Improving teamwork: the effect of self-assessment on construction design teams

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This research tested the hypothesis that regular assessments of the way teams function can help improve team performance. Teams of building designers were instructed to pause mid-way through a timed design task to evaluate their teamwork processes. Designers gave significantly more positive ratings of various aspects of their team working after assessing their team. An analysis of open-ended comments made at the end of the design task echoed this result. Further, the designers' ratings of team process were positively related to team outcome, suggesting a link between what design teams produce, and how effectively they work together.

Keywords: collaborative design, evaluation, inter-disciplinary, teamwork

Since the 1960s, larger UK design firms have shown increasing interest in promoting teamwork in building design. More recently, attempts to incorporate teamwork practices in the design process have led some of these larger firms actively to seek out commissions and contracts where teamwork is a specified goal. However, despite its growing popularity, there has been very little rigorous study of teamwork practices in building design. In fact, although individual designers (and their decision-making processes) have been studied in the past, the integration of individual design work with teamwork is typically overlooked. It therefore remains largely uncharted territory.

The research presented here begins to map out this new land. It stems from a detailed study of teamwork practices in three British design teams working on high profile construction projects[1]. This work represented a first step towards documenting and understanding the intricacies of teamwork processes as related to practising design teams. Part of the research

1 **Palmer, J M, Busseri, M A and Macmillan, S** *Building teams: working together in construction design* Forthcoming from Construction Research Communication, London, UK (1999)

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involved a series of controlled laboratory design sessions in which the researchers attempted to isolate and test the importance of several variables. These variables were thought to be related to effective teamworking. This paper reports the results of one such experiment—exploring the importance of team assessment and its effect on designers' perceptions of satisfaction and team performance.

1 *Past research and theory*

Teamwork is a multi-faceted concept—a rich and deceptively complex term. It has been defined as 'a small number of people with complementary skills who are committed to a common purpose, performance goals and approach, for which they hold themselves mutually accountable'[2]. Teamwork is also said to be characterised by[3,4]: helpfulness, coordinated effort, a shared approach to working, open communication, and friendliness.

Professionals from different backgrounds can work together in many different ways but in an *inter-disciplinary* team, team members strive to contribute beyond their disciplines' traditional boundaries. One engineering executive explained that in this kind of team, 'a designer's influence extends beyond their own skill base, beyond what they're contracted to do.' In practice, this kind of teamwork blurs the distinction between contributions from, say, an engineer and an architect[5].

Objectives of inter-disciplinary teams include[6]:

- breaking down stereotyped attitudes,
- improving the flow of information,
- refining the decision-making process, and
- increasing the efficiency and cost effectiveness of design procedures.

The term 'designer' is used in this paper to refer to each member of the design team—regardless of their profession. However, in practice the different people involved in designing buildings—architects, engineers, quantity surveyors, and client representatives—may not consider each other (or even themselves) as 'designers'. In any event, members of a true inter-disciplinary team accept responsibility for the design and strive to take part in all aspects of its development—in this way, each team member qualifies him or herself as a 'designer'.

Every building design project, every team, and every team member is unique. The way individual teams work together is equally unique. Consequently, recommendations for one team may not apply for another. However, Palmer et al.[1] identified a number of issues that could face teams during their respective projects.

2 **Katzenbach, J R and Smith, D K** *The wisdom of teams* Harvard Business School Press, Boston, US (1993)
3 **Lawson, B** *How designers think* Butterworth Architecture, London, UK (1983)
4 **Hatcher, L and Ross, T L** 'From individual incentives to an organization-wide gainsharing plan: effects on teamwork and product quality' *Journal of Organizational Behaviour* Vol 12 (1991)
5 **Arup, O** *Key speech, The Arup Journal* Vol 20 (1995) pp 34–37
6 **Muir, T and Rance, B** *Collaborative practice in the built environment* E and F N Spons, London, UK (1995)

Teamwork in construction design starts with the forming of a design team in response to a project brief, usually prepared by a client. From here, effective teams may face issues including:

- defining their goals,
- setting boundaries,
- defining responsibilities, and
- clarifying their leadership and the role of the client.

