An Exploration of the Relationship between Contribution Behaviours and the Decision Making Process in Agile Teams

Completed Research Paper

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Abstract

Agile software development teams are self-managed; setting and complying their own rules, defining their own behaviours and encompassing a devolved decision-making structure. They rely heavily on the input of their team members for decision making. Research has indicated how ASD teams are susceptible to group process losses and coupled with traditional complexities, this produces some significant challenges. In the context of ASD teams, this research proposes that alternative-generation during decision making may only be achieved when group members engage in contribution behaviours. Drawing on existing literature, the paper examines the relationship between contribution behaviours and decision making. Utilising a multiple case study approach, it investigates the occurrence and impact of contribution behaviours during the group decision making process in ASD. Findings shed light on the important role that contribution behaviours play and reveal that many factors can influence their occurrence such as time pressure, skillset, experience and communication.

Keywords: Decision Making Process, Contribution Behaviours, Agile Software Development, Agile Teams

Introduction

The importance of effective decision making has long been recognised as a critical component of organisational success (Eierman et al. 1995; Garvin and Roberto 2001). In addition, to minimise individual cognitive biases, researchers have advised managers to include others in the decision-making process by embracing a “team-based structure for decision making” (Houghton et al. 2000). This is conducted in order to maximise the potential for making informed decisions in environments that are subject to rapid changes and inherent decision complexity such as that of information systems development (ISD). In ISD projects, team-based or group-driven work is a necessity because there is often a tacit nature to user requirements, project design specifications or overall project understanding that cannot be fully captured in formal documents (Janz 1999). Agile Software Development (ASD) in particular, dictates the need for devolved, collaborative decision making within self-organised teams. This is an intrinsic principle incorporated into ASD methodologies, radically different from decision making.
associated with the command-and-control structure of traditional software development. ASD emerged as the result of continued pressure for radical change to the traditional approach to development whereby “life-cycle approaches that result in the eventual delivery of systems after several years” were no longer appropriate (Fitzgerald 1998). There are several ASD methodologies used in practice. According to many authors (Batra et al. 2010; Dingsoy et al. 2012; e.g. Salo and Abrahamsson 2008), the most popular ASD methodologies are that of XP and Scrum. Scrum provides “an agile approach for managing software projects while increasing the probability of successful development of software, whereas XP focuses more on the project level activities of implementing software” (Salo and Abrahamsson 2008).

This research conducts a case study of two teams across two organisations deploying Scrum. The study explores the relationship between contribution behaviours occurring at an individual level and the decision-making process occurring at a group level in ASD teams. The study subsequently explores the occurrence and impact of these behaviours during the group decision-making process in ASD teams. The findings show that in order to help overcome the challenges associated with decision making in ASD teams, team members need to actively engage in the decision-making process which can only be achieved when team members engage in contribution behaviours. A model of contribution behaviours in the context of ISD is proposed by Olivera, Goodman et al. (2008) consisting of three stages; awareness, searching and matching, formulation and delivery.

Research Motivation

Research has indicated that decision making is frequently challenging in an ASD environment for the following reasons:

1. Team members have diverse skillsets, goals and priorities. This is very prevalent in ASD teams consisting of project facilitators, business analysts, systems analysts, technical architects, quality assurance personnel and so on.
2. Agile teams are vulnerable to group process losses e.g. groupthink
3. Process losses can affect the information processing capability of team members

In the first instance, highly-interactive team members (who are entirely responsible for decision making) have largely diverse backgrounds, goals and priorities compared to a traditional approach where one person, usually the project manager is responsible for decisions (Nerur et al. 2005). Secondly, due to their highly cohesive nature, ASD teams are vulnerable to ‘group process losses’ such as that of groupthink (McAvoy and Butler 2009), which can negatively impact decision making (Coyle et al. 2013). Groupthink occurs when team members ‘conform’ to one another’s ideas and do not surface or tolerate divergent opinions (Janis 1971) which mean that necessary information required for decision making may not be surfaced (Coyle et al. 2013). Thirdly, process losses such as groupthink affect the information processing of groups during decision making. Information processing in groups “involves the degree to which information, ideas or cognitive processes are shared and are being shared among group members and how this sharing of information affects both individual- and group-level outcomes” (Hinsz et al. 1997). Therefore, despite the fact that ASD methodologies promote shared and devolved decision making structures within highly interactive teams, decision making will be compromised if individual team members do not expose relevant, necessary information during the decision-making process. As a result, individual team members need to engage in contribution behaviours. When those behaviours are combined, they may help inform decisions during the group’s decision making process. However, hitherto, the relationship between contribution behaviours and the decision making process has not been studied. Due to the added complexity and challenges of decision making in ASD teams, there is a need to explore this relationship further. Little is known about the occurrence or impact of contribution behaviours on group decision making and no prior research has investigated this in the context of ASD teams. Furthermore, factors that influence contribution behaviours during group decision making are unknown. The purpose of this study therefore, is to:

