

Analyse des interactions dans les groupes :
de la détermination des types d'interactions aux liens
avec la performance, la satisfaction et le conflit perçu

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Thèse de Doctorat présentée en vue de l'obtention du grade de Docteur en Sciences
Economiques et de Gestion

Université libre de Bruxelles
Solvay Brussels School of Economics and Management
Centre Emile Bernheim (CEB)

Année académique : 2017-2018

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“I’ve always believed that you should never, ever give up and you should always keep fighting even when there’s only a slightest chance.”

Michael Schumacher (2007)

« Considérant les événements présents de notre vie, nous oscillons sans cesse entre la croyance au hasard et l’évidence du déterminisme. Pourtant, lorsqu’il s’agit du passé, nous n’avons plus aucun doute : il nous paraît évident que tout s’est déroulé dont la manière dont tout devait, effectivement, se dérouler. »

Michel Houellebecq

Les Particules élémentaires (1998)

Remerciements

Je souhaiterais tout d’abord remercier le Professeur Michel Verstraeten, pour m’avoir permis de débiter enfin un projet de thèse après un long parcours du combattant. Merci à lui de m’avoir fourni tout au long de ce parcours sa confiance, son temps précieux, des conseils avisés et de m’avoir incitée à persévérer dans les moments de doute.

Mes remerciements vont également aux membres de mon jury, le Professeur Alain Eraly, le Professeur Nadine Lemaitre-Rozencweig, le Professeur Florence Duvivier et le Professeur Lucy Van Hove, pour avoir accepté de faire partie de mon jury de thèse. J’adresse enfin un remerciement tout particulier au Professeur Marie Chédru, pour l’intérêt pour les sciences de gestion qu’elle a su susciter chez moi alors que je n’étais encore qu’étudiante en école d’ingénieurs. Sans le savoir, elle m’a donné l’envie de me réorienter vers des sujets plus centrés sur l’humain et a ouvert la voie à de nouvelles perspectives professionnelles.

Je remercie de même le professeur Dieter Beck (Deutsche Universität für Verwaltungswissenschaften Speyer) pour son orientation quant au développement initial d’une grille de codage des interactions, et le professeur Marshall Scott Poole (University of Illinois at Urbana-Champaign) pour les précisions qu’il a pu m’apporter quant à la validation des grilles de codage.

A tous les étudiants de la SBS-EM et de l’EPB qui ont pris part à l’expérience sur laquelle se fonde cette recherche, un grand merci pour leur participation et leurs remarques parfois inspirantes.

Je remercie aussi Monsieur Wayne Jones pour sa relecture attentive et efficace de mes articles en anglais, et ses conseils de rédaction.

Merci également à mes parents pour m'avoir soutenue dans ce projet, après une année d'errance et de remise en question à la sortie de mes études. Je suis allée là où je devais être.

J'adresse de même des remerciements tout particuliers à mes amis du Mans et de Bruxelles. Vous avez partagé ma motivation, mon découragement, mes espoirs parfois démesurés, mes échecs aussi, mes (pourcentages de) phases de codage des interactions, de tests statistiques, et de rédaction des articles, au fil du temps. Je ne peux oublier naturellement mes chers amis manceaux Jacques et Jean-Claude, qui ont suivi mes aventures ces dix dernières années et avec qui le contact n'a jamais été rompu malgré le temps et la traversée des frontières. Merci pour l'intérêt que vous avez marqué pour mes études, mais aussi de manière plus générale, pour mon développement en tant que personne.

Enfin, je n'oublie pas ceux qui ont souligné ironiquement ma persévérance obstinée, et qui ont tenté de me dissuader de m'engager sur cette voie, pour quelque raison que ce soit. Merci de m'avoir donné la force de continuer à avancer dans les moments de doute et de m'avoir fait comprendre à quel point il aurait été dommage de lâcher prise. « *Quant à ce qui est d'affronter des aventures, croyez-moi, seigneur don Diego, il y a plus à perdre en reculant qu'en avançant.* » (*Don Quichotte de la Mancha* – Miguel de Cervantès)

Résumé des termes employés et équivalences français-anglais

Interactions jouées dans une équipe (identifiées via la grille de codage INSIDE TEAMS^{3D}) :

- Dimension « nature » (*functional meaning*)
 - o « Offre » (*Offering*)
 - o « Demande » (*Asking*)
 - o « Décision » (*Deciding*)
 - o « Socialisation » (*Socializing*)
- Dimension « convergence » – mesure du conflit sur la tâche ou le processus
 - o Neutre
 - o Négative
 - o Positive
- Dimension « socio-émotionnelle » (*interpersonal emotional meaning*) – mesure du conflit relationnel
 - o Neutre
 - o Négative
 - o Positive

Conflit perçu par un membre d'équipe (mesuré via un questionnaire) :

- Sur le contenu de la tâche (*content-oriented conflict*)
- Sur le processus (*process-oriented conflict*)
- Relationnel (*relationship conflict*)

Satisfaction d'un membre d'équipe (mesurée via un questionnaire) :

- Instrumentale (satisfaction vis-à-vis du processus, des résultats et de la performance de l'équipe)
- Sociale (satisfaction vis-à-vis des relations, jugées agréables dans l'équipe)

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Introduction

1. CONTEXTE

1.1. Etude des interactions : les origines

Quotidiennement, dans des situations très variées, les individus sont amenés à se rassembler en groupes. Le concept de *groupe* peut être défini comme « un ensemble de personnes interagissant entre elles, conscientes de la présence des autres et se considérant comme appartenant à ce groupe » (Buchanan & Huczynski, 1997). Le groupe n'est pas un simple assemblage d'individus indépendants les uns des autres : une interdépendance entre les membres existe, nécessaire à l'atteinte des objectifs communs du groupe (Augustinova & Oberlé, 2013). Ces groupes, choisis volontairement ou non, présentent des caractéristiques et des raisons d'être très différentes, mais montrent des similitudes dans leur dynamique (Bales, 1950). Cependant, approcher la dynamique des groupes reste complexe : de nombreuses variables, aussi bien individuelles que collectives, peuvent influencer la dynamique des groupes. L'étude et la compréhension des phénomènes intragroupaux nécessitent l'observation des groupes, et notamment l'observation « de la manière dont les membres interagissent, réalisent leurs tâches, prennent des décisions » (Forsyth, 2010).

Cette question des interactions dans les groupes exerce une certaine fascination en psychologie sociale (Becker-Beck, 2001). Elle s'intéresse à l'identification et à la compréhension des expressions verbales (auxquelles s'ajoutent parfois les expressions non-verbales) affichées par les membres des groupes, perçues comme la « résultante des forces propres aux groupes auxquels les individus appartiennent » (Augustinova & Oberlé, 2013; Becker-Beck, 2001; Lewin, 1947; London & Sessa, 2007). Les interactions jouées dans les groupes reflètent à la fois une focalisation sur la tâche occupant le groupe, sur le groupe en tant que tel et sur les aspects socio-émotionnels que celui-ci fait naître (Augustinova & Oberlé, 2013). Les interactions représentent le niveau le plus riche et élémentaire auquel l'observation des comportements groupaux s'effectue, telles des composantes à l'échelle atomique des phénomènes collectifs. Elles fournissent de plus des informations neutres, dénuées de jugement ou d'interprétation, sur les comportements adoptés.

Les premiers travaux relatifs à l'étude des interactions dans les groupes remontent à la fin des années 1940, initiés par le psychosociologue américain Robert F. Bales pour le domaine de la psychologie clinique. Celui-ci a développé un des premiers systèmes de classification des interactions dans les

groupes (aussi appelés grilles de codage des interactions ou interaction coding systems en anglais) par des observateurs extérieurs et a priori neutres, ce sans nécessiter de recours à des entretiens avec des membres des groupes (Schermuly, Schröder, Hachtwei, & Scholl, 2010). De telles grilles de codage des interactions ont permis de fournir des outils d'observation objective de groupes et de décrire de manière plus claire et sans équivoque le type de comportements se jouant en groupe et leur fréquence (Forsyth, 2010). L'apparition des premières grilles de codage des interactions par Bales a ouvert la voie à de nombreuses recherches en dynamique de groupe, dans des contextes aussi variés que les réunions de travail, les thérapies individuelles ou de groupes, ou l'analyse des relations familiales ou de couple. L'étude des groupes restreints et plus particulièrement, celle des interactions intra-groupales, a certes connu un intérêt conséquent de par le passé, mais a aussi plus récemment fait l'objet d'une moins grande attention dans le domaine de la recherche (Kettner-Polley, 2000).

1.2. Etude des interactions : quels enjeux pour la gestion ?

Aujourd'hui peut-être plus que jamais, les équipes sont une composante fondamentale des entreprises à tous les niveaux (équipes de direction, de recherche et de développement, équipes de projet, etc.) (May, 2003). Les groupes, bien souvent à travers la notion d'équipe, occupent une place d'importance dans le domaine du management. Bien que le travail en équipe représente une réalité parfois imposée, et souvent inévitable, il peut représenter une source d'inconfort ou créer des difficultés chez les travailleurs, obligés de collaborer, d'interagir dans un groupe et de débattre pour parvenir à des décisions unanimes ou du moins acceptées par l'équipe (de la Torre-Ruiz, Ferron-Vilchez, & Ortiz-de-Mandojana, 2014). Ces échanges entre individus ayant des points de vue dissonants peuvent aboutir à des conflits intra-groupaux que l'équipe va devoir gérer (Amason, Thompson, Hochwater, & Harrison, 1995; Pelled, Eisenhardt, & Xin, 1999). Néanmoins, ce sont les ressources cumulées des équipes et leur capacité à se rassembler, échanger de l'information et former une entité et non une somme de particules élémentaires, qui vont leur assurer de répondre aux objectifs de performance attendus d'elles (Foo, Sin, & Yiong, 2006; Forsyth, 2010).

Dans ces conditions, la capacité à comprendre la dynamique de ces groupes s'avère centrale pour favoriser leur performance, mais également le bien-être de leurs membres. Pour ce faire, l'analyse des interactions dans les équipes de travail peut s'avérer d'une grande aide, permettant l'appréhension des comportements collectifs et leur impact potentiel sur l'efficacité des équipes, l'occurrence de conflits ou encore la satisfaction vis-à-vis du groupe ou de la tâche (Jung, 2016). Ceci représente un défi important,

d'autant plus que de nombreux paramètres individuels et collectifs ne peuvent être contrôlés. A ce jour, peu de recherches se sont penchées sur les liens entre types d'interactions et respectivement performance, satisfaction et conflit, ce malgré les avantages que cela pourrait apporter aux équipes en termes de réception de feedbacks ou de suggestions d'amélioration (Jung, 2016). Il s'agira alors de proposer une nouvelle direction de recherche et de relancer l'intérêt pour l'analyse des interactions en lien avec le milieu professionnel.

2. OBJECTIFS DE LA THÈSE

Ainsi, certains manques sont à constater dans l'analyse des interactions dans les équipes de travail, tant dans les outils à disposition que dans les liens entre les interactions et la résultante de la dynamique du groupe (satisfaction des membres, conflit perçu par les membres, performance du groupe). La première étape consistera à mettre en lumière les différentes grilles dédiées au codage des interactions, leurs spécificités et leurs limites. Le chapitre 1 présentera alors une revue de littérature exhaustive sur le sujet. Face à ce bilan sur les outils rendant compte des interactions échangées en équipe, la nécessité de fonder une nouvelle grille de codage s'imposera. Sa création par itérations, sa validation et un guide d'utilisation seront détaillés dans le chapitre 2. Cette grille, nommée INSIDE TEAMS^{3D} (IT^{3D}) répondra notamment aux besoins suivants :

- Elle assurera de coder toutes les interactions rencontrées dans les réunions d'équipe, ce quelle que soit la finalité de celles-ci (brainstormings, prises de décisions, réunions d'informations, etc.)
- Elle intégrera un codage selon trois dimensions, éclairant ainsi sur des caractéristiques distinctes des interactions sans les substituer les unes aux autres :
 - La nature des interactions (dimension « *functional meaning* »), soit la catégorisation de ce que le locuteur dit par le biais de son interaction
 - La convergence entre les interactions (dimension « *convergence* »), soit l'articulation logique entre les interactions (support, acquiescement relatif à une idée énoncée, ou à l'inverse, opposition à une interaction). Une interaction codée négativement sur cette dimension convergence, est considérée comme révélatrice de conflit sur la tâche (contenu ou processus)
 - La composante socio-émotionnelle (dimension « *interpersonal emotional meaning* »), soit la constituante affective ou relationnelle des interactions (soutien, enthousiasme,

ou au contraire, agressivité, condescendance, coupures de parole, etc.). Cette composante, prise sur le versant négatif, indique la présence de conflit relationnel dans le groupe.

