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Team approach, idea generation, conflict and performance

Stephen Wood
School of Management, University of Leicester, Leicester, UK
George Michaelides
Division of Psychology, School of Social Sciences, Nottingham Trent University, Nottingham, UK, and
Chris Thomson
Business School, University of Hull, Hull, UK

Abstract

Purpose – The punctuated equilibrium model of group activity and the positive task conflict-performance relationship are prominent in the team literature; however, their respective underlying concepts, team approach and ideas-task complexity fit have been neglected. The first aim of the paper is to introduce these concepts, show how these underlie the two theories, and how they might be linked together in a novel way. The second aim is to illustrate the value of these ideas through the use of a case study of three teams working separately on an identical software engineering project.

Design/methodology/approach – The performance, conflict levels, approaches and ideas of three teams working on an identical software project are compared. The data were largely collected by observation of all the teams' meetings.

Findings – The findings show that the team approach and ideas-task complexity fit are significant in determining performance. It is also found that ideas emerge as frequently outside of conflict as in it and that the team's approach shapes conflict, not vice versa. Though the team with the most conflict performed best, it was differences in approach and the matching of the variety of ideas (not conflict) to task complexity that was important. Conflict in the teams reflected the approach, influencing its execution more than its development.

Practical implications – The research highlights the importance of initial meetings and the need to consider the team approach concept in teamwork training.

Originality/value – The paper re-emphasises the significance of Gersick's conception of team approach and the importance of the level of ideas fitting the complexity of the task, which is itself shaped by the approach; the case study makes a valuable contribution as it focuses on teams conducting an identical project for a single client.

Keywords Team working, Group work, Group dynamics, Complexity theory

Paper type Research paper

Tekleab *et al.* (2009) have recently reawakened our interest in Gersick's punctuated equilibrium model of team performance. They linked this to the more prominent literature following Jehn (1995, 1997) on how task conflict can have positive effects on a team's performance relationship. The argument is that successful groups will have

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conflict around the midpoint of any project on which they are working, when the punctuation in activity is assumed to take place.

Underlying Gersick's punctuated equilibrium model is the concept of team approach as the significance of midpoint activity for Gersick is precisely that it may precipitate a change in the team's approach. But this has not attracted the attention that either the midpoint of a teams' activity (Hall, 2007; Okhuysen and Waller, 2002) or its level of conflict has (e.g. Amason, 1996; Farh *et al.*, 2010; Greer *et al.*, 2008, Kankanhalli *et al.*, 2006-2007; Matsuo, 2006). In this paper we wish to redress this imbalance.

The thesis that the midpoint will be associated with more conflict, at least in successful teams, entails a set of assumptions that may not always hold. Moreover, an appreciation of the concept of team approach and other such ideas that underlie the punctuated equilibrium thesis and the positive task conflict performance may take one in different directions. It is these possibilities that we wish to explore in this paper and in so doing we will develop a set of ideas that are consistent with the underlying notions of these theses, but not with their argument that associate midpoints with transformations in the team's activities whose creation will entail conflict within the team. In particular, the underlying concepts that we build on are the "approach of the team" that underlies Gersick's (1988) application of punctuated equilibrium theory and the "ideas-task complexity fit" that is the foundation of Jehn's positive conflict-performance theory.

The paper has two aims. First to introduce these concepts, show how these underlie the two theories, and how they might be linked together in a novel way. Second, to illustrate the value of these ideas through the use of a case study of three teams working separately on an identical software engineering project. In so doing we hope to reinforce Tekleab *et al.*'s lead in bringing attention again to Gersick's work on teams.

During our initial analysis of this case material, which was focused on the conflict-performance theory and Tekleab *et al.*'s. (2009) linking of it to the punctuated equilibrium, we began to realise that the more fundamental concepts of team approach and the ideas-task complexity fit were more crucial for understanding the performance differentials between the two teams. Whilst the ordering of the team's performance of the teams positively correlated with their levels of conflict, as we shall show, this was not decisive in explaining the variation in performance. This suggests an over-concentration on conflict may be at the expense of the importance of the level of ideas and the team's approach. Equally, the recent emphasis on shared mental models and transactional memory systems (Crux *et al.*, 2006) and the more longstanding tradition of identifying team characteristics that make for effective performance (Campion *et al.*, 1993) needs supplementing with more exploration of the content of the approach and ideas that teams develop.

The theoretical argument

The approach and punctuated equilibrium theory

The concept of team approach is best applied to project teams, defined by Gersick (1988, p. 13) as groups "convened to develop a concrete piece of work, whose lives begin and end with the initiation and completion of special projects". Again, following Gersick (1988), we characterise a team approach as how a team tackles a project on three dimensions: context, task and internal interaction (relationships). The

distinctiveness of a team's approach reflects the way in which the three dimensions intertwine. Approaches are "frameworks of givens about [the group's] situation and how it will behave" that are established early in the life of a project team (Gersick, 1988, p. 17); the opening discussions in the group's first meeting are an especial important part of this process. They develop implicitly through the group's discussions and behaviour, though elements of a team's approach may be stated explicitly, either as it is being developed or after it has matured. The opening discussions of the Teams doing similar or the same task are likely to develop distinctive approaches, which structure the progression of their activities.

The concept of the approach can aid our understanding of "whatever groups [do] to make their products come out specifically the way they [do]" (Gersick, 1988, p. 12) in better ways than Tuckman's forming-norming-storming-performing theory of group development can, because of the latter's emphasis on processes and perhaps also a normative orientation (Seeger, 1983). Actions and conversations that create the substantive of the team's approach dominate the initial discussions, rather than the forming or norming in Tuckman's theory. Moreover, the approach differs from shared mental models that the team may develop as it will emerge both through decisions and behaviour and what is not said; the team's consciousness of it will itself be emergent and not necessarily uniformly understood at any one time or even at the completion of the project.

The team approach is associated with the concept of punctuated equilibrium as Gersick concludes from her observations of teams that they tend in the midpoint to reappraise and modify their approach. After the early formulation of the basic approach there follows, according to Gersick, a period of stability in the group's activities. Associating this period with inertial activity, Gersick then identified the need for groups to reappraise their activities at the midpoint of their life. Teams will break their momentum at this point and step back, take stock and re-commit, modify or even fundamentally change their pre-transition approach. There is thus a punctuated equilibrium in team activity. The implication in the emphasis that writers place on the midpoint is that teams that make the best use of their reappraisal at this time will outperform other teams.

