: meaning...uuhhhmm... constrained to being a librarian or keep a...*

*P2: obviously it doesn't mean that to me at all, to me it just means like*

*P1: yeah, being professional in what we do*

*P2: yeah*

*P1: now, as long as we know that's what it means I am fine... so...*

*F: I mean, offering leading edge services doesn't it increase your visibility?*

*P1: I... yes, I think it does.*

*F: then where... and where is the 'visibility' ((referring to a contribution))?*

*P1: but it can... it can have more than one link can't it?*

*P3: (saying something unintelligible)*

*F: yes...*

*P1: so, have a link to 19 in there's something about visibility... uuuhmm*

In this example we observe the facilitator directly asking P1 to appropriate the model.

### Relate to other structures

'Relate to other structures' are appropriations in which the structure at focus may be blended with another structure.

The 'relate to other structures' categories are:

#### **Substitution**

##### *Part Substitution*

In this category the structure is used partially instead of its whole.

Example

[Context: The group is at the point of clarifying the meaning of contributions. One contribution revolves around 'professional reputation'. Two participants exchange ideas about what this means and at some point the facilitator requests one of the participants to identify another contribution.]

*F: One is 'secure new business' which is a new...a new concept here, but then we have 'win new businesses' which came from the previous one, are they the same?/*

*((P2 nods affirmatively))*

*F: yeah? so we keep 76 cause that's more ((two words unintelligible))/*

*P1: sure/*

*F: uuuhm...so its 76 only, there you are,/*

*uuuhm and then the same 154 and 106?/*

***uuuh 106 came from the previous screen as a goal .../***

*so let me just keep that one instead of 154/*

*do you agree? /*

*P2: ((together with P4)) yeah/*

In this example we observe a concept from a previous screen being invoked in the current screen discussion. As such a specific concept of the previous screen model is

used while being clearly acknowledged that concept 106 comes from a previous screen.

### *Related Substitution*

In this category a similar structure is used in place of the structure at hand.

Example:

[Context: The group is in the process of developing a goal system. Doing so requires concepts to be qualified as goals. In this example concept 142 is about proposed as a goal concerning employee morale.]

*F: And obviously 142 it is a goal in itself. yeah?/*

*Is that what you're saying?/*

*uuuhm 'maintain good employee morale',*

*I am not sure whether we have anything about morale/*

*let me just doublecheck uuh/*

*P1: we should do/*

*P4: we don't have/*

*F: we have nothing but that concept on morale/*

*P4: we don't need either ((comment resulting in slight group laughter)),  
ban it uuuh/*

*strike that from the record please((jokingly resulting in group laughter))/*

*F:        uhh but obviously that that is probably related to the previous screen  
as well/*

*P4:        for us that... We use a shorthand... we use a shorthand which is about  
the core of the organisation, whether we're talking about maintain what the  
company is about its ethos and all of that/*

In this example the discussion results in P4 making a strong suggestion, masked in humour, that there should be no concept on morale. The facilitator relates the morale concept with a previous screen and as such he is invoking a similar model to spark the discussion for the current one.

#### ***Unrelated Substitution*** \*4

In this category an opposing structure is used in place of the structure at hand without acknowledging that it is a different structure.

Example:

[Context: In this example the facilitator is asking the participants to explore a question resulting from exploring a contribution revolving around what the company characteristics are.]

*F:        a good point Colin is that you've got 148 there*

---

<sup>4</sup> Categories with an asterisk \* represent unfaithful appropriations (i.e. appropriations that are inconsistent with the spirit of the structure). All the others are faithful appropriations.

