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Management control and trust in virtual settings: A case study of a virtual new product development team

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ABSTRACT

In this case study, we draw on theory relating to the trust-control nexus to investigate how formal Management Control Systems (MCS) and inter-personal trust relate in Virtual Teams (VTs), and examine the implications of this interplay for VT outcomes. Taking a virtual new product development team as our research site, we evidence the reciprocal influences between trust and formal MCS in a virtual setting. We show that in addition to formal MCS helping uphold inter-personal trust, trust enables the adoption and workability of incomplete formal MCS, hence expanding and shaping the set of control alternatives that are available to a VT. We further extend prior theory by providing evidence of synergies between inter-personal trust and formal MCS that span both the decision-facilitating and decision-influencing MCS roles, indicating that the combination of trust and formal MCS enhances the informational and motivational effects of controls, as well as the motivational effects of trust, on VT outcomes. Overall, this study adds to the accounting literature by shedding light on how formal MCS help manage highly interdependent tasks in dispersed contexts where inter-personal trust is present.

1. Introduction

Virtual Teams (VTs) have become commonplace in contemporary organisations (Boudreau, 2012; Cascio, 2000; Lurey and Raisinghani, 2001; Martins et al., 2004; Montoya et al., 2009). In such teams, members who are geographically and/or temporally dispersed collaborate on highly interdependent tasks across boundaries through information and communication technologies to achieve common goals (Gibson and Cohen, 2003; Hertel et al., 2005; Malhotra et al., 2007; Schweitzer and Duxbury, 2010). Despite their many potential advantages – e.g. more widespread access to resource pools, cost savings, higher flexibility (Geister et al., 2006; Hunsaker and Hunsaker, 2008) – VTs face the significant challenge of effectively managing highly interdependent tasks in non-collocated contexts.

A line of research has pointed out the importance of inter-personal trust for ensuring the effectiveness of VTs (e.g. Jarvenpaa et al., 1998; Muethel et al., 2012; Staples and Webster, 2008). Other studies argue that VTs may be effective in the absence of trust if control practices are implemented (e.g. Gallivan, 2001). While both the accounting and the broader management literatures have long established that trust and control often coexist in many organisational forms (e.g. Costa and Bijlsma-Frankema, 2007; Das and Teng, 1998; Dekker, 2004; Vosselman and van der Meer-Kooistra, 2009), little is known about how inter-personal trust and formal Management Control Systems (MCS) intertwine and collectively contribute to the effectiveness of VTs.[1] Given the idiosyncratic communication difficulties and organisational and motivational issues VTs have to cope with (Majchrzak et al., 2000; Piccoli et al., 2004; Powell et al., 2004), it cannot be taken for granted that prior knowledge about the trust-control nexus in non-virtual settings (e.g. Coletti et al., 2005; Velez et al., 2008) can be directly and uncritically applied to VTs. The limited research on the trust-control nexus in VTs has tended to focus on the effects of control practices on trust and less so on the effects of trust on control practices or on the synergies between them. Within this stream, some scholars indicate

[1] Broadly defined, Management Control Systems (MCS) are constituted by procedures, processes, tools and practices that managers use to guide direction and ensure that their behaviours and decisions as well as those of their employees are consistent with the organisation's objectives and strategies (Merchant and Van der Stede, 2012). Formal MCS are a subset of MCS whose key characteristics include being consciously designed, officially sanctioned, codified and recurrent (e.g. budgets, metrics-based reports, rules and regulations, mission statemens, codes of conduct) (Cardinal et al., 2004; Collier, 2005; Davila and Foster, 2007).

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that formal performance feedback is vital to build and maintain inter-personal trust in VTs (e.g. Jarvenpaa and Leidner, 1999) as well as VT effectiveness (e.g. Hertel et al., 2005). Yet, other studies suggest that the use of formal MCS is associated with the deterioration of inter-personal trust among VT members (e.g. Piccoli and Ives, 2003). Overall, the literature falls short of providing a rich and conclusive picture of the trust-control nexus in VTs.

With the aim of increasing knowledge on the trust-control nexus in VTs, we examine one category of VTs – those with high levels of initial inter-personal trust (Jarvenpaa and Leidner, 1999). It is common in contemporary forms of VTs that team members are recruited through interpersonal relations so that, even if they operate at a distance, they share similar ascribed characteristics (e.g. age, prior network ties), which results in familiarity and high interpersonal trust being present from the outset of the team's activities (Aldrich and Kim, 2007; Ruef et al., 2003). Nowadays, tens of thousands of instances of this organisational form operate on a global scale, particularly in the case of small, early-stage teams that engage in new product development (NPD) (Andres, 2002; Boudreau, 2012; Boutellier et al., 1998; Leenders et al., 2003). The VT setting we choose allows us to go beyond the investigation of how trust is affected by formal MCS to further look at how formal MCS and their implications are affected by trust.

In this study, we investigate the interplay between formal MCS and interpersonal trust and examine the implications of this interplay for VT outcomes. Prior VT literature has adopted different approaches to examine VT outcomes, including affective outcomes such as member satisfaction and performance outcomes such as effectiveness, speed of decisions and decision quality. In this paper, by VT outcomes, we refer to the information quality of the action choices and the degree of congruence in behaviours that underlie VT effectiveness (Martins et al., 2004; Powell et al., 2004). To this end, we examine the workings of HighTec, a nine-member innovation virtual team over a period of 13 months in the field. The team was in charge of the core project within a small, early-stage software incubator. In trying to maximize the likelihood of success of its innovative software design and future access to venture capital financing, the HighTec team faced the challenge of managing its highly interdependent NPD tasks in a context of geographical dispersion. During our field research, we observed a suite of formal MCS that gravitated around four emergent themes, i.e. coordination and knowledge integration, management of urgency, management of uncertainty, and motivation. These four themes can be meaningfully related to the theoretical notions of decision-facilitating and decision-influencing roles of MCS (Abernethy and Vagnoni, 2004; Baiman and Demski, 1980; Sprinkle and Williamson, 2007; Tomkins, 2001; Velez et al., 2008). Hence, after using theory on the trust-control nexus to position our study of the intertwining between formal MCS and inter-personal trust in virtual settings, we consider notions of decision-facilitating and decision-influencing roles relating to these formal MCS to shed further light on their relationship. These notions are relevant for our purpose because their respective informational and motivational effects relate to the communication difficulties (Powell et al., 2004; Stevenson and McGrath, 2004) and organisational and motivational issues (Lee-Kelley and Sankey, 2008; Piccoli et al., 2004) that underlie the potential pitfalls and challenges facing VTs. We argue in this paper that bringing these notions into the analysis and coalescing the distinction with the specificities of VTs contributes to a richer understanding of the inter-personal trust-control nexus in VTs.

This case study examines how formal MCS help manage highly interdependent NPD tasks in contexts of dispersion where inter-personal trust is present. Its contribution to the accounting literature is two-fold. First, it emphasizes the reciprocal influences between formal MCS and inter-personal trust. Prior literature has tended to concentrate on the effects of control systems on trust (e.g. Das and Teng, 1998; Coletti et al., 2005; Velez et al., 2008), largely ignoring the influence of trust on control systems. In contrast, we extend prior findings to provide a richer picture that highlights their mutual links in a virtual setting. We show that in addition to formal MCS helping uphold inter-personal trust, trust enables the adoption and workability of incomplete formal MCS, hence shaping and expanding the set of available control alternatives. Second, we further contribute to the accounting literature by considering and separately examining the different roles of formal MCS and their interplay with trust in a virtual setting. Earlier studies explored the roles of control systems and their links with trust in non-virtual settings (Abernethy and Vagnoni, 2004; Velez et al., 2008). Studies in virtual settings looked at the roles of control systems, but without considering trust or showing an absence of trust (e.g. Gallivan, 2001; Gerdin, 2005). Finally, other studies examined the interplay of trust and control in virtual settings without considering the various roles of control systems (e.g. Coletti et al., 2005; Malhotra and Murningham, 2002). The simultaneous consideration of the different roles of formal MCS, presence of inter-personal trust and virtuality allows us to extend and qualify prior findings (Das and Teng, 1998; Velez et al., 2008) on the effects of the combination of MCS and trust on the outcomes of contemporary forms of VTs.

In addition to the above two accounting contributions, our study makes two other contributions to the trust-control nexus literature and the VT literatures. We contribute to previous organisational theory on the trust-control nexus by refining its postulates as they are examined in an idiosyncratic setting where highly interdependent tasks are combined with dispersion. Compared to earlier work in this stream (Malhotra and Murningham, 2002; Piccoli and Ives, 2003), our study further contributes by combining the examination of the mutual effects between formal MCS and interpersonal trust with the synergistic effects of their combination on VT outcomes. Finally, we add to the VT literature exploring control issues (Gallivan, 2001; Gallivan and Depledge, 2003; Knights et al., 2001; Piccoli et al., 2004) by capturing the distinction between the decision-facilitating and the decision-influencing roles of formal MCS. These notions have been largely ignored in the VT literature and acknowledging them sheds new light on how formal MCS and inter-personal trust collectively contribute to VT outcomes.

The remainder of the paper is organised in five sections. The first section reviews prior literature on the theoretical frameworks and concepts that underlie our case discussion. The second section outlines our research method, including case design and relevant case background. The third section reports our case findings. The fourth section discusses the findings, integrating case evidence into prior theory to analyse our observations. The fifth and last section sets out our conclusions and limitations of the study, as well as suggestions for future research.

2. Literature review

Our literature review first considers how organisational research defines VTs and specifies their associated advantages and challenges. Next, we identify prior accounting and broader management literatures that examine how inter-personal trust and formal MCS help VTs overcome these challenges. Finally, we review theory on the trust-control nexus, paying special attention to the limited literature studying this nexus in virtual settings.

2.1. Virtual teams

A Virtual Team (VT) is a group of geographically and/or temporally dispersed co-workers brought together across time and space through Information and Communication Technologies (ICT) to accomplish a common organisational goal (Duarte and Snyder,

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2006; Geister et al., 2006; Gibson and Cohen, 2003; Malhotra et al., 2007; Piccoli et al., 2004). VT members work together on highly interdependent tasks (Lipnack and Stamps, 2000; Powell et al., 2004) with mutual accountability and shared responsibility for outcomes (Hertel et al., 2005). VT members rarely collaborate face-to-face (e.g. Martins et al., 2004; Schweitzer and Duxbury, 2010) and geographic dispersion and asynchronicity are overcome by their high reliance on ICT (Griffith et al., 2003; Hunsaker and Hunsaker, 2008). For most teams, being virtual is a matter of degree (Axtell et al., 2004; Kirkman et al., 2004), falling in a continuum between the extreme of being exclusively collocated and wholly virtual. The balance struck between the two is likely to evolve over time (Lipnack and Stamps, 2000; Schweitzer and Duxbury, 2010). For example, in practice, the amount of face-to-face interaction can range from no physical interaction to periodical face-to-face team meetings (Kirkman et al., 2004; Lipnack and Stamps, 2000; Townsend et al., 2001).[2] A mainstream position in the VT literature is to apply the term 'virtual team' to teams with a high degree of virtuality, which is manifested through highly interdependent tasks, a high level of dispersion, the preponderant reliance on ICT to communicate with other members, and a low relation of face-to-face to non-face-to-face communication (Hertel et al., 2005; Powell et al., 2004).[3]

As a result of the confluence of advancing technology and the trend towards more dynamic environments, decentralized work processes and versatile structures, VTs have become a structural component of many organisations (Cascio, 2000; Lurey and Raisinghani, 2001; Maznevski and Chudoba, 2000), replacing traditional collocated groups in both large firms (Lee-Kelley and Sankey, 2008; Martins et al., 2004; Montoya et al., 2009) and small ones (Andres, 2002; Boudreau, 2012; Boutellier et al., 1998; Gassmann and Keupp, 2007; Leenders et al., 2003). The popularity of VTs is linked to a range of expected business benefits, including: the ability to bring together dispersed talent, qualifications and expertise without time, space and organisational limits (Jarvenpaa and Leidner, 1999; Leenders et al., 2003); greater flexibility and responsiveness (Hunsaker and Hunsaker, 2008; Piccoli et al., 2004; Powell et al., 2004); the reduction of time-to-market (Lipnack and Stamps, 2000); the leverage of scarce resources across boundaries (Gassmann and Keupp, 2007) and the saving of operating and capital expenditures (Geister et al., 2006).