- Le caractère user-friendly de la grille de codage sera une préoccupation importante lors de sa conception :
 - La grille de codage sera constituée d'un nombre certes exhaustif, mais limité, de catégories de codage (pour chacune des dimensions)
 - Elle permettra un codage en temps réel des interactions (on considère que sans retranscrire le texte des interactions, un codeur pourra suivre 4 à 5 participants d'une réunion et coder leurs interactions sur les trois dimensions en direct)
 - Elle sera facile à appréhender : un nouveau codeur pourra être opérationnel et assurer un codage fiable après quelques heures de formation seulement, notamment grâce à un guide complet d'utilisation de la grille de codage)

Fort de cette nouvelle grille de codage des interactions, la compréhension des liens entre la dynamique de groupe et sa performance, le conflit ressenti par ses membres et la satisfaction de ceux-ci, sera au cœur de la thèse. Pour ce faire, une observation a été réalisée auprès de 264 participants répartis dans 41 groupes se réunissant dans le cadre d'un exercice de conception et de construction impliquant des échanges et des prises de décisions attendues. Des mesures de satisfaction et de perception du conflit ont été effectuées auprès des membres des groupes pour rendre compte de leurs ressentis à différents moments stratégiques de l'expérience.

En premier lieu, il s'agira de mettre en évidence les liens potentiels entre les types d'interactions joués dans un groupe et la performance de celui-ci. Le chapitre 3 aidera à identifier les types d'interactions (en nature, convergence et composante socio-émotionnelle) qui semblent être liés à une plus grande performance, ou inversement, à une performance moins élevée. Ceci répond à différents objectifs, à savoir de pouvoir d'une part comprendre les comportements à préconiser ou éviter en réunions pour favoriser de meilleurs résultats, et d'autre part de se positionner sur l'impact du conflit sur la performance, ce afin de plus facilement imaginer les réponses à apporter à l'apparition de conflit dans des groupes.

En second lieu, nous nous consacrerons à la compréhension des liens entre les types d'interactions, le conflit ressenti et la satisfaction des membres, ce qui donnera corps au chapitre 4. Ainsi, des liens

pourront être faits entre la dynamique de groupe et la satisfaction de ses membres, ce qui permettra d'identifier les éventuels comportements liés positivement ou négativement à la satisfaction dans les réunions de travail. De même, une attention particulière sera apportée à la perception du conflit par les membres afin de voir si le conflit, tel qu'il est perçu de l'intérieur par un membre, est associé à sa satisfaction.

Ces résultats sur la dynamique de groupe apporteront un éclairage nouveau sur les interactions jouées et sur l'importance qui doit leur être consacrée. Les conclusions liées aux associations entre interactions et satisfaction ou conflit perçu seront utiles pour fournir aux équipes un support de type coaching, feedback, ou même des recommandations visant à améliorer leur fonctionnement.

3. MÉTHODOLOGIE

La thèse se décompose en deux phases principales : la création d'une nouvelle grille de codage des interactions, et l'utilisation ensuite de celle-ci pour se pencher sur les liens entre types d'interactions, performance, satisfaction et conflit perçu.

En ce qui concerne la création de la grille de codage, une démarche abductive a été adoptée, mêlant induction et déduction (Nunez Moscoso, 2013). Au lieu de formuler des hypothèses sur base de la théorie ou d'idées de recherche, ou inversement de fonder une théorie sur base d'observations, c'est une démarche itérative qui a été à la base de la création de la nouvelle grille de codage des interactions. Une étude de la littérature a certes permis de synthétiser l'état de l'existant, mais c'est par le biais de nombreuses observations de groupes variés et exercices de codage que les types d'interactions exhaustifs pour représenter trois dimensions des interactions en groupe ont pu émerger et être isolés. La grille INSIDE TEAMS^{3D} (IT^{3D}) constitue alors « un système décrivant effectivement la réalité », un modèle permettant de représenter et étudier certaines caractéristiques des interactions de manière objective (Thietart, 2007; Willett, 1996).

Toutes les recherches relatives aux liens entre types d'interactions, performance, satisfaction et conflit perçu, s'appuient sur une méthode quantitative essentiellement hypothético-déductive, étant donné que les hypothèses déduites de la théorie sont transposées à la réalité (conséquences observables) et soumises empiriquement à validation (Paugam, 2010). La thèse a été conduite selon une approche épistémologique positiviste : la théorie étant trop limitée à ce jour pour comprendre le fonctionnement des groupes ou obtenir des indications fortes quant aux phénomènes s'y déroulant, la réalité de ces groupes est observée pour pouvoir l'expliquer, « en découvrir la structure sous-jacente » et valider ou

infirmer empiriquement les hypothèses issues de la théorie (Thietart, 2007). Une orientation objectiviste est adoptée tout le long de la thèse, compte-tenu du pont de vue externe et objectif adopté (Bryman & Bell, 2003).

La recherche est une étude corrélacionnelle, employée à la fois pour confirmer des relations issues de la théorie et en explorer d'autres lorsque la littérature sur le sujet était inexistante ou ne permettait pas de se positionner (analyses de nature confirmatoire, descriptive ou exploratoire) (Vallerand & Hess, 2000). Ce plan corrélacionnel, basé sur l'observation de 41 groupes, compte seulement des variables observées, mais non manipulées (Vallerand & Hess, 2000). Différentes limites inhérentes à ce type de plan sont recensées. Tout d'abord, les plans corrélacionnels permettent difficilement d'établir des relations causales entre variables : plusieurs causes peuvent coexister, l'antériorité des causes n'est pas aisément montrée et on ne peut écarter la présence de variables médiatrices ou de variables de confusion. Face à ces difficultés, et comme leur nom l'indique, ces plans restreignent alors à l'obtention de corrélacions (Vallerand & Hess, 2000).

4. RÉSUMÉ DES CHAPITRES SUIVANTS

Chapitre 1 – Grilles de codage des interactions : une revue de la littérature

De nombreuses grilles de codage des interactions ont été développées ces 70 dernières années pour rendre compte des comportements individuels, mais aussi permettre une meilleure compréhension de la dynamique dans les groupes restreints. Malgré la juxtaposition d'un nombre croissant de grilles de codage des interactions, toutes répondant à des objectifs et exigences différents, la littérature sur le sujet n'apporte pas de vision nette et complète des grilles de codage des interactions disponibles. Le chapitre 1 fournira par conséquent une revue de littérature exhaustive des grilles de codage des interactions dédiées aux groupes restreints, et détaillera leur structure, raisons d'être et spécificités. Une telle analyse éclairera sur le choix de la grille de codage la plus appropriée à une recherche en dynamique de groupe selon les exigences de celle-ci. L'article inclut de ce fait des recommandations préalables au développement de futures grilles de codage.

Chapitre 2 – INSIDE TEAMS^{3D} (IT^{3D}) – Développement d'une grille de codage des interactions multidimensionnelle

Ce chapitre a été co-écrit avec Michel Verstraeten (second auteur).

L'analyse de la dynamique de groupe est devenue un défi majeur dans la compréhension d'éléments du travail en groupe, comme le conflit, la performance ou la satisfaction des membres. A ce jour, de nombreuses grilles de codage des interactions ont été développées pour aider à identifier les types d'interactions échangées entre les membres d'un groupe, mais un certain nombre de lacunes quant à leur structure, leur complexité ou leur fiabilité, subsistent. Dans ce chapitre, nous présenterons la nouvelle grille de codage INSIDE TEAMS^{3D} (IT^{3D}), dédiée à l'étude des interactions dans les groupes restreints et développée de manière itérative à partir d'expériences de groupes. Sa création repose sur différentes exigences, comme sa facilité d'utilisation, le caractère exhaustif des catégories de codage et la prise en compte du caractère multidimensionnel des interactions. La grille IT^{3D} prend en effet en considération trois dimensions des comportements individuels qui sont la nature des interactions (functional meaning), la convergence entre les interactions, et la composante socio-émotionnelle des interactions (interpersonal emotional meaning). La grille de codage IT^{3D} apporte ainsi une plus grande vue d'ensemble sur divers aspects de la dynamique de groupe. L'analyse de la fiabilité inter-codeurs et de la validité de la grille sont également comprises. Un tel outil contribue à ouvrir de nouvelles perspectives de recherche et sur le terrain, ce afin de favoriser une meilleure compréhension des phénomènes intra-grouaux.

Chapitre 3 – Souligner les liens entre les types d'interactions jouées et la performance des groupes

Certains types d'interactions sont-ils bénéfiques ou néfastes à la performance des équipes ? Doit-on inciter ou éviter l'occurrence de conflit entre les membres pour atteindre de meilleurs résultats ? De nombreuses questions se posent lorsqu'on cherche à comprendre comment la dynamique d'un groupe impacte sa performance. Cet article vise à souligner les types d'interactions verbales qui sont liés à la performance d'une équipe pendant une réunion. Une expérience en deux phases (conception et construction) impliquant une prise de décision a été organisée auprès de 41 équipes et enregistrée. Toutes les interactions ont ensuite été codées via la grille de codage INSIDE TEAMS^{3D} (IT^{3D}). Trois dimensions des interactions ont été prises en compte : leur nature (functional meaning), la convergence entre les interactions (incluant le conflit sur la tâche ou le processus) et la composante socio-émotionnelle (interpersonal emotional meaning, incluant des marques de conflit relationnel). La performance a été mesurée pour chaque groupe comme le résultat de l'expérience. On constate qu'elle est positivement associée au nombre total d'interactions échangées. Les résultats confirment que

certaines natures d'interactions sont associées positivement à la performance : ainsi, les groupes partageant davantage de dons d'opinions ou de suggestions sur le contenu, obtenaient en moyenne de meilleurs résultats. Les catégories de socialisation (faire des blagues, entretenir la conversation) sont également corrélées positivement à la performance. L'étude de la convergence des interactions dans les groupes apporte de même des résultats importants, indiquant que des désaccords sur le contenu sont liés positivement à la performance de l'équipe. La composante socio-émotionnelle négative présente également une association positive avec la performance, qui est discutée dans cet article. Au-delà de ces considérations sur les types d'interactions, cette recherche révèle que les groupes avec des contributions équilibrées entre les membres pendant l'exercice obtiennent une plus grande performance que les groupes confrontés à une forte hétérogénéité dans les proportions d'interventions.

Chapitre 4 – Satisfaction et perception du conflit dans les équipes : mise en évidence de leurs relations et de l'importance des types d'interactions

Ce chapitre vise à comprendre comment les interactions sont liées à la satisfaction instrumentale et à la satisfaction sociale, au conflit perçu, que ce soit sur la tâche ou la relation. 264 étudiants répartis dans 41 équipes ont été impliqués dans une expérience de conception et de construction, enregistrée et codée intégralement grâce à la grille de codage IT^{3D}. Une forte relation positive est notée entre les interactions de type socialisation et la satisfaction. On remarque de plus que lorsque les interactions porteuses de conflit sur la tâche (contenu) sont plus nombreuses, les satisfactions instrumentale et sociale décroissent. Inversement, les conflits sur le processus ou la relation ne montrent aucune corrélation avec la satisfaction. La relation entre les interactions porteuses de conflit dans les groupes et la perception du conflit par les membres de ces groupes est également étudiée : seule la perception de conflit sur la tâche s'avère liée à la proportion d'interactions opposant des idées (convergence négative), alors que les interactions indiquant un faible conflit relationnel ne sont pas perçues par les membres comme indicatrices de conflit relationnel. Enfin, l'étude de la satisfaction des membres d'équipe et de leur perception du conflit indique que la perception du conflit sur la tâche est néfaste à la satisfaction instrumentale et à la satisfaction sociale, alors que la perception du conflit relationnel est aussi liée négativement à la satisfaction sociale.

1. Chapter 1 – Interaction coding systems: a literature review

ABSTRACT

Many interaction coding systems have been developed in the last 70 years to highlight individual behaviours and get a better understanding of small group dynamics. Despite the juxtaposition of an increasing number of interaction coding systems responding to different aims and demands, literature on this subject does not provide a complete overview of all available coding systems. This article, therefore, offers a comprehensive literature review of the interaction coding systems dedicated to small groups and details their structure, purposes and specifications. Such an analysis may help shed light on the most appropriate existing coding system according to the requirements of a research study in group dynamics. It also points out a number of major limitations of such models. Implications for necessary prerequisites for the development of future coding systems are consequently included.

Key words: interaction coding systems; team meetings; small groups; review of literature

1.1. INTRODUCTION

Studying group dynamics is essential when it comes to appreciating behaviours within teams and their potential impact on individual or collective phenomena and outputs such as performance, conflict or the well-being of members (Kauffeld & Lehmann-Willenbrock, 2012; Schermuly & Scholl, 2012). From this perspective, getting sequential analysis of intragroup interactions enables it to classify behaviours in a structured and well-defined set of categories (Bull & Roger, 1988; Forsyth, 2010; Trujillo, 1986). For this purpose, many coding systems, intended to be used by external and neutral observers (or rarely by internal members of the groups themselves), were developed from the late 1940s and have accumulated one upon the other. Some partial reviews were made in the past (Bonoma & Rosenberg, 1978; Rogers & Farace, 1975), but no recent comprehensive review of the contribution, structure, content, and limitations of these coding systems was undertaken. The selection of an interaction coding system for a specific purpose may therefore become a tricky or random process.

As no exhaustive overview of interaction coding systems had been developed yet, the purpose of this paper is to offer an updated and critical picture of the existing systems analysing interactions in small groups. Consequently, this paper presents a review of literature that informs on the aims, structural orientations and interconnections of these coding systems. It then emphasizes some significant perspectives regarding the construction of the systems and classifications of behaviours they provide. An identification of major common weaknesses of these systems is also provided, which will be of interest to any researcher or practitioner choosing a coding system, or initiating the creation of a new coding system. Various aspects concerning the structure and intent of the coding systems are reviewed in this paper.