*'the company of the future is recognizable as XXX ((company name))', at the moment we can't recognize what XXX ((company name)) is, so what it.../*

*F: can you say what it is that would characterise your company?/*

*Pl: yeah, we have a succinct statement which would say that./*

*Which would be "unearthing the spark of brilliance in the individuals that we deal with exploding it in to their lives" in that... by achieving that we secure people into work by changing their lives, we change society,/*

*so we have a statement, we call it our passion, which says exactly what our aim... our ultimate aim is, /*

*so if we want to get away from all of that and we would want to look at what it is... what was our mission, what was our vision, if you like those we label passion/*

*we came up with a... a three prompt attack to what is our passion,/*

*what is the thing that drives us and what is the thing that is the economic engine behind that,/*

***that all sits as a piece of knowledge we all have outside of this/***

*and all of that ensures that that will happen/*

*F: so is that something you have available?/*

*Pl: yeah yeah it's on every location you ever go into XXX ((company name)) there is a little house/*

*P4: ((interrupting)) it defines us/*

*P1: and it defines what we are, so every single member of staff every day they go into work actually see it and we used to have it as a screensaver/*

Here we observe the facilitator asking for what would characterise the company. P1 and P4 invoke a model outside the facilitated modelling session as an opposing model which is specifically identified by P1 as a ‘little house’ (in bolded italics) and that answers the question rising from the current model (i.e. what would characterise the company), rendering any further discussion and potential expansion of the current model as obsolete.

## **Combination**

### *Composition*

In this category two structures are combined in a way that is consistent with the spirit of both.

Since the structures of interest in this research are the models, combining the structures means that the components of models (i.e. the individual contributions), are combined.

Example:

[Context: The group is at the point of clarifying the meaning of contributions. The meaning of the contributions is explained and if the meaning is the same the contributions are combined.]

*P2: 29 and 3 are the same/*

*P1: yes it is/*

*P2: its part of succession planning actually/*

*F: its part of that or the other way around?/*

*P2: nah that's right/*

*F: ok/*

*P2: as is...as is that./*

*F: number 12 as well,/*

*P2: yeah/*

*F: ok. How about 5? "To identify and develop potential future managers from within the existing staff"/*

*P2: Aahh that's, that's the same as 12/*

In this example we observe that P2 is combining contributions that bear the same meaning<sup>5</sup>.

### *Paradox\**

In this category two contrary structures are combined with no acknowledgement that they are contrary. For this code a certain degree of interpretation ability is required by the coder in order to identify contrary structures that are not acknowledged as contrary.

Example:

[Context: In this example the discussion revolves around political issues and how a change in government may affect the future of the business. The CEO (P1) elaborates on what he thinks are the key points.]

*P1: you have to make a few decisions strategically of who you are going to align yourself in terms of your delivery philosophy and methodology, and/*

*there are two very different... well... two quite close approaches just presented differently between Conservatives and Labour party,/*

*so you have one of our competitor XXX ((company name)) which is closely affiliated with the Labour Party and is a donation... you know... they make donations to them.../*

*you almost get to a position that you can't be a-political,*

---

<sup>5</sup> While the combination may not seem too obvious, by identifying the similarity of meaning between two contributions the participant is essentially telling the facilitator to combine the contributions by electronically manipulating the model.

*you have to link your philosophy delivery to a given staff, /*

*if you want to take advantage of what may happen in the next two years. /*

***If you were doing uhhh... PEST analysis at the moment and you were looking at the political influences that sit outside there which may impact on you over the next 24 months that's fairly major. /***

In this example we observe P1 using an opposing structure (PEST analysis)<sup>6</sup> in place of the model at hand.

### ***Corrective***

In this category a structure is used as a corrective for a perceived deficiency of another.

Example:

[Context: In this example the group is in the process of clustering contributions under cluster labels. Two contributions (3 and 4) meaning is explored.]