Yet, while VTs provide major advantages over traditional collocated face-to-face teams, they also face potential pitfalls that their traditional counterparts either do not suffer or that are heightened in virtual contexts. Some pitfalls relate to communication difficulties such as fragmentation and absence of totality, lower and slower rates of information transfer (Geister et al., 2006), differences in salience and interpretation of written texts, the absence of non-verbal communication and the leaner, more limited set of communication cues conveyed by electronic media (Powell et al., 2004). Collectively, these difficulties increase the likelihood of communication breakdown (Stevenson and McGrath, 2004). Other pitfalls relate to the absence of a common frame of reference for all team members, lack of clarity on the management agenda, diffused roles and responsibilities (Lee-Kelley and Sankey, 2008), a lower degree of participation from remote team members, low individual commitment and absenteeism, more scope for opportunistic behaviours and social loafing (Jarvenpaa and Leidner, 1999), less group cohesion and the challenges of managing conflict (Piccoli et al., 2004).

2.2. The case for inter-personal trust in virtual teams

Because of the absence of physical proximity and visibility, virtual contexts render forms of informal social control such as direct supervision, unplanned communication exchanges, peer surveillance, socialization, culture or tone-at-the-top (Collier, 2005), inoperable or less operable than in collocated workplaces (Jarvenpaa et al., 1998; Putnam, 2001). Some earlier studies have also considered that rules, regulations, formal procedures, metrics-based reporting requirements and other forms of formal control are hard to activate in VTs, where managers often lack the cues needed to properly interpret formalized data on the work of VT members (Majchrzak et al., 2000) and where structural characteristics diminish the role of traditional authority and hierarchy compared to their collocated counterparts (Lipnack and Stamps, 2000).

Taking into account the difficulties of deploying informal and formal controls in virtual contexts, a line of research has emphasized the importance of inter-personal trust to manage inter-dependent tasks overcoming the pitfalls caused by dispersion (e.g. Jarvenpaa et al., 1998; Muethel et al., 2012; Staples and Webster, 2008).[4] Inter-personal trust is a psychological state comprising the intention or willingness of a person to accept vulnerability based upon positive expectations of the intentions or behaviour of another person and stemming from assessments of that person's trustworthiness, irrespective of the ability to monitor that other person (Bachmann and Zaheer, 2006; Piccoli and Ives, 2003; Rousseau et al., 1998; Simons, 2002). In VTs, inter-personal trust may arise from selection procedures based on previous knowledge (e.g. resulting from friendship or a common history of prior transactions between team members) (Aldrich and Kim, 2007; Ruef et al., 2003; Staats, 2012), or out of trust-building mechanisms—that is, deliberate actions by management undertaken once the team engages in operations (Coppola et al., 2004; Das and Teng, 1998; Zaheer et al., 1998). Broader management research has shown that inter-personal trust increases subordinates' voluntary compliance, their commitment to organisational goals as well as their willingness to exhibit extra-role behaviours (Long and Sitkin, 2006). It positively influences information-sharing and mitigates uncertainty about others' behaviour (Bstieler, 2006; Martins et al., 2004; Muethel et al., 2012; Zaheer et al., 1998). Stressing the importance of inter-personal trust for ensuring success in the particular case of VTs, Powell et al. (2004) show that VTs exhibiting high inter-personal trust experience predictable communication patterns, positive leadership, enthusiasm and better ability to cope with technical uncertainty. Trust also prevents geographical or temporal distance leading to psychological distance (Jarvenpaa et al., 1998; Lurey and Raisinghani, 2001; Martins et al., 2004). Along these lines, Staples and Webster (2008) found inter-personal trust to be positively associated with knowledge transfer within VTs, which was eventually reflected in better team effectiveness. The positive relationship between inter-personal trust and team effectiveness has been found to be stronger

[2] Even extremely virtual teams who rarely share a workspace are likely to meet physically and have some face-to-face contact at some point, especially in the earlier stages of the team's operations. For instance, kick-off workshops used to define key activities are often conducted in physical proximity. Even in traditional face-to-face teams, some degree of dispersion is present and it is rare that members do not rely on communication technology at some point to overcome spatial distances (Schweitzer and Duxbury, 2010).

[3] In line with most extant definitions of VT, we do not consider the absence of a common history or future (see Jarvenpaa and Leidner, 1999 for an exception) as a required definitional trait of a VT.

[4] Some studies have looked at trust as a mode of informal social control (e.g. Dekker, 2004). In this paper, and in line with the dominant perspective held in the trust-control nexus literature (e.g. Costa and Bijlsma-Frankema, 2007; Das and Teng, 1998, 2001; Gallivan, 2001), we consider controls (including informal social controls) and trust as two distinct phenomena.

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as geographic dispersion and computer-mediated communication increase (Muethel et al., 2012).

2.3. The case for formal MCS in virtual teams

Another stream of literature suggests that it is unlikely that VT effectiveness stems mainly from inter-personal trust. The lack of physical proximity and visibility hampers or even precludes inter-personal trust (Gallivan, 2001). Building and maintaining inter-personal trust in a virtual environment is problematic if team members have no common history and no future reference as a base upon which to build trust, and they have not met face-to-face in the past. This is largely due to opportunities for future face-to-face interactions being scarce (Baskerville and Nandhakumar, 2007; Handy, 1995; Lin et al., 2008). Yet, VT members need to be committed to organisational goals and have to align their tasks if the VT is to be effective. According to this line of thought, in VTs where inter-personal trust is hard to build and maintain, the procedures and processes provided by formal MCS may help boost a VT's effectiveness. This is likely to be the case particularly when the lack of physical proximity and visibility further hamper the deployment of informal social control systems (Jarvenpaa et al., 1998; Putnam, 2001).

A number of studies indicate that VTs use formal MCS similar to those used in conventional teams—e.g. standard operating procedures (Bell and Kozlowski, 2002), management by objectives (Hertel et al., 2005) and monitoring and sanctions (Markus et al., 2000). Prior accounting literature has drawn upon the distinction between the decision-facilitating and the decision influencing roles of MCS to examine how these systems work in organisations (Baiman and Demski, 1980; Grafton et al., 2010; Sprinkle &Williamson, 2007).[5] Under their decision-facilitating role, formal MCS provide timely and relevant information to organisational members preceding their action choices so they make better-grounded judgments and decisions. The sought-after informational effect reduces pre-decision uncertainty and thereby improves action choices. Under the decision-influencing role, formal MCS offer managers the opportunity to produce a motivational effect that directs or changes behaviour of subordinate managers and employees. This effect mitigates conflicts of interest between organisational members who might otherwise acti in their own interests, and thereby risk the reduction of firm value. Its expected outcome is goal congruence (i.e. the alignment between organisational goals and self-interest), which is a precursor to actual congruent behaviour. To the best of our knowledge, the distinction between the decision-facilitating and the decision-influencing role has not been applied in prior studies on VTs.

Still, prior literature on VTs provides evidence suggesting that formal MCS may help VT members scan changes in environmental conditions and be aware of the broader situation (Bell and Kozlowski, 2002), align and synchronize schedules as well as integrate knowledge of individuals with differentiated skill sets (Lee-Kelly and Sankey, 2008). It also evidences that formal MCS may provide feedback and accountability adapted to the forms of hierarchy entailed by virtual settings (Duarte and Snyder, 2006; Geister et al., 2006; Hertel et al., 2005). Gallivan (2001), for example, describes how explicit rules, community policies and lines of authorization contribute to ensuring that autonomous agents who participate in open-source software projects where inter-personal trust is mostly absent perform in a goal-congruent manner.

The literature further points out two characteristics of formal MCS that are much more common in VTs than in collocated teams. First, as the ability of VT leaders to monitor team member's performance is severely restricted by the high dispersion and the lack of face-to-face contact, a large part of the monitoring is distributed to the team itself so that it self-regulates its own performance (Bell and Kozlowski, 2002; Hertel et al., 2005). Second, the enactment of formal MCS in VTs typically includes drawing upon electronic-based tools such as Electronic Performance Monitoring systems (EPM) (Andres, 2002; Hertel et al., 2005) and Team Awareness Systems (TAS) (Dabbish and Kraut, 2008; Geister et al., 2006) that report feedback information on the activities and performance of other members of the team.[6] EPM and TAS offer VT members a context for oneís own activity and provide the ability to monitor the performance of other team members as well as that of the overall team. While EPM and TAS can be available and valuable to all teams, VTs tend to depend much more on these electronic-based tools than non-virtual teams. Yet, the use of EPM and TAS in the absence of trust risks being perceived by employees as a surveillance technology that undermines workplace morale, increases suspicion between employees and supervisors and promotes unethical behaviour (Ariss, 2002; Alder et al., 2006).

2.4. The trust-control nexus

Inter-personal trust does not exclude the possibility for control, and *vice versa*. A long tradition of studies mostly focusing on Inter-Organisational Relationships (IOR) has acknowledged that: (i) both trust and control share the common goal of enhancing effectiveness, and (ii) trust, control and their effects are interlinked (Costa and Bijlsma-Frankema, 2007; Vosselman and van der Meer-Kooistra, 2009). This interlink is controversial, as evidenced by the existence of competing interpretations on how trust and control relate, including a substitution (e.g. Dekker, 2004; Knights et al., 2001; Van der Meer-Kooistra and Vosselman, 2000), a complementary (e.g. Bachmann et al., 2001; Sitkin, 1995) and a supplementary perspective (e.g. Das and Teng, 1998). Within their contextual-based approach, Das and Teng (1998) provide a model to capture the complexity of the trust-control nexus. Here, we highlight two of their propositions. One is that the deployment of formal MCS undermines the level of trust among partners as it questions intentions, creates stress and suggests lack of belief in oneís goodwill. The second is that the level of trust positively moderates the efficacy of MCS in setting the control level. Subsequent IOR studies (Velez et al., 2008) have qualified the first of these propositions, suggesting that the track records provided by formal MCS may in fact nurture and strengthen trust between partners. The second of these propositions has seldom been investigated in the subsequent literature.

Some researchers indicate that the distinctions between roles of formal MCS help shed light on the complexity of the trust-control nexus in IOR. Tomkins (2001) distinguishes between information from the control systems used to master events (which is needed independently of the level of trust) and information used to verify

[5] The accounting literature has proposed several alternative typologies, largely analogous to these two roles, e.g. decision management- versus decision control function (Abernethy and Vagnoni, 2004; Zimmerman, 2011) and co-ordination versus monitoring function (Velez et al., 2008).