Investigate the occurrence and impact of contribution behaviours during group decision making in ASD teams to include an assessment of factors that impact their occurrence.
By initially drawing on existing literature, the next section of this paper identifies linkages between the stages of contribution behaviour at an individual level and the decision-making process. The paper subsequently describes the research design used and concludes by presenting research findings and discussing their implications.

**Decision Making Process**

Decision making is an integral organisational process that impacts every level including individuals and groups (Akdere 2011). According to Vroom and Yetton (1973, pg. 4), understanding the decision making process is critical not only for explaining individual behaviour but also for understanding the behaviour of complex organisations. The former is particularly relevant in the context of this research and while the decision making process may impact individual behaviour, individual behaviours relating to contributions may in turn inform decisions during the decision process. When Decision Support Systems (DSS) are being designed “an explanatory model of the decision process and the system involved” needs to be established first in order to specify the information needed to make a decision (Ackoff 1967). In the same manner, this section of the research paper reviews literature in order to understand the decision process prior to assessing group engagement that may occur during it.

Decision making is a complex process because decision makers themselves may be subjected to biases, are limited in their cognitive abilities to process complex information and often find it difficult to reach a solution that will satisfy different interests (Eierman et al. 1995). As Simon et al. (1987), explain, there are restrictions placed on people such as “the incompleteness and inadequacy of human knowledge”, as well as our inconsistencies of preference and inherent conflicts among people and groups. However, “the right decision making process is critical for using different professionals’ expertise to the best effect and for energy, morale and work satisfaction in teams” so it remains surprising that “it is the most neglected and least understood aspect of team design and development” (Ovretveit 1995). This is even more relevant in the context of ISD which significantly relies on team-based work (Janz 1999) but in particular ASD which is inherently self-organised and team orientated (Highsmith and Cockburn 2001; Moe et al. 2010). With this in mind, it helps to have a “comprehensive descriptive model of decision making as a process” (Bahl and Hunt 1984). While descriptive models for classifying decision making in the context of ASD are absent from literature, many different models for the classification of decision making in ISD exist. The notorious Gorry and Scott-Morton (1971) framework (Appendix A), is the most commonly-quoted framework for the implementation of ISD as it continues to remain the “best known, most durable and most frequently cited in the IS field” (Sammon et al. 2003). The framework is based on the combined work of Simon (1960) and Anthony (1965) where one half (based on Simon), shows decision-making processes ranging between highly structured to unstructured while the other half (based on Anthony), “defines three broad categories that encompass managerial activity” namely, strategic planning, management control and operational control (Turban et al. 2008). As this research focuses on decision making within ASD teams, all decisions encountered by the team are relevant, be they structured, unstructured or semi-structured. Unstructured decisions are “new, novel ill-structured” and “difficult to solve” whereas structured decisions are “routine, repetitive, well structured” and “easily solved” (Courtney 2001). Semi-structured decisions contain a mix of unstructured and structured features where only part of the problem contains a ‘clear-cut’ answer. According to Moe and Aurum (2008) “agile development is changing the way decisions are made” and for a team to be able to self-manage, decisions on all levels in managerial activities must be aligned. This is because the focus of decision making moves from the project manager to the team and the decision-making process changes from individual to shared (Moe et al. 2012). As a result, Anthony’s (1965) model that represents a top-down view of the organisation and a hierarchical view of how decisions are made is not a strict representation of the shared decision-making process associated with ASD teams (Moe et al. 2012). As with structured, unstructured and semi-structured decision types, all decision categories are relevant to an ASD team be they strategic, managerial or operational in nature (Appendix A).