Communication between team members from meeting to meeting, and with people outside of the team, are also important issues—as is the management of conflict. Team meetings are an important platform for communication, and can be a useful time for teams to address critical 'process oriented' issues such as: preparing, facilitating, making decisions, and being productive in meetings.

Teams may also benefit from improved understanding of the relationships and issues associated with groupwork, and team development. It may be advisable to consider how to foster team identity and help different disciplines to work together. It is not always easy to work effectively and smoothly in teams—in all likelihood team members will be forced to confront stumbling blocks that block progress on the project. Understanding team dynamics might help to resolve some of these problems.

Teams seeking to improve their performance might also benefit from finding ways to measure team effectiveness, which would allow them to assess how well they are working. Such measurement forms the focus of this paper.

Analysing team effectiveness, and regular review of team goals, may uncover differences in priorities among members, or reveal new bases for cooperation[7]. Assessment also allows team members to focus on factors that could lead them to stray from their targets and goals. In addition, feeding evaluations of a team's past performance into present action can improve future performance[8]. Feedback based on monitoring a team's processes can be given by the team members themselves[8,9], or by outside parties[10].

Any appraisal of teamwork needs to be designed so that it actually assesses team-related performance and processes. Further, to get the maximum benefit from such assessment requires defined standards against which to bench-mark the team. Specific criteria for evaluating a construction team's performance (or productivity) and processes can include:

7 **Alderfer, C P** *An intergroup perspective on group dynamics* Prentice–Hall Inc, New Jersey, US (1987)

8 **Syer, J and Connolly, C** *How teamwork works: the dynamics of effective team development* McGraw–Hill, London (1996)

9 **Grossman, S** 'Turning technical groups into high performance teams' *Research–Technology Management* Vol 40 (1997) pp 9–11

10 **Whitfield, JM, Anthony, WP and Kacmar, KM** 'Evaluation of team-based management: a case study' *Journal of Organisational Change Management* Vol 8 (1995) pp 17–28

- whether the team's output (e.g. the designs, or the completed building) meets or exceeds the standards of those who review or use the output—such as the client, future users of the building, or the designers themselves[11–15],
- whether members are more satisfied than frustrated by their experience of working in a team[11,13,15,16],
- whether the mode of teamwork enhances the capability of members to work successfully together over time[11–13,15],
- whether the team achieves its aims in the most efficient way[6]—calculated in terms of the ratio of outputs to inputs, or the number of high quality design solutions[16], or avoiding counterproductive behaviour[14],
- what emphasis there is on team performance[14]—accepting a successful outcome for the group as being more important than an outcome for any individual team member[17].

The midpoint of a team project can be used as an important opportunity for teams to reassess and renew communication[18]. In this study, we sought to test the general principle that team assessment can lead to improvement in team functioning. Our focus was explicitly on team *processes*—how team members behave—as distinct from *product*—the designs that result. We examined how a team of designers from various construction disciplines reacted to a simple intervention: a very basic team evaluation, midway through a time-constrained design task.

1.1 Hypotheses

This study was designed to test two experimental hypotheses. First, that there is a link between how well a team works together and what it produces. More specifically, positive regard for your team and team-mates will be associated with positive evaluation of what your team achieves. Second, that assessing team performance during a task will positively affect how well the team functions. That is, a team that pauses to assess its teamwork processes will work more effectively, and have higher levels of member satisfaction than a team that does not undergo such self-evaluation.