The ideas-task complexity fit and task conflict

The ideas-task complexity fit refers to the importance for team performance of matching the variety and complexity of ideas to the level of the complexity of the task. Those teams that get this fit right should outperform those that do not. This principle is founded on Ashby's (1956) theory of requisite variety. According to which, the variety in a control system must be equal or larger than the variety of its perturbations for it to maintain stability. Transferring this to the teamwork context, the law of requisite variety states that the larger the variety of ideas the team can generate, the more complex the problems the team can effectively solve.

This theory underlies Jehn's positive conflict-performance theory (Jehn, 1995, 1997). The core assumption is that the generation of diverse ideas depends on conflict. Illustrative of the power of this assumption Farh *et al.* (2010, p. 1174) even interpret it as meaning that team members must be "motivated to engage in task conflict to generate ideas", which they consider are especially vital in at the early stage of a project.

On the basis of the association of conflict with idea generation, Jehn goes one stage further in applying Ashby's theory of requisite variety than the ideas-task complexity fit. She argues that it is the matching of the level of task conflict to the complexity that is vital:

> [. . .] the amount of disagreement and variety in a group needs to match the level of variety in the task for the group to be effective (Jehn, 1995, p. 260).

Thus task conflict is associated with higher levels of performance through its role in "the synthesis of diverse perspectives and increased understanding" (Jehn, 1995, p. 260). The greater cognitive understanding that conflict is assumed to generate is needed more when problems are complex or non-routine; conversely, high levels of task conflict might interfere with the performance of groups tackling routine problems. Such arguments rest on the assumption that other forms of conflict (relationship or affective) that may be detrimental to performance (Amason, 1996; Eisenhardt and Zbaracki, 1992; Jehn, 1995, 1997) will not undermine any beneficial effects of task conflict or that task conflict will not readily mutate to these detrimental forms.

The linking of punctuated equilibrium and positive task conflict-performance theories

The association of Gersick's midpoint punctuated equilibrium (Jehn and Mannix, 2001; Tekleab *et al.*, 2009) with conflict derives from the latter's association with idea generation. The conflict, so the theory goes, generates the ideas that are especially important at the midpoint. Thus, those groups that have more conflict at the midpoint will have successful transitions and hence outperform those that do not, precisely because of the level of conflict. Jehn and Mannix (2001) offer some empirical support for this as they show that high-performing groups did indeed have higher levels of conflict at the midpoint, even though over the whole project the teams they studied had lower levels of conflict than other teams.

However, as the focus on conflict at the midpoint (Tekleab *et al.*, 2009, p. 170) is at the expense of the more fundamental notions of the team's approach and the ideas-task complexity fit that teams take to their task in favour of conflict. The team approach is, however, the more fundamental concept than the midpoint. The concept of a midpoint transition has no meaning independently of the concept of approach. Whilst the positive conflict-performance theory assumes it is ideas that are important and that these are predominantly developed through conflict. Moreover, the nature and development of the approach will affect the nature of the issues facing the team at the midpoint or, more generally, at any point in time. Most tellingly, it could be that the approach, perhaps in conjunction with any subsequent refinement at the midpoint or elsewhere, is what is decisive for performance, not the team conflict that has been at the centre of much group theory.

The saliency of the negative conflict-performance relationship

Indeed, De Dreu and Weingart (2003) published a meta-analysis of conflict-performance studies that undermined the empirical foundation of the positive conflict-performance thesis[1]. This found that in the vast majority of studies the extent of task as well as relationship conflict was negatively related to task performance. A subsequent study by van Woerkom and van Engen (2009) found a negative conflict-performance relationship. Attempts to salvage the positive task

conflict-performance theory in the light of this lack of supporting evidence have been made. None of these is convincing.

First, De Dreu (2006) himself attempted to rescue the positive theory by arguing that performance has several components, and conflict may have positive effects on one – innovation – but negative effects on what he calls goal accomplishment, including efficiency and co-ordination. But only if we assume all the performance measures in the studies are concentrated on goal accomplishment is this consistent with the finding that task conflict has negative effects on performance. Moreover, in non-routine tasks and multidimensional projects, the distinction between the innovation and goal accomplishment dimensions may not be readily identifiable or even meaningful, as the need to be creative may be inherent in the goals.

Second, there is the avenue suggested by Jehn and Mannix's (2001) finding that conflict is linked to successful punctuated equilibriums: that the positive benefits of task conflict will vary depending on when they occur. Though there may be some plausibility to linking the significance of conflict to when it occurs, the relationship between performance and the overall level of conflict throughout the project in Jehn and Mannix's study was consistent with the negative relationship found in the De Dreu-Weingart (De Dreu and Weingart, 2003) meta-analysis. Moreover, the temporal pattern-of-conflict approach adopted by Jehn and Mannix treats each time point in the team's activity as if it were independent of the others when they are interlinked, not least through the team's approach.

Subsequently though Greer *et al.* (2008) have shown that process conflict tends to perpetuate itself and other forms of conflict. Also, Farh *et al.* (2010) acknowledge that the team's focus at later stages of a project will depend on what has gone before and is unlikely to be on translating new ideas into creative outcomes as the deadline for the project approaches. Such a theory, whilst implying that an approach constrains the activity of a team, nonetheless rests on Jehn's association of idea generation with conflict.

Giving primacy to the approach

Giving more weight to the approach involves the development of theories around it. We will here outline the basis of such a theory that has four main elements. The first element is that the approach is decisive for performance of the team. Without this, the grounds for giving primacy to it are weak. Second, the approach adopted by the team will impact on the idea-generation processes of the team. Third, ideas may not emerge only through conflictual exchanges. Consistent with this it is the level and complexity of ideas that must match the task complexity, not the level of conflict. Fourth, the approach shapes the nature of conflict and in so doing affects the role and, perhaps level, of conflict in the team's activity.

