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## ABSTRACT

Group decision making is increasingly important for the successful completion of software development projects. Group oriented development approaches such as agile methods, which emphasize a sense-and-respond approach are becoming an integral part of software development. These methods are being used by an increasing number of organizations as a means of improving the agility and quality of the development process, and within these processes groups are increasingly involved in critical decision making. Groups are required to make regular group decisions and group members work closely with each other to develop software in time-boxed iterations. However, the literature lacks a clear understanding about how varying degrees of time pressure affects the decision outcomes of the development groups. As group cohesion is viewed as the most fundamental issue facing group decision-making processes, in this research-in-progress paper we develop a research instrument to measure the impact of time pressure and group cohesion on decision-making outcomes.

## Keywords

Decision Making, Group Cohesion, Time Pressure, Agile, Software Development, Group Decision Making

## INTRODUCTION

As information becomes more readily available and group decision-making scenarios become increasingly complex, two major streams of research have emerged from the literature. Both streams aim to support the decision-making process, albeit by entirely different means. The first of these is the decision support system (DSS) literature with a focus on the technology used to support a decision-making environment (Jensen, Lowry, Burgoon and Nunamaker 2010). Technological advances in systems design, artificial intelligence and machine learning have led to the creation of DSS that not only use data to recommend optimum decisions but can also learn and grow in a dynamic matter (Nissen and Sengupta 2006). The second major stream of decision making focuses on the behavioral features and cognitive abilities of the decision makers. Making informed decisions involves the gathering of all pertinent information and the processing of that information to establish an output choice from a number of possibilities. While there have been major technological advances in DSS, the behavioral side of the decision making process lags behind the technology, with many reporting that decision makers often do not use the technology at their disposal (Appelt, Milch, Handgraaf and Weber 2011; Kayande, De Bruyn, Lilien, Rangaswamy and van Bruggen 2009). It is imperative that researchers continue to gain greater understanding of the human behavioral aspect of the decision-making process. Humans and software agents complement each other during the decision-making process; however, the technological advances made may be underutilized if the human characteristics of the decision-making process are not fully embraced (Grudin 2002; Nissen et al. 2006).

This research-in-progress paper focuses on the behavior aspect of decision making, in particular, we examine group decision making. Group dynamics are ingrained in human nature through millions of years of evolution and these dynamics are unsusceptible to change and inaccessible to conscious awareness (Grudin 2002; Kock 2009). Given these arguments, DSS must accommodate the way we act naturally and group decision support systems (GDSS) will be of little value if group dynamics or group cohesion is not considered as an antecedent to their employment. Much of the extant research within group decision making highlights the positive effects of GDSS on decision outcomes,

such as improved group cohesion (Dennis and Garfield 2003; Dennis and Wixom 2001). However, the premise for this study is that GDSS, while valuable in their own right, are of secondary importance to the cohesion of the group itself. That is, group cohesion should be antecedent of GDSS use rather than an outcome and group cohesion is an important factor in group decision making irrespective of GDSS design or use. In this study we develop an instrument to measure the effects of group cohesiveness on the relationship between time pressure and group decision outcomes for software development groups.

**Group Decision Making**

Many critical strategic and operational decisions for an organization are group based. As groups and group work begin to become a more fundamental part of organizations (Mathieu, Maynard, Rapp and Gilson 2008), modern environments requiring operational agility utilize group-work as a means of achieving flexibility while remaining economically efficient (Tannenbaum, Mathieu, Salas and Cohen 2012). Within the management and organizational literature there is a general trend towards more empowering and autonomous groups and a move from command and control to member-led leadership. More shared leadership within the group is driven by the belief both that self-management is motivational, empowering and engaging and also by the economic need for leanness (Tannenbaum et al. 2012). As groups become more self-managing they begin to take on greater decision-making responsibility. The decisions made by the group will often have a critical impact on both the project success and other less tangible aspects of the development environment, such as group learning (Brodbeck, Kerschreiter, Mojzisch and Schulz-Hardt 2007), satisfaction (McNamara, Dennis and Carte 2008), mental workload (Speier and Morris 2003), participation (Yoo and Alavi 2001) innovation (De Dreu and West 2001), and creativity (Watson, Kumar and Michaelsen 1993).