*F: ok, 3 and 4 you say they are closely linked /*

*P1: its linked to succession, /*

*while this here is I think a broader issue than succession, /*

*that's meeting the business requirements as they are today, tomorrow and... /*

---

<sup>6</sup> PEST is a static framework assisting on the analysis within certain dimensions (i.e. Political, Environmental, Social and Technological) and is not designed for dialectical and participatory decision making while facilitated modelling is a flexible process encouraging participation and discussion. As such PEST analysis has an opposing spirit to facilitated modelling

*CS<sup>7</sup>: Succession planning is just one of them isn't it? One of the challenges/*

*F: ok, would 4 and 3...I mean can we use 4 instead of 3?/*

*Is that because its explaining better what is that we try to do is continue to develop.../*

*P1: yeah could do/*

*F: OK/*

*P1: I would do that yeah/*

In this example we observe two contributions (3 and 4) being assessed in terms of what they mean and eventually 4 is chosen over 3 as a corrective one bearing a broader meaning

## **Enlargement**

### *Positive*

In this category the similarity between the structure and another structure is noted via a positive allusion or metaphor.

Example:

[Context: In this example the group has just finished the clustering part and the facilitator calls for a break.]

---

<sup>7</sup> CS = Consultant

*F:       okay, good. I think it's time for a break, well done/*

*P1:       excellent, good session/*

*P5:       fantastic software/*

*F:       what?/*

*P5:       fantastic software, **like post it notes only electronic.../***

*P1:       we're heading for a ruby merry moment aren't we? ((jokingly))/*

In this example, in the bolded line, P5 uses a positive allusion (i.e. “fantastic software, like post it notes only electronic...”) to note the similarity between the model used and models created via post it notes. It is important to note that it is not the compliment made (i.e. “fantastic software...”) that is coded here but rather the positive allusion that notes the similarity between what is currently used and another model (i.e. “like post it notes only electronically...”).

In the case where only the statement of “fantastic software” was to be made (as in the previous comment of P5) the code should be one of diagnosis bearing a positive sign (6C+).

### **Negative**

In this category the similarity between the structure and another structure is noted via a negative allusion or metaphor.

Example:

[Context: In this example the group is in the process of clustering contributions under cluster labels. Two clusters ('succession planning' and 'ownership') are explored.]

*P2: I think there's no denial that succession planning isn't impacted upon 'ownership'.*

*as supposed to succession planning is going to be different, but,/*

*so therefore there's two stages, the 'succession planning' in the current state, but we can't really predict what succession planning in the future, it may be wrong, can we?/*

*P1: It would still exist/*

*P4: And that is the point./*

*There is a link/*

*P2: yeah, there is a link/*

In this example we observe P2 comparing the two clusters ('succession planning' and 'ownership'). While in the first instance (bolded) a negative allusion is given for succession planning, in the next instance P2 agrees that there would be a link between the two. P2 implicitly notes the similarity of 'succession planning' and 'ownership' by stressing the time factor between the two clusters. This becomes clearer by P2's final sentence in which he agrees that there is a link and thus a similarity.

While throughout the entire coding process careful reading of the previous and next thought units, as well as watching the video, allows for more accurate interpretation, in this example it becomes almost impossible to derive the code without having a solid understanding of the context and without watching the video.

## **Contrast**

### *Contrary*

In this category the structure is expressed by noting what it isn't, that is, in terms of a contrasting structure

Example:

[Context: In this example the group is in the process of clustering contributions under cluster labels. Two contributions (3 and 4) meaning is explored.]

*F: ok, 3 and 4 you say they are closely linked/*

*P1: its linked to 'succession',/*

***while this here is I think a broader issue than 'succession',/***

*that's meeting the business requirements as they are today, tomorrow and.../*

*CS<sup>8</sup>: 'Succession planning' is just one of them isn't it? One of the challenges/*

*F: ok, would 4 and 3...I mean can we use 4 instead of 3?/*

---

<sup>8</sup> CS = Consultant

*Is that because its explaining better what is that we try to do is continue to develop.../*

*P1: yeah could do/*

*F: OK/*

*P1: I would do that yeah/*

In this example P1 identifies the link between contributions 3 and 4 as being one in relation to ‘succession’. He further stresses that another concept (“while this here...”) is broader than ‘succession’ (bolded line) thus contrasting the contributions implying that contributions 3 and 4 are not as broad as the other contribution.

### ***Favored Contrast***

In this category the structures are compared with one favoured over the others.