1.2 Novelty and relevance

There has been precious little systematic research of teamwork in construction design. If we are to take forward our understanding of teamwork practices—and refine it beyond a state of opinion and intuition—there needs to be more empirical observation and case studies. Such studies should be rigorous, and test pre-defined hypotheses. Ideally, to make it easier to interpret the results, the studies should be performed under controlled conditions. This study was unique not only in its attempt at controlling some of the experimental conditions (which allowed for some inferences to be

11 Ancona, DG 'Groups in organisations' *Review of Personality and Social Psychology* Vol 9 (1987) pp 207–230

12 Goodman, P S *Designing effective work groups* Jossey–Bass Ltd, London, UK (1986)

13 Hackman, J R *The design of work teams* Prentice–Hall Inc, New Jersey, US (1987)

14 Neumann, J E, Holti, R and Standing, H *Change everything at once!* Management Books, Oxford, UK (1995)

15 Sutton, RI and Hardagon, A 'Brainstorming groups in context: effectiveness in a product design firm' *Administrative Science Quarterly* Vol 41 (1996) pp 685–718

16 Jones, MC and Harrison, AW 'IS Project Team Performance: an empirical assessment' *Information and Management* Vol 31 (1996) pp 57–65

17 Ritchie, I 'Synthetic thinking between engineers, architects and designers' in *Redefining the design team* Royal Academy of Arts/Cambridge University, Cambridge, UK (1995)

18 Gersick, CJD 'Time and transition in work teams: toward a new model of group development' *Academy of Management Journal* Vol 31 (1988) pp 9–41

drawn), but also in defining tight research hypotheses. It is therefore novel in both the specific ideas that it tests, and in its attempt to use a more controlled methodology.

2 Methods

2.1 Subjects

Participants were construction industry professionals enrolled in a Masters level graduate course offered through the University of Cambridge, entitled 'Interdisciplinary Design the Built Environment' (IDBE). All of them were qualified, practising designers, seeking to learn more about working with people specialising in different aspects of building design. The group comprised 15 professionals from a variety of backgrounds: six architects, five engineers, two quantity surveyors, one lawyer, and a construction designer. Eleven of them were men, and four were women.

Participants were invited to take part in this study as part of their course curriculum. Given that they were enrolled in the IDBE course, they were viewed as a motivated and eager group of individuals, and were committed to inter-disciplinary teamwork in design. By the time of the present study, the group had already spent a total of four and a half weeks in the course together, over a seven month period. They were therefore familiar with each other—having previously worked through small projects and assignments together.

2.2 Procedure

2.2.1 Experimental teams

Participants were divided into two predetermined teams (by researchers who were not familiar with them) to ensure a balance of disciplines and gender:

- Group A comprised eight members (three architects, three engineers, one surveyor, one lawyer) of whom six were men, and two were women,
- Group B comprised seven members (three architects, two engineers, one surveyor, one construction designer) of whom five were men, and two were women.

The study was timed, and lasted a total of 60 min. The design teams worked through two tasks—one task under experimental conditions, another under control conditions. Group A worked through the experimental then the control condition, while Group B began with the control condition. This experimental design (known as AB–BA) made the effect

of the experimental condition easier to distinguish from confounding effects arising from group-specific factors, or from the order to which groups were assigned conditions and tasks.

The groups worked through each task simultaneously, in two different rooms. Each room contained several tables placed together, and enough chairs for each member spread around the table. The rooms were laid out to resemble each other as closely as possible. Teams were also provided with a flip chart and markers. The only other person in the room was the researcher who ran the study and monitored team progress.

2.2.2 *Experimental protocol*

At the start of the first task, each group member was given a 'Design Brief' sheet (see Appendix A: Design briefs). This sheet gave a description of the design task and a rationale for doing it, plus an instruction to produce a simple sketch of the final design and a description of its features. The researcher told participants that they had 20 min to complete the task. Participants were given 2 min (timed by the researcher) to read through their project briefs individually and were then instructed to begin the task.

After 10 min of the design task had elapsed, the groups were instructed to pause for 5 min. Each member of Group A (experimental condition) was given a new sheet of paper containing specific assessment criteria (see Appendix B: Assessment sheets). Team members were instructed to make a collective, verbal assessment of how effectively they were managing the process of teamwork, according to the criteria defined on the sheet. Group B (control condition), meanwhile, received a different assessment sheet with a similar set of assessment criteria, but this time referring to the room (again, see Appendix B). They were asked to assess the characteristics of the room in which they were working.