Although under-researched in information systems development (ISD), fields such as psychology have recognized the importance of group cohesion and work groups have long since been designed with cohesiveness in mind (Campion, Medsker and Higgs 1993; Campion, Papper and Medsker 1996). Several theories have been proposed that address the group cohesiveness aspect of group decision-making, arguing that the cohesiveness of the group will impact the decision-making outcomes (Beal, Cohen, Burke and McLendon 2003). Leadership-confidence theory posits that groups with an assertive-directive member form decisions based on the choices of the assertive-directive member. Other research of a similar vein into group decision-making shows that decision making outcomes tend to polarize around individuals demonstrating greater assertiveness (Pruitt 1971). On the other hand, groups composed of flexible-cohering members and without an assertive-directive member have a tendency to converge towards the group average. This is similar to groupthink, defined by Janis (1972) to be " a mode of thinking that people engage in when they are deeply involved in a cohesive ingroup, when members' striving for unanimity override their motivation to realistically appraise alternative courses of action". Work on group cohesion by Harrison et al. (1998) shows that group cohesion is also impacted by surface-level (demographic) and deep-level (attitudinal) diversity within the group. As the group work together over time, the effect of the surface-level diversity is weakened while the effect of the deep-level diversity is strengthened. Given that group cohesiveness is the most fundamental issue facing modern software development processes (Gartner 2009), researchers have called for more studies to examine how group cohesiveness will affect decision outcomes of software developer groups, particularly under conditions of time pressure (Drury, Conboy and Power 2012; Moe, Aurum and Dyba 2012).

**THEORETICAL DEVELOPMENT**

**Time Pressure**

The ability to make quick decisions and take fast actions is usually seen to be beneficial to organizations operating in changing environments(Forbes 2005). Previous studies show that quick decision making helps individuals and groups improve information processing and coordination (Kerstholt 1994). Others highlight the economic benefit to rapid decision making (Baum and Wally 2003). However, rapid decision making has also been shown to have a negative affect on decision outcomes (Waller, Zellmer-Bruhn and Giambatista 2002). The tendency to rely on past decision making strategies is greater when there is time pressure to make quick decisions (Perlow, Okhuysen and Repenning 2002). This can result in the same mistakes being made and learning being inhibited. Decision speed or time pressure is also known to impact decision outcomes. As shown by Perlow (2002), decision speed helps some groups but hinders the performance of others. The impact of decision speed is not fully understood and there appears to be a trade-off between decision speed and high quality decision-making. Despite the importance of group decision making within organizations and the current trend towards speedy decisions, there is a paucity of literature

examining the affects that both group cohesion and decisions speed have on the decision outcomes (El-Shinnawy and Vinze 1998). Research shows that group characteristics and cohesion will have an important impact on decision outcomes, yet, as highlighted earlier, research tends to focus on technology aspects and task complexity rather than group characteristics (Appelt et al. 2011) and group decision-making is one of the under researched areas within both the general decision-making literature and the information system development (ISD) literature in particular. Previous research also shows that group cohesiveness may be detrimental to the group decision-making process and therefore negatively impacting group decision-making outcomes. Theories such as groupthink suggest that group cohesiveness is counter-productive and is not conducive to optimum decision-making. However, there are a number of reasons to suggest that this may longer be the case. Research on group decision-making highlights the interplay between the task complexity, collaboration system usage, the decision making environment and group composition, noting the affects these constructs have on decision outcomes (Nunamaker, Dennis, Valacich, Vogel and George 1991). Given the developments in technologies, decision support systems and collaboration tools, the decision making process has changed considerably over the past decade. Newer tools help improve the transparency of the decision-making process, therefore issues such as groupthink may no longer have the same negative impact they had when they were first introduced into the decision-making literature.