Classic theories relating to the decision making process outlines three high-level sequential phases including intelligence, design and choice (Figure 1) but recognises that the cycle of phases themselves are “far more complex than this sequence suggests” and each phase is in “itself a complex decision-making process” having “wheels within wheels within wheels” (Simon 1960, pg. 3). Pomerol and Adam (2006), explain how there are interdependencies between the phases and feedback may occur from one stage to another (Figure 1 depicts this by including multi-directional arrows). Other variations of the decision-making process include Mintzberg and Westley’s (2001) (stages of define, diagnose, design and decide);
Bass (1983) and Elbing (1978) multi-stage process (of problem identification, alternative generation, alternative evaluation, choice, decision implementation and decision control) but such variations are extensions of the primary concepts embedded in Simon’s initial classic decision process theory. Therefore, Simon’s three-stage process theory (encompassing intelligence, design and choice) is adopted because it is the primary building block upon which subsequent extended decision process model variations are built (Pomerol and Adam 2006). It also “enables a progressive study of what is otherwise a very complex process” (Pomerol and Adam 2006).

The first stage of the process known as ‘intelligence’ is described by Simon (1960, pg. 2) as “searching the environment for conditions calling for decision”, in other words “finding the problem” (Gorry and Scott-Morton 1971). The second stage of the process, referred to as ‘design’, invents, develops and analyses “possible courses of action” (Simon 1960, pg. 2) or alternative solutions (Gorry and Scott-Morton 1971). The final stage of ‘choice’ selects “a particular course of action from those available” (Simon 1960, pg. 2) or selects the best solution (Gorry and Scott-Morton 1971) from the available alternatives.

**Contribution Behaviours**

Numerous research has been conducted as to what motivates individuals to make contributions by helping peers in their work environment such as that by Anderson and Williams (1996), Perlow and Weeks (2002) and Settoon and Mossholder (2002). In an ISD context, contribution can generally relate to many aspects of a project such as an individual’s contribution to tasks involving programming or documentation or even contribution towards managing a group’s schedule (Levesque et al. 2001). The most recent investigation of contribution behaviours in ISD was that by Olivera et al. (2008) where they define contribution as “voluntary acts of helping others by providing information.” While previous use of the term ‘contribution behaviour’ has not encapsulated decision making, the model of contribution behaviour outlined by Olivera, et al. (2008) consisting of awareness, searching and matching and formulation and delivery is developed from theories relating to problem solving (such as Newell and Simon (1972)’s work) to identify the individual “cognitive tasks that must be carried out to make a contribution” (Olivera et al. 2008). Problem solving itself subsequently falls under the umbrella of decision making whereby decision making primarily serves two purposes – to solve a problem or to exploit an opportunity (Turban et al. 2008).

On analysis of the three stages of contribution behaviours and Simon’s (1960) tripartite decision making process, some common linkages are evident between each of the stages. For comparative purposes each stage of contribution behaviour and each stage of the decision making process including their definitions by Olivera, Goodman et al. (2008) and Simon (1960) are respectively outlined in Table 1. For example, during searching and matching an individual provides or looks for information to inform their contribution while during the design stage of decision making an individual develops and analyses possible courses of action or alternatives. Both scenarios involve searching for alternatives or information to either inform the contribution or the decision. When applied to a group level, during ‘design’ stage of decision making the team collectively look for possible courses of action while each individual searches and matches to help inform their contribution to the decision or alternative-generation. The collective combination of contribution behaviours from individuals may therefore inform the group’s decision making process.
Table 1. Linkages between Contribution Behaviours and The Decision Making Process

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Awareness</strong></td>
<td>Recognising an opportunity to contribute</td>
</tr>
<tr>
<td><strong>Searching &amp; Matching</strong></td>
<td>Providing or looking for information to inform the contribution</td>
</tr>
<tr>
<td><strong>Formulation &amp; Delivery</strong></td>
<td>Articulating &amp; communicating the contribution</td>
</tr>
</tbody>
</table>

While contribution behaviours occur at an individual level where a team member may recognise an opportunity to contribute, decide whether to act on that opportunity, engage and look for information to inform their contribution and subsequently articulate and communicate their contribution; it is when individual contributions are combined that they inform the decision making process in a group context. Therefore, while linkages between awareness and intelligence; searching and matching and design and formulation and delivery and choice are evident from Table 1, each ‘stage’ of contribution can occur at any stage during the decision making process. During group decision making this relationship is not strictly linear. For example, an individual may recognise an opportunity to contribute (awareness) during the design stage of the decision making process (Table 1). As a result, this leads to the following depiction:

The Role of Contribution Behaviours during ASD decision making

As outlined in the introduction, there are significant challenges associated with decision making in ASD environments. ASD projects “derive much of their agility by relying on the tacit knowledge embodied in the team rather than writing the knowledge down in plans” (Boehm 2002), so team members engaging in contribution behaviours are essential for success in these environments. Because ASD projects are renowned for their high degree of interaction among team members, this may provide greater opportunities for individuals to contribute to decisions. As explained by Bonner et al. (2002), resources
available to a group include individual competencies, skills, and knowledge, collectively referred to as expertise. Access to such expertise is not sufficient if a group fail to use them wisely (Hackman 1987). Failure to identify and utilise the expertise of capable group members is a clear indicator of the existence of group process loss (Kerr and Tindale 2004) and studies have shown how group decision making can be biased and ineffective with regard to process losses (Alper et al. 1998). It is possible that this can be avoided if group members actively engage in contribution behaviours and in ASD in particular “conditions must be created for group members to share information and make decisions” (Alper et al. 1998).