After 5 min of assessment, the researchers removed the assessment sheets, and each group was instructed to continue with their design tasks for another 10 min. After 8 min, teams were told they had 2 min to complete their work. After this time had elapsed, team members were told to stop as the designs and lists of features were collected. Team members were then asked to push their chairs away from the table, and were given 5 min to complete questionnaires individually (see Appendix C: Participant questionnaire).

Both groups then moved on to the second task. The above procedure was repeated exactly, except that each team members was given a (different) second design brief (see Appendix A—Task B), and Group A did the room

assessment (control condition), while Group B did the team assessment (experimental condition).

2.2.3 Data collection

Several forms of quantitative and qualitative data were collected. With participants' permission, both teams were audio-taped during the design tasks to allow for a permanent audio record of the team's behaviour. As mentioned, each team was monitored by one researcher, who made pencil and paper notes about the proceedings. The researcher focused on five predefined aspects of teamworking: leadership, organisation, conflict, participation, and drawing management. At the end of each task, team members were asked to complete questionnaires comprising eight, 7-point Likert scale items (where higher ratings indicated more positive opinions). The questionnaires also included space for subjects to make open-ended written comments (see Appendix C: Participant questionnaires).

3 Results

3.1 Participant questionnaires

3.1.1 Correlational analyses

The participant questionnaires comprised eight scale items (see appendix C) which assessed various aspects of team functioning and performance. Only one of these items (Item 1) concerned the physical outcome of each team task, i.e. the team's design plans. The other seven items concerned how the team worked together. Correlations (Pearson *r*'s) were computed for Item 1 and the other seven items (see Table 1): to see if there was any link between the perceived quality of the plans and how well team mem-

Table 1 Correlations between participant ratings of team process and team outcome

'Team process' items		*Correlation to item 1 'team outcome' item (*rs*)*	P *level*
2	Decision making	0.62	> 0.0001
3	Whole group contributing	0.18	0.080
4	Satisfaction with process	0.50	> 0.0001
5	Quality of organisation	0.49	> 0.0001
6	Time management	0.52	> 0.0001
7	Mode of working	0.51	> 0.0001
8	Inclusion of individual ideas	0.63	> 0.0001
Average		0.49	> 0.0001

$n = 30$.
All *r*s are Pearson product–moment correlations.

bers thought they worked together. For six of the seven remaining items, ratings of how team members worked together turned out to be significantly related to what the team produced.

These results confirm our hypothesis that ratings of team process are significantly related to ratings of team outcome (average $r = 0.49$, $P < 0.0001$). That is, these results suggest that *how* a design team works together is positively linked to *what* it actually produces.

3.1.2 Reliability analyses

Responses given in the participant questionnaires were analysed for consistency and reliability in terms of how consistently participants used the eight scale items. A principle component factor analysis revealed that, together, the eight items comprised one unique factor, which accounted for 65% of the variance in scores. Further, a Cronbach Alpha test of scale reliability produced an alpha level of 0.92. These two results suggest that the way in which participants responded to the scale items was highly consistent and reliable. This means that we can justifiably average scores for the eight items into one index representing each participant's global evaluation of their team.

3.1.3 Analyses of scale ratings

Participant questionnaire index scores were subjected to a series of multifactorial analysis of variance (ANOVA) tests. We tested the effects of: profession (architect, engineer, surveyor, or 'other'), gender (male, female), and design task (task A, task B) on subjects' ratings of their team (under experimental vs. control conditions). All results were non-significant [Fs < 1], suggesting that subjects' professional backgrounds, what sex they were, and the order they completed the tasks, did not determine their responses to the questionnaire. These variables were therefore excluded from subsequent analyses.

Index scores were then submitted to a 2×2 ANOVA of condition (experimental vs. control) and group (Group A vs. Group B). In support of our hypothesis, a main effect of condition was found [$F(1,15) = 5.97$, $P = 0.022$], in which index scores in the experimental condition (M = 5.61) were significantly greater than scores in the control condition (M = 4.83). Further, a main of effect of group was found [$F(1,15) = 5.56$, $P = 0.026$], in which participants in Group A (M = 5.63) gave significantly higher ratings than participants in Group B (M = 4.81). However, the interaction between condition and group was non-significant [$F(3,15) < 1$]. Regardless of which group participants were in, team members were significantly more satisfied with their team in the tasks where they paused to assess their performance, compared with the tasks in which the team did not.