In complex tasks, groups can become more concerned with reaching a consensus or reaching a decision quickly and less concerned with other goals such as decision outcomes or systematically evaluating alternatives or more creative decisions (Kelly and Loving 2004). Measuring time pressure and decision speed has received a lot of attention in both the management and management information systems literatures (Ancona, Goodman, Lawrence and Tushman 2001; Arrow, Poole, Henry, Wheelan and Moreland 2004; Mitchell and James 2001; Saunders and Ahuja 2006; Street and Ward 2012; Zaheer, Albert and Zaheer 1999). One interesting area is the study by Zaheer et al. (1999) who discuss the circadian rhythm of time intervals. Circadian rhythm, as distinguished from its biological science definition, is defined by Zaheer et al. (1999) as the pattern of variation in business activity levels that occurs over a period of 24 hours and shows the differences in analysis that may be achieved using different time scales. Therefore it is important to consider the time intervals to be used in this study and their relevant impact on the outcome of the research. Zaheer et al. (1999) conceptualize five time scales associated with the phenomena under study.

- The existence interval: The basic type of time scale for one instance of the process, pattern phenomenon, or event to occur

- The validity interval: The interval that defines the time scale over which the theory holds

- The observation interval: A researcher-defined period of observation required to develop the theory

- The recording interval: The granularity of the data recording (collect data every month, day, hour, minute etc.)

- The aggregation interval: The time scale the recorded information is to be aggregated for testing theory about the phenomena

Given that the existence interval constrains the requirements of the other intervals, this puts the study of the time on decision outcomes in an ISD environment at an advantage (i.e. because we can study groups with this defined real world interval, scrum meetings, planning, review and retrospectives). Because we can observe more than the existence interval we have a greater probability of covering variability within the model. Time pressure is often operationalized using two levels (low v high) (Bowman and Wittenbaum 2012; Hwang 1994) however for this study we use the terms challenge and hindrance rather than low and high as indicators of time pressure. While studies show that an increase in time pressure is likely to lead to poorer decision performance, increased time pressure is also often associated with increased or better performance (Hwang 1994; Maule, Hockey and Bdzola 2000). Therefore challenge and hindrance time pressure are viewed more suitable to indicate decision-making performance. The two indicators have been adapted from a previously validated instrument (Chong, Van Eerde, Chai and Rutte 2011). Challenge time pressure is the degree to which a group perceives time pressure as a stressor which promotes goal achievement, while hindrance time pressure is the degree to which a group perceives time pressure as a stressor which constrains goal achievement (Chong et al. 2011).

**Group Cohesion**

Many meta-analyses have been published on the cohesion–performance relationship (Beal et al. 2003; Carron, Brawley, Bray, Eys, Dorsch, Estabrooks, Hall, Hardy, Hausenblas and Madison 2004). The general conclusion stemming from these quantitative studies is that the correlation is moderate, positive, and highly dependent on intragroup processes (Chiocchio and Essiembre 2009). However, a study by El-Shinnawy et al. (1998) found that

group cohesion had no impact on the decision outcome. Their study does not rule out the importance of group cohesion as they control for factors such as group size and history and call for future research to further examine the group cohesion construct. So while early work on group cohesion revealed no relationship between group cohesion and group performance (Deep, Bass and Vaughan 1967), recent work has found that there is, indeed, a relationship between group cohesion and task performance with members of established groups formulating varying levels of cohesion over time (Schwarz and Schwarz 2007). Others have used the group attitude scale (Evans and Dion 1991) to measure group cohesion and the results indicate a positive impact it has on group consensus (Yoo et al. 2001) and user satisfaction of group support system technology (Chidambaram 1996). Schwarz and Schwarz (2007) show that group cohesion predicts enjoyment and effectiveness but did not have an impact on the efficiency of the group. Efficiency was measured by the time it took to come to a decision. In an ISD environment, groups have a deadline in which to arrive at a decision. However, there is a scarcity of literature examining the impact of time pressure on decision outcome and the moderating effect group cohesion has on this relationship. In this study we view cohesion as a multi-component construct consisting of four sub components: social cohesion, task cohesion, perceived cohesion and emotional cohesion (Forsyth 2006).