1.2. REVIEW METHODOLOGY

A systematic bibliographic search was undertaken from various databases (Sage, Science Direct, Wiley Online Library, JSTOR and the Internet) to collect literature that met the following inclusion criteria: 1. The paper or book chapter was published in English, French or German before December 2016; 2. The paper or book chapter includes, explains or quotes an interaction coding system explicitly meant to describe face-to-face verbal interactions in global or specific contexts of small groups meetings. The search rejects coding systems which do not embed a classification of verbal interactions (e.g. only taking into account nonverbal characteristics or timing of the interactions regardless the content). Similarly, the coding systems dedicated to specific relationships within the group (e.g. any but interactions between

members and leader) are not within the scope of the review. Finally, the coding systems developed for other purposes than face-to-face team meetings, such as online discussions, group therapies, medical consultations or family interactions were studied but excluded from the review as long as they were irrelevant to other contexts. Indeed, the coding systems dedicated to therapies, marital interactions, family interactions, interactions between patients and their relatives, therapists or doctors, etc. involve significant drawbacks regarding their use for neutral coding in general meeting contexts: focus on the sole emotion carried out in the interaction (positive/negative affect, prosocial/aversive behaviours), focus on the pathological development, assessment of the behaviour quality for recovery or its impact on the relationship. These coding systems then intend to provide a specific viewpoint on interactions which is not compatible with general meetings and with an observation of interactions which is meant to offer objective information on the exchanges. Key words used to retrieve relevant sources were: interaction coding, coding grid, coding system, coding instrument, coding scheme, interaction scale and behaviour coding.

1.3. RESULTS

Using this process, forty-two coding systems that met the inclusion criteria were gathered and listed chronologically in Table 1.1. This list reveals the impact of the Interaction Process Analysis (IPA) on further development of coding systems (direct or transitive inheritance). Examples of coding systems when available are provided in appendix 1.

Interaction Coding System	Authors	Year	Inheritance
Steinzor's coding system	Steinzor	1949	
Interaction Process Analysis (IPA)	Bales	1950; 1970	
Carter's coding system	Carter	1951	
Crouch's coding system	Crouch	1960	
Interaction Process Scores (IPS)	Borgatta	1961	IPA
Categories for Analysis of Idea Development	Crowell & Scheidel	1961	
Behavior Scores System (BSs)	Borgatta	1963	IPS
Soskin and John's analysis of talk behavior	Soskin & John	1963	
Sign Process Analysis (SPA)	Mills	1964	IPA
A Method For Classifying Group Interaction	Ohlsen & Pearson	1965	
Borke's coding system	Borke	1967	
Feedback Rating Instrument	Leathers	1969	IPA
Mark's coding system	Mark	1970	

Decision Proposal Coding System	Fisher	1971	
Factor Analysis of Process Variables	Heckel, Holmes & Rosecrans	1971	
Interaction Behavior Measure (IBM)	McCroskey & Wright	1971	Feedback Rating Instrument
Rackham's coding system	Rackham	1971	IPA
Process Analysis Scoring System	Gibbard & Hartman	1973	
Pattern Variable Coding System (PVCN)	Mabry	1975	
Transactional level coding system	Rogers & Farace	1975	
Ellis' coding system	Ellis	1976	
Social Information Processing Analysis (SIPA)	Fisher	1976	
Social Influence Rating System (SIRS)	Bonoma & Rosenberg	1978	IPA
Items to assess group members behavior	Gouran, Brown & Henry	1978	
Verbal response modes (VRMs)	Stiles	1978	
System for the Multiple Level Observation of Groups (SYMLOG)	Bales & Cohen	1979	IPA
System for the coding of function-oriented interactions (FOICS)	Hirokawa	1982	
Conversational Exchange Analysis	Thomas	1982	
AICS	Weeks	1982	
Group Working Relationships Coding System (GWRCS)	Poole; Poole & Dobosh	1983; 2000	
Organization Verbal Behavior (OVV)	Gioia & Sims	1986	
Group Field Dynamics (GFD)	Polley	1987	SYMLOG
Time by Event by Member Pattern Observation (TEMPO)	Futran, Kelly & McGrath	1989	
Conference Coding System (CCS)	Fisch	1994	IPA, SYMLOG
Group Development Observation System (GDOS)	Wheelan, Verdi & McKeage	1994	
Act4teams	Kauffeld, Lorenzo, Montasem & Lehmann-Willenbrock	2000	IPA, GFD, FOICS, CCS
KATKOMP	Badke-Schaub & Stempfle	2001	
SYNPRO	Simon	2002	
Kolbe's coding system	Kolbe	2006	KATKOMP, SYNPRO
Discussion coding system (DCS)	Schermuly & Scholl	2007	CCS
Instrument Zur Kodierung von Nonverbaler Kommunikation (IKN)	Engelbrecht	2007	DCS
Group Argument Coding System	Seibold & Weger	2007	

Table 1.1: Interaction coding systems and foundations

1.3.1. Diversity of orientations for the design and use of coding systems

Despite the perceived inheritance among some coding systems and the great influence of the IPA on a number of the subsequent coding systems, significant differences in their conception and expected use exist.

Even though coding systems all meet the same need to analyse interactions occurring in nonspecific group contexts, each design stems from the observations of different group contexts: problem-solving processes, therapies (but not limited to therapies), negotiation. Their purposes are also diverse: identifying strengths and weaknesses of members, measuring the impact of interactions on efficiency or conflict. This generates a juxtaposition of different designs and choices of categories within each coding system that tend to orient the kind of use a coding system will have. Furthermore, these coding systems vary widely in precision and category number (from 4 to 53). When some coding systems help analyse interactions with a limited number of categories, others provide a significant level of detail thanks to a large number of categories focusing on specific behaviours (e.g. *evaluate the ability to overcome a problem, ask for organisation and deadlines, mention economic aspects*).

Another difference is related to the importance given to nonverbal behaviours, which varies a lot from one coding system to another. Even though interaction coding is mainly based on the analysis of verbal interactions, the examination of nonverbal features of interactions such as facial expression, gesture or paralanguage is included to different extents in most coding systems. For example, taking account of nonverbal behaviour turns out to be necessary to clarify interactions, especially in case the verbal message is ambiguous (Schermuly & Scholl, 2012) but is also of paramount importance in coding systems aiming at qualifying behaviours on dimensions such as friendliness, involvement or submission.

1.3.2. Two different approaches of interaction coding

When examining the structure of the abovementioned coding systems, two different approaches of interaction coding emerge. On the one hand, most coding systems focus on the functional meaning of verbal interactions and offer classifications of interactions into categories such as *giving information, asking for opinion, agreeing, offering a solution, expressing feelings* (Schermuly & Scholl, 2012). These categories describe both the verbal interactive act (e.g. *question, statement*) and the kind of information exchanged within the group (e.g. *fact, opinion*) (Thomas, Bull, & Roger, 1982). On the other hand, a few coding systems do not code the functional meaning of verbal interactions, but score the way interactions

are perceived and rated on several behavioural dimensions. An example of such a coding system is the SYMLOG, which rates interactions according to three behavioural dimensions: *dominant vs. submissive*, *friendly vs. unfriendly*, and suggesting *acceptance vs. non-acceptance of Authority in the group* (Bales, Cohen, & Williamson, 1979). Another example is the Feedback Rating Instrument, which collects perceptions on interactions thanks to twelve dimensions of interactions such as the *measure of relevance, concision or tension of interactants* within the group (McCroskey & Wright, 1971). Only two coding systems intend to capture both the functional meaning of verbal interactions and their perceptions on behavioural dimensions (IKN, DCS). In the following analysis, we will only focus on the coding of functional meaning and put aside coding systems dedicated to the perception of behaviours.

1.3.3. One-dimensional or multi-dimensional perspectives on interactions

At the very heart of interaction coding, functional meanings of interactions are divided into two kinds, as introduced by Bales in the IPA: the task-oriented ones (content and process) and the socio-emotional ones (positive or negative reactions towards an idea or a member). A few coding systems do not aim at analysing relational aspects of behaviours and preclude the classifications of socio-emotional interactions. Nevertheless, most coding systems follow this distinction and take into account socio-emotional considerations on top of task-oriented aspects to reflect “types of expressions of sociability and affect” (Nam, Lyons, Hwang, & Kim, 2009).

However, authors disagree regarding the way to code interactions combining both task-oriented and socio-emotional components in coding systems which focus on the functional meaning of interactions. As such coding systems include categories for task-oriented interactions and some others for socio-emotional interactions, two perspectives exist. The first perspective is based on the assumption that an interaction is a one-dimensional entity which must be labelled in a single category of a coding system. Such coding systems gather both task-oriented and socio-emotional categories at the same level. This implies that an interaction includes whether a task-oriented or socio-emotional message, but this excludes the possibility of coding both aspects of an interaction in two categories. In situations where the same interaction provides simultaneously task-oriented and socio-emotional messages, priority rules are then given to help the coder decide which category to associate with the interaction, as done in some coding systems as the IPA. The second perspective is to consider interactions as multi-dimensional objects: an interaction can then contain information on both the task-oriented and socio-

emotional dimensions, so that the coder is not forced to choose between dimensions and lose the richness of the interaction content (Trujillo, 1986).

1.3.4. Inclusion of further information to refine the analysis of group dynamics

A greater level of detail can be added when collecting complementary information on the interactional process. In this respect, some authors decided to code elements such as the sequential ordering of interactions (e.g. Steinzor's coding system), the direction of the interaction (keep record of the senders and recipients of interactions) or even the hierarchical relationships among the senders and recipients (e.g. SPA, OVB, AICS). This may help refine the analysis of interactions within groups, and especially among team members at work.

Table 1.2 shows a summary of the structural elements discussed above.

Interaction Coding System	Focus	Dimension	Socio-emotional	Number of categories	Other information
Steinzor's coding system	Functional meaning	Unidimensional		19	Time
Interaction Process Analysis (IPA)	Functional meaning	Unidimensional	x	12	Time
Carter's coding system	Functional meaning	Unidimensional	x	53	
Crouch's coding system	Functional meaning	Unidimensional	x	unknown	
Interaction Process Scores (IPS)	Functional meaning	Unidimensional	x	18	
Categories for Analysis of Idea Development	Functional meaning	Unidimensional		36	
Behavior Scores System (BSs)	Functional meaning	Unidimensional	x	unknown	
Soskin and John's analysis of talk behavior	Functional meaning	Unidimensional	x	6	Frequency; duration of talking
Sign Process Analysis (SPA)	Functional meaning	Multidimensional	x	16	Locus of the interaction; hierarchical relationships
A Method For Classifying Group Interaction	Functional meaning	Unidimensional		28	
Borke's coding system	Functional meaning	Unidimensional		20	
Feedback Rating Instrument	Perception of behaviour	Multidimensional	x	30	
Mark's coding system	Functional meaning	Unidimensional		19	Frequency; duration of talking
Decision Proposal Coding System	Functional meaning	Unidimensional		11	
Factor Analysis of Process Variables	Functional meaning	Unidimensional	x	unknown	
Interaction Behavior Measure (IBM)	Perception of behaviour	Multidimensional		12	
Rackham's coding system	Functional meaning	Unidimensional		8	
Process Analysis Scoring System	Functional meaning	Unidimensional	x	18	

Pattern Variable Coding System (PVCM)	Functional meaning	Multidimensional	x	4	
Transactional level coding system	Functional meaning	Unidimensional	x	15	
Ellis' coding system	Functional meaning	Unidimensional	x	13	
Social Information Processing Analysis (SIPA)	Functional meaning	Multidimensional		16	Time orientation
Social Influence Rating System (SIRS)	Functional meaning	Unidimensional		30	
Items to assess group members behavior	Perception of behaviour	Multidimensional	x	9	
Verbal response modes (VRMs)	Functional meaning	Unidimensional		unknown	
System for the Multiple Level Observation of Groups (SYMLOG)	Perception of behaviour	Multidimensional	x	26	
System for the coding of function-oriented interactions (FOICS)	Functional meaning	Unidimensional		14	
Conversational Exchange Analysis	Functional meaning	Unidimensional		12	
AICS	Functional meaning	Unidimensional	x	15	
Group Working Relationships Coding System (GWRCS)	Functional meaning	Unidimensional	x	7	
Organization Verbal Behavior (OVb)	Functional meaning	Unidimensional		11-15	Hierarchical relationships
Group Field Dynamics (GFD)	Perception of behaviour	Multidimensional	x	26	
Time by Event by Member Pattern Observation (TEMPO)	Functional meaning	Unidimensional		5	Time
Conference Coding System (CCS)	Functional meaning	Unidimensional	x	15	Locus of the interaction
Group Development Observation System (GDOS)	Functional meaning	Unidimensional	x	8	
Act4teams	Functional meaning	Unidimensional	x	45	
KATKOMP	Functional meaning	Unidimensional	x	12	
SYNPRO	Functional meaning	Unidimensional		34	
Kolbe's coding system	Functional meaning	Unidimensional		30	
Discussion coding system (DCS)	Functional meaning	Unidimensional Multidimensional	x	4 28	Locus of the interaction

	Perception of behaviour				
Instrument Zur Kodierung von Nonverbaler Kommunikation (IKN)	Functional meaning Perception of behaviour	Unidimensional Multidimensional	x	4 28	Locus of the interaction
Group Argument Coding System	Functional meaning	Unidimensional	x	7	

Table 1.2: Summary of the structure of the coding systems

1.4. DISCUSSION

Several major limitations emerge from the study of the forty-two coding systems presented and must be highlighted as they may strongly impact the interpretation of findings resulting from their use.

