CONTRASTING FRENCH AND JAPANESE VIEWS ON THE QUALITY OF COLLABORATION IN CREATIVE DESIGN SESSIONS

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ABSTRACT

Based on previous studies on the quality of collaboration and its assessment, the objective of our research is to understand "cultures of collaboration", on national, and institutional levels. We present an experiment in which Japanese and French engineering students were asked to judge the quality of collaboration in engineering design, using a specific multidimensional method ("QC", for "Quality of Collaboration"). Based on the degree of agreements between judges on their social representation of 'ideal' collaboration, our results suggest a common institutional culture of engineering design as well as specificities at the national level.

Keywords: Co-Design, collaboration, Culture, Creativity.

1 INTRODUCTION

Based on previous studies on the quality of collaboration and its assessment (Détienne et al. 2012) from a perspective in cognitive ergonomics, the objective of our research is to understand "cultures of collaboration", on national, and institutional levels. The concept of "culture of collaboration" is intended to capture the set of specific norms, values and practices that are inherent in institutional 'cultures', and across 'Cultures' (in the global and anthropological sense of the term), which develop over time. In the research presented here we aim to understand engineering students' visions of the quality of collaborative design processes across two engineering schools, in Japan (Tokyo Technical University) and in France (Telecom ParisTech). In our experiment, Japanese and French engineering students were asked to judge the quality of collaboration, using a specific multidimensional method ("QC", for "Quality of Collaboration": Détienne et al. 2008), on the basis of excepts of videos of students working on collaborative design projects, in either Japan or France. Judges were also asked to state what they thought should be 'ideal' collaboration, with respect to the dimensions of the QC method (e.g. coordination, conflict resolution, social relations, etc.). Based on the degree of agreements between judges on 'ideal' collaboration, our results suggest a common institutional culture of engineering design as well as specificities at the national level.

2 THEORETICAL BACKGROUND

The notion of quality of collaboration

In the field of design studies (e.g. McDonnell & Lloyd, 2009), a major and continuing topic of interest has been to understand the collaborative processes by which co-designers work towards common, negotiated design solutions

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(Bucciarelli, 1988). Empirical studies involving analyses of interactive processes have also raised questions concerning the relationship between the design process, the collaboration process and the resulting design product. More precisely, the question could be formulated as: what are the relations between specific collaborative design processes and the characteristics of the design artefacts to which they give rise? We address this question in terms of the integrative concept of *quality of collaboration* (Détienne et al. 2012). This concept encapsulates much of what is currently known about collaborative processes in design meetings, and is operationalised in the form of specific multidimensional methods for analysing and evaluating what constitutes effective collaboration in design. Understanding what makes for effective collaborative design is clearly of importance for professional practice and training of designers. Intuitively, the concept of the quality of collaboration can be understood in terms of the commonplace observation that collaboration may work more or less 'well'.

A method to assess quality of collaboration (QC)

Burkhardt et al. (2009) have proposed a multi-dimensional rating scheme for evaluating the quality of collaboration (QC) in technology-mediated design. This method, initially (and partly) based on the method of Spada et al. (2005) in CSCL (computer-supported collaborative learning) research, distinguishes several dimensions, along three aspects, identified as central for collaboration in design: (design) task-oriented processes (e.g. divergence, argumentation), group-oriented processes (communication interaction as well as socio-relational processes), and balance between task vs. group orientation.

The reliability as well as the usability of an initial version of the QC method has been tested on the basis of inter-rater correlations, interviews and analyses of judges' activity during their application of the method (see Détienne et al. 2008 for the evaluation approach).

The QC method was applied in two studies on design meetings. The first study (Burkhardt et al. 2009) aimed to compare the quality of collaboration across three distinctive technology-mediated architectural design situations: pairs in co-presence, pairs at a distance and 4-designer groups at a distance. The objective was to test the sensitivity of the method to various technology-mediated situations. In a second study, the method has been applied in a longitudinal approach to the study of a collaborative distant architectural studio (Safin et al. 2010). The objective was to analyse the interrelation between the design process and the quality of collaboration.