In the extreme this set of ideas implies that if there is any positive relationship between conflict and performance it is an epiphenomenon of the approach. A less extreme argument might accept that the timing of conflict may be significant and more specifically that conflict during the evolution of the team's approach and any reappraisal of it (at the midpoint or otherwise) has a greater effect on performance than will other occurrences. The emphasis on the approach and its development at an early stage takes the focus away from the midpoint punctuated equilibrium.

Moreover, it is important to break the association of the midpoint with shifts in the approach. While the midpoint transition has no meaning independently of the approach, the midpoint itself need not be similarly defined. Indeed, in Gersick's terms, it is defined by the period of relative inactivity prior to it being arrested through the final or other deadlines becoming more salient in the minds of the team. Gersick thus implies that midpoints are transitions by virtue of being breaks in momentum involving attentional, cognitive or emotional shifts and do not necessarily involve change in the team's approach.

Prior to the midpoint it is assumed that the early momentum involved in developing the approach has been lost or at least reduced; the shift in focus is brought about by concerns about how the project is going and whether it will be completed by the deadline. These preoccupations provide the ferment for substantive changes in the approaches of teams, as appeared to be the case in many of Gersick's examples. But although the concept of punctuated equilibrium does imply dramatic change, midpoint transitions need not be defined as entailing substantive changes. It is not inevitable that midpoints result in fundamental discussion of the approach or even if they do it will involve conflict. More generally ideas need not be developed in conflict.

Defining transitions solely by breaks in momentum first allows for the possibility that teams may take stock but decide that the course they are already on is the right path. Moreover, transitions are not inevitable, and mild transitions where the attentional shift is small may be more prevalent than Gersick implies. Second, decoupling midpoint deliberations from punctuated equilibriums allows us to identify unsuccessful transitions, as Gersick (1989, p. 34) did, on the basis that a team has deliberated in the midpoint and felt "it is time to move ahead" yet was "unable to do so". The team has, in effect, missed an opportunity to re-fashion its direction. Finally, we need not identify the midpoint as the first time that the group has serious explicit discussion of the approach (Hall, 2007). The approach may emerge without the team overtly labelling their initial discussions as approach formulation, but what is said becomes a vital ingredient of both the approach and the process of its creation. And indeed as Gersick (1988, p. 17) observed, the teams she studied "occasionally clearly indicated their approach to something, stating their premises and how they planned to behave". The importance of the implicit dimension to the development of team approaches is not simply that the overall approach may not be articulated but also that what is not said may be as important as what is. It establishes what is taken as given. For example groups do not need to say that they will have a norm of being polite, at least until it is violated, or more specifically as in the case study we are about to report, the teams did not need to make explicit the negative point that they would not be following any approach that was completely at odds with the house style.

It is premature to test the hypotheses entailed in our theory through the large-scale comparative project that would be required: we need to develop concepts and measures to differentiate approaches in samples of diverse projects. It would also be extremely expensive to capture a large enough sample and to study teams over their lifetime. To warrant such investment, the ideas need exploring in qualitative and small-scale surveys. In the second part of this paper we present a case study of three teams embarking on identical software development projects, in order to illustrate the power of our core ideas. Taking our cue from De Dreu and Weingart's (2003, p. 747) argument that "research is needed that observes and codes conflict episodes in teams, going

beyond mere self-report measures", we base our case studies on data collected through observing the three teams in their meetings and whilst working.

The case study

Our study is of three teams working in a University Software house all tackling the same software development project and competing to produce a software solution that would eventually be used by the client. They were also managed by the manager of the software house, not a tutor.

As the three teams were working on an identical problem it provided an ideal opportunity to identify differing approaches and to compare their performance. The projects lasted ten weeks. The teams each consisted of five undergraduate computer science students working in a university-owned software house whose role included creating student projects. The teams were three of 14 teams working on total of four projects in the year of the study and this project was studied, as it was the only one where all three teams volunteered to take part in the study. Having a real client who would implement the outcome of their work, the teams' project differed significantly from the typical student project.

The client's requirement was to design a web site and associated database (often called a content management system). Two novel features were required, which meant that no off-the-shelf solutions were available and any attempt to use an existing package would involve considerable modifications. The teams were directed to design a system that allows the members of the organization to share documents within specific subgroups for development and review purposes. Once approved the documents were to be published on a public web site as final reports. The whole system was to be managed by a non-technical administrator.

Following the initial presentation of the brief to all the students, each team then interviewed the client independently. The teams were encouraged to meet the client regularly for about 30 minutes, and they were also able to contact the client via e-mail.

In this case, there was scope for variation on all three dimensions of Gersick's approach, which we interpret thus: the context is the client and his requirements, the task is the processes and methodology used to achieve the requirements, and the internal interaction is primarily the division of labour. The approach of teams towards the context may differ for three main reasons: some requirements were defined by the client as mandatory while some were optional, the product requirements were open to interpretation, and the nature of the interaction between the teams and the client may vary.

In terms of the task, all teams were told to follow the XP agile method but, as its name implies, teams are meant to be flexible both between and within projects, in particular to tailor their approach to the client's needs (for the Agile Manifesto see http://agilemanifesto.org, also Holcombe (2008)). The effect is that teams can approach the ordering, interleaving and weighting of processes differently. Additional variation in the approach to the task arises from individual personal requirements, particularly the wish to write more elegant code or add functions not strictly necessary. Finally, there was scope for differences in the team's approach to interaction, arising from the extent to which they followed XP team processes such as pair programming (individuals working side-by-side on the same computer). Variations could also depend

on whether teams defined a fixed division of labour at the outset or allocated tasks in a fluid way throughout the project.

At the end of the project, the client judged the teams on their product, how well they implemented the features, and how well the final product matched requirements. He then selected his favoured solution for deployment in his organization. In addition, the teams were evaluated on how closely they followed the house's agile approach based on the XP method. Using logs of the teams" work, the house manager assessed the process performance on three dimensions: the recording of meetings, XP process conformance (excluding testing) and testing.

Core data were collected through non-participative observation of all the meetings of the groups and recording of the content of the discussions. Each team was observed by the same researcher throughout the project, either in its meetings or at work in the software house. Meetings were audio recorded and then transcribed, as well as being recorded by hand by the researcher using a template[2]. The analysis of these data was conducted collectively by the three researchers.