When similar 2×2 ANOVAs were computed for each scale item individually, a pattern of results similar to that of the index score was found for each of the eight items. For five items, the main effect of the experimental condition reached statistical significance [all Fs(1,15) > 3.00, all Ps $<$ 0.05], while the interactions with group (team A vs. team B) were non-significant [Fs $<$ 1].

Compared to responses from the control condition, participants in the experimental condition gave significantly higher ratings for the following items:

- item 1—the team's design (Ms for experimental and control conditions, respectively = 5.4, 4.0)
- item 2—the effectiveness of the team's decision process (Ms = 5.5, 4.6)
- item 4—how pleasant was the team's mode of working (Ms = 5.5, 4.7)
- item 6—satisfaction with the group's use of time (Ms = 5.6, 4.7), and
- item 8—satisfaction with the way individual's ideas were accepted by the team (Ms = 5.6, 4.9).

3.1.4 *Calculating raw change scores and the size of effects*

We went on to compute the raw change (how much each index score varied between conditions) in each participant's index scores (the average of the eight scale ratings). For 14 of the 15 participants, ratings improved in the experimental condition. Averaged across all subjects, the index score under experimental instructions was 0.8 units (on the 7-point Likert scale) greater than the same measure from the control condition (improvement scores varied from 0.1 to 1.9 on the 7-point scale).

In order to standardise the average raw change of 0.8 units, effect size calculations were computed using the d statistic[19]. The advantage of calculating effect size using d scores (as opposed to comparing differences in raw change scores, or using differences in mean scale ratings between conditions) is that it allows for direct comparison with results from other studies using different types of measures. The d score can range from 0 (indicating no difference in effect size between experimental and control conditions) to 1 (indicating an effect size of one standard deviation between experimental and control conditions). Across all participants, the effect size was calculated as $d = 0.73$ which, for this statistic, is accepted as a moderately large effect[20].

Taken together, the raw change scores and the effect size results suggest that the positive effect in the experimental condition was moderately large

19 **Smith, M L, Glass, G V and Miller, T I** *The benefits of psychotherapy* The John Hopkins University Press, Baltimore, US (1980)

20 **Cohen, J** *Statistical power analysis for the behavioral sciences* Academic Press, New York, US (1969)

in standardised terms, and was not specific to just a few participants. All but one of the participants experienced a significant rise in satisfaction when they paused to assess their team's performance.

3.2 Open-ended comments

3.2.1 Coding the responses

Each of the 15 participants completed the qualitative part of the questionnaire twice (once at the end of each task), giving a total of 30 open-ended passages. Remarks were divided into three categories: positive, negative or neutral. Most participants made both positive and negative comments in a single passage. In such cases, the frequency of each kind of comment—positive or negative—was counted. Classification of each comment was then determined by the most frequent kind of comment made. Neutral passages were characterised by either a non-evaluative description of the group's work (and/or design solution, and/or the task itself), or an equal number of positive and negative comments.

Two raters each categorised 15 passages independently. To check for agreement between raters in the way in which passages were categorised, each rater also coded six passages from the other rater's allotment—resulting in 12 cases of double coding. For these 12 cases, inter-rater reliability was 84%, suggesting there was satisfactory consistency between the different raters' categorising. Discrepancies between raters for all passages were resolved before further analyses were performed.

3.2.2 Analysis of responses

In the experimental condition (i.e. when the teams were assessing their performance), 67% of the 15 comments were coded as positive—twice as many as were negative (10 positive and five negative comments, respectively, with no neutral comments). However, in the control condition, this trend was reversed—63% of the 15 comments were negative—more than twice as many as positive comments (four positive and 10 negative comments, respectively, with one neutral comment). These results are consistent with the evidence from analyses of participant questionnaire scale scores. They too indicate that team assessment resulted in higher levels of satisfaction and ratings of team effectiveness.