The results of the comparative study show that the QC method reveals interesting differences in the quality of collaboration that can be related to technology mediation or group factors. The results of the longitudinal study highlight quality of collaboration and design processes appear to have a bilateral relationship: a good collaboration allows the design process to progress, and the progression of the design process provides the conditions for a good collaboration.

From QC to culture of collaboration

Collective design requires collective efforts and collaboration between diverse social actors, with development of a « culture of collaboration »(e.g. Schuman, 2006 or the notion of "common frame of reference" developed by Hoc & al., 2002). Without a common culture, humans cannot communicate, understand

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and elaborate a common project. They have to create a common world. We understand "culture of collaboration" here, as a set of shared common norms and values of how to work together, on collaborative engineering design projects. Although this is not the specific aspect studied here, an important aspect of such 'cultures' is that they develop and become reified over time, in the form of a "collaborative working relation" (Andriessen, Baker & van der Puil, 2011; Andriessen, Pardijs & Baker, 2013). The research presented here contributes to such an understanding of the concept of culture of collaboration by contrasting collaborative design practices, across two engineering schools in two different countries, as a way of highlighting what is specific to those cultures.

The norms, values and practices that constitute cultures of collaboration can be approached by using the QC method. In this research we will contrast French and Japanese views on the Quality of Collaboration in Creative design sessions

2. METHODOLOGY

Our experimental protocol comprises the following four main stages.

(1) Creation of a data corpus (videos of brainstorming sessions). The data corpus consisted of four video extracts of four minutes duration, involving either French or Japanese groups of engineering students during brainstorming sessions. In these sessions, the students had to collaborate to generate creative ideas ("brainstorming") concerning technological products. The videos extracts show brainstorming sessions with groups of students in engineering universities, half of the videos being recorded either in France or in Japan.

(2) Assessment of data corpus by judges: Participants/analysts (N=20) were engineering students, different from the participants in the brainstorming sessions, half of them being French nationals, the other half Japanese nationals. The experiment consisted in ten sessions in total. Half of the sessions were facilitated in French, with the participation of pairs of French judges, the other half were in Japanese, with the participation of pairs of Japanese judges. The participants had to watch the aforementioned videos and to complete a questionnaire to evaluate the quality of collaboration and creativity of the four groups of engineering students. We used a new version of the QC questionnaire. Thirty-three questions are used to assess the quality of collaboration and creativity, along eight dimensions as displayed in Table 1.

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DESIGN TASK		TASK/GROUP	GROUP PROCESS				
			Communication		Relations		
Co-Design & Creativity	Argumentation in problem solving	Distribution of different types of activities	Fluidity of communication	Sustaining joint focus & mutual understanding	Coordination	Distribution of roles across participants	Interpersonal relations
Divergence/ Convergence Quality & Quantity of ideas Deepening of ideas Premature commitment Up-take of ideas	Giving reasons Agreement/ Disagreement Competition/ Cooperation	Distribution between problem solving, interpersonal & off-task activities Group reflexivity	Communication (turn taking management, silences, rate of speech) & joint use tools coordination	Joint visual focussing & mutual understanding with respect to the task and use of tools	Project management (work planning, distribution & management of tasks interdependencies, time management) Meeting management (ordering, postponing of topics, agenda & time management)	Distribution of: Speech Tools use Group work management Idea generation Argumentation	Socio-relational climate Emotional arousal Regulation of interpersonal relations Mutual support & encouragement Participation in group work

Table 1 – Dimensions of Quality of Collaboration and Creativity

Here are some examples of questions/answers of the questionnaire:

Turn-taking management
1. To what extent does speech overlap?
   ❑ To high degree
   ❑ To a moderate degree
   ❑ Very little or not at all

Generation of ideas
11. To what extent does the group propose alternative ideas?
   ❑ *Many*
   ❑ *A few*
   ❑ *None*

Distribution between problem solving and interpersonal activities
21. *What is the group most focus on?*
   ❑ Main focus on problem solving and/or coordination
   ❑ Mixed focus
   ❑ Main focus on interpersonal activities

   (3) Assessment of "ideal" collaboration by judges: Following the assessment of data corpus, the judges were asked to fill out the QC questionnaire according to what they think was an "ideal" collaboration. They had to answer the thirty-three questions with responses reflecting a good collaboration. This was intended to help us to understand their social representation of collaboration culture.