Example:

[Context: In this example the group is in the process of clustering contributions under cluster labels. The direction of the link between two contributions (38 and 55) is explored.]

*P1: ((interrupting)) so what you're saying Ken is so is reviewing it we find innovative ways of doing it.../*

*P6: ((interrupting)) I think they all link in to it/*

*P1: so does 38 going to 55 or does 55 going to 38?/*

*P6: well I think 38 is the centre/*

*P1: yeah, /*

*P6: and then.../*

*P1: ((completing P6's sentence)) and then the other centre around/*

In this example we observe contributions 38 and 55 being compared and in the bolded line P6 qualifies contribution 38 as being the central contribution on which the other contributions should link on.

### ***None-favoured Contrast.***

In this category the structures are compared with none favoured over the others

Example:

[The group is in the process of developing a goal system for the clusters that have been previously developed. In this instance the group is working on cluster labelled 'efficiency'. The participants have been asked to type in the reasons why addressing the challenges or issues, as identified in clustering, is important.]

*F: as you do these I am remembering what things you brought before still I.../*

*for instance 'economies of scale' was mentioned before/*

*so I just brought them back to see whether they are the same or not,/*

*the same with 'winning new businesses'/'*

*or 'securing new businesses' and so on/*

Here the facilitator, within the context of an example (i.e. "...for instance..."), identifies two qualifying concepts (i.e. 'winning new business', 'securing new business') for comparison to identify similarities. The important notion for this code is that none of the two contributions are favored in the facilitator utterances while it is made clear that similarities between the two are to be explored.

### ***Criticising Contrast***

In this category there is criticism of the structure, but without an explicit contrast.

Example:

[Context: In this example the group is in the stage of prioritisation. The facilitator checks whether there are any key concepts that have not been captured.]

*F: yes, I mean, some of these things are actually related through different groups uuhm/*

*the issue of ((one word unintelligible)),*

*148 then says it, a key one, ((one word unintelligible)) force ((short pause)) culture./*

*Is anything missing there?/*

*What you think?/*

*P6: there are quite a lot missing, uuhm we tended to select.../*

*F: ((talking over)) you prioritised, yes/*

*P6: a number a time/*

*F: you... you/*

*P6: so we've prioritised them, I think from my point of view it's the things that I need to do at the moment, and there are some longer term things I might not be able because of the shorter term/*

In this example we observe P6 criticising the model in the sense that a lot of key concepts are missing because of the selection process during the prioritisation stage. Additional contextual comments are provided by P6 in the last line where he indicates that the current key concepts are viewed as short term actions.

## **Constrain the structure.**

### **Constraint**

Constraints are appropriations that attempt to narrow the model to gain a better understanding or use it more effectively. Constraint categories include:

### **Definitions**

Explaining the meaning of the model and how it is used (e.g. “a link represents a causal relationship between two contributions”).

### **Example**

*[Context: After an initial gathering of ideas has taken place the facilitator is giving procedural direction as to the next steps and in doing so explains the view on the screen.]*

*F: OK? Right so you have an idea..I mean ..!*

*some of these ideas obviously some of these aspirations, if I may call them like that, they are –you know- they lead perhaps to a particular unit of the division or maybe broad enough to encompass not only the division but beyond the division as well..!*

*if there is repetition we'll sort it as we speak/*

*. What I want to do now/*

*is I want to really understand the logic behind this and..and..and for that what I want to do is this /*

*for instance, eh..let me just eh.. give you an example, eh.. /*

***the numbers that each of these ideas have, or concepts, have eh.. /***

***they don't mean anything in particular /***

***its not any prioritisation its just the ordering which they were entered into the system./***

*but they will be helpful later on as I show you more, /*

*so for instance 'increase customer numbers' -you know- /*

*my question be why is that important and the answer might be obvious, /*

*the answer might be there and I wonder whether there is anything in there which  
[...]*

In this example we observe the facilitator defining what a particular feature of a GDSS is (i.e. the numbers next to concepts).

### **Commands**

Commands is when directions for others or ordering other to use the model are given.