1.4.1. Coding systems limited to the study of task-oriented behaviours

As shown in the analysis of the existing coding systems, some models (e.g. Conversational Exchange Analysis, FOICS, TEMPO) focus on the task-oriented interactions and exclude any coding of socio-emotional interactions. The disadvantage of this position is to leave aside the potentially important impact of relational aspects of interactions on group dynamics. For this reason, such coding systems provide access to a narrow understanding of the way members communicate within a group and should only be used for specific needs.

1.4.2. Issues regarding the exclusivity among categories in coding systems

The same kind of limitation is likely to occur in unidimensional systems focusing on the functional meaning of interactions. Whereas it is easy to understand that an interaction can only be coded into a single task-oriented or a single socio-emotional category, problems arise when an interaction contains both task-oriented and socio-emotional contents (e.g. IPA, IPS, Kolbe's coding system). As pointed out for the IPA coding system, mixing task-oriented and socio-emotional categories and preventing the coder from labelling an interaction into two different categories (mutual exclusivity) generates a conflicting and ambiguous situation (Peräkylä, 2004). In such a case of multiple possible coding, the authors provide priority rules from one dimension over the other or let the coder choose the category that seems to be the most appropriate one (Bonoma & Rosenberg, 1978). In any case, this positioning leads to a loss of information on one dimension or the other and hinders a combined analysis of task-oriented and socio-emotional behaviours.

1.4.3. Issues regarding the exhaustiveness in coding systems

Even if we do not consider the case of socio-emotional interactions or mixed interactions, some purely task-oriented interactions are difficult to code in predefined categories of the existing systems. Whereas some systems seem quite exhaustive, many others restrict coding on a too limited set of specific task-oriented categories and add a miscellaneous category where all the residual interactions that do not fit in any category can be brought together (e.g. Borke's, Carter's and Rackham's coding systems).

Unfortunately, this way of coding may enable some form of theoretical exhaustiveness, but is making it difficult to explore and interpret the interactions collected in the same catch-all category.

1.4.4. Issues regarding the complexity and lack of documentation of coding systems

One important consideration when creating or selecting a coding system is the ability for potential coders to understand and internalise the structure of the system and the way interactions should be categorised within it. Two main issues raise concern about the user-friendliness of many coding systems, even for the most used ones like the IPA (Pennington, 2002). On the one hand, some existing coding systems set too many categories, creating ambiguity on the differentiation between some of these categories which seem very close. If the recommendations given by the authors are not precise enough, some generic categories tend to be overused (Bonoma & Rosenberg, 1978; Borgatta & Crowther, 1965; Thomas et al., 1982) while others may be shelved. Even when sufficient and adequate rules are provided to prevent ambiguities as much as possible, coders can still get lost in the categorisations of an excessive number of behaviours. On the other hand, training time spent to reach high proficiency levels with some coding systems then turns out to be extremely long (Rogers & Farace, 1975). For example, between a few weeks and six months full-time are necessary to be well-trained in the use of the IPA (Borgatta & Bales, 1953). The same consequence occurs with coding systems including a large number of categories, or vague or abstract categories: being trained to distinguish their content and develop the ability to associate an interaction with the right category is a time-consuming process.

1.4.5. Subjectivity of the coding

The use of imprecise or inexplicit coding categories also raises a problem affecting the way the coder understands the coding categories as well as the types of interactions he is facing. Too much room for the interpretation of the categories and for judgement of the interactions by the coder creates a risk of a higher subjectivity in the coding process. This is all the more true when coding systems deal with the observation of nonverbal behaviours or the socio-emotional component of interactions, especially when the authors of the systems give no clear direction. Huge variations among the coders may then appear and call into question the reliability of such coding systems.

1.4.6. Lack of reliability and validity tests

Although some of the abovementioned coding systems stem from the modification of an existing coding system, most of coding systems propose new sets of categories, sometimes inspired by combination of

previous coding systems or starting from scratch, but redesigned to shape a new way of analysing interactions. Due to this situation, few coding grids address the issue of reliability, i.e. the consistency of measurement across time, categories and independent raters, that is to say a measure of intercoder agreement (Compton, Love, & Sell, 2012; Poole & Hewes, 2016). Similarly, the question of the validity of coding systems i.e. the ability of the coding system to measure what it is supposed to measure (understanding of group interactions) has often been ignored or neglected (e.g. no measures for Behavior Scores System, average reliability measures for some dimensions of the SYMLOG). And yet, reliability and validity tests would bring credibility to ensure a coding system is appropriate to study group dynamics and obtain valid results (Bonoma & Rosenberg, 1978; Poole & Hewes, 2016, to be published).

1.5. LIMITATIONS

The aim of this literature review was to identify coding systems dedicated to the analysis of verbal interactions in face-to-face contexts. It was then deliberate to restrict the selection to systems meeting this requirement, even though coding systems for other contexts were studied. However, one limitation must be highlighted. The mentioned coding systems were selected regarding their publication language (English, German, French). Even though most coding systems may have been found, potential other models may have been put aside due to this language criterion.

1.6. CONCLUSION

This paper reviews the various coding systems that emerged until now to study verbal group interactions and clarifies the choices of their authors. This takes account of coding systems focusing on the functional meaning of interactions or rating interactions on several behavioural dimensions, but also the decisions regarding the structure of the coding systems. Such questions involve the inclusion of nonverbal behaviour, socio-emotional aspects of interactions and the distinction between more than one dimension. The analysis of the forty-two existing coding systems highlights a number of shortcomings limiting their use. Most of them imply uncertainty in the way coders understand (and should understand) categories and in the validity and reliability of the coding systems, thus of the conclusions drawn from coded interactions. Such findings encourage a deep analysis of existing systems before selecting a coding system according to the kind of expected use. Similarly, particular attention should be paid to the limitations when a new coding system is under development in order to help minimise restrictions in its use.

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APPENDIX 1: EXISTING CODING SYSTEMS

The articles or book references given with each table give information on the source where the coding systems can be found.

Interaction Process Analysis (IPA)

Positive Reactions	Shows solidarity, raises other's status, gives help, reward
	Shows tension release, jokes, laughs, shows satisfaction
	Agrees, shows passive acceptance, understands, concurs, complies
Attempted Answers	Gives suggestion, direction, implying autonomy for other
	Gives opinion, evaluation, analysis, expresses feeling, wish
	Gives orientation, information, repeats, clarifies, confirms
Questions	Asks for orientation, information, repetition, confirmation
	Asks for opinion, evaluation, analysis, expression of feeling
	Asks for suggestion, direction, possible ways of action
Negative Reactions	Disagrees, shows passive rejection, formality, withholds help
	Shows tension, asks for help, withdraws out of field
	Shows antagonism, deflates other's status, defends or asserts self

Table 1.3: IPA (Bales, 1950)

Interaction Process Scores (IPS) – Behavior Scores System

Common social acknowledgments
Shows solidarity through raising the status of others
Shows tension release, laughs
Acknowledges, understands, recognizes
Shows agreement, concurrence, compliance
Gives a procedural suggestion
Suggests solution
Gives opinion, evaluation, analysis, expresses feeling or wish
Self-analysis and self-questioning behavior
Reference to the external situation as redirected aggression
Gives orientation, information, passes communication
Draws attention, repeats, clarifies
Asks for opinion, evaluation, analysis, expression of feeling
Disagrees, maintains a contrary position
Shows tension, asks for help by virtue of personal inadequacy
Shows tension increase
Shows antagonism, hostility, is demanding
Ego defensiveness

Table 1.4: IPS (Borgatta, 1965)

Categories for Analysis of Idea Development

A					Assertion	Explicit declaration
	O				Information	Reporting of data as basis for thought
	E				Inference	Thought-movement from data or from other inferences, e.g., generalizations and value judgments
		S			Substantive	Concerned with the actual subject-matter of the discussion
		P			Procedural	Concerned with mechanics of group functioning, participation, or use of time.
			V		Volunteered	Remarks without prior stated request from another.
			R		Requested	Remarks in response to explicit request
				1	Initiation	Earliest mention in the discussion of an inference or piece of information
				2	Restatement	Repetition in identical or similar terms
				3	Clarification	Development of the idea at hand by elaboration, example or explanation
				4	Substantiation	Proof offered
				5	Extension	Development beyond the immediate logical limits of the idea under consideration
				6	Simple response to request	Remark that sets something straight or settles a minor point at issue in order to facilitate continued functioning of the group
				7p (s/1)	Pro modification (small or large)	Revision of prior idea, involving affirmation of its essentials but suggestion of some change within the general affirmation
				7c (s/1)	Con modification (small or large)	Revision of prior idea, involving rejection of a substantial portion of that idea through subtraction or substitution, thus producing a somewhat abrupt change in the direction of the idea
				8a (u/q)	Stated acceptance (unqualified or qualified)	Declaration of approval for a preceding thought unit
				8r (u/q)	Stated rejection (unqualified or qualified)	Declaration of disapproval of a preceding thought unit
				9	Synthesis	Concise organization of interrelationships discovered or produced

			10	Summary	Concise restatement of major points previously established
I				Imperative	Simple directive of attention or effort
Q				Question	Asking, interrogation or inquiry through tone or word for certain responses
	O			Information	Asking for data as basis for thought
	E			Inference	Asking for thought movement from data or other Inference
		S		Substantive	Inquiry concerning the actual subject-matter of the discussion
		P		Procedural	Inquiry concerning the mechanics of group functioning, participation, or use of time
			1	Initiation	Asking for introduction of new data or new inferences
			2	Restatement	Asking for repetition in identical or similar terms
			3	Clarification	Asking for development of the idea at hand
			4	Substantiation	Asking for proof
			5	Extension	Asking for development of the present idea into related matters
			6	Simple response	Asking for a reply that will set something straight, settle a minor point at issue, etc.
			7	Modification	Asking for revision of the idea under consideration
			8	Judgment	Asking for acceptance or rejection of an idea
			9	Synthesis	Asking for concise presentation of interrelationships
			10	Summary	Asking for restatement of major points
			AQ	Assertion-Question	Declaration of content plus request for response within a single thought unit
			D	Delayed relationship	Reference is to earlier than the preceding thought unit
			Ds	Delayed self relationship	Reference is to speaker's own earlier comment

Table 1.5: Categories for Analysis of Idea Development (Crowell & Scheidel, 1961)

Sign Process Analysis (SPA)

Affective direction	Positive
	Negative
	Neutral
Object of statements	Other group member
	(Therapist)
	Self
Contextual field/nature	Collective
	Individual
Locus	Internal to the group
	External to the group
Sociological status	Superior
	Subordinate
Sex	Male
	Female
Nature	Social
	Nonsocial

Table 1.6: SPA (Bonoma & Rosenberg, 1978; Hare, 2009)

Decision Proposal Coding System

<p>Interpretation: Simple value judgment, no support stated</p> <ul style="list-style-type: none"> - f-favorable - u-unfavorable - a-ambiguous
<p>Substantiation: Includes evidence, explanations, arguments</p> <ul style="list-style-type: none"> - f-favorable - u-unfavorable - a-ambiguous
<p>Clarification: Providing or seeking information</p>
<p>Modification: Amending or changing the decision proposal</p>
<p>Agreement: With the preceding comment</p>
<p>Disagreement: With the preceding comment</p>
<p>Other</p>

Table 1.7: Decision Proposal Coding System (Fisher, 1994)

Interaction Behavior Measure (IBM)

Task oriented – Socially-emotionally oriented
Ideational – Personal
Bothered – Cool
Tense – Relaxed
Flexible – Inflexible
Unchangeable – Changeable
Relevant – Irrelevant
Related – Unrelated
Interested – Apathetic
Involved – Withdrawn
Wordy – Short
Brief – Lengthy

Table 1.8: IBM (McCroskey & Wright, 1971)

Rackham's coding system

Seeking Suggestions
Suggesting
Agreeing
Disagreeing
Seeking Clarification
Clarifying
Interrupting
Miscellaneous

Table 1.9: Rackham's coding system (Rackham, Honey, & Colbert, 1971)

System for the Multiple Level of Observation of Groups (SYMLOG)

1	U	Active, dominant, talks a lot
2	UP	Extroverted, outgoing, positive
3	UPF	A purposeful democratic task leader
4	UF	An assertive business-like manager
5	UNF	Authoritarian, controlling, disapproving
6	UN	Domineering, tough-minded, powerful
7	UNB	Provocative, egocentric, shows off
8	UB	Jokes around, expressive, dramatic
9	UPB	Entertaining, sociable, smiling, warm
10	P	Friendly, equalitarian
11	PF	Works co-operatively with others
12	F	Analytical, task-oriented, problem-solving
13	NF	Legalistic, has to be right
14	N	Unfriendly, negativistic
15	NB	Irritable, cynical, won't co-operate
16	B	Shows feelings and emotion
17	PB	Affectionate, likeable, fun to be with
18	DP	Looks up to others, appreciative, trustful
19	DPF	Gentle, willing to accept responsibility
20	DF	Obedient, works submissively
21	DNF	Self-punishing, works too hard
22	DN	Depressed, sad, resentful, rejecting
23	DNB	Alienated, quits, withdraws
24	DB	Afraid to try, doubts own ability
25	DPB	Quietly happy just to be with others
26	D	Passive, introverted, says little