**Decision Outcomes**

Measuring decision outcomes is difficult because it is difficult to determine the optimum decision outcome in differing scenarios. Some studies use simplistic measures such as the group is either right or wrong based on previous experience or on expert judgement techniques. Most of these studies are, however, experimental and are carried out under controlled laboratory conditions. Other real world studies have used outcomes such as, consensus (Cooper and Haines 2008; Yoo et al. 2001), quality (McNamara et al. 2008), learning (Brodbeck et al. 2007), satisfaction (Dennis 1996), mental workload (Speier et al. 2003), participation (De Dreu et al. 2001), innovation (De Dreu et al. 2001), accuracy (Speier et al. 2003) and creativity (Watson et al. 1993). Others used outcome measures such as process improvement, commitment, creativity, pro-activity, efficiency, effectiveness, confidence, initiative, time taken to internalize role, supervisor ratings, feedback improvement and identity. However, two major indicators of decision outcomes that emerge from the literature are decision confidence (Schwarz et al. 2007) and decision consensus (Salisbury, 2002; Yoo et al., 2001; Cooper & Haines, 2008). Decision confidence relates to how the group view the choice they have made. It is often not be possible to measure the actual final outcome of that decision but measuring the decision confidence should provide a good indication about how positively the group feels about a decision. Decision consensus relates to how the group as a whole understood the reasons for the decision. High consensus will result in complete group buy in and represents high group participation in the decision making process. Based on this theoretical overview we developed our conceptual model for this study (Figure 1).
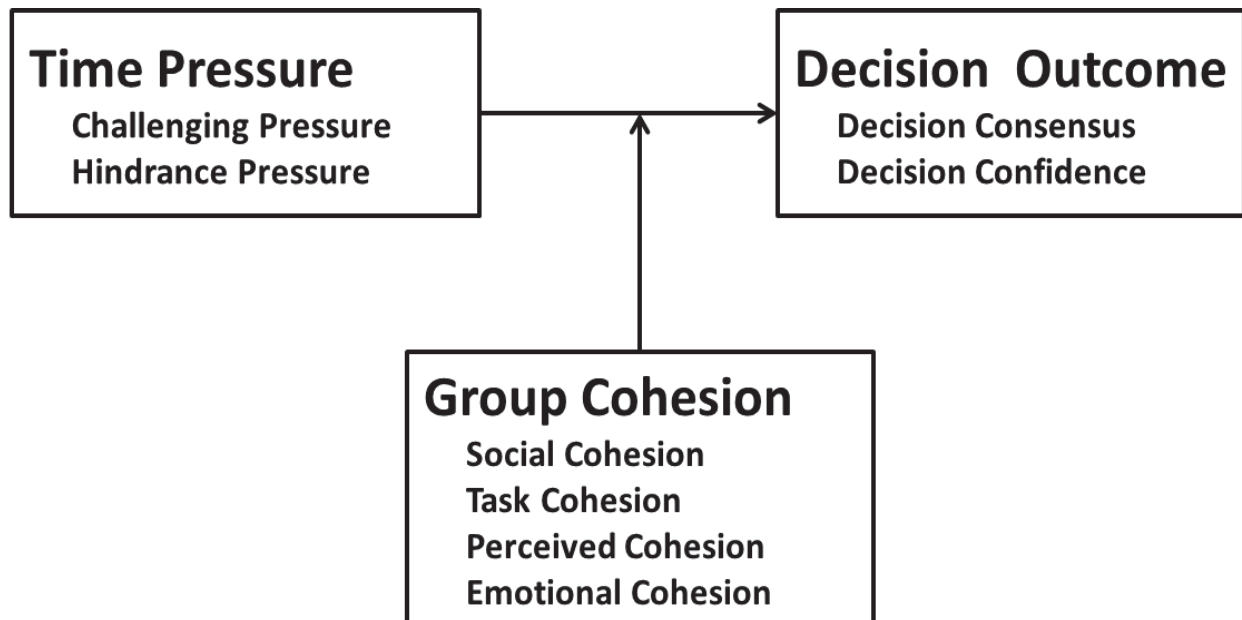