Effective interaction through contribution behaviours during the group decision-making process should allow groups to combine members’ knowledge and produce higher quality decisions. Ensuring member involvement in ASD decision making by promoting contribution behaviours can encourage fuller acceptance of the decision pursued and is likely to affect the attitudes of group members towards group work (Nemiroff and King 1975). As depicted in Figure 2, contribution behaviours can therefore ‘feed’ into the group decision making process. Because teamwork is compulsory in ASD and team members must acquire, share and use knowledge in order to make effective group decisions (Janz and Prasarnphanich 2009), contribution behaviours are not only desirable but become a necessity for informing group decisions in these self-managing environments.

**Research Design**

In order to achieve our research objective we conducted two case studies across two organisations both of which had been deploying Scrum for over three years. We intentionally chose two cases that were (a) experienced in the deployment of ASD for a relatively similar period of time and (b) utilising the same ASD methodology so we could draw reliable comparisons between the cases with regard to the occurrence and impact of contribution behaviours during the decision making process to include an assessment of factors that impact their occurrence. Behavioural considerations were of critical importance to this research and over the last decade or so, both IS academics and practitioners “have begun to realise it is more appropriate to extend the focus of study to include behavioural and organisational considerations” in order to improve the effectiveness of IS implementations (Galliers and Land 1987; Myers and Avison 2002, pg. 13). Coupled with the need to investigate behavioural aspects and the fact that research examining contribution behaviours during ASD decision making was non-existent, a qualitative case study approach was applied. Case study research allows a holistic, in-depth investigation of phenomena that cannot be studied independently from the context in which they occur (Keutel et al. 2014). This is especially true when assessing contribution behaviours during the decision making process. Furthermore, according to McAvoy and Butler (2009), in order to investigate problems with decision making in software development teams there needs to be an exploratory research approach that permits the team to be examined in context. Qualitative case study approaches have also been utilised and validated in prior ASD decision making research such as that by McAvoy and Butler (2009) and Drury-Grogan and O’Dwyer (2013).

In this study, the level of inquiry as it relates to decision making was at a group level so therefore the unit of analysis was the ASD team. The researchers had access to ‘light’ documentation (e.g. screenshots, uploaded notes to Jira, product backlogs, burn-down charts and so on) on each of the team’s project activities to include some peer evaluations and meeting guidelines. This yielded insights into team members’ workloads and areas of responsibility. The unit of analysis of a study are often the units of observation, whereby we examine them and often create summary descriptions of such units to explain differences between them (Babbie 2010). A total of ten observations of team meetings were conducted consisting of five observations for each case. These are denoted as Obs. C1 and Obs. C2 where C1 and C2 represent case one and case two respectively. Each observation was documented and provided valuable insight into the occurrence and impact of contribution behaviours during ASD decision making to include an assessment of factors that impact their occurrence.

InvestCo. Ltd. was a leading multi-national provider of security software solutions while SoftCo. Ltd was a leading multi-national provider of financial services solutions. A combination of direct observation and one-to-one interviews were used to collect data. In total, eighteen 1-hour interviews were conducted over a 6-month period. C1 consisted of eight members while C2 consisted of ten members all of whom were interviewed. In C1, the team’s goal was to develop, test and integrate new functionality into security software while C2 had to develop new functionality and maintain release updates, fix system bugs and
manage change requests for existing clients. Table 2 provides an overview of the research participants in both cases. The study involved a diverse mix of research participants ranging from scrum masters to developers to Quality Assurance (QA) personnel.