The difference between a command and a bid is that in a bid there is a suggestion for use, often phrased in a question format and open to rejection (i.e. one may choose to use or not use the model). A command is usually phrased in a ‘must do’ fashion. Rejecting a command would signify explicit ‘disobedience’.

### **Example**

*[Context: After the initial gathering the facilitator moves on the next step of the GDSS application which includes linking several concepts on the screen using arrows, thus forming a hierarchy of concepts. In so doing the facilitator explains the rationale behind this step and asks for the group to work with the model (i.e. the map)]*

*F: The reason...the reason I am asking about this is because for me...some of these objectives or aspirations they are means to fundamental objectives/*

*to which probably most of you will agree at that level./*

*, and we need to have that hierarchy clear in our heads/*

*a.a.a.and thats what I'm doing so... basically what I would suggest now is that if you understand what I'm trying to achieve here is/*

***I would like you to explore the map and you suggest the links that are being suggested/***

*How do you do that?-well now you can use the other-you know-box there a.a/*

*.and we can engage in the conversation in a moment but aa,/*

*where you see link statements, basically what you have to do../*

*if you believe there are things that are linked you type the number/*

*, for instance here fourteen is linked to two in that sequence... /*

*so I would type in the box fourteen plus two and the link will appear../*

*does that make sense??*

*PI: mhhmm (agreement)*

In this example we observe the facilitator giving directions to the group participants on how to use the GDSS technology, and more specifically on asking

### **Diagnoses**

Utterances that comment on how the model is working. They can be either negative (-) (e.g. “that output doesn’t look right”) or positive (+) (e.g. “that’s right, look at how the ideas are tagged”).

Example:

*[Context: The group is in the process of prioritising the concepts in terms of importance. This is performed by colour coding the concepts.]*

*F: Let me just change the colours so ..I got that and I'll change it later.so this..you see this is going to there and I' m going to change the colour of that..there..fine. How about the other? We are trying to...The ones that are in black in the moment are the ones that are ultimately good in their own right, uh, if we don't believe that then we'll change them, so lets go to...*

*F2: **They're too small F (-)***

*F: The're too small I know..uuhm. Is that better?*

*Someone: **Yeah (+)***

*P1: **Yeah (+)***

In this example we observe a negative comment being made in the sense that the concepts as displayed via the projector on the wall are too small to be legible. This flaw was attended to by the facilitator and that resulted in positive comments being made. In this situation the interpretive ability of the coders need to be able to identify the direction of simple utterances and how they link with the text (in our case a simple “yeah” would mean nothing if it wasn’t a response to the facilitator’s question “Is that better?”)

### *Orderings*

Utterances that specify the order in which structures should be used.

(e.g. “let’s first clean up this listing, then print it”)

Example

*[Context: After the initial gathering the facilitator moves on the next step of the facilitative modelling procedure which includes linking several concepts on the screen with arrows, using the GDSS technology, thus forming a hierarchy of concepts]*

*F: So, now its time for you to ..short of a..propose links if there are any.*

*P5: Would it be worthwhile pooling (puling) together, cause there are a lot of repetitions, would it be worthwhile going through an exercise together to pool (pull) together all the ones that are...*

*((Interrupting)) (P1 and F speaking together essentially completing the phrase of P5)*

*F: Yes , OK I think its a good idea*

*P1: **OK, so if we get rid of those first....***

In this example P1 is ordering the group's next activities by indicating that the first thing to do is to eliminate any duplicates as proposed by P5.

### *Queries*

Utterances that ask questions about the model's meaning or how to use it.

(Is X the same as Y?)

Example

Query about the model's meaning

*[Context: During the process of linking concepts a group conversation takes place in order to clarify which concept is linked to which and with what causal relationship (i.e. is X enabling Y or the opposite)]*

*P1: so fifty three is wider and we can get rid of twelve cause fifty three has got it all, yeah?*

*F: or is it twelve an enabler? one is about easy access and ....*

*P1: ((OVER))...yes*

*P7: ((OVER)) yeah*

*P1: ((OVER)) yeah, yeah...*

*F: ....the other one is about increasing retention (retention not sure sounded like that)*

*P1: yeah..twelve leads to fifty three*

*P8: what about seventeen in the right of twelve...is that linked?*

In this example a query regarding the meaning of a number of concepts is observed. Clarifying the meaning will enable the participants to better identify the causal relationships between concepts.