The team approach and any distinctive personal requirements were identified through analysis of the dialogue in meetings. Observation of the meetings also greatly aided the researchers in gauging the significant moments in the development of the team's work and approach.

Ideas were also identified through the transcripts of the meetings. We define an idea to be an artefact that was part of the solution to the core task, including task allocation. Where ideas were challenged and a competing idea was suggested the latter was treated as a distinct idea.

We defined a conflict episode as a disagreement between two or more team members, and identified it as beginning with an utterance that indicated disagreement with something previously said and ending when the discussion moved to another theme. Each conflict episode was classified according to Jehn's (1997) trichotomy of task content, task process and relationship conflict. Task content conflict is disagreement over a group member's idea and views about how the task is being or should be carried out. It may include the interpretation of the client's requirements and procedures or guidelines, in this case concerning agile, the distribution of resources and the interpretation of facts. Task process conflict involves logistical and task allocation issues, such as who should do what or how much work one person should do. Finally, relationship conflict covers personal issues, such as differences over attitudes, personality and political beliefs. We also recorded when conflicts mutated from one form to another. Examples of each type of conflict are presented in the Appendix.

In addition, the team members all completed the Work Preference Inventory (Amabile *et al.*, 1994) to measure their intrinsic and extrinsic motivation. The former is concerned with the motivation to engage in work primarily for its own sake, the latter is concerned with motivation in response to something apart from the work itself, such as the reward, recognition, or to fulfil the dictates of others such as a client. This inventory measures an underlying motivational orientation that should be stable over time, and certainly over the period of the project. Example questions include, for intrinsic motivation: "I enjoy trying to solve complex problems" and "It is important for me to have an outlet for my self expression"; for extrinsic motivation: "I am strongly motivated by the recognition I can earn from other people" and "I am strongly motivated by the money I can earn".

Product performance was measured by whether the product was used by the client and the client's evaluation on a number of dimensions. Process performance was measured by the manager's assessment against the 12 practices that constitute the XP methodology (Beck, 2004).

We will now present the approach, idea generation and conflict of each team in turn before comparing across them. The three teams will be labelled First, Second and Third.

The First team

Being very client-focused and working with an existing platform was the core of the team's approach. The seeds were sown at the first meeting, which had focused on the process criteria and what the XP agile method entailed. The team decided at this early stage not to follow the method rigidly, and while making this decision one member broached the subject of using an existing platform. The crystallisation of the teams' approach was in the second meeting, when contemplating whether to use an existing platform, but uncertain about its suitability, the First team decided to consult the client to see if this was acceptable. From this emerged its client-centred approached, so subsequently, the maximisation of the product criteria guided all major decisions and the client was consulted on key dilemmas. The following example illustrates this: rather than taking any unilateral decision regarding the proposed function, the leader (A) and member E decided that the best course of action would be to clarify the issue with the client:

> *E*: He [the client] wants commands for every section.
>
> *A*: But that's too complicated, we'll end up with too many empty boxes. It's a lot of work, just provide an edit box. So users say what they're commenting on.
>
> *E*: The client said he wants to comment on different sections. To display comments only for one section.
>
> *A*: It's impossible to split a PDF into different sections.
>
> *E*: OK, we may need to mail him about this.

Deciding to use an existing platform shaped the team's work approach, but there was little conflict surrounding this decision and the team involved the client in making this decision. The idea was initially proposed by member E at the first meeting, but it was broached more fully again in the second meeting after further requirements had been agreed with the client. This did not provoke conflict, although it did raise questions that were then put to the client for a decision.

Overall there were 81 conflict episodes in the First team, of which 55 were task, 25 were process and two were relationship conflicts. One of the relationship conflicts began as a task conflict but mutated into relationship conflict. Of the 340 ideas produced by the First team, 60 per cent of ideas involved conflict.

Any conflict surrounding the approach followed rather than precipitated it. In total 70 per cent of conflicts reflected tensions between the leader and one member (E), which surfaced after the team adopted an existing platform. Some of member E's ideas began to conflict with the approach, as he became increasingly concerned with his personal requirements to write good code and frustrated with the lack of opportunities

to do this. The vast majority of the conflicts precipitated by E arose from his suggestions for different methods to the ones being followed; these became conflicts once the approach began to settle precisely because they involved going against the selection of an existing platform or clashed with what would best serve the client's needs. The following includes examples of such conflicts involving E:

E: I learned PHP in two weeks. Not difficult if you know C or Java.

A: I think we'll have problems.

E: No, there'll be no language barriers.

D: So are we going to use PHP? I don't know it. It would be easier with Java.

E: No, it would be easier with PHP. We may need a crash course.

A: You're saying it's easy because you know both languages.

E: It *is* easy, trust me. Don't be afraid of PHP.

E: If you want to install a server use Linux and not Windows.

A: It's easy if you know Linux, otherwise it isn't.

E: It *is* easy, you don't have to know anything.

E: I can give different views for lists and icons.

A: No need to do that. Just have a list – don't create extra work.

E: It isn't creating extra work and it gives the client more options.

Initially, some of these conflicts contributed to the consolidation of the approach, but they increasingly meant any attention given to them did not contribute to the final outcome.

Many of the remaining 30 per cent of the conflicts were process conflicts concerning the work and role of E that occurred when he was not present, such as disagreements over whether to assign tasks to him or uncertainty about the state of a task he had been allocated. Other conflicts centred on additional requirements or who should do a particular task.

The team's client-focused approach itself became a means of resolving conflicts with E as they were increasingly resolved by reminders of the primacy of the client. Members literally defended their position by stating, in so many words, "this is what the client wants". So conflict in this group served to cement, rather than directly create, the team's approach to the task. Conflicts over the use of an existing platform served to convince the members of the group (other than E) that the correct approach had been selected as the conflicts with E served to heighten all the team's awareness of the approach and the commitment of all but E to it. In so doing it reinforced all but E's sense of identity as a group, and E was viewed increasingly as different from the rest of the group.

The Second team

The Second team's approach was to jointly optimise the process and product criteria, an approach that developed from their adoption of an incremental delivery strategy whereby the team would select the features of the client's requirements that it would complete in the coming week. This decision emerged from their initial discussions, which again focused on the process criteria. In its second meeting, the team initially reflected on the client's needs and the forthcoming week's work and this led to a lengthy discussion about whether to follow the XP protocol of continual testing, an issue that was especially pertinent given the team's adoption of the incremental, modularised approach.