<table>
<thead>
<tr>
<th>Code</th>
<th>Participant Role</th>
<th>ASD experience (years)</th>
<th>Time working with current team (years)</th>
<th>Average ASD experience (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1PO</td>
<td>Product Owner</td>
<td>5</td>
<td>3</td>
<td>4.06</td>
</tr>
<tr>
<td>C1SM</td>
<td>Scrum Master</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C1D1</td>
<td>Developer</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C1D2</td>
<td>Developer</td>
<td>3.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>C1D3</td>
<td>Senior Developer</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C1D4</td>
<td>Senior Developer</td>
<td>4.5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C1QA1</td>
<td>Quality Assurance</td>
<td>1.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>C1QA2</td>
<td>Quality Assurance</td>
<td>4</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>C2PO</td>
<td>Product Owner</td>
<td>4</td>
<td>1.5</td>
<td>2.68</td>
</tr>
<tr>
<td>C2SM</td>
<td>Scrum Master</td>
<td>3</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>C2D1</td>
<td>Junior Developer</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>C2D2</td>
<td>Developer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C2D3</td>
<td>Developer</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C2D4</td>
<td>Developer</td>
<td>0.25</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>C2D5</td>
<td>Senior Developer</td>
<td>6</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>C2QA1</td>
<td>QA Lead</td>
<td>3.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C2QA2</td>
<td>Quality Assurance</td>
<td>2</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>C2QA3</td>
<td>Quality Assurance</td>
<td>2.5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Capturing the ‘time worked with current team’ (Table 2) and delineating between junior and senior developers was important when observing individual contribution behaviours and their instance of occurrence during the decision making process. It is however, important to note that the teams themselves did not distinguish between ‘senior’ or ‘junior’ but instead referred to the ‘development team’. On average, C2 had just under 1.5 years less experience of using agile than C1. C2 was therefore, a little less experienced than C1 with regard to devolved decision-making and a self-managing team structure. Interviews with each team member was structured using a series of predetermined questions relating to the occurrence and impact of contribution behaviours (specifically, (i) awareness, (ii) searching and matching and (iii) formulation and delivery) during group decision making. Interviews were recorded and transcribed.

NVivo (a software tool for analysing qualitative data) was used extensively to aid data collection and analysis. All field notes and audio files were initially saved and then later coded by one coder to maintain consistency. Following the structure of the interview protocol, codes were created as they relate to each contribution behaviour and ‘tree nodes’ were established for each stage of the decision making process. This allowed for ‘mapping’ during instances of occurrence of any contribution behaviour during any stage of the decision making process. Each transcript was carefully examined to identify overlaps among contribution behaviours and the decision making process. Each behaviour was directly coded to its relevant ‘tree node’ created in NVivo. Some items were coded to more than one tree node where the discussion under one interview sub-heading evolved to be also relevant to another. All documents were dated, grouped and numbered as they related to each case. Due to the use of a structured interview protocol that contained sub-headings relating to each stage of contribution behaviour, it was possible to
commence immediate coding once the interview audio files were transcribed. Field notes documented during observations were carefully read (and also uploaded to NVivo) to identify instances of contribution behaviour with each segment placed under its relevant tree node heading in the case study database. This allowed for collective examination of observation and interview data.

Once coding was completed, the data was analysed. Cross-case comparison was facilitated by comparing each of the coded headings between both cases, helping to identify similarities and differences among the data.

**Findings**

The purpose of this study was to investigate the occurrence and impact of contribution behaviours during group decision making in ASD teams. Factors that influence their occurrence were also explored. The results show that when contribution behaviours are minimal or non-existent during the decision making process, the information processing capability of the ASD team whereby information or ideas are being shared among group members (which subsequently impacts both individual- and group-level outcomes), may be reduced. As a result of this, they may be vulnerable to group process loss particularly, that associated with groupthink, reaffirming previous research investigations with regard to the occurrence of group process losses (Coyle et al. 2013) and groupthink (McAvoy and Butler 2009) in ASD teams. The findings shed light on the important role that contribution behaviours play during the group decision making process in ASD teams and their occurrence may depend on a multitude of factors including communication, colocational, team member skillset or experience.