[6] EPM systems are systems to assist a supervisor to remotely observe and record input or output activities of employees and employee performance. They include, but are not limited to, performance management softwares, computer networks and wireless audio/video links (Hertel et al., 2005; Stanton and Barnes-Farrell, 1996). TAS systems refer to technology designed to provide contextual information about the activities of group members. These are conducted to improve the coordination of communication between parties comprising the team (Dabbish and Kraut, 2008). EPM differs to TAS in that EPM systems might relate to the monitoring function of any style of organisational arrangement, be it individual, collective, project- or team-based, while TAS specifically relates to the application of systems relating to teams.

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actions of the other party (which helps create trust and influences how trust develops). Velez et al. (2008) distinguish between and pay attention to both the co-ordination and the monitoring roles of MCS. They find that the monitoring function of MCS is detrimental to trust as it implicitly assumes opportunistic behaviour and fosters suspicion. However, in contrast to Das and Teng (1998), Velez et al. (2008) find that the co-ordination function of MCS has positive connotations for trust-building. As IOR partners perceive the co-ordination role as much more salient than its monitoring role, they find that formal MCS encourage commitment and trust.

The research on the relationships between formal MCS and trust in settings other than IOR is rather limited and has tended to focus on how inter-personal trust is affected by formal MCS. Some experimental studies have found that the use of formal MCS in non-virtual collaborative settings undermines the development of inter-personal trust as behaviour of the controlled party is attributed to the use of formal MCS rather than to genuine goodwill (Irwin et al., 2014; Malhotra and Murnigham, 2002; Tenbrunsel and Messick, 1999). By contrast, other experimental studies have demonstrated that if formal MCS provide economic incentives that induce greater cooperation and if cooperation is observable through performance feedback, cooperation grows and this control-induced cooperation engenders inter-personal trust (Coletti et al., 2005).

2.5. The trust-control nexus in virtual teams

Knowledge about the trust-control nexus in IOR and non-virtual settings cannot be immediately transferred to VTs. Two structural aspects set VTs apart from IORs. First, VTs present a much higher degree of task interdependence than IORs (Lipnack and Stamps, 2000; Powell et al., 2004). Second, hierarchy has a more important role in the governance of VTs (e.g. superior-subordinate relationships in a project management structure) than is the case in IORs (Bell and Kozlowski, 2002; Dekker, 2004; Duarte and Snyder, 2006; Geister et al., 2006; Hertel et al., 2005). In turn, compared to their collocated counterparts, VTs face greater communication difficulties such as fragmentation, absence of non-verbal communication, and a more limited set of communication cues to properly interpret information (Powell et al., 2004). The greater communication difficulties that VTs experience affect (and are affected by) their ability to build and maintain inter-personal trust (Gibson and Cohen, 2003; Jarvenpaa et al., 1998), to effectively deploy formal MCS (Majchrzak et al., 2000), and the way inter-personal trust and formal MCS interrelate (Muethel et al., 2012).

Despite the idiosyncrasies of VTs, research on the trust-control nexus in that setting is still scarce.[7] Jarvenpaa and Leidner (1999) found that in VTs that maintained high levels of inter-personal trust, members gave thorough feedback (i.e. regular, substantive and timely feedback, involving perspicacious evaluation rather than mere cursory perusal) on fellow members' work. Jarvenpaa and Leidner concluded that such thorough feedback is vital for constructing spaces where experiences can be shared and helps overcome VTís communication challenges. Thus, feedback facilitates the development and maintenance of inter-personal trust and contributes to high VT performance. Along the same lines, Hertel et al. (2005) suggest that frequent, concrete and timely performance feedback, both at the individual and the team level, prevents feelings of exploitation and consequently favours inter-personal trust. However, other VT studies suggest that the use of formal MCS in VTs is associated with a deterioration of inter-personal trust among VT members. Piccoli and Ives (2003) investigated how the definition of explicit and specific work assignments, the specification of rules and procedures and the filing of periodic reports on the transformation process of VT members' work influence inter-personal trust. Their results indicate that these forms of control increase vigilance and make more salient the instances when individuals perceive that VT members have fallen short (i.e. reneging and incongruence). Controls that raise the odds that such incidents are detected strengthen the impact of reneging and incongruence, making inter-personal trust wane. Overall, the limited empirical research on the interrelationships between inter-personal trust and formal MCS in VTs has tended to focus on the effects of formal MCS on inter-personal trust and less so on the effects of the presence of trust on the adoption and development of formal MCS. Moreover, this literature has not taken into consideration the distinct roles of MCS, and offers inconclusive findings.

3. Research method

3.1. Case background

Our case setting is the HighTec project within Innova,[8] an innovation-based software incubator. Innova was founded in Melbourne in 2007 with the purpose of conceiving, developing and marketing applications for mobile and traditional technology platforms for a wide range of customers spanning multinational corporations to children's charities. Operating under a 'build' strategy (Langfield-Smith, 1997), Innova produces a range of software programs and applications, including children's computer games to facilitate disability improvement, driver-friendly mobile phone audio controls, as well as remote engine start-ups for motor vehicles. Its business model is primarily based on developing app software innovations and selling them or granting their use to other companies, even if in addition to that core business, the firm occasionally provides consulting solutions for specific technology innovation problems. In the period 2009–2011, Innova's annual revenues and grants from private corporations ranged between half a million and one million Australian dollars. Some of Innova's innovations received national media coverage in Australia, and the firm has gained a strong foothold in Silicon Valley, where it has won prestigious innovation awards.

Innova uses a project-management approach and sees itself as a portfolio of projects. Within Innova, the HighTec project was tasked with developing a software program for global uptake in the retail clothing sector. The goal of the HighTec software was to perform an auto-configuration function of clothing sizes, through item association. In HighTec's vision, individuals purchasing garments online would stand holding a credit card, take pictures, submit those to the HighTec software, and their shirt size would be determined next to the credit card. Once the shirt size had been set, the software identified the ideal size for the online purchaser when searching the vendor's online catalog. The software purported to reduce the likelihood of product returns and boost online sales by raising the

[7] Within the accounting literature, elements of virtuality can be found in studies that have examined the role of MCS in settings as diverse as multi-site manufacturing companies (e.g. Boyns and Edwards, 1997), large software firms (e.g. Ditillo, 2004), colonial regimes (e.g. Annisette and Neu, 2004; Nuñez Torrado, 2002) and multinational corporations (e.g. Busco et al., 2008; Dossi and Patelli, 2008; Quattrone and Hopper, 2005). Yet, the theoretical background from these studies is of limited use to investigate the trust-control nexus in VTs. In part, this is because VT are, first and foremost, teams and they exhibit substantially higher task interdependence (Lipnack and Stamps, 2000; Powell et al., 2004) than the one observed in the aforementioned settings. Moreover, while these studies examine control systems in contexts where some elements of virtuality are in place, they mostly ignore the issue of trust (with the exception of IOR studies, e.g. Tomkins, 2001; Velez et al., 2008).

[8] We have suppressed the actual name of the innovation firm under which this project team exists and the title of the software being developed in order to preserve their anonymity.

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confidence of purchasers using this service. During the period of our field-based research (November 2010–December 2011), HighTec represented Innova's core project and was considered its *raison-dîêtre* at that time.

The project team comprised 9 members who were drawn from different functional backgrounds. All of them were selected at the start of the project, and continued to be involved in the project throughout the 13 months of research in the field. Four of these members (PM, TM, SP1 and SP2) worked full-time for Innova and became involved with it before HighTecís formation. PM and TM were the two co-founders of Innova and took managerial roles in HighTec. SP1 and SP2 were Innova software programmers. The remaining five team members (MK, SP3, SP4, SI and PD) had a primary outside job and were involved with Innova as a secondary job and then only because of HighTec. MK was the project conceptor who envisaged the original broad space around sizing in internet retailing. SP3 and SP4 were in charge of software programming. SI bridged the interaction between programmers and non-programmers at an operating level. PD was in charge of the design aspects of the website. Despite HighTec being their secondary job, these five individuals worked long hours during the week and devoted significant time to the project.

In trying to maximize the likelihood of success of its innovative software design and future access to venture capital financing, the HighTec team faced the challenge of managing its highly interdependent NPD tasks in a context of geographical dispersion. This paper documents the series of interactions between the HighTec team members over the life of this project up to the point of completing the innovation and just before the selection of a venture capitalist. This setting was regarded as ideal for the purposes of our research, as preliminary contacts with the project members had provided circumstantial evidence that inter-personal trust was present in HighTec while formal MCS were also used to some extent.[9]

3.2. Data collection and analysis

Over a 13 month period, we were granted complete access to the team and conducted nineteen interviews with HighTec members. Three additional follow-up interviews were conducted after this period. Interviews were with:

1. Project manager (PM – six interviews)
2.Technology manager (TM – six)
3–6. Four software programming members (SP1 to 4 – one each, total four)
7. Software Interfacer (SI – two)
8. Product design expert (PD – two)
9. Marketing expert/project conceptor (MK – two)

All interviews were semi-structured, with an initial set of questions to respondents relating to their role, individual responsibilities and tasks. This was followed by open-ended discussions regarding the nature of the team, perceptions of members regarding its progress and possible challenges. We did not ask explicit initial questions on trust or on control in the interviews, so as to observe how inter-personal trust and control systems integrated into the broader practices of team members. In all of the interviews, issues bearing on trust and around control systems were spontaneously raised by the interviewees at some point. When that happened, we followed up the leads and further questioned interviewees to clarify their perceptions of how trust and control systems related to their work. Interview times ranged between 25 min and 75 min (except one follow-up, 15 min). Most interviews were conducted face-to-face in a series of five visits to Innova's premises, while some were conducted over the phone. All discussions were recorded and transcribed. When *ad hoc* conversations arose from our engagement with any team member outside recorded discussions, detailed notes were taken and later cross-checked with the respondent. In addition to the face-to-face and telephone interviews with each of the members of the team, we physically attended two general meetings as well as several discussions regarding the workings of the team. We were also granted access to financial data as well as project briefs. Following the initial round of interviews, one of the authors frequently interacted with the team members, clarifying case evidence and assessing the extent to which the interpretations derived from observations were consistent with the views of the team members. In line with Chenhall et al. (2010) and Free (2007), we drew upon Eisenhardt's (1989) approach for the analytical stage of the case research, organising data from the original transcripts around key issues, identifying emergent recurrent themes and comparing the emergent themes with existing research.

The organisation of the data in our original transcripts on key issues led to the identification of five core activities. These were the *sourcing of the team*, *organisational arrangements, setting the playground, planning and implementation*, and *adaptation and responsiveness*. We observed evidence of a suite of formal MCS being used at HighTec and we related specific instances of these MCS to the five core activities. This evidence is summarized in Fig. 1. Items in bold italics in Fig. 1 cells refer to the specific systems observed (e.g. Trello) whereas items in standard font refer to the expected contributions of those systems (e.g. timeline planning). The arrows in Fig. 1 indicate instances where we observed one system providing specific data that fed another system. After mapping our observations and analysing the patterns underlying them, we recognized four emergent themes around which formal MCS gravitate across activities: coordination and knowledge integration; management of urgency; management of uncertainty; and motivation (see bottom Fig. 1). We next present the findings on formal MCS in relation to each activity and visualize how the emergent themes surface. The implications of these findings for the relationship between MCS and trust will subsequently be analysed in the Discussion section.