**Figure 4 Conceptual Model**

**HYPOTHESES DEVELOPMENT**

Insights from goal-setting theory (Locke and Latham 2002) show that challenging goals are a strong motivator and help a group focus its activities on achieving the goal they perceive are attainable. Other studies have shown that challenge time pressure is seen as a positive stressor and enhances group performance (Chong et al. 2011; Chong, van Eerde, Rutte and Chai 2012; Podsakoff, LePine and LePine 2007). Under conditions of challenge time pressure (i.e. a pressure that promotes goal achievement) we hypothesize that groups will work with each other to produce the required decision. Therefore we hypothesize the following:

*Challenge time pressure positively impacts decision outcomes*

Once a group perceives that the goal is no longer achievable within the allocated time, motivation drops and performance suffers. Under conditions of hindrance time pressure (i.e. a pressure that constrains goal achievement) groups will tend to accept the choice of a single group member and polarize quickly around that choice to produce the required decision (Cheng and Chiou 2008). Therefore the majority of the group members will not actively participate in the decision-making process and will be less confident of the decision-making outcome. Bearing this in mind we hypothesize:

*Hindrance time pressure negatively impacts decision outcomes*

*Group cohesiveness* is the extent to which a group is attracted to the group and to each other (Chidambaram 1996). When groups members have a strong attraction to their group they will place emphasis on shared group commitment to tasks and group membership (Beal et al. 2003). This may indicate that, regardless of the time pressures placed on the group tasks, group members will share the commitment to group decisions and outcomes, regardless of the levels of participation in the decision-making process. We therefore hypothesize that:

*High/low levels of group cohesion moderate the impact of time pressures on decision outcomes*

This study is a quantitative study involving a large scale survey to determine the effects of group cohesion on decision outcomes under differing degrees of time pressure. The survey is available online at www.groupcohesion.com. The draft questionnaire was pretested for validity with 5 software developers who have experience working in groups within software development organisations. This resulted in some modifications and/or deletions to the questionnaire.

**CONTRIBUTION**

We intend to make the following contributions through this paper and its subsequent research. Firstly, IT project managers will be interested to understand the effects of time pressure on software development group decision processes. Project managers will be contacted directly or via a third party and asked to complete the survey themselves along with at least three other members of their team. Potential respondents are identified through a database of organisations we know or expect are working with agile methods. The results of this study will indicate how time pressures will affect decision outcomes and the moderating impact group cohesion will have on this relationship. We will measure four components of group cohesion, social, task, perceived and emotional cohesion. Each of these may impact the decision outcomes differently and project managers can use this information to aid them in the design and management of software development teams.

Secondly, we wish to further our understanding of the effects of time pressure on decision-making outcome. Previous results show that time pressure and decision speed is often positively associated with decision outcome. However, practitioners in particular, should note that in certain situations, time pressure will often have a detrimental effect on group decision-making outcome. We will discuss both the positive and negative effects of time pressure on group decision-making outcomes.

Thirdly, we adapt previously used instruments and use them in a time pressured, decision-making environment, exploring the effects of group cohesion on decision outcome under conditions of rapid decision-making. To date, no other study has attempted this important step in developing our understanding of group decision making in rapidly changing environments. We will offer advice on how group cohesion can aid in balancing the negative effects associated with rapid decision-making.

Fourthly, while prior ISD literature has not explicitly defined the optimum group cohesiveness required for ISD projects, we propose that group cohesiveness has an important effect on decision outcome, particularly under conditions of rapid decision response time. We will discuss our findings and offer advice for the ISD field on group cohesiveness for ISD projects.

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