Literature in the preceding sections outlined ‘linkages’ between individual stages of contribution behaviour and that of the decision making process (Table 1). The findings confirm that which is depicted in figure 2 whereby all three stages of contribution behaviour can occur during any of the group decision-making process stages in ASD teams but of additional significance are findings which indicate that these behaviours can directly impact the decision-process stages. For example, when team members do not act on ‘awareness’ it results in non-engagement during all stages of the decision making process. Instances where there was insufficient ‘searching and matching’ or ‘formulation and delivery’ also impacted the design and choice stages of decision making respectively. Table 3 provides a summary of the research findings.
<table>
<thead>
<tr>
<th>Contribution Behaviours</th>
<th>Finding</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Awareness</strong>&lt;br&gt;Individuals recognize an opportunity to contribute to group decisions</td>
<td>Instances where individuals did not act on awareness (C1, C2) subsequently impacting the decision making process resulting in non-engagement during intelligence, design or choice</td>
<td>Team member personality (C2QA2); Fear of going ‘outside comfort zone’ (C1QA1); Experience (Obs. C2); Skillset (C2D4, C2SM)</td>
</tr>
<tr>
<td></td>
<td>Ineffective communication (untimely information or brief explanations) reduces and/or delays awareness (C1, C2) impacting the decision making process in particular, the <em>design</em> stage.</td>
<td>Lack of senior management communication (C2D1); Inadequate team member descriptions of a problem (Obs.C1); External factors not communicated in time to allow team to make informed decision (C1SM)</td>
</tr>
<tr>
<td></td>
<td>Team member experience and skillset plays imperative role in awareness and subsequent participation in the decision making process (C1, C2) Individual skillset diversity increases awareness (C1)</td>
<td>Contingent on individual experience and skillset relative to decision type (C2D4, Obs. C2). Reduced awareness in new or inexperienced team members (C2PO). Increased awareness in experienced team members (C1SM).</td>
</tr>
<tr>
<td></td>
<td>Colocation can increase awareness (C1, C2) resulting in greater participation in the decision making process</td>
<td>Being remote may reduce sense of involvement and interaction (C1Po, C2D2)</td>
</tr>
<tr>
<td><strong>2. Searching and Matching</strong>&lt;br&gt;Team members look for and share information to inform group decisions</td>
<td>Found to occur in all cases during group decision making (C1, C2)</td>
<td>Of the three stages of contribution behaviour this is the most prevalent during group decision making in ASD teams.</td>
</tr>
<tr>
<td></td>
<td>Instances of insufficient searching and matching impacting design stage of decision making (C1, C2)</td>
<td>Time pressure (C1D2, C2D4) and/or perceived time pressure due to ineffective communication (Obs. C1, C1D2)</td>
</tr>
<tr>
<td></td>
<td>Team design with regard to skillset and experience impacts degree of searching and matching (C1, C2)</td>
<td>Contingent on experience and skillset relative to decision type (C1D1, C2QA1, Obs. C2)</td>
</tr>
<tr>
<td><strong>3. Formulation &amp; Delivery</strong>&lt;br&gt;Articulation and communication of group decision</td>
<td>Insufficient formulation and delivery (C1, C2)</td>
<td>Too many contributions during searching &amp; matching without adequate control/emphasis on formulation &amp; delivery (Obs. C1, C2). Communication of final decision (<em>choice</em>) isn’t clear (C1PO)</td>
</tr>
</tbody>
</table>
Individuals not acting on awareness

Numerous examples by research participants across both cases were provided, whereby individuals often did not act on awareness and subsequently did not contribute to group decisions thereby impacting the entire decision process. C1QA1 spoke about the implications of failing to act on awareness stating, “when team members decide not to contribute to decisions, I think it’s because people don’t want to go outside their comfort zone but it means we’re not making the most of the information we have and we’re simply not going to find the best solution.” Not surprisingly, acting on awareness was sometimes impeded by team member personality or seniority where C2QA2 explained, “I think there’s ample opportunity to contribute to decisions but some people don’t like to speak up in front of their peers especially if they’re inexperienced.” During Obs. C2, the team’s junior developer (C2D1) was a lot less vocal during all meetings and this may be attributed to inexperience (Table 2).

Team member experience and skillset

In both cases, team member experience and skillset played an imperative role in determining the degree of awareness. For example, C2D4 referred to instances where he didn’t contribute: “if it’s a technical decision, I’ll see lots of opportunity to contribute but other types of decisions I’m not so comfortable with particularly if they are very business-related”. This reaffirms the importance of skillset in creating awareness. C2SM explained how awareness is “automatic because apart from one individual the rest of the team are highly experienced overall so we see constant opportunities to contribute to decisions.” The conflicting implication of this finding is that new or inexperienced team members generally cannot recognise opportunities to contribute (or are not aware) and therefore may not engage in any stage of the decision-making process.