4. Case findings

4.1. Sourcing of the team

PM and TM met at university, where they studied similar degrees, and became close friends. Shortly after university, PM and TM secured employment in the R&D department of a large multinational company. After a few years of employment together in the multinational, both resigned simultaneously to pursue entrepreneurial careers and co-founded Innova. Within Innova, they began the HighTec project with MK, who had previously been employed in the same multinational, working closely with PM and TM, and with whom they had kept in touch. MK was the idea facilitator who identified the conceptual area within which the innovation might develop. As MK recalled

> *"Well, the idea came from an apple on the head moment where I was looking to buy a T-shirt online . . . from overseas . . . I just found myself going through the process, finding a vendor, accepting all the nuances of the online process. . . then I got to the final point and it's like, what size are you? Whoa, I really don't know. I could be a large or sometimes I'm an extra large. . . There's no real defined*

[9] Following development and marketing, HighTec aimed to seek funding from venture capitalists for the final roll-out of the new software. In fact, venture capitalists had showed strong interest in the software application. The search was still ongoing at the time of finishing the field research.

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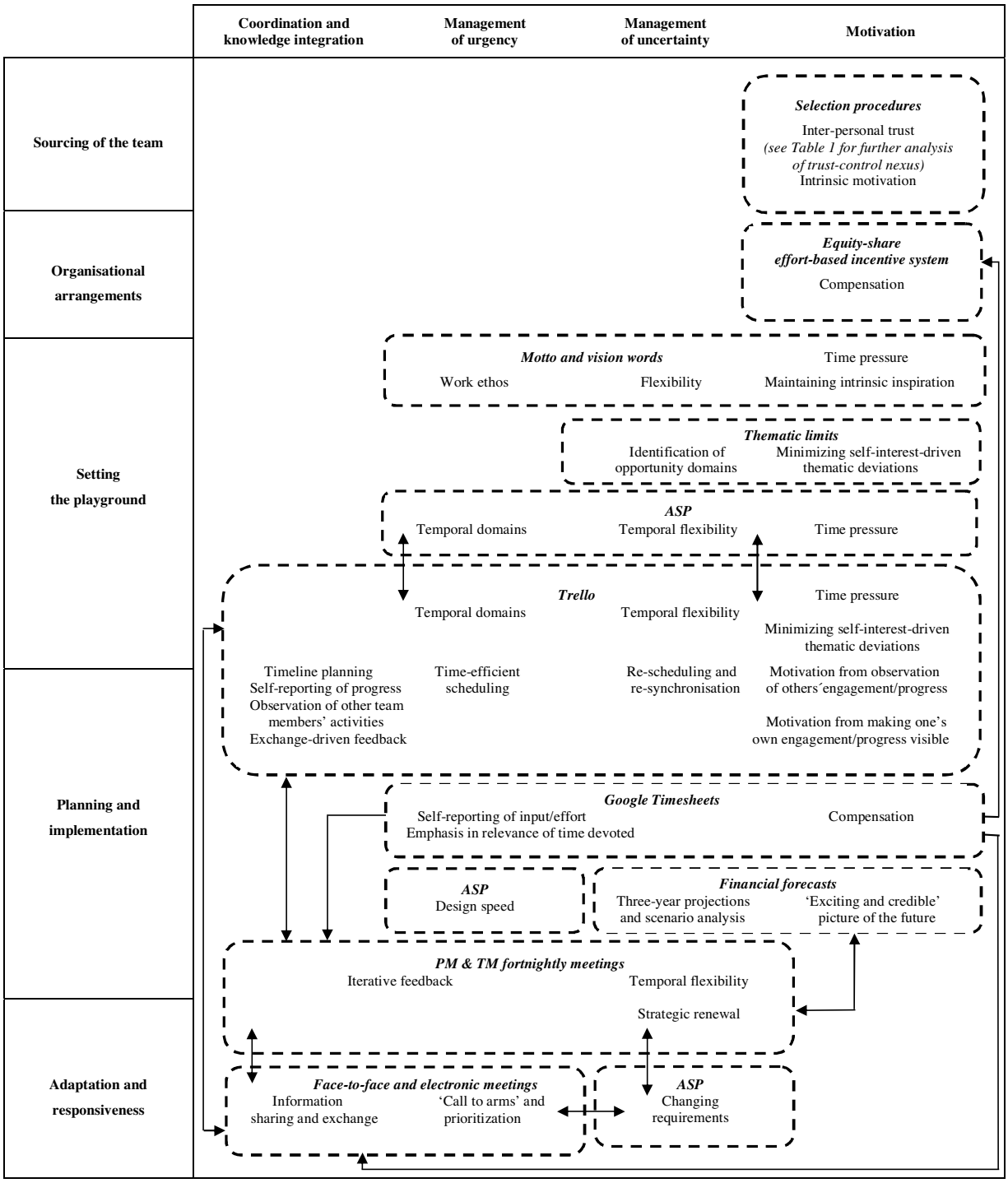

Fig. 1. Formal MCS in HighTec.

standard and I knew that was the case... That's where the idea came from..." (MK)

MK introduced the idea to PM and TM, and encouraged PM to manage the project. PM and TM agreed to develop the innovation, its prototyping, beta testing and initial roll-out, prior to engaging in a later stage in the search for venture capitalist funding injection for branding and global expansion. Subsequently, PM tasked TM with driving and overseeing the software coding and programming needed for the application. HighTec team members were mainly selected through personal and professional acquaintances established across PM and TM's social networks. TM identified four software programmers (SP1-4). Two were Innova members (SP1 and SP2), while the other two were drafted in exclusively for the HighTec project (SP3 and SP4). Additionally, PM enlisted a product design expert (PD) and a software interaction (SI) expert. PD managed the aesthetics and structural appeal of the software from a customer perspective, while SI was responsible for ensuring the website was easy for customers to use. The four software programmers (SP) and the software interfacer (SI) met PM and TM at university and back then had repeatedly discussed the possibility

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of working together on an entrepreneurial venture after graduating. SI explained how his close friendship with PM and TM drove his participation in the project:

> *"With TM and with PM . . . we haven't just been kind of Uni-mates, we kind of done a lot of things together outside Uni as well. . . we just kind of jelled. . . If someone had a breakup with something, or was going through a bad time . . . we would really help them out. And then we did our projects, we'd always work on each other's strengths. . . . We had a lot of different experiences, . . . which kind of brought all this trust."* (SI)

The selection procedures adopted by HighTec revealed a strong preference for individuals who already trusted one another. The presence of high inter-personal trust from the outset of the project was echoed by TM:

> *"We took a leap of faith, because you know, the guys are all close buddies. I trust them like, wholeheartedly . . .., that's where that trust side came in."* (TM)

As highlighted by PM, inter-personal trust not only stemmed from common friendships, backgrounds and undertakings through periods of personal challenges. It also involved an acknowledgement of the team members' capabilities. In PM's words:

> *"They have delivered before, and I've built that rapport with them."* (PM)

The selection of team members was also based on the extent to which they were intrinsically inspired and motivated to partake in the project (see top row Fig. 1). Over the period of our field access, we found evidence of shared enthusiasm and a strong buy-in by all members involved in the project. Intrinsic inspiration and motivation within the team stemmed from the nature of the selection procedures and job conditions. As PD stated:

> *"I have known (PM) and (TM) for quite a few years, just through mutual friends. I actually run a branding and graphic design agency. . . Because of the (flexible work hours), and because we were all in similar ages and similar level of open mindedness it was [an] environment where everyone could feel very open to express their ideas and put their hand up to take on responsibility. . .[There was] certainly a high level of enthusiasm . . .. I thought it would be interesting to be involved and to see where it goes in terms of technology."* (PD)

4.2. Organisational arrangements

HighTec had a simple organisational structure, with PM acting as the project manager with strategic and co-ordinative functions since its inception in November 2010. Team members saw value in PM's managerial role, attributing it to the fact that the team's flexible and dispersed work arrangements required a loose coordinating mechanism. However, they did not see PM as hierarchically 'above them'. According to PD:

> *"It was crucial for someone to be project manager, just by nature of that [some of us] have other commitments outside of the project. Just by nature we all have different skill sets as well. So I think it was important for the effectiveness of the group to have someone coordinating the meetings or feedback or the milestones and things like that. But I don't know exactly why there doesn't appear to be any kind of distinct hierarchy. ···We were all kind of equally – all our skill sets and our ideas and opinions were all valued equally. No one trumped someone else just for the sake of – sorry – just as a result of any sort of hierarchy. . ."* (PD)

In HighTec, the tasks involved in the progressive definition of the innovation thematic space, software programming testing and pilot running were intertwined. Repeated task-driven interaction between programmers, PM, TM and marketing-focused project members was needed to move the project ahead. For example, the definition of the thematic space and the software programming activities were largely dependent on each other and required sustained interaction. The software tasks that were developed using narrowly focused, time-conscious Agile Systems Programming (ASP) influenced the narrow selection of target customers and *vice versa*.[10] More generally, team members had to regularly synchronise their activities as the performance of one member strongly affected the work process of other team members.

High Tec members conducted most of their work separately at a geographical distance, communicating and submitting their progress electronically. In the first two months after the project start, they met in person once a fortnight. Following this initial period, face-to-face meetings gradually became more sporadic to the point that in the last six months of the data collection process (months 8–13), the entire team only physically met once. As explained by SP3:

> *"We were'nt doing a nine to five and werenít in proximity with the others in the team during the day. So we had to work remotely. (Yet, initially) we had to kind of settle for meeting up maybe once every two weeks."* (SP3)

Some team members acknowledged that working from a distance required a special mind set. SP 3 noted that:

> *"And look, the funny thing is, I, I probably wouldn't be really good working remotely for a really long time because I like interaction, I like people, talk to people . . . But a lot of guys in the software world, they actually don't like that. They're introverted, they kind of like, they want space, they can work really well in a quiet environment. They have control over what they do, you know, what's around them. . . remote working jobs (are) perfect for guys like that. Like, you know, they get no interaction with the walk to the coffee shop or something like that, but they just like this space, and yeah, it's just um, it works, it works so well for some people, not so much for other people"* (SP3)

TM further commented that the distance between members made it somewhat difficult, at times, to maintain communication:

> *"Yeah, it was quite difficult. I mean, . . . a lot of the time you need to be together to work on it. It's very difficult for someone to take a little bit and go off and I'll work on it and I'll take a little bit and work off isolation. Especially, at the early stages, you need to be together. You need to bounce ideas off each other. Do something quickly and show the other person, does this work, doesn't it? That was quite difficult"* (TM)

HighTec relied on a package of formal management systems. This package was not a deliberate configuration resulting from an in-depth conscious design. It was not the result of serendipitous development either. At the outset of the project, PM in consultation with TM thought about the formal management systems (including formal MCS) to put in place. The main criteria for adoption were ability to respond to perceived informational needs and workability, even if no great thought was given to the implications of the adoption of a given system or to how components of the package might interact or combine. One exception in that regard was the design of the compensation system, to which

[10] ASP is a system applied in software development that focuses on critical incremental and iterative techniques that disaggregate the software development process into smaller sub-components, prioritised in an order that speeds up innovation time while allowing for software development to alter into alternative forms, should rapidly changing technology require it (Erickson et al., 2005).