   (4) Statistical analysis of the assessment data: The results are being analysed in order to compare inter-rater agreements between the assessments of French and Japanese judges, between French pairs of judges and Japanese pairs of judges and between all pairs of judges. Thus, in order to highlight various cultures of collaboration, we expect that the results show high intra-agreements between same type of judges (French and Japanese) and low inter-agreements between them (French vs. Japanese).

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Two statistical methods have been used. At the questionnaire level, we used Cohen's kappa (k). For each questionnaire, the responses of each judge were compared with those of all the other judges. Based on the proposed Landis and Koch (1977) table for interpreting the results by categorizing kappa by order of magnitude, the results were divided into six levels of agreement ranging from "disagreement" for values under 0 to "almost perfect agreement" for values comprised between .81 and 1.

At the individual questions level, we used IQV (Index of Qualitative Variation), a measure of variability for nominal variables. Comprised between 0 and 1, 0 means that there is no variability between judges' answers for one question and 1 that judges' answers are scattered between all the three categories of answers.

Table 2 shows the IQV as calculated for all the possible distributions of answers into three categories for ten judges. In our results we will consider that IQV scores comprised between 0 and 0,75 reveals a very good to moderately good agreement across judges and that IQV scores comprised between 0,81 and 1 shows a disagreement across judges.

	Response 1	Response 2	Response 3	IVQ	Agreement
	10	0	0	0	
	9	1	0	0,27	
	8	2	0	0,48	
	8	1	1	0,51	Very good to moderate agreement
	7	3	0	0,66	
	7	2	1	0,69	
	6	4	0	0,72	
Judges number (n=10)	5	5	0	0,75	
	6	3	1	0,81	
	6	2	2	0,84	
	5	4	1	0,87	
	5	3	2	0,93	Disagreement
	4	2	4	0,96	
	4	3	3	0,99	
	3,3	3,3	3,3	1	

Table 2 – Distribution of IQV

3. RESULTS

In this paper we will present and discuss the results concerning the "ideal" collaboration as assessed by French and Japanese judges. The results on the evaluation of the data corpus will not be developed. However, this step in our procedure is considered to have given examples of good or bad collaborations to the judges and prepared in this way the following step, under study, on 'ideal' collaboration.

"Ideal" collaboration: weak agreements at the questionnaire level

Regarding the assessment of ideal collaboration, the kappa scores calculated at the whole questionnaire level on all the pairs of judges are moderate to perfect (k comprised between 0.41 to 1) for 51,6 % of pairs. The same levels of agreement are found for 46,6% of the French judges (intra-French groups), 57,7% for the Japanese (intra-Japan groups), and 51% for Japanese vs French

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judges (inter-groups). These results do not allow us to contrast cultures of collaboration between French and Japanese judges, on a global level, i.e. with respect to all dimensions of QC.

"Ideal collaboration": distinctive agreements and disagreements at the questions level

➢ At the individual questions level, we analysed first whether or not inter-judges agreement or disagreement were concentrated on some particular dimensions and/or questions. In order to be able to discriminate these convergences/divergences we calculated, as we presented above, the IQV for each questions (see Table 3, 4, 5.a and 5.b).