Ineffective Communication

On two occasions (Obs. C1) ineffective communication in the form of untimely information or brief explanations was shown to reduce awareness, which negatively impacted decision making particularly during the design phase. For example, Obs. C1 showed team member C1D4 providing excessively brief descriptions of a development problem, which reduced the team’s overall understanding of the issue and resulted in limited exploration of alternatives during the design phase of the decision making process. As a result, a decision of gross underestimation with regard to the development effort required to fix the problem was made by the team, which subsequently caused significant problems. C2D1 stated, “there are overall business needs and factors from a higher level that the team just aren’t made aware of in time and these really impact us and we end up having to revisit an earlier decision and act very impulsively.” This results in a vast reduction of contribution behaviours and subsequently the team need to immediately progress to the choice stage of the decision making process without having spent adequate time on alternative exploration during design. A further example of communication issues was provided by C1SM where “at the last minute a requirement gets launched from somewhere higher up in the food chain and it lands in our team, impacting decisions we’ve already made earlier in our sprint.” In this instance, ineffective communication dramatically delayed team member awareness.

Colocation creates greater ‘awareness’

Research participants in both cases also referred to the importance of colocation in creating greater awareness. C1PO stated how “being remote always impedes my ability to recognise opportunities to contribute to team decisions; nothing can substitute face-to-face interaction” while C2D2 agreed stating, “when you’re based offshore, it’s very difficult to recognise those opportunities...you may not feel the same sense of involvement.” Both these team members had experience of being geographically dispersed from the ASD team during group decision making.

Searching and Matching: Impacted by Time Pressure & Skillset

The study shows that of the three stages of contribution behaviours, searching and matching is the most dominant during group decision making in ASD. C1QA2 stated, “our group is made up of experienced people working together on alternatives, openly collaborating and discussing things and we’ve all got collective ‘buy-in’ to decisions.” According to C2D3, “we don’t make unilateral decisions, we run things by one another, contributions are listened to and considered, every contribution would be acknowledged, assessed and discussed thoroughly” highlighting a strong presence of searching and matching during the
decision making process. In both cases occasional time pressure impacted searching and matching and reduced alternative exploration during design. C2D4 explained, “as the name suggests, you work in sprints, so you run short, but you run very fast so sometimes we just don’t have time to look for or share information because we’re under pressure to get the task done.” C1D2 stated, “there are times when we’re very panic orientated like kids in a playground running after a ball, our priorities shift and our decision making reflects that. We develop new things and we don’t have or give enough time to explore other options because the focus has to be on running after the ball and getting something out the door.” Internal communication issues (whereby release dates were very unclear) in case one (Obs. C1) created perceived time pressure, resulting in quick decision making that hindered searching and matching and design. Findings also indicate that team design with regard to skillset significantly impacts the degree of searching and matching during the decision making process. For example, C2QA1 explained how searching and matching can be restricted when “you’re thrown out of your depth and can’t contribute. I work in QA so when decision making gets very technical, I have to take a step back.”

**A Lack of Formulation and Delivery & Excessive Searching and Matching**

In both cases, a lack of formulation and delivery during group decision making in ASD was evident which primarily impacted decision choice. According to C1PO, “sometimes the communication isn’t clear and if we’re not fully sure of the decision we’ve agreed upon or who is responsible then we’re not clear as to why we’re actually doing it and we’ll make some assumptions that may turn out to be wrong and this can really affect our deliverables.” According to C1SM, “in instances where we realise the solution isn’t within our reach and we need help from other teams, we often don’t want to ask for it and then a final decision isn’t articulated; Things just get stuck.” It was observed (Obs. C1, Obs C2) on four occasions during the group decision making process that some excessive amounts of searching and matching were occurring without adequate emphasis being placed on formulation and delivery. This resulted in some uncertainty among team members as to the nature of the decision they were making which impacted all three stages of the decision making process.

**The use of additional, ‘non-specific’ ASD practices**

Three research participants across cases one and two (C2PO, C2D4, C1QA2) referred to the use of additional, non-specific ASD practices such as ‘breakout sessions’ or additional in-depth meetings in helping to create awareness and promote searching and matching which positively impacted the decision making process. Participants explained how forums like these created “room for more detailed discussions” (C1QA2) and allowed team members to get “more engaged in decisions around design and implementation” (C2SM). In case two in particular, these breakout sessions were topic-specific and of significant duration to allow time for detailed discussion, prompting opportunity contribution behaviours to occur. However, due to their infrequent occurrence, we were unable to conduct direct observations of these meetings.

Several observations (Obs. C1, C2) across both cases indicated that when team members engaged in contribution behaviours new ideas were often exposed to the team thereby reducing the likelihood of the group process loss associated with ‘groupthink’. In addition, C1PO stated, “during meetings we always get ideas and suggestions from team members that really help us solve significant client requirement issues which I can then bring back to the customer” while C2SM explained, “the team is great at sharing ideas and solving problems as a result…I don’t think anybody is afraid to share a different view and that kind of mentality really helps us in producing the best products.” As a result, information processing within the team is more effective when its members actively engage in contribution behaviours.