Table 1.10: SYMLOG (Pennington, 2002)

Function-Oriented Interaction Coding System (FOICS)

Orientation comments	Statements that (a) identify or clarify group goals, (b) comment on time and resource limitations, or (c) suggest how the group should organize and conduct its discussion.
Problem analysis comments	Statements that (a) identify or clarify the nature of the problem, (b) identify or clarify symptoms or indications of the problem, or (c) identify or clarify the cause(s) of the problem
Criteria development comments	Statements that (a) identify or clarify preexisting evaluation standards, or (b) identify or clarify a quality or characteristic of a good solution
Solution development comments	Statements that (a) identify or clarify a possible solution or (b) modify, build on, or provide details for a possible solution
Positive evaluation comments	Statements that (a) identify or clarify a positive quality or characteristic of a proposed solution or (b) elaborate or substantiate (provide proof for) a positive quality or characteristic of a proposed solution
Negative evaluation comments	Statements that (a) identify or clarify a negative quality or characteristic of a proposed solution or (b) elaborate or substantiate a negative quality or characteristic of a proposed solution

Table 1.11: FOICS (Salwen & Stacks, 1996)

Organization Verbal Behavior (OVB)

Verbal behavior category	Description
Task information statement	Statement providing task-related information to the manager
Task information request	A request by the subordinate for task-related information
Task opinion statement	An opinion about how a task should be accomplished
Task opinion request	A request by the subordinate for the manager to give his opinion
Attribution statement	A statement attributing cause for task performance
Quantitative goal statement	A future-oriented statement of intended accomplishment which specifies a numerical and/or time target
Positive (personal) self-evaluation statement	A positive, personally directed statement concerning performance
Positive (task) self-evaluation statement	A positive, task-directed statement about performance
Negative (personal) self-evaluation statement	A negative personally directed statement concerning performance
Negative (task) self-evaluation statement	A negative, task-directed statement about performance
Request for evaluation	A request by the subordinate for the manager to render an evaluation

Table 1.12: OVB (Gioia & Sims, 1986)

Conference Coding System (CCS - KONFKOD)

Behaviours	Sub-categories
Task-oriented interaction forms	<ul style="list-style-type: none"> - Asking for information - Question including statement - Information - Explication - Statement and analysis - Opinion - Proposition of a solution
Procedural interaction forms	<ul style="list-style-type: none"> - Procedural question - Procedural proposal
Socio-emotional interaction forms	<p>Socio-emotional positive:</p> <ul style="list-style-type: none"> - Positive evaluation - Approval - Expression of positive feeling <p>Socio-emotional negative:</p> <ul style="list-style-type: none"> - Negative evaluation - Rejection - Expression of negative feeling

Table 1.13: CCS (Beck & Fisch, 2000)

Group Development Observation System (GDOS)

Categories	Descriptions
Dependency statements (D)	Show the inclination to conform with the dominant mood of the group; to follow suggestions made by the leader and, generally, to demonstrate a desire for direction from others.
Counterdependency statements (CD)	Assert independence from and rejection of leadership, authority, or member attempts to lead.
Fight statements (FI)	Convey participation in a struggle to overcome someone or something and imply argumentativeness, criticism, or aggression.
Flight statements (FL)	Indicate avoidance of task, and confrontation.
Pairing statements (P)	Include expressions of warmth, friendship, support, or intimacy with others. Pairing statements are similar to positive maintenance statements as outlined by Bales (1950).
Counterpairing statements (CP)	Indicate an avoidance of intimacy and connection as well as a desire to keep the discussion distant and intellectual.
Work statements (W)	Represent purposeful, goal-directed activity and task-oriented efforts.
Unscorable statements (US)	Include unintelligible, inaudible, or fragmentary statements.

Table 1.14: Group Development System (Wheelan & Williams, 2003)

Act4teams – Kasseler-Kompetenz-Raster (KKR)

PROBLEM-FOCUSED STATEMENTS

Problem: identifying a (partial) problem

Describing a problem: illustrating a problem

Connections with a problem: naming causes and effects

Defining the objective: vision, description of requirements

Solution: identifying a (partial) solution

Describing a solution: illustrating a solution

Problem with a solution: objection to a solution

Connections with a solution: naming advantages of solutions

Organizational knowledge: knowledge about the organization and processes

Knowing who: reference to specialists

Question: question about opinions, content, experience

PROCEDURAL STATEMENTS

Positive

Goal orientation: pointing out or leading back to the topic

Clarifying: ensuring that contributions are to the point

Procedural suggestion: suggestions for further procedure

Procedural question: questions about further procedure

Prioritizing: stressing main topics

Time management: reference to (remaining) time

Task distribution: delegating tasks during the discussion

Visualizing: using flip chart and similar tools

Weighing costs/benefits: economical thinking

Summarizing: summarizing results

Negative

Losing the train of thought in details and examples: irrelevant to the goal, monologues

SOCIO-EMOTIONAL STATEMENTS

Positive

Encouraging participation: addressing quiet participants

Providing support: agreeing to suggestions, ideas, etc.

Active listening: signaling interest (“hmm”, “yes”)

Reasoned disagreement: contradiction based on facts

Giving feedback: whether something is new or already known

Lightening the atmosphere: jokes, humor

Separating opinions from facts: marking one’s own opinion as such

Expressing feelings: mentioning feelings like anger or joy

Offering praise: positive remarks about other people

Negative

Criticizing/running someone down: disparaging comments about others

Interrupting: cutting someone off while speaking

Side conversations: simultaneous talk on the side

Self-promotion: pointing out one's work experience, tenure.

ACTION-ORIENTED STATEMENTS

Positive (proactive)

Interest in change: signaling interest in ideas, options.

Taking responsibility: taking on responsibility

Action planning: agreeing upon tasks to be carried out

Negative (counteractive)

No interest in change: denial of optimization opportunities

Complaining: emphasizing the negative status quo, pessimism

Empty talk: irrelevant proverbs, truism

Seeking someone to blame: personalizing problems

Denying responsibility: pointing out hierarchies, pushing the task onto someone else

Terminating the discussion: ending or trying to end the discussion early

Table 1.15: Act4teams (Lehmann-Willenbrock, Meyers, Kauffeld, Neiningen, & Henschel, 2011)

KATKOMP

Focus	Category
Content	Goal clarification Solution generation Information management Evaluation Decision Control
Process	Planning Information management Evaluation Decision Control
Interpersonal relations	Expression of emotions

Table 1.16: KATKOMP (Bierhals, Schuster, Kohler, & Badke-Schaub, 2007)

SYNPRO

Stimmungsbarometer (Sb)	
Zielklärung (Zk)	(St) Stellungnahme (Sa) Situationsanalyse (Fa) Analysierende Fragen (V) Vorschlag (DV) Detailvorschlag (GV) Gegenvorschlag (Ef) Entscheidungsfällung
Prozessklärung (Pk)	(St) Stellungnahme (Sa) Situationsanalyse (Fa) Analysierende Fragen (V) Vorschlag (DV) Detailvorschlag (GV) Gegenvorschlag (Ef) Entscheidungsfällung (KE) Koordinationsentscheidung
Problemanalyse (Pa)	(St) Stellungnahme (Sa) Situationsanalyse (Fa) Analysierende Fragen (If) Informationsfrage (Iw) Informationsweitergabe (Fv) Fragen an den Versuchsleiter (Rv) Reaktionen auf den Versuchsleiter
Produktionsphase (Pr)	(St) Stellungnahme (Sa) Situationsanalyse (Fa) Analysierende Fragen (V) Vorschlag (DV) Detailvorschlag (GV) Gegenvorschlag (Ef) Entscheidungsfällung
Prozesskontrolle (Pl)	(KD) Koordination des Diskussionsprozesses (BD) Bewertung des Diskussionsprozesses (OA) Organisation der Arbeitsmittel (BP) Bewertung der Problembewältigung

Table 1.17: SYNPRO (Simon, 2002)

Kolbe's coding system

Explizite Prozesskoordination	Anrede	Persönliche Anrede
		Namentliche Anrede
	Handlungsanleitung	Aufforderung
		Pers. Zuweisung
		Vorgehensvorschlag
		Bitte um Klärung
		Bitte um Vorschläge
		Ermahnung
	Strukturierung	Zusammenfassung
		Wiederholung
		Zielformulierung
		Entscheidung
		Zielandeutung
		Darstellung d. eigenen Vorgehensweise
	Frage	Informationsfrage
		Meinungsfrage
		Klärungsfrage
		Verfahrensfrage
		Lösungsfrage
		Einverständnisfrage
Entscheidungsfrage		
Inhaltliche Beiträge	Feststellung	
	Information	
	Meinungsäußerung	
	Zustimmungsreaktion	
	Ablehnung	
	Inhaltlicher Vorschlag	
	Lösungsvorschlag	
Zusatzkategorien	Unterbrechung	
	Fokussierende Einworteinleitung	

Table 1.18: Kolbe's coding system (Kolbe, 2006)

2. Chapter 2 – INSIDE TEAMS^{3D} (IT^{3D}) – Development of a multi-dimensional interaction coding system

ABSTRACT

The analysis of group dynamics has become a major challenge to capture parameters of collective work such as conflict, performance or team member satisfaction. To date, many interaction coding systems have been developed to help identify types of interactions among group members, but some shortcomings involving their structure, complexity and reliability remain. In this paper, we present the INSIDE TEAMS^{3D} (IT^{3D}), a new coding system dedicated to the study of verbal interactions in small groups and developed iteratively from varied group experiences. Its creation focuses on some significant requirements such as the user-friendliness of the system, the exhaustiveness of its categories, and the multidimensional essence of interactions. Thus, the IT^{3D} takes account of three dimensions of individual behaviours which are the functional meaning of interactions, the convergence among interactions and the interpersonal emotional meaning of interactions. It hence provides a bigger picture on different aspects of group dynamics. Intercoder reliability and validity are also ascertained. Such a tool contributes to opening up new research and practical opportunities to a greater understanding of intragroup phenomena.

Key words: group dynamics; interaction coding system; INSIDE TEAMS^{3D}; dimensions; reliability; validity

2.1. INTRODUCTION

Understanding group dynamics has been a rather complex issue at the heart of many researches for almost six decades. One interesting way to figure out behaviours within groups is to focus on interactions among team members. If we consider the interaction types as “fundamental particles” of collective processes, the ability to identify them and consequently, to code them and see the way they combine with each other becomes an invaluable tool to obtain a better knowledge of how the group works. To make this observation possible, a number of coding systems meant to highlight and analyse interactions patterns emerged, with varied aims and perspectives (Théry, 2017b).

Although interaction coding systems have aroused higher interest since their creation in the late 1940s, some major limitations have restricted their use and led to a deceleration in the field of interaction analysis (Schermyly & Scholl, 2012; Théry, 2017b). Some structural flaws call into question the exhaustiveness of coding categories, especially for task-oriented behaviours including socio-emotional aspects. Then, the usability of coding systems turns out to be quite hazardous given the complexity of the classification, the training time to reach proficiency and situations where choices among categories are left at the sole discretion of the coder. This contradicts the importance of user-friendliness and greatest objectivity when coding group interactions. Finally, few coding systems offer reliability and validity measures, even if it would bring credibility to ensure they are appropriate to study group dynamics (Poole & Hewes, 2016, to be published).

In the light of the above limitations, this paper presents a new multidimensional coding system appropriate for all group meeting contexts and called INSIDE TEAMS^{3D} (IT^{3D}). Our aim was mainly to enable an exhaustive coding of group verbal interactions with a user-friendly coding system that could be easily used for live coding e.g. for team coaching. The IT^{3D} was then designed with the following specifications in mind: a) it should be exhaustive, b) it should be easy to assimilate and offer an easy use under real-time conditions after a short training course, and c) its categorisation has to be precise and unambiguous in order to provide a framework to the coder. Firstly, we detail the construction of the IT^{3D} in line with these specifications. Secondly, we widely present its structure and content. Thirdly, we give advice for use of the IT^{3D}. Finally, we establish intercoder reliability and validity of the system. We conclude by offering perspectives for future research based on this model.

2.2. CONSTRUCTION OF THE CODING SYSTEM

To favour user-friendliness of the coding system and its possible use in real-time situations, we made various choices. Firstly, the IT^{3D} is intended to give a general overview of the kinds of interactions occurring in groups, but not to include too specific categories. Consequently, we decided to limit the number of categories included in the system to provide a sufficient intermediate level of precision, but ensuring exhaustiveness anyway. Out of the same concern of live coding, the IT^{3D} mentions the speaker but does not track the recipient of the interaction or the relationships among team members (e.g. hierarchical relationships). Likewise, duration or temporal sequencing of interactions are not reported. The IT^{3D} does not consider the effect of interactions on a member or the group (e.g. creation of a good atmosphere) or intentionality behind interactions (e.g. commitment to strengthen the group). Nonverbal behaviour (e.g. tone) is not intended to be coded per se, but is taken into account to understand the functional meaning of ambiguous verbal interactions and provide information on their interpersonal emotional meaning (Fisher, Drecksel, & Werbel, 1979).