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special attention was paid. PM and TM agreed that all project members would receive equity share as compensation. All team members would work towards the attainment of prospective equity, under the expectation that a venture capitalist could be found to invest in the project in the near future. The split for the HighTec project equity was 51% to MK, 15% to Innova co-founders (PM and TM) and 34% to all team members (except MK) based on the time they spent on the project. There was some conjecture on the extent to which everyone's efforts might be weighted equally, as reported time might not accurately reflect the importance or impact of the different HighTec members' work. In PD's words:

> *"It was a lengthy discussion of how we would do this because my time spent on the project was the least of anyone actually. We did have to have a discussion about the actual time you spent on a project versus the value of your contribution. I must admit, it was always a sticky point, I suppose. . . .. Because I felt that the value of what I was contributing might be considered greater than the amount of time I could spend· · ·I just felt puzzled the developers were working so many more hours than me. . .. (and this would) be reflected in how we would divide up the share of the company."* (PD)

In addition to PD, SP3 and SP4 also voiced the possibility that a time-based equity system might not perfectly reflect the contributions of all members. Even though they acknowledged the system as potentially flawed, they eventually came up to the conclusion that a fierce battle over the issue was best avoided. When sharing his concerns, SP4 would explain them in the context of the affinity between team members:

> *"I guess what happened was we all argue for our idea and explain why we think it's the best. Then when you explain that you actually get feedback and maybe you change your mind. So just a proper discussion. If after a discussion, you still don't reach agreement, then you need to make a compromise. . ."* (SP4)

After intensely debating the merits of the contributions of the team members with different functional expertise, it was eventually concluded that no individual's work would be valued above another's. As the project proceeded, all team members accepted that time invested would be the primary driver of equity share. Towards the end of our research period in the field, we asked PD whether she was satisfied with the equity-share effort-based incentive system. She replied "*Absolutely*". Eventually, the equity share effort-based incentive system formed the core basis upon which group members were to be rewarded (Fig. 1).

4.3. Setting the playground

To a large extent, the thematic area to focus on in HighTec was defined by its members' genuine personal interest and their intrinsic inspiration.[11] We observed some formal tools that were consistent with these intrinsic forces, and at the same time shaped them and contributed to their maintenance. HighTec had an officially sanctioned motto (*"Innovation must happen quickly, the world moves forward in the time we say it cannot be done")*, as well as three vision words adopted from Innova ("*being malleable to change*", "*taking ownership*" and "*making a difference*").[12] These were formalized in a visible way and communicated in a structured manner. Innova's vision words were prominently indicated in its premises, where HighTec members occasionally met. The motto and the vision words were further emphasised on a regular basis by PM and TM in their electronic correspondences with team members. They were also consistently included in presentations to potential clients and new team members. Additionally, our attendance at meetings revealed that implicit or rephrased formulations of the motto and vision words were often made during discussions between HighTec members.

One message conveyed by the vision words was that, when searching in HighTec's innovative thematic area, team members were expected to be pro-active, bridge functional boundaries, exchange and share information with others and work collaboratively. For example, PD explained how being the only female in the team allowed her to translate the "making a difference" vision words into concrete terms:

> *"I was actually the only female in the group. I suppose the end user of High Tec – when we sort of storyboarded it out, we assumed that it would be a woman or that was a fair assumption to make. Of course, it is technology that can be used by a man as well. But I suppose I was able to bring a bit of that first hand female online shopping experience. . . Yeah, so I suppose that may have assisted them to think about how a user might actually navigate through the website (. . .) when (she) gets there."* (PD)

Moreover, references to the motto and vision words told and reminded HighTec members of the high levels of cognitive effort required of them. All members were expected to live up to this ethos.

> *"At the end of the day, it comes down to how hard we work – we are serious here, there's no time to waste, we have to get stuck in and get things done. . . if we don't do it, someone else will,* (and) *we miss the boat. . ."* (PM)

The work ethos helped manage the urgency requirements of HighTec. While it did not set deadlines or say what would happen if they were missed, it did stress that meeting deadlines was vital if HighTec was to be a success. It signalled that it was only through individuals having the sufficient drive to do "work for its own sake" that tasks could be completed in the allotted time. As HighTec was a secondary job for some of the team members, this ethos emphasized that all members had to work hard on HighTec so that the project could be completed fast. The work ethos was reinforced by other tools which focused the project members' attention on the management of urgency through the establishment of temporal domains. Thus, formal deadlines were stated through the timelines description included in Trello,[13] an off-the-shelf web-based project management application. ASP additionally introduced a temporal domain to the writing of code, helping members to manage urgency by delivering a "finished" innovation product that – even if not arguably complete – was visible and testable by the broader public. Collectively, these tools provided a soft but persistent pressure in favour of including urgency considerations in decision-making. In PM's words,

> *"The group works to our deadlines, that's just what it is expected from everyone – they have to, we have deadlines and if we don't meet them, there had better be a good reason. . ."* (PM)

[11] A thematic area refers to the target space within which team members are broadly expected to search. For example (but not limited to the following), HighTec's innovation existed within the fashion space, and was dominantly targeted towards the online retail sector. The definition of thematic areas goes together with the definition of thematic limits that delimitate the 'non-go' areas.

[12] Team members often referred to 'the three words that represent our vision', 'the three words (that) are thought of as our vision' and alike. We refer to those as the 'vision words' (our term). For purposes of maintaining anonymity, the researchers have not been permitted to use the exact wording of the motto or the 3 vision words as it is prominently displayed in the group's website. The terminology we report was agreed with the case participants as being appropriately close and identical in meaning.

[13] https://www.trello.com/.

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PD acknowledged that HighTec management was flexible if members had pressing, justified reasons for unmet deadlines. PM acknowledged the same, when conceding that the project's timescales set by Trello and ASP sometimes were subject to change:

> *" (The) timeline is something we stick to but if something big happens we have to bring it forward or push it back, it just depends on what happens – to some extent there has to be the flexibility. . . but that doesn't mean the emphasis isn't there, I mean the whole team has to work towards meeting them. . ."* (PM)

The frequent reference to the motto and vision words further emphasised the need for team members to be flexible and willing to manage uncertainty. Even if the thematic area of HighTec was initially broadly envisaged by MK, it was progressively fine-tuned through contributions from the rest of the team. At the same time, however, PM and TM emphasised that the project's objective was to take advantage of the opportunities provided by one specific functionality for roll-out as soon as possible. PM and TM established thematic limits that demarcated the 'non-go' areas. PM and TM insisted that all idea generations from HighTec members should be restricted to software programming within the retail space and referred to some specific classes of garments. Trello further contributed to focusing members on the targeted thematic area by stopping them straying beyond the tasks related to that area. In TM's words,

> *"Look, we have a pretty broad area we can work in. . . . but we make it clear that we can't go off dreaming, we have to talk about things within the retail software program space. . ."* (TM)

TM explained that the team could not afford to waste "thinking time" looking at unrelated or peripheral areas. This was particularly relevant given the risk of thematic deviations induced by team members' enthusiastic personal interests that might detract motivation to work in HighTec's innovation space. For example, SP 3 explained that in earlier stages he made suggestions that he thought were sound and valuable for the project development. These ideas were summarily dismissed by TM in consultation with PM, given that they lay beyond the thematic limits of the software functionality required to beta test the software online. Looking back on these instances, SP3 reflected:

> *"(Some) people within HighTec thought that we needed more features, such as saving (your choices) for later, having a collection, having favourites, which I think that could happen in the future . . .. Whenever you build anything online, you should just focus on a very minimal set of features you need and then start getting feedback straight away."*(SP3)

To summarise, the formal MCS presented in this subsection gravitate around three emergent themes: first, management of urgency, which underlies the strong work ethos embedded in the motto and vision words as well as the temporal domains provided by Trello deadlines and ASP; second, the management of uncertainty is an overarching theme behind the consideration of flexibility in coming up with the vision words and in setting up thematic limits, as well as in the use of Trello and ASP; and finally, motivation, which surfaces through the maintenance of intrinsic inspiration as well as the minimization of the risk of self-interest-driven thematic deviations. The control tools and their connections with these three emergent themes are depicted in Fig. 1.

4.4. Planning and implementation

PM, TM and MK developed a chain of planned tasks from identifying the innovation core idea to setting down steps for potential venture capital interest. They populated the expected timelines into Trello, which helped schedule and align HighTec tasks in a synchronized manner. As the project advanced, team members would record in Trello that they had completed an allotted task. The Trello charts were visible to all team members via a cloud server, and team members received a notification when a completed task had been added. Trello allowed team members to observe the advancement of the whole project and the progress made by the team members on the specific tasks. Nevertheless, Trello would not have any indication of the effort or input time actually taken to achieve the same.[14]

The Trello timelines and boards were used to virtually discuss the implications of the activity progress and outputs of team members for the tasks ahead. In particular, PM found that the feedback provided by Trello provided valuable leading indicators on interactions between HighTec members. Through this exchange-driven feedback, team members could tell whether other members were falling behind and this allowed them to pick up their slack if skillsets required to conduct the task were aligned. If they were not, and only one individual could perform a task, then PM might reflect on the possibility of varying the timeline. Where a member did not complete a task on time, this activated conversations between PM and the relevant team member to identify a workable variation to the activity timeline. While Trello boards provided an electronic means to engage in such exchanges, PD conceded that it was better effected when members met face-to-face, and harder to effect when done virtually:

> *" [Trello Boards] provide[d] a platform for [team members] to express their concerns and then an opportunity for everyone to throw around ideas . . . there was an opportunity for people to stick their hand up and say, have you thought about doing it like this or do you need me to assist you with this. (. . ..) It was harder to do once we'd moved away from those [initial fortnightly] meetings."* (PD)

Thus, through timeline planning and synchronisation, self-reporting of progress, observation of other team members' activities and exchange-driven feedback, Trello helped to coordinate and integrate knowledge in HighTec. In addition, timeline planning through Trello allowed HighTec to schedule tasks in a time-efficient manner.[15] The competing professional and personal constraints of team members occasionally involved re-scheduling and re-synchronisation. According to PD,

> *"There were a number of occasions where other people had work commitments or something like that and the milestones (were moved) a little bit. I think that TM and PM understood that other people do have those other commitments and were . . .. flexible, when they needed to be bent a little bit."* (PD)

As there was an implicit understanding that team members possessed an intention to contribute to the project, they would only receive contact from PM and TM if Trello reported a marked slow-down in task completion. Even then, the purpose of any conversation was to understand the reasons for the slow progress rather than to censure or to evaluate team members. Trello was neither used as a basis for a reward system in case of satisfactory progress. In PM's words:

> *"So we've got controls but even till today, we just don't necessarily see them as controls because there's trust, if that makes sense. So they are controls, (Trello timelines) are subtle motivators to do the*

[14] The Trello version that HighTech was using at the time of our field research did not allow for the recording of time spent by staff on the stages of the project. Later versions of Trello incorporate this feature.

[15] For software programming, ASP was in addition largely instrumental in ensuring time-efficient development through design speed.