The testing issue was the first significant conflict, and arose as the leader could not see the value of this and some other XP practices. His priority was satisfying the client whilst fulfilling a personal requirement to produce elegant code, and he disagreed when one member (D) pointed out that what had been done so far needed to be tested, which he saw as "a waste of time". The conflict was resolved by member D volunteering to do the testing; the team decided that he and another member would be responsible for it throughout the project, and that testing would be done "automatically", as laid down in the XP protocols.

Similar tensions between the product, process and personal requirements emerged in subsequent meetings; the team's incremental strategy meant that tensions between criteria could emerge at any point in the discussion of the specification of each week's work. An approach to resolving these tensions emerged that aimed to jointly optimise the process and product criteria. Prioritising neither of the objectives ahead of any discussion of tasks, the team aimed to achieve the client's requirements whilst following the process requirements as closely as possible. This joint optimisation approach emerged as a way to reconcile the potentially conflicting biases, which were apparent in much of the discussions throughout the project. Such conflicts were thus the mechanism through which the underlying approach to jointly optimise the product and process criteria both evolved and was realised. The team did not consult the client to resolve such conflicts but limited its contact with him after the initial meeting to demonstrating work and receiving feedback.

Whilst conflict played a role in resolving the tension between the criteria, only 19 per cent of the group's 253 ideas emerged from conflict episodes, of which there were 22. The conflict episodes were almost equally divided between task (11) and process (10), with only one relationship conflict. Similarly, although conflict had played some role in the evolution of the approach, some key product decisions did not involve conflict, such as the choice to remain with the visual style of the client's existing web site.

Conflicts were manifestations of a tension between the leader and the rest of the group, arising from the leader's very high level of intrinsic motivation and low extrinsic motivation (see Table I). This meant that his initial concern was for technically challenging work that would also satisfy the client's requirement as opposed to strictly following the XP agile methodology, but it was increasingly tempered by the rest of the group's concern to follow key features of the methodology.

The joint optimisation approach that emerged was manifested in the form that the conflict episodes took: typically, they involved one person or subgroup exploring the

	Intrinsic	Extrinsic
Compartmentalising		
A (leader)	2.47	2.73
B	3.07	2.80
C	2.67	2.33
D	2.78	2.70
E	2.48	2.58
Mean	2.73	2.62
Standard deviation	0.31	0.25
Joint optimising		
A (leader)	3.67	1.40
B	3.07	2.40
C	2.33	2.20
D	2.60	2.67
E	2.87	2.53
Mean	2.84	2.75
Standard deviation	0.43	0.49
Client focused		
A (leader)	3.20	3.40
B	2.60	2.27
C	2.13	2.80
D	2.93	3.07
E	3.33	2.20
Mean	2.84	2.52
Standard deviation	0.48	0.52

Note: The intrinsic and extrinsic motivation is measured using scales of the Work Preference Inventory (Amabile *et al.*, 1994)

Table I.
Intrinsic and extrinsic motivation of team members

implications of an idea in terms of the product or client criteria, and another individual or subgroup discussing it from an alternative vantage point. Compromises were reached and these represented a balance of effort between the two potentially competing criteria. It was as if the group was consciously using devil's advocacy (Schwenk, 1984) as its main method of decision making. Through the resolution of conflicts the team struck a balance between client and managerial requirements. As such, conflict in the Second team was a direct manifestation of the conflict inherent in the criteria, and the expression of the group trying to maintain a balance. Nonetheless, discussion of a problem from different vantage points, the hallmark of the team's processes, was as likely to be conducted without any overt conflict as it was with conflict.

The Third team

Again, the first meeting was crucial in the development of the third team's approach, as it concentrated on going through the process criteria in order to specify the nature of the tasks that had to be completed throughout the project. The team interpreted them in a rather literal way and a division of labour where the leader would do the majority of the programming, with the remaining work done by the rest of the team, was established very early on. This resulted in an approach that we characterise as

compartmentalised, as the strong division and dominant-leadership style led to a fragmentation of the client's requirement, tasks, and relationships.

Both the initial meeting with the client and that with the manager were crucial to the development of the approach, as the leader, initially self-selected and dominating discussions, had his role affirmed. For example, when asked by the manager whether the team would be using the house's main programming language for web sites (PHP), he replied in the singular: "Yes, because I understand the security issues better". He had already decided, unilaterally, to do most of the programming and testing himself.

Subsequently, the rest of the team was allocated all other tasks. There was no pair programming, except when two of its members worked together to show one another how to do something. The continual testing required under the XP agile method was also neglected until the midpoint of the project when the manager reminded the leader of the need to do this. The client was not consulted on a regular basis: no contact was made after the initial meeting, until an embryonic version of the team's solution was shown to the client in week four.

Rather than through overt agreement or explicit mention, the team confirmed their acceptance of the leader's role and his task allocation through their behaviour. Conflict thus played no role in the emergence of a compartmentalisation approach. Nor much in its execution, as the team had two conflicts: task conflicts that occurred in the same (third) week. None of the 40 ideas generated came from these conflicts.

Unlike the First team, which involved the client as a means of conflict resolution, the issue of whether to involve the client was the source of the Third team's two conflict episodes. They both involved the leader and member B, and concerned whether the team should ask the client for input – in one case the leader thought they should ask the client when B did not, whilst in the other the stances were reversed. Both conflicts were resolved by agreement that the team would consult the client.

The Third team's compartmentalising approach, which was not the result of any conflict episodes, led to a mode of working, definition of goals and shared understandings that meant conflict was minimised. Individuals were not motivated to go beyond their own tasks, to interfere with other members' work or to confront each other if they disagreed with anything. The lack of conflict was achieved through creating a situation where issues did not arise rather than through ensuring people stuck to a norm of conflict avoidance.

Similarities between the teams

There were no major differences in terms of the range of skills between teams and all students had completed the same courses in the university prior to the project. None of the students had applied the house's XP method (Beck, 2004) before, except in class exercises. Each team was led by the one person who had had more experience at programming than the rest of the group. The leader was explicitly selected in the First and Second team, but in the Third team the leader simply adopted the role and his leadership status was subsequently affirmed in the first meeting with the client.