2.2.1. Methodology

There is apparently no indisputable method to create a coding system, especially as the aim of such a tool can be quite varied. We therefore started by studying the structure of the reviewed existing coding systems dealing with functional meaning of interactions (Théry, 2017b). Indeed, most of the coding systems focus on functional meaning, that is to say the kinds of functional acts which enable communication functions (Schermyly & Scholl, 2012). We listed their coding categories, similarities and differences and then compared those categories to the kinds of interactions identified in many artificial or real group situations, in recorded or live contexts. Because we intended to offer a system appropriate for all kinds of meetings, we gathered many recorded samples of group situations such as information meetings, decision-making or negotiation meetings (e.g. union meetings), sequences from meetings in films, political debates, and other formal or informal meetings. The running total of interactions included in these samples amounted to around 31,000. This approach also responds to the aim of providing an exhaustive classification of verbal group interactions (Levine & Hogg, 2010). The two authors worked in parallel on the construction of the coding system. By successive iterations and revisions, we excluded existing categories we found hazy or specific to a context, as long as the interaction could be included in another appropriate and precise category. We merged some other categories whose categorisation seemed very close to us. We also added new categories based on interactions we met in some of the

group situations we analysed, that could not be coded in existing categories. In the end, each one of the collected understandable interactions could be included in a category. All the remaining categories were then given a clear definition of the types of interactions they covered.

2.2.2. Structure of the coding system

To reflect the wealth of interaction content, we consider that on top of the functional meaning, two other aspects of interactions should be coded, which will represent the other two dimensions of the IT^{3D}. We hence reject the unidimensional characterization of interactions and consider that every interaction has one unique code on each of these three dimensions. Because of its construction, each dimension is divided into exclusive and exhaustive categories.

This three-dimensional structure helps get a better understanding of the way interactions influence the group dynamics and provide a more exhaustive vision of the intragroup phenomena. The three dimensions are defined below, whereas their categories are detailed later in the article.

First dimension: the functional meaning of the interaction

The *Functional meaning* should report on three kinds of interactions in group situations: content-oriented (i.e. interactions related to the content of the group meeting, aim, task, problem, etc.), process-oriented (regulation i.e. interactions about how to tackle and organise processes within the group) or socio-emotional interactions (i.e. relational interactions involving personal feelings, forming, strengthening or weakening relationships among members) (Beck, 2001; Emmitt & Gorse, 2009; Fisch, 1994). As the IT^{3D} intends to code all interactions, it will include categories dealing with these three kinds of situation, and not be restricted to the ones related to the task, contrary to many existing coding systems. We suggest that the functional meaning of any of these interactions fundamentally belongs to one and only one of those four exclusive classes: *Offering*, *Asking*, *Deciding* and *Socializing*.

Offering and Asking

The first two classes, *Offering* and *Asking*, are about giving or asking for statements or judgements and are the core of any exchange of ideas (Schermyly & Scholl, 2012). *Information*, *opinion*, *suggestion* and *metacommunication* are the locus of these offers or questions and can be related to the task, the process or metacommunication in the group.

Information refers to factual elements that are brought into the group. An *opinion* implies a kind of judgement or evaluation and a personal implication from the speaker. In that respect, an opinion generally leads to a higher level of constraint for the addressee(s): rejecting an opinion is tougher than

rejecting information. Making/asking for *suggestions* consists of bringing/asking for new ideas and making/expecting proposals that imply a reaction from the group members (in particular, agreement, refusal or suggestion). In the same way that rejecting an opinion is tougher than rejecting information, rejecting a suggestion is tougher than rejecting an opinion. *Metacommunication* is a specific way of communicating in which the object of the communication is the communication process, the interactions or relationships in the group. This will also include clarifications a person can bring to what he has said or done, even if it is usually not enclosed in the common sense of metacommunication (Bateson, 1951, 1972).

Deciding

The third class, *Deciding*, deals with interactions committing the group or its members and concluding debates. It involves both task-oriented and process-oriented interactions.

Socializing

Socializing refers to phatic communication i.e. interactions in the margins of the meeting and contributing to the socialization process. This fourth class takes into account other relationship-oriented interactions “directed at being social” and allowing members to “maintain contact” (Jakobson, 1960; Kulkarni, 2013).

Second dimension: the convergence of ideas

The *convergence* dimension aims at keeping track of convergence or divergence among ideas and embrace the dynamics of interactions instead of looking at them independently. It enables us to take into consideration the direction of an interaction compared with the previous one or clearly-related one i.e. does the interaction support or dispute the previous interaction (or clearly-related one)? Does the speaker support the other's idea or oppose it? An interaction will not be necessarily coded positively or negatively according to this dimension as talk may be neutral compared to the previous or clearly-related interaction, or not absolutely obvious (the position of the speaker is not marked). It then amounts to considering that the interaction is neutral on the convergence dimension.

Third dimension: the interpersonal emotional meaning of the interaction

The third dimension shows the potential relational aspects embedded in the interaction, that is to say an evident positive or negative feeling towards a member or the group as perceived by the coder. It is called the *interpersonal emotional meaning*. Does the speaker give affective support to the other e.g. shows enthusiasm, benevolence or warmth towards a member or defends a member who is attacked? Conversely, does a speaker show signs of irritation, impatience, scorn or aggressiveness in his attitude?

Let's keep in mind that we will not necessarily code positively or negatively an interaction according to this third dimension. If an interaction is not clearly affectively-oriented, it will be coded as neutral on the interpersonal emotional meaning dimension. In the majority of group situations, most of interactions are coded neutrally on this dimension.

Contrary to what was done in previous coding systems such as the IPA, we decided to dissociate the interpersonal emotional meaning of an interaction from its functional meaning. Indeed, these two dimensions seem really independent: for example, giving an opinion (*functional meaning*) can be done with condescendence, warmth or in a neutral manner (*interpersonal emotional meaning*).

This interpersonal emotional meaning dimension is not overlapping the convergence dimension either. For instance, a member of a group can take a stand which is contrary to what was offered previously (*convergence dimension*) while expressing benevolence, aggressiveness or neutrality toward an idea, another member or even the group (*interpersonal emotional meaning dimension*).

An interaction will then be coded on the three separate dimensions of the IT^{3D} coding system, but it can only be coded in one category on each dimension. The categories of the IT^{3D} are presented in Table 2.1. Let's note that the groups of categories are introduced to make the coding system more didactic and user-friendly and the coding process easier, but do not result from a factor analysis on the categories. Definitions and detailed explanations on the categories are given in appendix 1.

First dimension: functional meaning of the interaction			
Groups of categories		Categories	Category ID
Offering	Gives information	Gives information on the content	Olc
		Gives information on the process	Olp
	Gives opinion	Gives an opinion on the content	OOC
		Gives an opinion on the process	OOp
	Makes suggestion (proposal)	Makes a suggestion (proposal) on the content	OSc
		Makes a suggestion (proposal) on the process	OSp
Metacommunicates	Gives a feeling, clarification or perception on the group, member or the interaction	OM	
Asking	Asks for information	Asks for information on the content	Alc
		Asks for information on the process	Alp
	Asks for opinion	Asks for an opinion on the content	AOC
		Asks for an opinion on the process	AOp
	Asks for suggestion (proposal)	Asks for a suggestion (proposal) on the content	ASc

		Asks for a suggestion (proposal) on the process	ASp
	Asks for metacommunication	Asks for a feeling, clarification or perception on the group, members or the interaction	AM
Deciding		Decides on the content	Dc
		Decides on the process	Dp
		Synthesizes elements before a decision-making stage	DSyn
		Opposes to a decision on the content	DOc
		Opposes to a decision on the process	DOp
		Gives his/her agreement on the content	DOAc
		Gives his/her agreement on the process	DOAp
		Asks for agreement on the content	DAAc
		Asks for agreement on the process	DAAp
		Undertakes doing a future act	DUnd
Socializing (phatic function)		Fosters the conversation, fills the silence, digresses	SConv
		Exchanges polite small-talk, apologizes	SPol
		Makes jokes	SJok
Second dimension: convergence or divergence between ideas			
Interaction going in the same direction as the previous one (or the related one)			Cv+
Interaction going in the opposite direction as compared with the previous one (or the related one)			Cv-
Interaction with no related direction vis-à-vis the previous one or any previous one			Cv0
Third dimension: interpersonal emotional meaning of the interaction			
Interaction including a positive feeling toward a member or the group (encourages, supports, defends)			IEM+
Interaction including a negative feeling toward a member or the group (discourages, shows signs of irritation, impatience, scorn or aggressiveness, cuts someone off)			IEM-
Interaction with no clear positive or negative feeling toward a member or the group			IEM0

Table 2.1: INSIDE TEAMS^{3D} (IT^{3D}) Interaction coding system

2.3. INSTRUCTIONS FOR USE OF THE IT^{3D}

2.3.1. Coding unit

For any coding system, decomposing discussions into interactions implies defining a clear coding unit which will be the elementary entity carrying a message. Some rules are required to determine how to separate an interaction into coding units. Previous coding systems provide divergent perspectives and recommendations on the definition of a coding unit (Thomas et al., 1982). For our part, our definition is based on the work carried out for the creation of the coding systems CCS and DCS with some

revisions (Beck, 2001; Schermuly et al., 2010). Therefore, a coding unit is a segment or a complete verbal interaction:

- From a specific member of the group (the coding unit and even the interaction end as long as the member stops talking and another member takes over from him or the meeting is over),
- Directed at the group or a specific member (a new coding unit starts when the speaker clearly addresses someone else or moves from the group to a member or vice versa),
- Belonging to the same category of the coding system (a new coding unit starts as the functional meaning, convergence or interpersonal emotional meaning related to the interaction changes or appears e.g. an interaction was neutral on the convergence dimension and becomes positive on the same dimension).

In this way, one interaction carries out a single thought or idea, thus refining the understanding of speech (Thomas et al., 1982). Contrary to what was embedded in the coding systems IPA or DCS, we do not take into consideration the duration of interactions to divide them into coding units. We consider that differences related to the duration may stem from the fact people do not talk at the same speed and are not as concise as each other, which does not justify a new coding unit.

2.3.2. Position of the coder

We follow Bales' instructions about the way an observer should position himself to code interactions: the observer tries to think of himself as a generalized group member or, insofar as he can, as the specific receiver of an interaction (Bales, 1950). At no time do we consider the interaction according to the effect on the group or on the task success.

Furthermore, we decide that the rare interactions which are too obscure for the observer should be set aside in order to prevent misinterpretations. Two main kinds of uncertainty are emphasized. Firstly, some interactions are vague and the coder is not able to classify them because this would involve guessing what the speaker meant. For instance, short sentences such as "Oh my God" or "Look where that's got us" cannot be classified if there is a lack of non-verbal support (tone, etc.). Secondly, other interactions seem to be understood by the group or a part of it (i.e. private jokes) but remain abstruse for the coder as the meaning escapes him. Both these cases did not make it possible to conclude on the category to choose without involving much room for interpretation, a position that we reject.

2.4. EXAMINATION OF THE IT^{3D} COMPLIANCE WITH REQUIREMENTS

To demonstrate the validation of the IT^{3D}, we will examine its compliance with our initial requirements of exhaustiveness, user-friendliness (precision and use under real-time conditions) and its logical consistency (Poole & Hewes, 2016).

2.4.1. Exhaustiveness of categories

One of the requirements when creating the IT^{3D} was to ensure that all interactions could be coded on each of the three constitutive dimensions of the coding system. The early stage of exhaustiveness validation is based on the study of approximately 31,000 interactions extracted from varied group contexts. With regard to the functional meaning dimension, any comprehensive interaction could be coded in one category of this dimension. 1,240 of these 31,000 interactions were excluded as their functional meaning was incomprehensible for an external coder (e.g. interactions which do not make any sense without some context, member talking to himself, private jokes) or as the interactions were cut off.

For the convergence and interpersonal emotional meaning dimensions, the exhaustiveness is obvious because of the symmetrical construction of these dimensions and their inclusion of a neutral position.

2.4.2. Ability to achieve a high proficiency level under real-time conditions

Many previous coding systems do not provide concrete explanations on the content of their categories and prevent easy training and reliable use of the systems (Théry, 2017b). To avoid such difficulties, we developed a detailed coding manual for the IT^{3D} which gives definitions and examples of interactions intended in each category (see appendix 1 for the coding manual). Borderline cases are also provided to ensure coding in line of the IT^{3D} development and a quicker assimilation of the coding system by trainees. After doing two tests, each with 16 individuals, training time is estimated to 1.5 hour to get a high proficiency level with the coding system and 3.5 hours to be able to code correctly under real-time conditions. Reliability results are presented later in the article.

We note after several experiments with trained coders that it is highly possible to follow four to five team members in a meeting under live conditions and code all their interactions on the three dimensions of the IT^{3D}, provided that the discussion flow is normal and the interactions are clearly understandable. We consider that a coder can analyse more members directly if less information is gathered (e.g. taking into consideration a single dimension of the system or group of categories instead of precise categories).

2.4.3. Logical consistency

The coding system includes three separate dimensions which represent three different aspects of interactions. When studying 31,000 various interactions, all the categories in the system were used: it implies that no useless or marginal category remained in the IT^{3D}. On the functional meaning dimension, we divided the categories depending on their class (*Offering, Asking, Deciding* and *Socializing*) and relation to task (content or process) or relationship to facilitate the coding work.