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*right thing, because you've got your name assigned to a task. You could easily not do it, no one's going to tell you anything, you could easily not do it but you're going to do it just because the team is relying on you and you don't want to f#*k up your own company."* (PM)

Team members attributed motivation to the visibility that Trello provided. Team members were motivated not only by making one's own progress visible, but also by observing other's engagement. As illustrated by SI:

"It's actually great to also to . . . seeing what MK was up to as well. . . he was writing up contracts, doing presentations for companies and stuff, so gets me more motivated as well to see that, you know. He's doing stuff in the background that's not software related but business related. This is gonna help out so it's good that way." (SI)

Separate to the Trello management software, each of the team members was asked to complete a Google timesheet document to self-report the time spent in HighTec. This could be accessed real-time by any other team member. The Google timesheets did not incorporate any planning of expected or required individual effort. The data from Google timesheets fed into the effort-based incentive system and therefore eventually determined the individuals' equity share in the project. The compensation package was thus based on a single self-reported input metric for which there were no pre-set targets. Other systems contained pre-set targets for processes and outputs (e.g. deadlines for tasks, deliverables) but none of these was used as a basis for compensation. As explained by TM:

". . .the timesheet is more of an overall reflection of time. . . just time – how many hours from an equity perspective, you know, there's a lot of trust in that. So if you put more hours in, you get more." (PM)

During our field research, we noted the absence of internal controls to check the reliability of the self-reported time devoted to the project. Yet, we did not observe fears of self-reporting biases. When asked whether there was concern over peers gaming the system, team members repeatedly stated their belief that other team members were playing fair in reporting their hours. They blithely assumed that other team members were trustworthy. On several occasions HighTec members stated they were willing to risk dilution of their own equity, given their expectation that other team members were as good as their word. Thus, while PD, SP3 and SP4 had voiced disagreements when the equity-share compensation system was designed, we did not observe any concerns regarding the accuracy of the data fed into the compensation system from the self-reported Google time-sheet documents. For instance, SP4 claimed his familiarity with team members allowed him to believe their claims for the hours put in:

"I think other ways are more complicated and maybe hard to track. I worked with most of the guys before, I know how they work and I trust them. So if they say they did five hours, then I know what five hours of their work were. I'm happy with it and I don't have a problem with it." (SP4)

TM explained how team members were willing to openly share the time they devoted to their work and the manner in which they were completing their tasks, without wondering if another might use that information against them. TM and SI attributed the workability of Google timesheets and Trello to trust among team members:

"Everyone gets access and sees what everyone else is doing and that only works if you've got that trust, I trust that I can show you exactly what I'm doing, how I'm working and how long I'm doing stuff. I think if there was not that trust, those tools probably would not have been used. (. . ..) So if it was different (no trust), you'd think I'll do it how I do it, I don't really want them to know how I do it. . . and then I tell them how much, how long it took me, even though it might not have taken me that long. . . Yeah, (if there is trust) you worry about just the actual thing you have to do rather than anything else that might happen, you know what I mean?" (TM)

". . .. We trust each other. Because we know each other so well, it isn't a big issue really. (SI)

Google timesheet documents were rarely used to question the efforts of other members or to mobilise explanations for their efforts. Yet, and despite the absence of quantified pre-set time commitments, the calls to frequently report actual time devoted increased team members' awareness that time spent on the project was crucial for meeting deadlines. PM encouraged members to immediately record the time they had spent as they completed each task. He would contact team members whenever he noted that, towards the end of any activity, they had not filled in the timesheets. In those cases, team members would often review the Trello charts to estimate their past efforts:

'Yeah, we did (remind employees). I mean it mattered more toward the end (of a task), I think that's where people would go back and check Trello, and say "I did this, I did this.' (PM)

Hence, Google timesheet documents reminded team members that their time commitment was closely linked to the need to finish the project quickly. These reminders were crucial as the project was an after-work venture for some of the team members. As SP4 and PD stated:

'I've got a full-time job, a young baby as well. So I really don't have many hours to spare during the week. So that was difficult on that side of things.' (SP4)

"(As some of us) do this on the side, while working full time . . .,the system gets us doing more." (PD)

During the 13 months of our field research, PM regularly held fortnightly face-to-face meetings with TM. In these meetings, they used or cross-referenced information from Trello, ASP and Google timesheets to keep track of the project progress and to assess new action plans. The assessment of the project progress and action plans over fortnightly periods resulted in an iterative feedback from PM and TM to the group as a whole as well as to individual team members. For example, in alluding to his ability to support his programmers, TM stated:

". . . [Google timesheets] is also a good prompt to say hey you've been working a lot on it, are you having trouble with it [lack of Trello progress], or do you want us to help?. . ." (TM)

PD emphasized the role of email technologies regarding this feedback:

"*Generally what happens is that feedback would be presented to the group via an email, I suppose. Then everyone had a chance to comment on it, if they felt for or against it or had anything else to add, Where I might have wanted to say, are we able to put in this feature, then I wouldn't spend my time trying to work that out. I'd merely just put the ideas to them and see what the feedback is.*" (PD)

The timeline planning and contents of subsequent activities were altered if feedback from PM and TM meetings required it. This temporal flexibility minimised the risk of commitment to certain courses of action merely based on the efforts previously devoted and helped deal with the inherent uncertainty of the project. Iterative feedback was also used to decide whether to hold the project

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on course or shift direction, although PM stressed that cancellation of the project was not an option.

Feedback from PM and TM meetings based on Trello and Google timesheets was provided as an information input for team members to take action rather than for evaluating individual team members' hours spent, progress or outputs. Even so, PM expected the combined use of Trello and Google timesheet documents would pick up any signs of flagging commitment by team members or untrustworthiness should such issues arise. Potential symptoms of such depletion would be detected through low time records as reported in the Google timesheets combined with missed deadlines and targets as captured by Trello:

> *"So, a developer canít say (he has done) 12 hours of work and when we check Trello he has only done two cards (laughs). Something hasn't been updated?"*(PM)

Yet, we did not actually observe such symptoms of depletion in our field study. Even in the absence of those symptoms, the information provided by Trello and Google timesheet documents allowed team members to mutually validate trustworthiness and to uphold their pre-existing inter-personal trust. This feature was highly valued by the team members. In TM's words:

> *"It's not like we think the other guys are going to do wrong by us. It's just that the systems like the timesheet documents and Trello are there to give you comfort that you can check if you have to, even if you don't expect to. It's just great to know it's there in the event it's needed, though it's rare that we actually think that way."* (TM)

Further, the information from Trello and Google timesheets was used in HighTec as a bridge through which potential 'difficult' conversations could be had without getting into affective conflict, and hence contributed to uphold trust:

> *"Sometimes . . .we don't want to say the hard thing, to do the difficult thing and offend anyone. The systems we have help us to maintain our trust, because it's not personal, you know – it's just the hours are what they are, and I'm asking you questions about how you might need help or need to do more, if your hours are lower than expected. Not because I don't trust you but the system actually allows me to have that conversation without offending someone else".* (TM)

Team members also alluded to the use of financial forecasts and their analysis using Google Analytics applications. These forecasts were first constructed in the 6–7 month mark of the 13 month period of observation and updated as the project progressed. A first, second and third year financial forecast provided reasonably detailed annual projections of revenues, operating expenditures (salaries, office and sales & marketing expenditures) on a year-by-year basis, including expected capital expenditure, profitability and cash flow. PM specifically explained the use of scenario analysis, identifying best-case and worst-case scenarios for future periods. Financial forecasts shaped operational decisions on how the innovation was structured and focused software implementation towards areas that were seen as more profitable. For example, the focus of ASP was narrowed to programming areas where it was perceived that customer profitability would be greater via higher sales volume (i.e. focusing on the enhancement of the "female online shopping experience" referred to by PD). Financial forecasts provided team members with a quantified picture of the expected financial outcomes of the project under different scenarios. This reaffirmed the financial feasibility of the project as well as the likely future rewards arising from the realisation of their equity stakes. For some team members, financial forecasts engendered "peace of mind" as they instilled a confidence that the probability of financial success relating to the innovation was high and that the financial results would not be below the worst-case scenario. Other team members highlighted the motivational force of financial forecasts as they provided an exciting credible picture of a 'bright future' that invited engagement. As TM would recall,

> *". . . (financial forecasts) add to the motivation because you believe there's actually a solid business model behind it. . . we're not just building something for the hell of it. . . .. I think they were generally surprised there was that much, you know, T-shirts being sold, that many people buying, if you take that small a percentage of the market the income . . . so I think it (the financial forecast) had everyone excited. But you know there were some criticisms as well. For some of it, it was good because you needed that tension in the team to go. . . are you dreaming?, can we really get that much? It was really good . . . Not everyone got involved in discussing it. Some of the guys like SP4 and SP2 would work on something (else) but the other guys were pretty interested in the business model. . ."* (TM)

In sum, coordination and knowledge integration emerges as a common pattern behind timeline planning, the self-reporting of progress, the observation of other team members' activities and the exchange-driven feedback that Trello provides as well as behind the iterative feedback resulting from PM and TM fortnightly meetings. Additionally, the three emergent themes previously mentioned also surfaced when examining planning and implementation issues at HighTec (see Fig. 1). The time-efficient scheduling brought in by Trello, the emphasis in the reporting of time devoted through Google timesheets and the design speed that ASP allows relate to management of urgency. Management of uncertainty emerges as a common theme behind the flexibility to reschedule in Trello, the consideration given to temporal flexibility in the fortnightly meetings between PM and TM and the use of scenario analysis in the financial forecasts. Finally, the package of formal MCS has a strong motivation component as a result of the visibility of progress that Trello entails, the key input for compensation schemes provided by Google timesheets provide and the 'exciting and credible' picture of the future represented in the financial forecasts.

The adoption and workability of formal MCS for planning and implementation purposes was made possible by the high levels of inter-personal trust in HighTec. This enabling of formal MCS by trust will be further elaborated upon in the Discussion section.

4.5. Adaptation and responsiveness

In the initial fortnightly face-to-face meetings between all team members as well as in subsequent electronic meetings and conferencing, we observed discussions among team members on the threat of new market entrants, the technological evolution of software to ensure swift delivery to a live website or changes in customers' tastes and demands on visual interfaces. In the cross-functional context of HighTec, these key issues were tackled taking advantage of the many perspectives to hand. Information from Trello, Google timesheet documents, ASP and financial forecasts was often brought into these discussions. This elucidated an active strategic information exchange between team members from different backgrounds, triggering coordinated adaptive responses. For example, TM reflected on how HighTec members had relied on ASP, Trello and financial forecasts to discuss the expansion of the software reach beyond portals like eBay to individual online sellers and websites:

> *"From an architectural point of view, the good thing with software is that you can change architecture with something if it doesn't work. . . One thing we did, we tested it against eBay buyers and sellers. . . we had a few wins but not enough to make enough profit,*

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then we pivoted it to move to online sellers, online sites, and so we changed the business model to accommodate that." (TM)

Owing to PM's and MK's concern over changes in market conditions or competitors' moves, HighTec's management focused team members' attention primarily on time-based metrics with the intention of letting opportunities for adaptive responses emerge as soon as possible and securing first-mover advantage. This focus on time management constituted a continual "call to arms" to maintain a sense of urgency, pushing for re-doubled efforts and prioritizing the project over other commitments. Discussions on Trello and Google timesheets in face-to-face- as well as in electronic meetings reminded project members of the importance of members "walking the second mile" when their team mates had to temporally juggle with competing priorities.