Query on how to use the model.

*P5: Do the links work in one particular direction?*

*F: Well they work in the direction that you are actually arguing for. If they work either way then , you can do it twice, you can do fourteen goes into two and two goes into fourteen, th.that is possible as well.*

*P3: What about when we're suggesting similar things so ?*

*F: A! If you're suggesting similar...if you spotted anything that is similar what we can do is merge them into one concept that encapsulates them both. So for instance, just to give you an example, nine 'provide high quality library services and meet customers and community needs and there's something similar here.*

In this example a query regarding the way that the model can be manipulated is observed. In the first instance a query for clarifying the way links are to be applied is observed, while in the second instance a query regarding similar concepts is observed.

### *Closures*

Utterances that show how use of a model has been completed.

(‘ok so we’re done with that agenda item’)

Example:

*[Context: The group has been asked to input their contributions using the GDSS technology (i.e. laptops that are linked to a projector displaying all contributions on the wall). The group has been given 10 minutes to input their ideas and the time is up.]*

*F: OK?? I will give you one more minute before/*

*we stop monetarily make sense of what is coming up and then we can continue.*

*((PAUSE))*

F:        *OK?? Right...Now I am going to give you couple of minutes just for you...let me  
just stop that there ..ehm I am going to give you couple of minutes/  
  
to make sense of all that information/  
  
, you will see repetition and that's fine /  
  
**we will deal with repetition in a moment./**  
  
I wondered whether you want the light switched off so that you can see better/*

In this example we observe the facilitator signifying the end of the 10 minutes period and giving indication that a new procedural step is following (i.e. “we will deal with repetition in a moment”).

### *Status reports*

Utterances that state what has been done or is being done with the model.

(“I’ve got all the notes entered”)

Example:

*[Context: In these examples the group is going through the stage of identifying duplicate causal links as well as causal links that may lead to a concept through other concepts thus signifying a potentially different causal chain (i.e. X to Y through C so the causal chain instead of X to Y is X to C to Y)]*

F:        *are we saying that the link between fourteen and two is not really direct but fiv...*

PI:      *its five fifty seven*

F: *yeah...? so I'm gonna delete that and do that*

P1: *yeah*

F: *ok*

P1: *uumm three is part of twelve.. I'm sorry **I'm doing links now** not a ...*

F: *yes but they're duplicates though...that..thats fine*

F: *ok let me just...put that there..there you are.*

P1: *yeah...and nine..no **I am doing links again***

F: *that's fine heh*

In the first and second instances we observe P1 mentioning that instead of seeking out duplicate links she is actually making new ones.

### *Status requests*

Utterances that pose question(s) about what has been done or is being done with the model. ("Jim, did you print that yet?")

Example:

*[Context: In this example the facilitator explains a part of the process of the facilitated modelling. In doing so he uses an example which is picked up by one of the participants.]*

F: *so for instance 'increase customer numbers' -you know- /*

*my question be why is that important and /*

*the answer might be obvious, the answer might be there and /*

*I wonder whether there is anything in there which actually will be driven by increase in  
customer numbers, so, /*

*let me give you an example, would number two 'increase customer numbers' would be a  
means to achieve number one or would it lead to something else? /*

*That's what I mean...*

*PI: It could lead to a number of things (goughing by someone else cant hear word)  
even charged at the moment it may or may not.. /*

*it would be variable as to whether it makes our income cause /*

*it depend what the customer actually did so /*

*if we're full of Petes customers it might contribute to income if it were library customer  
and they borrowed a DVD it would but if they borrowed a book it wouldn't  
...necessarily. But, lets say, increasing the customers would improve our  
measured performance nationally*

*F: OK*

*PI: that's why., so that's one reason why its important.*

*F: **So hold on..hold on there. Is that in that map?***

*if its not I 'll include it now*

*PI: aahhh... there's something about top quartile performance..*

In this example we observe that the facilitator wants to capture the detail offered by the participant and enquires as to whether what P1 says is captured elsewhere in the model (i.e. the map), otherwise the facilitator will add it.