3.3 Monitoring notes

During the design tasks, observers made notes on each team covering five topics: leadership, organisation, conflict, participation, and drawing management. Like the observer scale ratings, these observations were made by only one observer per team and thus we cannot assess their reliability or validity. So again, our interpretation of these results is necessarily limited.

In general, minor differences between conditions were observed. When the groups were instructed to pause and assess their performance they seemed to become more attuned to unbalanced participation—when members were withdrawing and not contributing to discussion, or when some members were dominating. In the control condition, designers refrained from sketching anything until near the end of the task, whereas in the experimental condition some members sketched almost continuously.

However, we also observed several similarities in group dynamics across conditions. Leadership patterns remained the same within groups in both conditions—for most of the time Group A had a single, assertive leader, while Group B did not have one in either condition. Though Group A adopted a more consistent, organised approach to working than Group B, neither group was forced into rushing in order to meet the time deadline.

Further, neither group suffered unduly from problems of conflict in either condition, although participants did not often discuss and resolve differences of opinion—perhaps due to the tight time constraints. Lastly, the levels of participation and exclusion appeared to be largely the same across conditions.

In general, observed differences in group behaviour between conditions were small. Instead, differences in group dynamics were seen to vary significantly between groups—primarily due to the behaviour of individual participants. However, an important factor for group effectiveness appeared to be the presence of an individual who was both assertive enough, and who had sufficient authority, to establish him or herself as the leader. In the instances where this happened, organisation was observed to be better. Overall then, these observations highlight the differences between participant groups mainly attributable to individual participants and their interpersonal styles.

3.4 Results summary

In summary, across the various kinds of data collected in the study, we found several pieces of evidence that confirm our two hypotheses. First, ratings of the team's design were significantly and positively correlated to ratings of the team's processes, which suggests there is an important link between team process and team outcome. Second, perhaps most important, results from participant questionnaire ratings and open-ended comments suggest that instructing a group to pause mid-way through a design task in order to assess its group processes led to:

- significantly higher levels of self-rated and observer-rated group effectiveness,

- significantly higher levels of self-rated group satisfaction,
- double the number of positive comments (compared to negative comments) from team members,

compared to having the group pause to assess the room in which it was situated.

Importantly, results from changes in individual scale scores suggested that these benefits from team assessment were experienced by all (but one) participants and were moderately large in standardised terms. Thus, as predicted, an intervention aimed at improving group process by encouraging team assessment during a design task had significant observable and quantifiable positive effects.

4 *Discussion*

This study was designed to examine the effect of assessment on a team's performance. Specifically, it aimed to test two hypotheses. First, that there is a link between how well a team works together and what it produces. Second, that assessing team performance during a task will positively affect how well a team functions. Our results show that, in the teams we observed, there was a link between assessment and what a team produces. Assessing performance during design tasks appeared to improve the way the teams functioned, and raised team member satisfaction.

But what might account for the higher group satisfaction and perceived effectiveness when the teams paused during the design task to assess their performance? Perhaps the evaluation encouraged design team members to consider various aspects of *how* they were working together—at a time when they were intensely focused on the *what* they were producing. It is possible that team members, by taking a moment to step back from their own ideas and examining their collective working style, were able to see where the team was faltering in its processes. An optimistic view would suggest that, although the creative design process can be highly intuitive and individualised (i.e. hard to share), designers are quite capable of improving how well they work if they strive to make this a project goal.

To illustrate, two participants made comments which directly concerned group assessment:

> The 'Assessing the Group' exercise got the group working as a group more consciously.

> The project worked better than the last. The extra questions helped us to realise that we were not always addressing everyone's suggestions.

These comments suggest the assessment seemed to make more than a fleeting impact on these participants—they appeared to become more aware of how well they were working.