The high uncertainty in the HighTec business required the team to consider possible re-directions of the thematic areas of the project. PM and TM created scenarios of competitor duplication or software failure at key moments of the testing phase. In their fortnightly meetings, they would put forward ideas for strategic renewal if circumstances warranted. From the early stages of HighTec, PM and TM emphasised the importance of ASP in facilitating the compromise between time to market and the responsiveness to changing requirements. The purpose of the focus on ASP was to engage team members with the 'big picture' and the strategically important aspects of the software first, without getting bound up in micro changes. Finer functional points of software design might be modified at later, less critical junctures. According to TM and SP4:

"...(ASP) is really about ... get(ting) a product up and running really quick... It doesn't require you to have a lot of detail up front (...) What (ASP) does, it says now here's some very high level requirements. It's built and set up in a way that (....) you can't change the technical architecture at a high level but you can change small bits of it. But it's really good for changing requirements. In our case, we weren't able to write a detailed requirement because we were really finding our way through as we built it." (TM)

" *(build a website) very minimal with very good design.... we're focused on that, just clean design, good interaction and very minimal set of features"* (SP4)

In later stages of the project, TM would still praise the ability of ASP to speed up software design and its flexibility to change functionalities. However, he would also acknowledge that HighTec could have adopted ASP in a manner that aligned with a stronger commercial focus in their development of the software:

"The product in itself is a great product that we have built. It just hasn't been focused around the buyer, and commercialisation ...We probably could have got it in front of customers a little earlier, it is probably a mistake, we tried to build the best product, there is this saying, you should be ashamed of your first release... we wanted it to be more perfect" (TM)

Overall, we observed that PM and TM's fortnightly meetings, other electronic and face-to-face meetings and the use of ASP were crucial in ensuring the adaptation and responsiveness of HighTec. The formal MCS presented in this subsection gravitate around three emergent themes (Fig. 1): first, coordination and knowledge integration underlies the iterative feedback resulting from PM and TM fortnightly meetings as well as the information sharing and exchange that took place in the face-to-face and electronic meetings; second, management of urgency surfaces in the 'call to arms' and prioritization conveyed in the face-to-face and electronic meetings. Finally, management of uncertainty is a common pattern behind the discussions on strategic renewal in PM and TM fortnightly meetings and the use of ASP, which allows for tying off of less relevant developments, and instead focusing on new areas with changing requirements.

5. Discussion

The way operations were structured in HighTec caused team members to engage in highly interdependent tasks even if they were geographically and temporally dispersed. Communications among team members in carrying out the project were mainly through electronic means. Hence, HighTec epitomizes small, early-stage NPD teams with a high degree of virtuality (Bell and Kozlowski, 2002; Hertel et al., 2005; OíLeary and Cummings, 2007; Martins et al., 2004; Schweitzer and Duxbury, 2010). Its degree of virtuality tended to grow over the period of our field research as the relation of face-to-face to electronically mediated communication shrank over time. While we did not purposely explore the role of informal social systems, the data gathered during our field research did not provide evidence suggesting that direct observation, unplanned personal interaction or socialization played a major role in HighTec. This is consistent with prior theory characterising informal social controls as being hard to effectively operate when a majority of the work is done separately and remotely (Jarvenpaa et al., 1998 and Putnam, 2001). Nevertheless, HighTec presented high levels of reciprocal inter-personal trust, as signalled by direct references to it by team members as well as by their expressions of reciprocated care and concern, dependability on other team members, and of their willingness to make them themselves vulnerable to other members' actions (Bachmann and Zaheer, 2006; Rousseau et al., 1998; Simons, 2002). Inter-personal trust considerations drove selection procedures by which the team was staffed with members who were mostly familiar with one another, and all were personally acquainted with PM or TM. These selection procedures facilitated the presence of inter-personal trust from the outset. Interviews conducted throughout the project indicated that inter-personal trust was maintained through the project interactions and we found no evidence of it weakening over the 13 months that our field research lasted.

As summarized in Fig. 1, we observed evidence of a suite of formal MCS being used at HighTec. Of the four emergent themes around which formal MCS gravitate, three (i.e. coordination and knowledge integration, management of urgency, management of uncertainty) can be linked with the decision-facilitating role of MCS, and the fourth (i.e. motivation) relates to the decision influencing role. These links are depicted at the top of Table 1. We theoretically justify these links in the forthcoming two subsections, where we further discuss our findings as guided by the distinction between these two roles. This is followed by a discussion of the trust-control nexus in HighTec also informed by this distinction.

5.1. The decision-facilitating role of formal control systems in HighTec

In HighTec, formal MCS provided team members with timely and relevant *ex ante* information regarding issues related to coordination and knowledge integration, management of urgency and management of uncertainty (Fig. 1). Formal MCS provided a context for oneís own activity (Dabbish and Kraut, 2008; Geister et al., 2006) and contributed to the integration of knowledge among team members with multiple sources of expertise (Tidd and Bessant, 2009; Zahra et al., 2007). They made synchronization of activities and proper sequencing of interdependent tasks possible. The information content from formal MCS often gave rise to conversations between team members to note if they needed support. MCS were used to reduce pre-decision uncertainty and improve

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Table 1
The trust/control nexus in HighTec.

	Decision-facilitating role of MCS *(Coordination and Knowledge Integration, Management of Urgency, Management of Uncertainty)*	Decision-influencing role of MCS *(Motivation)*
Effects of MCS on trust		• MCS detect symptoms of depletion of trustworthiness • MCS validate trustworthiness/uphold trust
Effects of trust on MCS	• Inter-personal trust enables MCS adoption and workability	

Synergies between trust and MCS (effects on VT outcomes)	• Inter-personal trust helps deploy informational effects of MCS on quality of action choices by:
	  • creating perception of reliability of (often self-reported) data, which avoids delays [*mgmt. of urgency*] and distorted estimates [*coord. & knowl. integr.; mgmt. of uncertainty*]
	  • facilitating open exchange, management of difficult conversations and conflict resolution [*coord. & knowl. integr.; mgmt. of uncertainty*].
		• Inter-personal trust helps deploy motivational effects of MCS on behavioural congruence (perception of reliability of self-reported data used in incentive system)
		• MCS helps deploy the motivational effects of inter-personal trust on behavioural congruence (less distraction in translation of willingness into actual behaviour).

VT action choices with the aim of, eventually, enhancing VT effectiveness. Thus, the way formal MCS were used in HighTec to deal with the aforesaid three emerging themes was closely related to the decision-facilitating role described in prior theory.

Even if prior accounting literature has paid little attention to VTs, it has separately stressed the importance of the decision-facilitating role of MCS both in settings where tasks are interdependent (e.g. Bouwens and Abernethy, 2000; Gerdin, 2005) and in dispersed organisational arrangements (e.g. Boyns and Edwards, 1997; Busco et al., 2008; Quattrone and Hopper, 2005). Both features are combined in VTs and, on these grounds, it is reasonable to expect MCS to play a decision-facilitating role of MCS in HighTec. Nevertheless, whether extant theory applies in the particular case of VTs where high inter-personal trust is present is open to debate. Prior VT and accounting literature has not explored either whether or how the implications of the decision-facilitating role of MCS on VT effectiveness are shaped differently in virtual settings where trust is present. Abernethy and Vagnoni (2004) and Sprinkle and Williamson (2007) have highlighted the importance of the decision-facilitating role of MCS without considering virtuality or trust. Velez et al. (2008) and other IOR studies have examined the decision-facilitating role of MCS considering trust outside VTs. In Bell and Kozlowski (2002) and Gallivan (2001)'s examinations of control systems in virtual settings, inter-personal trust is absent. Jarvenpaa and Leidner (1999) and Piccoli and Ives (2003) provide insights on the effects of control in virtual settings where trust is present but have paid little attention to the outcomes of the different roles of MCS. Our field research in HighTec adds to this earlier literature by providing evidence about the extent to which formal MCS play a decision-facilitating role in a VT where inter-personal trust is present.

Autonomy coupled with exclusive reliance on electronic communication and little face-to-face interaction would likely result in poor action choices by team members (Powell et al., 2004). Yet, HighTec needed to manage its highly interdependent tasks in a context of team member dispersion. Even if inter-personal trust was present in HighTec, the facilitation of decision-making could not rely on it, since inter-personal trust did not yield sufficient informational content to effectively identify and assess alternatives and drive better-informed and improved action choices. Through their decision-facilitating role, formal MCS prominently provided the informational effects that assisted in decision-making around co-ordination and knowledge integration, management of urgency and management of uncertainty. The unorthodox work arrangements employed in HighTec further explain this prominence. In an uncertain context where time to market was a critical success factor and the project was a 'second job' for some members, staff time was a critical scarce resource to optimize and flexibility became a requirement. Overall, our findings are consistent with prior literature emphasizing the importance of the decision-facilitating role of formal MCS (Abernethy and Vagnoni, 2004; Sprinkle and Williamson, 2007) and the limited studies that examine the consequences of the use of control systems in virtual settings (Gallivan, 2001; Hertel et al., 2005; Piccoli and Ives, 2003). We add to this literature by providing evidence of an extensive decision-facilitating role of formal MCS in a VT where inter-personal trust is present. The combination of highly interdependent tasks and dispersion appears to make the decision-facilitating role particularly prominent in that virtual setting.

This prominent decision-facilitating role of formal MCS in HighTec manifested despite the communication difficulties often experienced by VTs (e.g. absence of context, limited transfer of information) (Majchrzak et al., 2000; Powell et al., 2004; Stevenson and McGrath, 2004). The informational effects brought in by formal MCS and the deployment of their decision-facilitating role helped HighTec to overcome some of these difficulties. Inter-personal trust was crucial in enabling and effectively deploying the decision-facilitating role of formal MCS. This aspect of inter-personal trust is discussed in a later subsection.

5.2. The decision-influencing role of formal control systems in HighTec

In HighTec, congruent behaviours largely stemmed from intrinsic motivation and inter-personal trust. In particular, the motivational effects of reciprocal inter-personal trust boosted the levels of voluntary compliance, raised HighTec team members' commitment to organisational goals and the willingness of team members to exhibit extra-role behaviours (Long and Sitkin, 2006) with the expectation that other team members would also be willing to behave in an aligned, non-opportunistic manner.

A number of instances evidenced uses of formal MCS in HighTec that also involved motivational effects promoting goal congruence (right column Fig. 1). These motivational effects relate to the decision-influencing role of MCS. Prior literature has emphasized the importance of the decision-influencing role of MCS (Abernethy and Vagnoni, 2004; Sprinkle and Williamson, 2007) but most of these studies have not considered virtuality or trust. Studies that have investigated the use of control systems in virtual settings have examined settings where trust was absent (e.g. Gallivan, 2001) or have not examined the outcomes of the decision-influencing role (e.g. Hertel et al., 2005; Jarvenpaa and Leidner, 1999 and Piccoli and Ives, 2003). In our case setting, we found some evidence of

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beneficial implications of the decision-influencing role in a VT where inter-personal trust is present.

The most salient evidence in this regard was the equity-share effort-based incentive system. This incentive system motivated team members to align self-interest and organisational goals. Yet, it was not aimed to increase the level of effort as this was assumed to be intrinsically-driven. The decision-influencing role of formal MCS in HighTec extended to the maintenance of intrinsic inspiration, time pressure, and the minimization of self-interest driven thematic deviations. Owing to dispersion, some HighTec team members might be potentially exposed at some point to the risk of losing sight of HighTec's interests, especially when faced with alternative priorities set by their other outside bosses in closer physical proximity. Hence, the motto and vision words reinforced the already existing intrinsic inspiration and goal congruence and helped ensure they did not wane. Additionally, thematic limits and Trello helped focus HighTec members' work notwithstanding their other employment constraints and interests. These reminders helped minimize the risk of self-interest driven thematic deviations. Furthermore, we observed a number of instances in which the decision-facilitating role of formal MCS had other side effects involving motivational issues, suggesting that it was largely intertwined with the decision-influencing role. For example, the visibility of other team members' progress provided by Trello not only helped coordinate activities but also simultaneously induced motivation from observing others' intense engagement. Similarly, financial forecasts facilitated decision-making around uncertainty but this was also inextricably linked to a motivational effect as the credible picture provided by them instilled excitement and confidence in the future.