The basis of all teams' internal interactions was created at their first meeting; and discussions at these meetings sowed the seeds of the approaches that emerged, focusing on the process criteria and the XP agile method; the crystallisation of the team's approaches began in the second meeting.

In the First and the Second teams the pattern of conflict over time was very similar. The level of conflict was highest in week three in both. But the conflict per hour was greatest in the Second team in the last week and in the First team in week two. There was also spike in the pattern of conflict (measured by both level of conflict and conflict per meeting hour) at the midpoint. These conflicts were connected to pending deadlines and creating and maintaining momentum – Gersick's (1989) central focus – rather than the content of the approach, and none of the teams overtly considered changing course either at the midpoint or elsewhere.

There was a peak in the pattern of the amount of code written in each team in week six, though week nine had by far the highest level and there was also a peak in week four. This pattern is commonplace in all the projects in this university house that have been observed in the past seven years, and reflects the way in which the first part of the project is dominated by clarifying requirements and exploratory work (systems analysis).

Differences between the teams

There are clear differences in how the teams approached the context, task and relationships. Consistent with Gersick's suggestion, the distinctive approaches of each team were identifiable on the basis of how the three dimensions interrelate. The importance of each of these in the formation of the approach varied and how they intertwined differed as the thread leading the intertwining varied between the teams. The context dimension was key in the First team: it drove the task and relationships elements of the approach, as the allocation, and to some extent definition, of tasks remained fairly fluid throughout the project. For the Second team, the task and context were equally important. The definition of tasks was done on a weekly basis, followed by their allocation, which was ostensibly on a voluntary basis, but in reality it was reasonably fixed according to individual preferences. In contrast to the others, the division of labour (interactions) in the Third team was decisive, as it was set so early in the project.

The approach adopted by the teams meant that the level of task complexity faced by each team varied. It mediated the original specification received by all the students. Moreover, the approach determined the complexity and was a compilation of all three of Gersick's dimensions and not simply the task element on which original specifications concentrate. The most significant influence on the complexity facing First team was its decision to involve the client in the engineering decision to modify an existing platform. It meant that the team had to learn how to re-use the code and integrate it in order to create the functions required in its new application. Another influence on task complexity included the First team's leaving the division of labour fluid, which added to the complexity of resolving group dynamics issues. The Third team fixed this element from the outset, and the way the two members of Second team volunteered in the second meeting to do testing tasks set a precedent for its voluntaristic approach to task allocation. The complexity facing First team was then greater than the other teams, though its adoption of an existing solution reduced the applicability of some of the XP practices and the complexity involved in following these.

The ranking of the number of ideas that emerged from the groups and level of conflict

Table II summarises the number of ideas, the number of conflicts and their relationships in the three teams. The ranking of the level of task complexity also follows the same pattern.

However, we have seen that ideas were not necessarily generated in conflict episodes and the key decisions of the teams did not involve conflict; conflict's significance in the generation of the approaches was confined to the Second team. A team's approach shaped the nature of the conflicts much more than the approach was shaped by any conflict. In the First team, the client-focused approach increasingly became a conflict resolution mechanism as the client, directly or indirectly, was brought into the decision-making process. Conflict was most integral to the Second team's approach, as its execution depended on discussion of alternative perspectives, but even then these did not necessarily have to emerge through the overt articulation of conflictual positions. Whilst in the Third team the approach centred on a mode of working that did not precipitate debate.

The performance of the teams

The labels given to the teams reflect their relative performance as shown in Table III. The First team's solution was deemed to be the best. In terms of meeting the client's requirements for a web site, the Second team's solution was closer to the First team's than it was to the Third's. The client's overall scoring of the projects put the performance gap between the First and Second teams as slightly greater than that between the Second and Third teams. The Second team's solution was not seen as complete as the First team's, nor was its visual appearance deemed as novel or impressive for users. Third team was judged to have failed to implement as many of the requirements as the other two and the quality of its documentation, including the user manual and installation guide, was inferior.

The ranking of the team's performance on the process criteria did not correlate perfectly with that on the product criteria. None of the teams was deemed by the house manager to have followed the method guidelines perfectly. The Second team slightly edged the First team on the overall evaluation, but this was mainly because the First teams's use of an existing platform precluded automated testing. It compensated with manual testing, and in fact performed more tests overall than the other teams. The members of the Third team did not have any strong personal requirements, so the team's performance was not disproportionately affected by any exceptional concern for elegance or pursuit of features that did not add to functionality. Our own independent evaluation of the process, based on the quality of the coding standards, confirms that the First and Second teams were substantially better than the Third team.

Table II.
Ideas and conflict in the three teams

	Compartmentalising (Third)	Joint optimising (Second)	Client focused (First)
No. of ideas	40	253	340
No. of conflicts	2	22	81
No. of ideas in conflicts	2	48	204
% of ideas in conflicts	5	19	60

	First	Second	Third
Client evaluation of the product performance (1: fail-5: exceptional)			
User manual	5	4	3
Installation guide	4	4	3
Maintenance document	5	4	3
Ease of use	3	4	4
Understandability	3	3	4
Robustness	4	3	4
Completeness	4	3	2
Innovation	4	3	3
Happiness	4	3	2
Total score	36/45	31/45	28/45
The manager marks			
Recording meetings	2/3	2/3	2/3
XP process conformance including testing	2/3	4/5	7/15
The process conformance of the teams			
Frequency of meetings (in a week)	2	2	1
Length of meetings (in a week)	2 hours	1 hour	12 minutes
Formal test sets (automated/ manual)	11/14	13/0	1/0
Code quality	Medium	Best	Worst
Pair programming (based on meetings)	Two members strongly against pair working, hence little pair working	Some occasional pair working, although much was done alone	Worked frequently as a pair
Independent measures			
Expert assessment of code quality	Average	High	Low
Lines per hour	195	255	80
Evidence of testing	High (but mostly manual)	Medium (mostly automated)	Low

Table III.
Team performance

Conclusion to the case study

On the surface, the case study is consistent with the positive task conflict-performance theory, and the level of conflict coincides with the ranking of both the number of ideas that emerged from the groups and their overall performance. However, our case shows that conflict as a means of generating ideas may not be as decisive for performance as this theory implies.