	DESIGN TASK							
	Co-Design & Creativity					**Argumentation in problem solving**		
	Alternative ideas	Varied & original ideas	Rapid commitment	Deepening of ideas	Up-take of ideas	Giving reasons	Disagreement	Competition vs. cooperation
IQV Japanese judges	0,27	0	0,66	0,27	0,48	0,66	0,27	0,48
Response	Many	Many	Medium	A lot	A lot	A lot	Sometimes	Cooperative
IQV French judges	0,48	0,27	0,51	0,27	0,72	0,27	0,48	0
Response	Many	Many	Medium	A lot	A lot	A lot	Sometimes	Cooperative

Table 3 – IQV Design task

	TASK/GROUP		
	Distribution of different types of activities		
	Focus on problem solving vs. interpersonal relations activities	Focus on-task vs. off-task activities	Group reflexivity
IQV Japanese judges	0,27	0	0,75
Response	Main focus on problem solving	Main focus on design task	To a high degree vs. to a moderate degree
IQV French judges	0,72	0,48	0,81
Response	Mixed focus	Main focus on design task on	To a moderate degree

Table 4 – IQV Task/Group

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	GROUP PROCESS									
	COMMUNICATION									
	Fluidity of communication					Sustaining joint focus & mutual understanding				
	Speech overlap	Talking together	Silences	Rate of speech	Joint use of tools	Joint visual focussing	Work to ensure mutual understanding (task)	Reparation of the misunderstanding (task)	Work to ensure mutual understanding (tools)	Reparation of the misunderstanding (tools)
IQV Japanese judges	0,69	0,27	0,27	0,48	0	0,48	0	0	0,27	0
Response	To a moderate degree	Mostly in one group	Few or none	Medium	Smooth & easy	To a high degree	To a high level	Yes	To a high level	Yes
IQV French judges	0,72	0,69	0,81	0,51	0,27	0,48	0,27	0	0,66	0
Response	Very little or not at all	Mostly in one group	Few or none	Medium	Smooth & easy	To a high degree	To a high level	Yes	To a high level	Yes

Table 5.a – IQV Group process

	GROUP PROCESS											
	Relations											
	Coordination		Distribution of roles across participants					Interpersonal relations				
	Project management	Meeting management	Speech distribution	Tools use distribution	Group work management distribution	Idea generation distribution	Argumentation distribution	Socio-relational climate	Emotional arousal	Regulation of interpersonal relations	Mutual support	Participation in group work
IQV Japanese judges	0,75	0,72	0,69	0,69	0,27	0	0	0,48	0	0,93	0,66	0
Response	A lot vs. sometimes	High vs. medium	Rather equal	Rather equal	Rather equal	Rather equal	Rather equal	Friendship, relaxed	Moderate	To a high degree	To a high degree	Almost all participants are highly involved
IQV French judges	0,72	0,72	0,27	0,87	0,93	0	0,27	0,27	0,27	0,27	0,27	0,69
Response	A lot	High vs. medium	Rather equal	Rather equal	Monopolisation	Rather equal	Rather equal	Friendship, relaxed	Moderate	To a high degree	To a high degree	Almost all participants are highly involved

Table 5.b – IQV Group process

Analysing Japanese responses distribution to the individual questions, we found a good degree of agreement for 26 of the 33 questions (0=<IQV=<0,75).

- For the dimensions related to group processes, we found agreement between Japanese judges for:
  - "Fluidity of communication"
  - "Sustaining joint focus and mutual understanding"
  - "Coordination"
  - "Distribution of roles across participants"
  - "Interpersonal relations" (expect for the question related to the *"regulation of interpersonal relations"*)

- For the two dimensions related to design task, "Co-Design and Creativity" and "Argumentation in problem solving" we found agreement between Japanese judges.
- For the dimension "Distribution of different types of activities" related to task vs. group orientation, we also found agreement between Japanese judges.

Analysing French responses distribution to the individual questions, we found a good degree of agreement for 22 of the 33 questions (0=<IQV=<0,75).

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- For the dimensions related to group processes, we found agreement between French judges for:
  - "Fluidity of communication" (except for the question related to *"silences"*)
  - "Sustaining joint focus and mutual understanding"
  - "Coordination"
  - "Distribution of roles across participants" (except for the two questions related to *" tools use"* and *"group work management"*)
  - "Interpersonal relations".

- For the two dimensions related to design task, "Co-Design and Creativity" and "Argumentation in problem solving" we found agreement between French judges.