## Express judgements about the structure.

### Affirmation

Affirmation is responsive appropriation representing the positive modes of response to other's appropriations or interpretations.

### *Agreement with the structure*

Utterances that agree with a certain appropriation of the model.

(“yeah, let's display that data ”)

### Example

*[Context: In these examples the group is going through the stage of identifying duplicate causal links as well as causal links that may lead to a concept through other concepts thus signifying a potentially different causal chain (i.e. X to Y through C so the causal chain instead of X to Y is X to C to Y)]*

*P3: number eleven on the right hand side is very similar to the one left over it isn't it or they're not?*

*F: aha yes because its hidden right there..there you are..increase customer satisfaction and maintain or increase..*

P1: *I think we should go for seven..increase*

P3: *right*

In this example we observe P3 agreeing with P1's appropriation of the model.

### *Bids to agree*

Utterances for asking others to agree with a specific appropriation of the model.

("shouldn't we display that data now?")

Example:

*[Context: In these examples the group is going through the stage of identifying duplicate causal links as well as causal links that may lead to a concept through other concepts thus signifying a potentially different causal chain (i.e. X to Y through C so the causal chain instead of X to Y is X to C to Y)]*

P3: *number eleven on the right hand side is very similar to the one left over it isn't it?*

F: *aha yes because its hidden right there..there you are..increase customer satisfaction and maintain or increase..*

P1: ***I think we should go for seven. 'increase***

P3: *right*

Here we observe a bid by P3 asking for agreement with the proposed appropriation of the model.

### *Agreement to reject*

Utterances indicating others agreement on rejecting a certain appropriation of the model. (“yeah let’s delete that data”). A certain degree of interpretation by the coders is required here in order to identify when a simple agreement is directed towards a previously mentioned utterance to reject

#### Example

*[Context: In these examples the group is going through the stage of identifying duplicate causal links as well as causal links that may lead to a concept through other concepts thus signifying a potentially different causal chain (i.e. X to Y through C so the causal chain instead of X to Y is X to C to Y) ]*

*F: are we saying that the link between fourteen and two is not really direct but fiv...*

*P1: its five fifty seven*

*F: yeah...? so I'm gonna delete that and do that*

*P1: **yeah***

*F: ok*

*P1: uumm three is part of twelve.. I'm sorry I'm doing links now not a ...*

*F: yes but they're duplicates though...that..thats fine*

.....

*F: ok let me just...put that there..there you are.*

*P1: yeah...and nine..no I am doing links again*

*F: that's fine heh*

In this example we observe P1 agreeing with F's rejection (i.e. deletion) of part of the model.

### *Compliments to the structure*

Utterances that note an advantage of the model (e.g. "That data says it all" ).

Example:

[Context: In this example the group has just finished the clustering part and the facilitator calls for a break.. Screenshots of the maps are printed and are handed out for the participants to consider during the break.]

*F: okay, good. I think it's time for a break, well done/*

*((F hands out maps))*

*P1: excellent, good session/*

*P2: see, and in these maps I can readily identify what links to what...so helpful./*

*Can I make notes on that?*

*F: Of course these are your copies. I will also send these in electronic form for you to have.*

P2: Cheers.

In this example we observe P2 noting the advantage of having links on a map.

## Negation

Negation is responsive appropriation representing the negative modes of response to other's appropriations or interpretations.

### *Direct rejection or criticisms with the structure*

Utterances that disagree or otherwise directly reject a certain appropriation of the model.