2.5. RELIABILITY OF THE IT^{3D}

To ensure the coding system would provide similar results with different raters, we carried out interrater reliability tests. An initial test on two trained coders watching fifty group interactions showed promising reliability rates on the functional meaning (Krippendorff's alpha = 0.898), convergence dimension (Krippendorff's alpha = 0.814) and interpersonal emotional meaning (Krippendorff's alpha = 0.66). Furthermore, we carried out a second inter-rater reliability test on sixteen individuals coding all the sixty-two interactions of the same recorded meeting (including elements from all categories on the functional meaning, convergence and interpersonal emotional meaning dimensions). These individuals were students assessed on their results to get serious involvement of their own. After only a ninety-minute training session on the IT^{3D}, we reached very satisfying reliability rates with Krippendorff's alphas equal to 0.753 for the functional meaning dimension, 0.896 for the convergence dimension and 0.701 for the interpersonal emotional meaning dimension (Hayes & Krippendorff, 2007). A longer training session did not influence the reliability results, but enabled a better fluidity in the use of the IT^{3D} under live conditions.

2.6. LIMITATIONS

One first limitation is related to the wide focus on verbal interactions to the detriment of nonverbal interactions. Even if it was a deliberate choice to restrict the coding of interactions to the verbal ones (especially to keep subjectivity in coding at the bare minimum), interactions which do not contain words were moved aside, regardless the importance and the impact they may have on group dynamics. Another limitation of the IT^{3D} is the difficulty in coding on the interpersonal emotional meaning dimension. As an external coder may face some uncertainty regarding the perception of interpersonal emotional meaning (condescendence, anger, support, encouragement, ...), he is supposed to code on this dimension provided that the emotion conveyed in the interaction is obvious. Coding of neutral interpersonal emotional meaning may then be more difficult for an external coder than it would be for an internal member of the group, who may have additional clues to understand the position of an interaction

on this dimension. Similarly, the perception of instrumental conflict (negative convergence) and relational conflict (negative interpersonal emotional meaning) may depend on the cultural background of the coder. Indeed, perception of intragroup conflict is differing according to the culture or country of the observer (Bisseling & Sobral, 2011; Parayitam, Olson, & Bao, 2010).

2.7. CONCLUSION AND FUTURE RESEARCH

In spite of the development of many interaction coding systems, some significant drawbacks still prevent a large use for the study of group dynamics. This article offers and presents a new coding system meeting high expectations for group interactions. The IT^{3D} is designed to avoid interpretations from the coder, especially on the effect or intentionality of interactions. It also provides a larger overview on the group dynamics and takes into consideration distinct behavioural aspects which are the functional meaning of interactions, the convergence among these interactions and the interpersonal emotional meaning that interactions may include. As it is multidimensional, it is not necessary anymore to choose one among overlapping categories. This coding system is intended to allow coding under live conditions and in many group situations. Knowing that its reliability and validity were also ensured, it brings the opportunity to carry out further research. An interesting angle is to study the functional meaning of interactions to see the emergence of roles, defined as systematic combinations of functional meaning categories. Finally, it may be useful to highlight links among categories of interactions or roles and outputs such as satisfaction, conflict or efficiency, to provide some suggestions for improvement. More generally, approaching team meetings with this coding system can help teams, whether at the collective level or at the individual one, be aware of their interactional styles (for instance, through consulting or coaching sessions).

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2.9. APPENDIX 1: EXPLANATIONS ON THE CATEGORIES OF THE INTERACTION CODING SYSTEM IT^{3D} (CODING MANUAL)

FUNCTIONAL MEANING

OFFERING

Gives information

Category 1: Gives information on the content (Olc)

This category includes statements about the elements which are on the agenda of the meeting or related to the content of the task or the problem to solve. It may be adding a point or mentioning a factual element. *Examples: “The turnover increased by 5%”, “This is forbidden by law”, “I have talked with the director about this issue”, “I remind you that he said earlier he didn’t agree with this idea”.*

It may contain statements aimed at confirming, rephrasing what is said or clarifying information or a fact which appears obscure in order to give more information or a better understanding of the content. *Examples: “When I said few members answered the survey, I meant about 15”, “This is not explicit in the document, but the results take into account all the employees of the firm”.*

Interactions whose goal is to rectify someone’s words or give one’s expertise or experience about the content of the meeting must also be coded in this category. *Examples: “No, it is not planned for next week, but for the week after”, “The calculations prove that the driver would not have been able to stop if he had reached such a high speed”, “I’ve already encountered such a problem in the software and it is not possible to fix it without calling the support team”.*

Category 2: Gives information on the process (Olp)

This category includes statements about the way the meeting and related processes are organized, the working method that is implemented. It also includes statements presenting the agenda, aims, stakes and deadlines. In this category, we code interactions giving factual elements about what is planned related to the global organization of the meeting (e.g. way of working all together, turns of speech). *Examples: “At the end of the meeting, we expected to decide if this project is worth going on or needs stopping”, “If we need more information, Jim is at our disposal to answer our questions”.*

It may contain statements aimed at confirming, rephrasing what is said or clarifying information or a fact which appears obscure in order to give more information or a better understanding of the process.

Examples: "I remind you that you have the right to make changes in this document if you want to", "For those who are lost in the document, the tables are given on page 42".

Any information intended to remind members of the process so that they observe it will be coded in the category "decides on the process" (category 16). *Example: "Remember we decided to finish at 10 a.m."*

Gives opinion

Category 3: Gives an opinion on the content (OOc)

This category includes judgements and opinions a member is putting forward about the content (i.e. elements which are on the agenda of the meeting or related to the content of the task or the problem to solve). It may contain confirmation or refutation of what is said. *Examples: "I think we should dedicate more resources to this project", "I am not sure this solution is worth being applied immediately", "I completely agree with you on that point", "You can't believe a word of this report, it doesn't prove anything".*

It may contain statements aimed at confirming, rephrasing what someone said previously or clarifying an opinion which appears obscure in order to give a better understanding of the content. *Examples: "What I mean is that I doubt this measure will allow us to reach our goals", "I said I agreed with this idea, but I think that some adjustments will be necessary nevertheless".*

This category excludes interactions which would be disapprovals, refusals, approvals or consents of a group decision. This kind of interactions closer to a decision will be linked to the categories "opposes to a decision on the content" (category 18) and "gives his/her approval on the content" (category 20). Moreover, if somebody paraphrases the opinion that someone external to the group once gave about the content, it will be coded in the first category "gives information on the content" and treated as bringing information to the group about the content. *Example: "The director thinks it will not be successful".*

Category 4: Gives an opinion on the process (OOp)

This category includes judgements, opinions a member is putting forward about the process (global organization of the meeting, agenda, aims, stakes, deadlines, and so on). *Examples: "I doubt we had enough information before the meeting to be able to decide today", "I don't mind whether we start with this point or another", "I think we should enable every member to have the same amount of time to speak in order to ensure greater equity".*

It may contain statements aimed at confirming, rephrasing what is said or clarifying an opinion which appears obscure in order to give a better understanding of the process. *Examples: "It's a good idea to*

“speak in a predefined order as it makes it easier for everyone”, “What I wanted to say is that I don’t think we will manage to discuss all the points of the agenda today”.

If somebody paraphrases the opinion that someone external to the group once gave about the process, it will be coded in the category “gives information on the process” (second category) and treated as providing information. *Example: “John advised us to discuss this issue first”.* Statements which are disapprovals, refusals, approvals or consents of the process submitted to an explicit decision-making stage will be coded in “opposes to a decision on the process” (category 19) or “gives his/her approval on the process” (category 21) as they deeply impact the decision-making outcome. *Example: “I do not agree to take part in this vote”.*

Makes suggestion (proposal)

Category 5: Makes a suggestion (proposal) on the content (OSc)

This category includes interactions bringing ideas about the content and that are submitted to the assent of the group or a part of it. Suggesting an idea (imagining new lines of thought, constructing some hypotheses on the content, for instance) implies a reaction expected from the group, in particular agreement, refusal or amendment. It can enable the group to broaden its outlook, think about different elements before drawing conclusions. *Examples: “Maybe the department should implement new procedures in order to make sure the initial requirements can be respected”, “Why don’t we meet this company to get more details on this product?”, “For this vacant position, I’d propose we only select candidates with more than 5 years’ experience in the field”.*

As a suggestion calls for a reaction from the rest of the group, it is more than just giving an opinion (category 3). Furthermore, the speaker does not impose his idea, so that it is separated from deciding (category 15).

Category 6: Makes a suggestion (proposal) on the process (OSp)

This category includes interactions bringing ideas about the process and that are submitted to the assent of the group or a part of it. Suggesting an idea (imagining new lines of thought, proposing new ways of working, for instance) implies a reaction expected from the group, in particular agreement, refusal or amendment. It can enable the group to consider different possibilities of organizing the meeting or the turns of speech, for instance. *Examples: “We can wait another five minutes to ensure that the late members would join us”, “Let’s take the facts one at a time”, “I think we ought to have an open ballot instead to see who stands where”, “Maybe we should have a break for lunch and go on after that”.*

As a suggestion calls for a reaction from the rest of the group, it is more than just giving an opinion (category 4). Furthermore, the speaker does not impose his idea, so that it is separated from deciding (category 16).

Metacommunicates

Category 7: Gives a feeling, clarification or perception on the group, member or the interaction (gives metacommunication) (OM)

In this category, the locus of the statement is related to the situation the speaker is dealing with: feeling or perception about what is lived (here and now) in the interaction or the relation with the others or even himself. *Examples: "It looks like it will be hard to reach unanimity on this subject", "There is always one member who opposes the others and makes them waste their time", "I don't see what you're going to prove", "I have never experienced such an effective meeting until now", "Could you stop criticizing the others' ideas all the time?", "Whatever I say, you will always question it".*

Furthermore, it is essential to raise the fact that only the verbal level of the interaction must be considered to code in this category. The tone the speaker adopts and the feeling conveyed through it are mainly taken into account through the interpersonal emotional meaning dimension as it provides no indication alone on the functional meaning of the interaction. On the one hand, an interaction dealing with metacommunication is not necessarily linked to an interpersonal emotional meaning orientation. And on the other hand, interactions dealing with the content or the process can reflect the feelings of the speaker about a member thanks to the tone adopted, e.g. aggressiveness, scorn, impatience, whereas such interactions are not related to metacommunication at all. In this case, the interaction must be coded in the adequate category on the functional meaning dimension (e.g. "gives an opinion on the content") and also coded positively or negatively on the interpersonal emotional dimension.

This category also gathers statements about the reason why the speaker is acting in a particular way or saying something. It can deal with advancing hypotheses about the other's intentions or motivations about his words or acts, his/her position, the way a behaviour which appears obscure is supposed to be clarified in order to get more information or a better understanding. *Examples: "It is important for me to develop my point of view so that you can understand it", "It is not a personal reaction, I am just tired of wasting my time", "Maybe he reacts this way because he was offended when we said that his idea was not enforceable", "If we do not stop digressing from our matter, I will leave".*

ASKING

Asks for information

Category 8: Asks for information on the content (Alc)

This category includes questions about the elements which are on the agenda of the meeting or related to the content of the task or problem to solve. It may be requiring additions of a point, a factual element which may have been forgotten or just mentioned superficially during the meeting according to the speaker. *Examples: "How many people will be involved in this restructuring?", "What would be the consequences on our turnover if we make this decision?", "When will this new technology be available?".* It may contain questions aimed at asking for evidence of words which have been made. *Examples: "Can you prove what you are saying?", "What do you stand on to affirm these elements?".*

It may include questions aimed at asking for a confirmation or rectification, rephrasing of what is said or clarifying information on a fact which appears obscure in order to get more information or a better understanding of the content. *Examples: "Can you confirm these statistics are up-to-date?", "These figures include all the members, don't they?", "When you say there will be new members in the department, how many persons do you mean?".*

Interactions whose goal is to ask anyone to give one's expertise/experience about the content of the meeting will also be coded in this category. *Examples: "Has anybody already used this program?", "Do you have further information on this subject?", "Can anyone confirm these words?".*

Category 9: Asks for information on the process (Alp)

This category includes questions about the way the meeting and related processes are organized, the method which is implemented so that the meeting can take place and the agenda, aims, stakes and deadlines can be taken into account. So we can code in this category questions about what is planned related to the global organization of the meeting (way of working all together, turns of speech) and what is expected (goal of the meeting, decision to make). *Examples: "Who will chair this meeting?", "How long will the meeting last?", "Which points are on the agenda?", "What are we meeting for?", "By what date is the report to be presented?".*

It may contain questions aimed at asking for a confirmation, precision, rephrasing of what is said or clarifying information on a fact which appears obscure in order to get more information or a better understanding of the process. *Examples: "Can you confirm this meeting will be ended at 8 p.m.?", "Can*

you be more precise about the way we will work today?”, “Does that mean it is necessary to get a unanimous consent before leaving?”.