Whilst it is difficult to calibrate the differences between the three teams, the gap between the First and the Second team's performance would not appear to be sufficiently large for the much higher number of conflict episodes in the First team. Not all ideas were generated in conflict and it was not the case that key decisions, which contributed disproportionately to performance, emerged through more conflict in the

First team than the others. If we allow that not all ideas were generated in conflict episodes and consider the percentage of ideas produced in conflict, then the distance between the First and Second teams is even greater: in the First team, 60 per cent of ideas involved conflict whereas the percentage was only 19 in the Second team.

Second, we need to consider the non-independence of these ideas as for the majority of conflict there will be at least two ideas that are mutually exclusive competitors. Making this allowance, the number of independent ideas that could contribute to the two leading teams' final outcome is much closer together than the total number of ideas or conflicts: the number for the First team is 238, the Second 229, and 39 for Third.

Overall, it is the approach adopted by the teams and the successful matching of ideas more than the matching of conflict to the resultant task complexity that explains the big divergence of performance between the Third team and the First and Second teams. It seems that the successful First team did match the number of ideas to its level of complexity, as did the Second team. The Third team's performance may reflect both a failure to generate sufficient ideas and their approach, which reduced the level of task complexity and was unlikely to produce a product as good as the First team's. The ideas teams generated both in and out of conflict were significant and arose from the teams responding to the complexity that their approaches had created, and how the demands that the approach imposed on the team affected its organization, decision criteria and definitions of satisfactory solutions.

Discussion

Our case study confirms the validity of the theoretical arguments we developed in the first part of the paper in which we highlighted the importance of the team approach concept for team performance. Through influencing what the individuals in the team did, the approach affected the outcomes: it did this through creating demands on team members and not simply through limiting what could be done.

In the First team, the approach demanded that the group prioritise the client's needs and understand these as fully as possible. It was through meeting these demands that ideas were generated and rich discussion became the norm. The overall demand to be client-focused created its own micro-demands that were reflected both in the allocation and definitions of tasks, and the accommodations the team made when faced with problems or client needs.

In the Second team, its approach demanded that it assess issues that arose from two sides. This generated ideas but there was less conflict than in the First team.

The Third team's main demand created by its approach was that individuals were committed to achieving the tasks or parts of tasks allocated to them in order to generate a product that was satisfactory to the client through a process that met the manager's specification. However, its rigid division of labour resulted in overloading the leader (too much to do in too little time) and underutilising the time and skills of the others. Accommodating the stresses arising from the task allocation reduced the team's commitment to achieving all aspects of the project, after the midpoint the team gradually lowered its sights on what could be achieved and, in March and Simon's (1958, pp. 140-1) terms, began to satisfice. This was exemplified by the team's failure to meet what the manager demanded from them and the leader's excuse to him that there was not sufficient time; also, the design became simpler as the project progressed.

The example of the Third team illustrates our perspective that midpoints, if they are potentially significant in some cases should be defined as breaks in momentum involving attentional shifts, and not necessarily as changes, dramatic or otherwise, in direction. More generally, our case study shows that transitions in approach or even energy levels are not inevitable, and through confirming the importance of the beginning of the lives of teams in the development of their approach, they encourage a downplaying of midpoint transitions at least relative to this.

A corollary of this downplaying and our decoupling of conflict-ideas link is that there is no reason to assume that task conflict has less effect on performance art the latter stages of a project. Basing their argument on the conflict-ideas link, Farh *et al.* (2010, p. 1178) argued this is the case because teams will not have the resources or time to translate ideas into concrete achievements as the completion date becomes increasingly imminent. However, it could be as happened in the First team that much of the conflict as a project progresses is not producing ideas that are directly relevant or even applicable to the tasks in hand, as they do not gel with the approach or are recurring process or relationship conflicts. In the case of Second team, conflicts were as likely as harmonious discussion to help resolve problems it faced through trying to jointly optimise both process and product criteria at any stage of the project.

Other explanations for the performance differentials we have observed cannot of course be ruled out. We can be reasonably sure that the way the conflicts were resolved was not an important factor: the extent to which conflict episodes were concluded by the conflicting parties agreeing was nearly the same in the First and Second teams (around 50 per cent), while in the Third team both conflicts ended with the agreement to consult the client.

Motivational orientations and effort levels do not appear to have played a significant factor. There were differences in the motivations of the individuals but the means of the scores for each team on both the extrinsic and intrinsic motivations did not differ significantly, though the standard deviation in the Third team was lower than in the other two (see Table I). The motivations of the leaders may have played a role in shaping the approach but did not directly influence the level of overall motivation. Consistent with this, performance differences did not reflect differences in the hours worked between the three teams as these did not vary greatly between the teams (the average weekly hours per individual were nine in the First and Third teams and 11 in the Second team).

We have not studied in detail the client-student interactions and these may have played a role. The extreme argument might be that it was inevitable that the First team's project was selected, as the client had inputted directly to its features. However, the involvement of the client with the First team's choices was largely to answer specific questions such as "Would it be OK if we adapted an existing platform?". The Second team demonstrated increments to the client whose feedback influenced what it did next. The Third team presented its initial ideas to the client and an embryonic web site just before the midpoint. Consequently the client was more familiar with the Second team's product than he was with the others' when he received the final solutions. Thus, his selection did not reflect his disproportionate input to one project's development over another, or his becoming habituated to a product as it developed.

This study has a number of strengths. The project was for an external client who would use one of the team's solutions and thus had many of the characteristics of

commercial software engineering. It does not rely on participants" subjective assessment of their own performance.

Nonetheless, the study size is small so we must be cautious about generalising the findings to all team behaviour. We did, administer personality tests to all the individuals (using the IPIP version of the big five measures (Goldberg *et al.*, 2006)) and none of the individuals in each group diverge significantly on any of the personality dimensions measured from the average scores for the cohort of students for their year. So there is no reason to suspect that the results are limited by the personality composition of the teams.