4.1 Limitations of this study

The design tasks set for these teams and the circumstances they were working in were artificial. The members of these teams knew that their designs will never be built, and the composition of the teams may also have been unrealistic. The time limits imposed were much shorter, and more strict, than would be the case had participants been in their normal work environments. For these reasons, they may have behaved differently from the way they usually work in teams. They may have taken the tasks set less seriously than they would normally. However, we suspect that these effects would not distort the study results unduly. Further, these effects were acceptable sacrifices for the controlled environment we needed to maintain for the sake of comparability. In addition, this study was based on a tiny sample: effectively just two teams—other teams may not respond in the same way if they paused to assess how they work together.

4.2 Future research

We invite other researchers to replicate our work, comparing their findings with ours (perhaps using a measure of standardised effect size such as *d*) so that the design research community can collectively develop an understanding of this aspect of design. In particular, we encourage other researchers to take further strides in quantifying the effects of the other variables which, according to accepted wisdom, are connected to effective teamwork.

Given the complexity of team functioning, and the unique nature of each design project, it is difficult to specify in detail what specific behaviour *every* team should adopt. Some form of introspection may be valuable to interdisciplinary design teams. Results from this study suggest that it may be useful for designers to reflect on how well they are working together from time to time—ideally using defined criteria (like those in Appendix B) to do so. For example, after major project milestones team members could ask the client (as well as themselves) what they think is working well, what is not working well, and how it can be improved.

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Appendix A: Design briefs

Task one

In the first task, team members in both conditions were each given the following instruction sheets:

Design brief

Design a free-standing domestic garage that is flexible enough to respond to changes in personal transport over the next 50 years.

(1) Your group has 20 minutes to prepare a simple sketch of the garage, and a short description of its features.
(2) Please turn this sheet over, set it aside, and begin.

Task B

In the second task, team members in both conditions were each given the following instruction sheets:

Design brief

Design portable toilets for construction sites that encourage use by women, as well as by men.

(1) Your group has 20 minutes to prepare a simple sketch of the toilet, and a short description of its features.
(2) Please turn this sheet over, set it aside, and begin.

Appendix B: Assessment sheets

Experimental condition

In the experiment condition, team members were each given a copy of the following instructions:

Assessing the group

Please take 5 minutes to discuss these issues as a group.

(1) How are group members' professional backgrounds affecting their contributions to the task?
(2) To what extent is the group dealing with all ideas that are raised?
(3) How aware is the group of its progress on the task?

(4) To what extent is each group member contributing?
(5) How organised is the group's approach to the task?

Control condition

In the control condition, team members were each given a copy of the following instructions:

Assessing the room

Please take the next 5 minutes to discuss these issues as a group.

(1) How comfortable is the temperature of this room?
(2) To what extent is the lighting in this room conducive to design work?
(3) How appropriate are the room's acoustics for this kind of work?
(4) To what extent does this room meet the group's seating requirements?
(5) How attractive is the interior of this room?

Appendix C: Participant questionaire

At the end of each design task, participants were asked to complete the following questionnaire individually.

IDBE task questionnaire

Your initials: .....

Please take 5 minutes to answer the following opinion questions. Indicate your response by circling a number below each question.

1. How would you rate the design that the group has produced for this task?

1	2	3	4	5	6	7
very poor			average			excellent

2. Which number best describes the way the group took decisions?

1	2	3	4	5	6	7
very ineffective			neutral			very effective

3. How would you rate group member contribution to this task?

1	2	3	4	5	6	7
no one contributed ideas			half the group contributed ideas			everyone contributed ideas

4. How do you feel about the way the group has worked?

1	2	3	4	5	6	7
very displeased			neutral			very pleased

5. What do you think about the group's organisation during this task?

1	2	3	4	5	6	7
very disorganised			neutral			very organised

6. How satisfied are you with the way the group used its time?

1	2	3	4	5	6	7
very dissatisfied			neutral			very satisfied

7. How do you feel about the way the group chose to proceed?

1	2	3	4	5	6	7
very displeased			neutral			very pleased

8. What do you think about the way in which your ideas were included in the group's design sketch?

1	2	3	4	5	6	7
very displeased			neutral			very pleased

9. Use the box overleaf to elaborate on any of your answers, or make other comments.