- For the dimension "Distribution of different types of activities" related to task vs and group orientation, we found agreement for the two questions about the *"focus on problem solving, interpersonal relations or off-task activities"* but a disagreement appears concerning the question on *"group reflexivity"*.

These results suggest that, in within each group –French and Japanese- the judges share values and norms on ideal collaboration with respect to the mentioned dimensions.

➢ In a second step, we analysed whether French and Japanese judges tend to converge or not on the same kind of answers to these questions. We will consider only questions for which a strong to moderate agreement was found within each group.

All judges converged on the same answers concerning the following questions presented by dimension:

  - "Fluidity of communication", French and Japanese judges converge related to the questions of *"talking together", "silences", "rate of speech" and "joint use of tools"*.
  - "Sustaining joint focus and mutual understanding", convergences are about *"joint visual focussing", "work to ensure mutual understanding"* (respect to the task and to the tools use), *"reparation of the misunderstanding"* (respect to the task and to the tools use).
  - "Coordination": *"meeting management"*
  - "Distribution of roles across participants": *"speech", "ideas generation" and "argumentation distribution"*
  - "Interpersonal relations": *"socio-relational climate", "emotional arousal", "mutual support" and "participation in group work"*
  - "Co-design and creativity": *"alternative ideas", "variety and originality of ideas", "rapid commitment", "deepening of ideas"*
  - "Argumentation in problem solving": *"giving reason", "disagreement", "competition"*
  - "Distribution of different types of activities": *"focus on problem solving or off-task".*

This suggests that there is a common culture of collaboration, shared by all the judges whatever their nationality. We could assume that this reflects a common culture in the two engineering schools from where our judges come from.

However we also found that French and Japanese judges diverged for the questions concerning the following topics:

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- *"Speech overlap" of the "Fluidity of communication" dimension*:
Japanese judges considered that it should be moderate, whereas French
judges replied that it should not occur.

- *"Project management" of the "Coordination"* dimension: Responses of
Japanese judges are divided into "a lot" or "sometimes" whereas the
French judges are more agree to answer ""a lot".

- Regarding the question of *"focus on problem solving or interpersonal
relations"* of *"Distribution of different types of activities dimension"*,
Japanese judges answer that the main focus should be mainly on
problem solving whereas French judges consider that it should be both
on problem solving and on interpersonal activities.

These divergences are related to questions on <u>group processes</u>, either
communication interaction or project management, and to <u>group versus task
orientation</u>. This result tends to highlight cultural specificities at the national
level.

4. DISCUSSION AND CONCLUSION

This study highlights the role of culture in the evaluation of quality of
collaboration and creativity during creative sessions.

- The convergences across all the judges about the representation of ideal
collaboration reveal the existence of a common ground. On the basis of
this study, there would therefore be a common "engineer's culture" of
collaboration, across the two engineering schools, in France and in
Japan.
- As for the divergences, they refer to group processes as well as
task/group orientation. Beyond their interpretations, they invite
questions concerning the QC questionnaire artefact and its structure.
Thus, some questions offer different kinds of responses. Whereas some
are building on an exclusive model (yes/no), other ones apply for an
ordinal assessment (more or less).

Our ongoing work involves detailed analysis of the video extracts in order to
observe if the values and the norms reflected through the social representation
of an ideal collaboration influence the assessment of situations.

In conclusion, whilst the analyses at the questionnaire level cannot allow to
highlight overall differences between the two groups of judges, analyses with
respect to specific dimensions of the quality of collaboration reveal some
divergences, across the French and Japanese institutions' judges, about the
social representations of the quality of the collaboration.

The convergences inside a group (intra-group) and the divergences across the
two groups of judges (inter-group) show that there are social representations of
the quality of collaboration shared inside the members of a same culture.
Nevertheless, the convergences of all the judges also reveal a common ground
that leads us to consider that there could be a common transnational "culture of
engineering schools". This shows that there are different levels of cultures:
national culture but also institutional/organisational cultures.

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