("let's delete that comment")

Example:

*[Context: In these examples the group is going through the stage of identifying duplicate causal links as well as causal links that may lead to a concept through other concepts thus signifying a potentially different causal chain (i.e. X to Y through C so the causal chain instead of X to Y is X to C to Y) ]*

F: are we saying that the link between fourteen and two is not really direct but fiv...

P1: its five fifty seven

F: yeah..? so **I'm gonna delete that** and do that

P1: yeah

*F: ok*

*P1: uumm three is part of twelve.. I'm sorry I'm doing links now not a ...*

*F: yes but they're duplicates though...that..thats fine*

In this example we observe the facilitator announcing the explicit deletion of a concept on the model.

### *Indirect rejection*

Utterances that reject a certain appropriation of the model by ignoring it such as ignoring another's bid to use it. Since, these rejections are identified through ignoring a certain appropriation, the coder is to make note of and include in double brackets that behaviour.

#### Example

[Context: The group is in the process of clustering and identifying potential links between the contributions.]

*P1: are we all ok with that?/*

*P9: mmm ((meaning yes))/*

*F: yes...so just 'high quality services' in general/*

*P1: that's it!/*

*P9: mmm ((yes))/*

*P1: yeah/*

F: good/

P1: yes..and twenty seven/

P2: **((OVER))** twenty two../

P1: Sorry..((addressing F))/

P2: 'revenue' twenty two../

P9: **((OVER))** 'revenue 'twenty two/

P1: ooh sorry twenty seven is the same/

F: the same..so...it goes/

P1: hahaha ((laughs))/

G<sup>9</sup>: ((laughs))/

F: That's very good/

Sorry somebody else said/

P9: and twenty two/

P1: twenty two/

F: There..?/

P1: yeah/

---

<sup>9</sup> G = Group

In this example, in the bolded lines, we observe the effort of P2 and P9 to add contribution 22 on the model. P1 ignores that contributions and continues talking about the contribution she proposed addressing the facilitator. At the end the facilitator asks again about the other contribution (namely 22) that was mentioned. Even though contribution 22 was later addressed for the utterances that were ignored the code of indirect rejection is to be assigned

### *Bids to reject*

Utterances that suggest or ask others to reject a certain use of the model.

(e.g. “Shall we delete that comment?”)

Example:

*[Context: The group is in the process of eliminating any duplicate concepts and merging the ones with similar meaning so as to reduce the complexity of the map.]*

*P3: number 24 top middle*

*P1: 'maintain' yeah*

*P5: (unintelligible) capacity*

*P1: that one do you think that you could get rid of yours... 30?*

*P8: yeah sure*

*P1: would you? is that okay?*

In this example we observe P1 asking P3 to reject his concept. The bid was successful and the concept has been dropped. Still, the code we are interested in is the actual bid to reject (bolded).

### Ambiguity or neutrality

Ambiguity or neutrality is responsive appropriation representing uncertainty, confusion, or neither agreeing nor disagreeing with appropriations or interpretations (e.g. “I don’t know”, “I am confused”, or “I don’t care one way or the other”)

#### Example

[Context: The group is in the process of clarifying and linking together concepts on the map]

P3: number 19 which is going left, there thats it that also goes to 43 sufficiently resourced meet

P1: yes it does

F: okay

P5: there is a link between 36 at the top aaaand 31 at the bottom right **I don't know if I understand (unintelligible) to be**

F: 'managment information to be more easily available and robust'

.....

P3: ...43 top middle...

F: yeah

P3: ...and ten just a little bit down right **I'm not sure again with that one may be both ways....** (pause) **I don't know** actually maybe it's okay the way it is

In the first example we observe participant P5 to be unsure about the meaning of a concept as it appears on the model (in italics). This is an instance which is not to be coded as ambiguity or neutrality. The ambiguity at this point is about the meaning of a concept and not how the model is to be appropriated.

In the second example we observe a case of ambiguity about how the model is to be appropriated and is to be coded as such.

### No Model Appropriations

Assign an NMA code to any units of interaction that cannot be assigned to any of the aforementioned codes.

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