Overall, we observed a considerable, though lesser, decision-influencing role of formal MCS, adding its motivational effects to those derived from interpersonal trust. However, the more evaluative aspects of the decision-influencing role of MCS as described in prior theory (Baiman and Demski, 1980; Sprinkle and Williamson, 2007) were not observed in our case setting. Thus, for example, Trello was not perceived as a means for mutual monitoring of process and output performance in the event of variances. Similarly, projected financial scenarios were not used for ex-post budgetary control, evidencing the motivational, non-evaluative nature of their decision-influencing role. This non-evaluative nature further illustrates how the decision-facilitating and the decision-influencing role of MCS were intertwined in HighTec.

The activation of the decision-influencing role of MCS in HighTec required overcoming the communication and organisational difficulties often experienced by VTs (Majchrzak et al., 2000; Powell et al., 2004). In the next section, we discuss how inter-personal trust helped in that regard.

5.3. The trust-control nexus in HighTec

We now turn to the analysis of the multiple ways in which the complex interplay between inter-personal trust and formal MCS took place in HighTec. We will first note that formal MCS validates and upholds inter-personal trust amongst team members. We then proceed to discuss how inter-personal trust simultaneously enables the adoption and workability of formal MCS. Finally, we will analyse how the combination of formal MCS and inter-personal trust yields synergetic benefits that go beyond how trust and formal MCS might separately affect VT outcomes. We elaborate on these forms of interplay, distinguishing between the decision-facilitating and the decision-influencing roles of formal MCS (see Table 1 for a summary).

5.3.1. MCS effects on inter-personal trust

At HighTec, we did not observe any indication of formal MCS damaging inter-personal trust, in contrast to what is suggested by Das and Teng (1998) and Malhotra and Murnighan (2002). We did not observe evidence either indicating that the decision-facilitating role of MCS entails the creation of further inter-personal trust or the maintenance of its pre-existing high levels (Velez et al., 2008). Still, and contrary to prior accounting theory on IOR (e.g. Das and Teng, 1998; Tomkins, 2001 and Velez et al., 2008) and some VT studies (e.g. Piccoli and Ives, 2003), at HighTec we found that the decision-influencing role of formal MCS had beneficial consequences for inter-personal trust. Despite trust-building not being a major concern at HighTec, there was a risk that established inter-personal trust would gradually fade without collocated social interaction (Baskerville and Nandhakumar, 2007). Thus, it was crucial for HighTec members to be reassured that, if there were symptoms of the willingness to take part in the project being depleted and of inter-personal trust waning, these would be signalled by the formal MCS. In a virtual setting, the evidence of trustworthiness cannot stem from experience gained through direct interaction or from directly observing others' behaviour. At HighTec, the input information captured in the timesheet-Google documents and the extent to which the Trello output targets were achieved would help show such symptoms.

Furthermore, even if there were no such symptoms, Trello and the timesheet Google documents played an important function in signalling that trustworthiness could be validated at any time, thus helping uphold the initial high levels of trust. This validation was not operated on an exception basis only when deviations were detected. It was not operated on a permanent, continuous basis either. In this virtual setting, what mattered was the peace of mind given by the certainty that feedback was immediately available if and at any time one wanted to access it. Occasionally, HighTec's highly interdependent but isolated member teams operating at a distance wanted or felt the need to seek reassurance that peers "were really there (in the virtual space)", obtaining confirmatory evidence of their commitment to the project. Thus, Trello and timesheet Google documents helped uphold the pre-existing high inter-personal trust among VT members. The ability to detect possible symptoms of waning trust as well as the validation and upholding of trust were not perceived by HighTec team members as interfering. Rather, they were welcome and highly valued as mutually reassuring tools for setting one's mind at rest that everyone was on board in the collective endeavour despite the geographical dispersion. These findings are consistent with prior research outside the accounting literature indicating that thorough feedback (i.e. regular, timely feedback, involving perspicacious evaluation) on the contributions of other VT members is essential for developing and maintaining inter-personal trust (Hertel et al., 2005; Jarvenpaa and Leidner, 1999).

5.3.2. Inter-personal trust effects on MCS

Our findings indicate that in addition to formal MCS supporting inter-personal trust, trust enabled the adoption and workability of formal MCS in HighTec notwithstanding team member dispersion. In the absence of inter-personal trust, many of HighTec's formal MCS might have been considered incomplete or sub-optimal in a virtual setting. As perceived by the team members, if inter-personal trust had not been there, the communication difficulties associated with virtuality would have made the adoption of the suite of MCS at HighTec impractical. The very premise upon which these controls were put to work was conditional on a high trust environment. In the unlikely case of adoption, if non-collocated members had low trust in one another, there would likely be suspicions of, for example, gaming around the recording of Google timesheets which would make difficult its subsequent use for decision-facilitating or

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decision-influencing purposes. As the incentive system was largely based on self-reporting, the idea that peers were trustworthy was a key driver for this possibly flawed method to be workable without tension or stress between team members, leading to its adoption and subsequent use in HighTec. The trust between members enabled the workability of an incomplete and potentially sub-optimal system that had potential to create disunity within the group.

It was precisely because inter-personal trust was present that PM and TM considered the adoption of those formal MCS and team members found them workable. This role of inter-personal trust as an enabler for MCS use in virtual setting has seldom been explored in prior literature. Our case study shows how formal MCS that might well be incomplete or sub-optimal in the absence of inter-personal trust, were considered for adoption and made workable by its presence. Thus, we found that inter-personal trust shaped and expanded the set of control alternatives available in our VT.

5.3.3. Synergies between MCS and inter-personal trust

The prior two sections explain how inter-personal trust and formal MCS shaped each other in HighTec. We observed an additional form of interplay between trust and formal MCS as, over and above their separate, individual effects on VT outcomes, trust and formal MCS combined to yield synergetic benefits that enhanced these effects. At HighTec, inter-personal trust aided the intensity of deployment of the informational effects associated with the decision-facilitating role of formal MCS. This happened through two channels. First, high reciprocal inter-personal trust translated into a perception of reliability of the data that was fed into the control systems. This perception avoided suspicions of slack and eliminated the need for double-checks and the confirmation of the self-reported data. Thus, the identification and assessment of alternative actions by decision-makers in the HighTec virtual environment was less prone to delays, which helped manage urgency. This also, to a lesser extent, made coordination easier. As team members were less likely to produce distorted estimates, the MCS applied facilitated coordination and knowledge integration, as well as the management of uncertainty. Second, reciprocal inter-personal trust at HighTec fostered the open exchange of information, mutual forbearance, a higher ability to engage in difficult conversations and a willingness to resolve conflicts. This further assisted in coordinating and managing uncertainty (see Table 1 for a summary of the most salient implications). Building on those two channels stemming from trust, formal MCS were better equipped to deploy their informational effects and improve the quality of action choices in HighTec. Hence, our findings adapt and extend Das and Teng (1998)'s proposition to suggest that the high level of inter-personal trust in VTs makes the decision-facilitating role of formal MCS more effective in actually improving action choices.

Regarding the decision-influencing role, and in line with Das and Teng (1998), we found that inter-personal trust was also instrumental in deploying the motivational effects of the incentive system in place. HighTec's equity-share effort-based incentive system was based on self-reported data. Consequently, its decision-influencing role was effective only if there was a high level of inter-personal trust whereby all team members believed that data fed into the timesheet Google documents was reliable, faithfully corresponded to actual effort and did not involve opportunistic reporting.

Finally, formal MCS were also needed for inter-personal trust to deploy its potential motivational effects. To the best of our knowledge, this aspect has not been developed in prior literature. Even if a high level of inter-personal trust was present at HighTec, the project faced the risk that this was not reflected in actual congruent behaviours as unintended distractions might wreak havoc despite the willingness and enthusiasm of team members. The risk of inter-personal trust not being actualized into congruent behaviours did not stem from an expectation that team members would seek to attain individual rents at the expense of the project team. It was rather a function of the unorthodox and flexible arrangements that existed for those team members who passionately did their HighTec work as a secondary job. When competing against other personal commitments (family, primary occupation, etc.), it was plausible that members might gradually lose track of the project requirements. Formal MCS (especially the time-based equity-sharing system and to a lesser extent, Trello) helped ensure that this potential waning of congruence in the team members' behaviours did not materialize.

6. Conclusions

This paper examines how formal MCS and trust interrelate in virtual settings (characterised by high task interdependence and employee dispersion), and the implications of this interrelationship for Virtual Team (VT) outcomes. Drawing upon our 13-month field observation of an application project within a software incubator, we found evidence of a widespread use of formal MCS in a new product development VT where inter-personal trust had been established from the project outset. In our case setting, we found a prominent decision-facilitating role of formal MCS that helped improve action choices. Under this role, formal MCS provided informational effects that inter-personal trust alone could not provide in a virtual setting. We also found evidence of a lesser decision-influencing role that promoted congruent behaviour. Used in a non-evaluative manner, the decision-influencing role of formal MCS provided motivational effects that accompanied those arising from inter-personal trust.

The analysis of our case study sheds new light on the trust-control nexus in VTs. While prior research has focused on the effects of control systems on trust (e.g. Das and Teng, 1998; Coletti et al., 2005; Velez et al., 2008), largely ignoring the influence of trust on control systems, this paper provides a richer picture that highlights the reciprocal nature of the influences between trust and formal MCS in a virtual setting. Thus, we show that in addition to formal MCS helping uphold inter-personal trust, trust enables the adoption and workability of incomplete and potentially sub-optimal formal MCS, hence expanding and shaping the set of control alternatives that are available to a VT.

Our findings also illustrate how, beyond inter-personal trust and formal MCS shaping each other in a virtual setting, they further interplay by combining in ways that enhance their separate implications for VT outcomes. While prior literature has hinted at the existence of synergistic effects between trust and control (Costa and Bjlsma-Frankema, 2007; Das and Teng, 1998), we extend prior theory by providing a rich empirical setting revealing synergies between inter-personal trust and formal MCS which span both the decision-facilitating and decision-influencing role of MCS. From the perspective of the decision-facilitating role, we find that inter-personal trust helps deploy the informational effects of MCS needed to better engage in coordination and knowledge integration, the management of urgency and the management of uncertainty. Related to the decision-influencing role, we find that inter-personal trust and formal MCS mutually reinforce their motivational effects.

We acknowledge several limitations to this study, which provide opportunities for future research. First, our focus is on the functioning of control systems within a specific VT, rather than on whether this VT is more effective than other VTs with other control configurations. Within the scope of our research, we were not able to assess the relative effectiveness of the VT under study. Second, the evidence presented in this paper is based on one example

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of a small, early-stage VT devoted to NPD. Further studies should be undertaken to examine the issues that arose in this study in other forms of virtual settings that differ in terms of size, life cycle or object of the activities. We also concede that the study locates within a project-centric setting. Future studies on these relationships may develop our contributions regarding functional or divisional settings. Finally, our case study does not delve into the dynamic aspects of the evolution over time of the roles and relevance of formal MCS (Tomkins, 2001; Velez et al., 2008). Even though case data were gathered over thirteen months, we observed much stability over this period. Observations over a longer period or across different life cycle stages could yield further insights concerning the dynamics and process-based aspects of MCS implementation in virtual settings. Despite these limitations, our findings shed light on how both inter-personal trust and formal MCS are crucial for VTs to effectively cope with the communicational and motivational challenges involved in the management of highly interdependent tasks in dispersed contexts.

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