The two most salient features of our case studies that may limit their generalisation are that they involved students and the XP methodology to software engineering, both not necessarily representative of other projects. Whilst the projects were distinctive compared with the traditional student project, as they involved a commercial client and were managed much as in an industrial context[3], the students were nonetheless new to the XP methodology. It may well be that had the engineers been more familiar with this or other agile methods, the opening dialogue might have been less focused on the nature of XP. Yet there is no reason to suspect that, even if this were so that the level and nature of conflict would be any more or less different had the same basic approaches been adopted by the team or even to suggest, given the various motivations of the actor, that the teams would have diverged greatly from the avenues they took early on.

Finally, reflecting on whether the presence of the researchers had an effect on the teams, we consider their behaviour was not affected by their being observed. The researchers passively observed the meetings and did not in any way get involved in them or the team's work outside of these. Being observed did not appear to make the team members reflect more on their team working, or the importance of being cohesive or polite to each other, nor to make them feel more obliged to follow the house's XP methods. The everyday demands of the projects were high and the teams' communications with one another, though creating very different outcomes, did not diverge in any noticeable from that of other teams we have observed in the same software house.

Conclusion

At the theoretical level, we have highlighted the primacy of the concept of approach that underlies task conflict and the importance of idea generation over conflict in group functioning and performance. The case study of three teams competing to produce a software engineering solution that would be selected by a client revealed the significant for the team's development and performance of the clear differences in the approach taken by the teams can be identified.

We have thus delved beneath the surface – both theoretically and empirically – of both the punctuated equilibrium theory and positive task conflict theory of performance that Tekleab *et al.* (2009), recently combined. Our conclusion is that the team's approach is more fundamental than is conflict's role in group performance and clearly should be studied further. It is quantity of ideas, not conflict, that needs to fit the level of task complexity; this is itself created by the team's approach and is not inherent to a task specification from a client or manager. Just as not all ideas emerge in conflict, so we have shown that conflict's role is not confined to idea generation. The nature and role of conflict also reflects the approach adopted by teams.

If primacy is given to the approach, then the beginning of the lives of teams should be accorded more significance than midpoint transitions, which are not inevitable. Our cases suggest it might be worthwhile exploring the extent to which agile or similar lean methods, modularised working or frequent feedback from clients or colleagues may make it less likely that midpoint transitions occur.

The complex interplay between team approach, task complexity, idea generation and conflict suggests that either as an alternative or precursor to further analysis, the area demands a more generative social science and is ripe for complex, non-linear modelling (see Epstein, 2006; Nowak and Valacher, 1998). This complexity may also account for the indeterminism that is reflected in the variety of results across the conflict-performance studies.

For policy, our research implies that more emphasis should be given to the importance of initial meetings as generators of powerful assumptions within groups about how they will go about their task, work together and evaluate their work. This is especially relevant for managers when they design teams and for trainers in leadership and teamwork, as well as teams themselves. It is not the case that nothing much happens early on because the team has only just got started, as is often thought or it feels like to the participants. The development of project teams begins in the mind of their creators, and continues with how they frame and communicate the task to the team, choose its members and convey their selection to them.

Gersick's dimensions of an approach may be useful for both the design of teams and for teams as they begin their work. Hackman (2002) and others do advise teams to be mindful about the choices they make, but it is noticeable that many checklists of how teams can be successful focus on conflict[4] and cohesion and do not include reference to their approach[5]. Nonetheless, an interesting avenue for further research is to measure the extent to which teams or individuals can or should be more explicit about their approach. Greater clarity changes the (complex) system from which the team approach emerges and, especially since experts often perform less well if they are asked to make explicit what they do well without such concentration, this may not guarantee a more successful team approach.

Notes

1. Jehn's (1994) study, which obtained a high positive correlation between conflict and performance, was excluded by De Dreu and Weingart (2003, p. 745) from their meta-analysis as an outlier.
2. The observational element of the study was piloted through all three researchers observing together six meetings of a group of five individuals working on a similar project to the one in the main study. Differences in the classification of conflict episodes were rare (six out of 24) in this pilot, but any were discussed after each observation session so the researchers could reach a common interpretation of the different categories. During the last two meetings observed in the pilot study, the researchers produced the same classifications. In the main study, each researcher initially identified the conflict episodes and ideas in their groups, and then this was checked by one of the other researchers using the transcript. The occasional contentious classifications (five out of total of 105) were discussed and agreed among the whole research team.
3. The manager's evaluation of their process conformity can be considered analogous to the performance appraisal in profit-making software houses.

4. One of the reasons why no renewed consensus has emerged around the negative conflict performance theory or simply the rejection of the positive theory (Tekleab *et al.*, 2009, p. 172) is partly because prescriptive writers on group processes have become increasingly committed to outlining ways of stimulating beneficial conflict (e.g. Okhuysen and Eisenhardt, 2000; Weingart and Jehn, 2000).
5. See for example: www.managementtrainee.co.uk/top-10-tips-for-improving-team-morale.html (accessed 19 September 2010) or Matale *et al.* (1995).

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Appendix. Examples of each type of conflict

Task conflict

E: People log in via a browser and generate MD5 using JavaScript.

D: No, we can generate MD5 via PHP.

E: I meant we can convert to MD5 from plain text.

A: But we already have the user name and password in a secure database.

E: Listen, MD5 is more secure. The system cannot be compromised.

Process conflict

C: Should we meet everyday?

E: No, that's too much. Two meetings per week is fine.

D: There's a big gap between Friday and Wednesday. We may have problems over the weekend.

A: I think we should stick to our schedule. Any additional meetings should be on a needs basis.

Relationship conflict

A: I'm not saying we should finish early. We can add on any additional features he desires.

E: You're trying to get it done without working hard [accusative tone]. How many lines of code or tests have you written?

A: You want to write code [equally accusative tone]. The goal of the project is to solve a problem, not to write code.

E: OK, just buy the components from Joomla [sarcastic tone]. We can't use existing software for everything. We have to build software for God's sakes [displays anger].

Mutated conflict (from process to relationship)

C: There are also story cards to write.

B: They take about two seconds, not much to do.

C: Last time it took me three hours to write a few.

B: That's because you didn't know what you were doing.

Corresponding author
Stephen Wood can be contacted at: s.j.wood@le.ac.uk