**Discussion and Implications**

This paper commenced by drawing on existing literature to highlight linkages between the stages of contribution behaviour and the decision-making process. Subsequently, the role of these behaviours during group decision making in ASD was explored. The research proceeded to investigate the occurrence and impact of contribution behaviours during the group decision-making process in ASD teams and presented primary factors impacting their occurrence. The findings confirm how contribution behaviours during group decision making in ASD can surface relevant, necessary information thereby reducing the
likelihood of ineffective information processing or group process losses such as groupthink. The findings confirm propositions in the literature that during group decision making, “the exchange of information in verbal discussion is not perfect; not all recalled information is actually contributed” (Dennis 1996) and this occurs in absence of contribution behaviours in ASD environments. The issue is further escalated when decisions need to be made quickly which is often the case in ASD (Batra et al. 2010; Misra et al. 2009) and fast decision making is viewed as an ‘enabler’ of agility. In this study however, time pressure was shown to restrict contribution behaviours, negatively impacting the decision making process.

Team members were more likely to engage in contribution behaviours when the decision related to an area in which they were knowledgeable. Conversely, inexperienced team members may not have awareness and subsequently may not be in a position to engage in any stage of the decision making process until they gain further experience. Team member personality was also found to influence the degree to which individuals are willing to engage in contribution behaviours and again this impacts all stages of the group decision making process. Finally, while contribution behaviours relating to awareness and searching and matching were shown to be relatively high during group decision making in ASD, a significantly insufficient degree of formulation and delivery was found. In some instances, too many contributions during searching and matching without adequate consideration to formulation and delivery can hinder the decision making process particularly that associated with ‘choice’. As a result, sufficient control and coordination of contribution behaviours during group decision making may need to be exercised in order to ensure effective formulation and delivery whereby decision alternatives and choices are clearly articulated and acted upon by the group.

Conclusions and Further Research

This research is a starting point in understanding the occurrence and impact of contribution behaviours during group decision making in ASD teams. Findings show that while contribution behaviours can occur at any stage during the decision making process in ASD, not all team members may act on their initial awareness (or opportunity to contribute) and therefore, may not partake in any stage of the decision making process. This is surprising because ASD projects are renowned for their high degree of interaction among team members. As outlined in the Introduction and Decision Making Process sections of this paper, this may cause significant issues particularly for decision making in ASD teams. When these behaviours occur however, (particularly during searching and matching), they have a positive impact on the group decision making process by generating more alternatives during design stage. An unexpected finding was that some research participants expressed the use of additional, non-specific ASD practices such as ‘breakout sessions’ that thoroughly promoted contribution behaviours having positive impacts on the decision making process. These meetings occurred infrequently and we were unable to observe them during our data collection. Therefore, additional research is needed to observe their occurrence and assess whether ASD practices should be extended to encompass such breakout sessions for the purpose of promoting contribution behaviours.

The findings indicate that if practitioners facilitate and promote contribution behaviours during the group decision making process in ASD environments, alternative-generation is improved (design stage of decision making) and they may reduce the likelihood of group process losses (such as groupthink) because divergent opinions are surfaced and tolerated. Contribution behaviours may also enable effective information processing within the team during decision making because ideas and information that help produce positive group outcomes may be communicated. This may subsequently result in innovative ideas and so future research could explore the relationship between team contribution behaviours and patterns relating to team-led innovation.

As this study involved just two case studies, future research is needed to investigate additional occurrences of the phenomena in order to determine whether the findings presented here are representative of other ASD environments. In addition, in this study there were many instances where each case supported each finding and some supportive and positive scenarios with regard to contribution behaviours and decision making were presented. Future research may target teams where contribution behaviours and decision making are significantly challenged which would yield interesting contrasts between these environments. Both cases were also experienced in their use of ASD (having implemented an ASD methodology for at least three years). It would be interesting to conduct the same study in organisations that are less experienced in their use of agile. In addition, the cases in this study were comparable in nature and
therefore future studies could investigate contrasting cases for example, those utilising different ASD methodologies and/or for different periods of time. This would no doubt reveal further insights and behavioural differences as well as identification of practices, which promote contribution behaviours to a greater extent. Given that this study's findings show the importance of contribution behaviours during the decision making process, future research that examines the enablers and inhibitors of contribution behaviours should be explored. Finally, a quantitative study could be conducted to investigate the correlation between contribution behaviours and decision quality outcomes such as that of decision satisfaction or confidence.

References


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Appendix A

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