Asks for opinion

Category 10: Asks for an opinion on the content (AOc)

This category includes questions about a judgement, an opinion of another member of the group about the content related to the meeting (e.g. facts the group is dealing with, ideas developed by another or oneself). *Examples: “What do you think of the solution which is offered?”, “Do you all agree with this position?”, “Do you have any critical comment about the proposal that has been made?”.*

It may contain questions aimed at asking for a confirmation, rephrasing of what is said or clarifying an opinion which appears obscure in order to get a better understanding of the content. *Examples: “Am I right so far?”, “Stop me now if I am forgetting something”, “Could you be more specific on the type of design you had in mind?”*

Interactions submitting an idea to the group for approval and asking for consent or an explicit agreement, and not only an opinion about the content, do not belong to this category and will be linked to the category “asks for agreement on the content” (category 22).

If somebody asks for the opinion that someone external to the group once gave about the content, it will be coded in the category “asks for information on the content” (category 8) and treated as information research.

Category 11: Asks for an opinion on the process (AOp)

This category includes questions about a judgement, an opinion of another member or the whole group about the process (global organization of the meeting, agenda, aims, stakes, deadlines, and so on) *Examples: “Does it suit you if we begin with discussing the new points?”, “Do you want any further point to be added to the agenda?”.*

It may contain questions aimed at asking for a confirmation, rephrasing of what is said or clarifying an opinion which appears obscure in order to get a better understanding of the process. *Examples: “Does this way of working suit you?”, “Which point do you want to start with?”, “Does the meeting timing is all right for everyone?”.*

Interactions submitting an idea to the group for approval and asking for a consent or an explicit agreement resulting in a decision-making process, and not only an opinion about the process, will be linked to the category “asks for agreement on the process” (category 23).

If somebody asks for the opinion that someone external to the group once gave about the process, it will be coded in the category “asks for information on the process” (category 9) and treated as search for information.

Asks for suggestion (proposal)

Category 12: Asks for a suggestion (proposal) on the content (ASc)

This category includes questions inviting members to bring ideas about the content and submit them to the assent of the group or a part of it. Asking for suggestions can enable the group to break deadlocks in the discussion, open up new horizons related to the content and may encourage some members to develop proposals. *Examples: “Does someone have an idea of a possible cause of this issue?”, “Any suggestion about what should appear in the report?”.*

It is different from just asking for opinions as suggestions of ideas (e.g. imagining new lines of thought, constructing some hypotheses on the content) are expected to give rise to reactions from the group, in particular agreement or refusal. Nevertheless, it is not related to an explicit decision to make: the addressee will not have to decide immediately on the content.

Category 13: Asks for a suggestion (proposal) on the process (ASp)

This category includes questions inviting members to bring ideas about the process and submit them to the assent of the group or a part of it. Asking for suggestions on the process can enable the group to break deadlocks in the discussion, open up new horizons related to the process and may encourage some members to develop proposals. *Examples: “So now that we tied in the vote, what do we do?”, “Does anyone have an idea about the way of sharing information today, other than a tour de table?”, “Which other points may be added to the agenda of the meeting?”.*

It is separated from just asking for opinions as suggestions of ideas (e.g. considering other possibilities for the process, offering a new way of working, another organization of the meeting) are expected to give rise to reactions from the group, in particular agreement or refusal. Nevertheless, it is not related to an explicit decision to make: the addressee(s) will not have to make an immediate decision on the process to adopt.

Asks for metacommunication

Category 14: Asks for feeling, clarification or perception on the group, members or the interaction (asks for metacommunication) (AM)

In this category, the locus of the request is related to the situation the addressee of the question is dealing with: feeling or perception about what is lived (here and now) in the interaction or the relation with the others or even himself. That is why it must be distinguished from asking for an opinion about the content or the process. *Examples: "Can you explain us why this conversation makes you so uncomfortable?", "Did my comments hurt you?", "Don't you think we are on the right track to reach our goals?"*.

Moreover, the category gathers questions about the reason why a member is acting in a particular way or saying something. It can deal with the other's intentions or motivations about his words, acts or positions. *Examples: "You wanted to say you agreed with us, didn't you?", "Why did you change your vote?", "Is it because of me that you changed your mind?", "What do you try to show?", "What's the matter with you?"*.

DECIDING

Category 15: Decides on the content (Dc)

This category includes interactions that endorse or ratify a position and thereby close a discussion on the content. Most of the time, this kind of interactions is used by the member in charge of the group (leader of the meeting) and commits the group. Decisions on the content can be voting, finding solutions and imposing them, giving instructions or sharing the tasks out among the members or assigning work to someone. *Examples: "I'd like to change my vote to not guilty", "I would ask you to discuss this issue with the technical department and explain us your conclusions during our next meeting"*. These interventions go beyond taking a stand on a theme submitted for decision: from the speaker's perspective they are not meant to be questioned or discussed, no dialogue is expected. That is why they are not coded in the category "makes a suggestion (proposal) on the content" (category 5) or in the category "asks for agreement on the content" (category 22). Similarly, interactions coming from a common decision-making stage where a member gives his or her approval/refusal to a decision are not linked to this category and belong to the categories "gives his/her approval on the content" (category 20) and "opposes to a decision on the content" (category 18) respectively.

Category 16: Decides on the process (Dp)

This category includes interactions that endorse or ratify a position and thereby close a discussion on the process. Most of the time, this kind of interactions is used by the member in charge of the group (leader of the meeting) and commits the group. Taking decisions on the process can be as varied as organizing a piece of work, giving instructions, assigning tasks, recapitulating the progress of the process during the meeting or giving a member the right to speak. *Examples: "Let's have a ten-minute break", "I call for a new vote", "Mr Anderson, you will insure that all the members here are given the same amount of time", "We have two points left to discuss during today's meeting", "Some people haven't talked yet. We should let them express themselves before moving to a new point".*

It also encompasses calling somebody or the group to order (e.g. putting pressure on the group, inducing action, reframing the debate and preventing digressions, reminding members of what has been decided and must be respected, especially in case of a transgression against this process). *Examples: "There is too much noise. Shall we continue?", "We should stop wasting our time and work at a faster pace", "You have to decide now what you want to do", "This point is not on the agenda, so it is not the place to be referred to", "Aren't we supposed to have a secret ballot, as agreed earlier in the meeting?", "We decided to talk in order, so you have to speak first".*

In this category, interactions are not meant to give pure information about the process, otherwise they would be coded in the category "gives information on the process" (category 2). These actions go beyond taking a stand on a theme submitted for decision: from the speaker's perspective they are not meant to be questioned or discussed, no dialogue is expected. That is why they are not coded in the category "makes a suggestion (proposal) on the process" (category 6) or in the category "asks for agreement on the process" (category 23). Similarly, interactions coming from a common decision-making stage where a member gives his approval/refusal to a decision are not linked to this category and belong to the categories "gives his/her approval on the process" (category 21) and "opposes to a decision on the process" (category 19) respectively.

Category 17: Synthesizes elements before a decision-making stage (DSyn)

This category includes interactions synthesizing useful elements (information, opinions or suggestions) mentioned during the meeting so that the group or a part of it can have a global vision before making a decision individually or collectively. *Example: "To sum it up, we have the pros and the cons of implementing this structure, as to say, ...".*

Category 18: Opposes to a decision on the content (DOc)

Interactions in this category are the ones which indicate that the speaker clearly opposes a decision related to the content, whether it was decided by an isolated member or the whole group (e.g. tasks allocation, solutions provided, future steps of a project). The speaker here refuses to obey what was decided about the content and his opinions are reflected in his interactions. *Examples: "I won't have enough time to make this report, so I won't", "I can't support such an idea and prefer withdrawing from this task", "Whether you want it or not, I don't agree to work in the development team"*. It is different from just expressing an opinion against a decision on the content and complying with it nevertheless, as in the category "gives an opinion on the content" (category 3).

Category 19: Opposes to a decision on the process (DOp)

Interactions in this category are the ones which indicate that the speaker clearly opposes a decision related to the process, whether it was decided by an isolated member or the whole group (e.g. refusing to respect the organization of the meeting, the agenda, the required deadlines, the turns of speech). The speaker here refuses to obey the process and his opinions are reflected in his interactions. *Examples: "Despite what you asked, I refuse to vote on this subject", "I won't attend the second part of the meeting", "I know the order to speak but I will explain myself now"*. It is different from just expressing an opinion against a decision on the process and complying with it nevertheless, as in the category "gives an opinion on the process" (category 4).

Category 20: Gives his/her agreement on the content (DOAc)

This category includes interactions giving an agreement on a decision on the content: the speaker shows he agrees with a decision or a suggestion which was made (formally or not) on the content. *Example: "It's fine with me, I agree with these deadlines"*. It differs from just giving an opinion on the content (category 3) going in the same direction as the previous interaction: approving implies committing oneself i.e. the speaker undertakes to follow and does not protest or oppose what is planned due to the decision.

Category 21: Gives his/her agreement on the process (DOAp)

This category includes interactions giving an agreement on a decision on the process: the speaker shows he agrees with a decision or a suggestion which was made (formally or not) on the process. *Example: "As I am the only one in this position, I will bow to the procedure you chose"*. It differs from just giving an opinion on the process (category 4) going in the same direction as the previous interaction:

approving implies committing oneself i.e. the speaker undertakes to follow and does not protest or oppose what is planned due to the decision.

Category 22: Asks for agreement on the content (DAAc)

This category includes interactions asking for an agreement on a decision or suggestion on the content: the speaker makes sure that the decision to make suits every member. *Examples: "Has anybody something to say against this proposal?", "Does anyone object or is this ok for everybody?"*. This is not a matter of asking for an opinion (such interactions will be coded in the category 10) as an approval (or refusal) is expected from the question.

Category 23: Asks for agreement on the process (DAAp)

This category includes interactions asking for an agreement on a decision or suggestion on the process: the speaker makes sure that the decision to make suits every member. *Examples: "Does anyone do not want to vote?", "Does everyone agree on modifying the way of working?"*. This is not a matter of asking for an opinion (such interactions will be coded in the category 11) as an approval (or refusal) is expected from the question.

Category 24: Undertakes doing a future act (DUnd)

This category includes interactions through which the speaker commits himself or his collaborators to carry out a future act. Contrary to some decisions made on the group, interactions belonging to this category do not compel the entire group to do anything. It may be an answer to a requirement of another member (asking the member to undertake doing an act) or a spontaneous proposal. *Examples: "I will be in charge of the communication with the direction", "I will write the verbatim records of this meeting and send it to you", "My team will propose further analysis for a week's time"*.

SOCIALIZING

Category 25: Fosters the conversation, fills the silence, digresses (SConv)

This category is dealing with interactions which are not related to the content, the process and what brings the members together, but tend to digress. It includes interactions meant to engage another in a talk to prevent a lull (e.g. talk about the weather, the daily life). Such interactions can be affirmations or questions. The addressee of such an interaction answers with an interaction belonging to the same category if he intervened within the same perspective. If he seems to answer succinctly (e.g. out of politeness or lack of interest) without really fostering the conversation, this interaction will be coded in the category "exchanges polite small-talk, apologizes" (category 26). Some other interactions which

don't intend to open a discussion with other people but to talk about oneself without metacommunicating are also included in this category.

Category 26: Exchanges polite small-talk, apologizes (SPol)

This category includes signs of politeness such as saying hello while entering the room, thanking people for their talk or presentation, apologizing for keeping people waiting, offering one's apologies for one's behaviour or words, asking for the right to speak. It also encompasses interactions showing explicitly that the speaker is listening and receptive to someone without giving an opinion, whether it is related to the content of the meeting or not. *Examples: "Yes, I see", "All right"*. All the interactions belonging to this category should contribute to the socialization part and should not be mistaken for bringing or asking for information, opinions or suggestions very politely. In this case, the interactions will be coded in the adequate category according to their functional meaning and also positively on the third dimension of the coding system (interpersonal emotional meaning).

Category 27: Makes jokes (SJok)

This category includes interactions intended to improve the atmosphere by telling a joke on purpose, no matter the effect on the group which may appreciate and understand it or not. Conversely, all interactions making a member smile or laugh should not necessarily be coded in this category, especially if the reaction seems to be related to mocking, sarcasm, cynicism or irony. Such interactions should be ruled out and coded negatively on the third dimension of the coding system (interpersonal emotional meaning).

Additional comments

Note that when a piece of information is integrated in an opinion, for instance to legitimate one's position (i.e. *"all big companies use such a system"*), this interaction will be coded as an opinion.

Coding an interaction in a category (or before that, to a group of categories) on the functional meaning dimension should not be based on the interrogative or affirmative form of this interaction. For example, interrogatives do not necessarily belong to categories from the group category "asks": the meaning must be evaluated to realize when it contains explicit rhetorical forms. Conversely, affirmatives may clearly encourage members to answer, i.e. *"I don't know what you mean"*.

Furthermore, it is important to distinguish what belongs to opinion, suggestion or decision. A member giving an opinion only expresses a point of view, without necessarily expecting an open reaction or adhesion from the group. *Example: "It is a shame we do not start now"*. Making a suggestion commits

the speaker as the group is intended to analyse the proposal (e.g. *“Why shouldn’t we start now?”*), whereas deciding does not involve any discussion and sharing anymore. The speaker is imposing his or her idea. *Example: “Let’s start now”.*

CONVERGENCE

Negative convergence

An interaction will be coded negatively on the convergence dimension (Cv-) if it is undoubtedly disputing the immediately previous interaction and any previous interaction which is clearly-related. Any interaction which opposes another interaction will be coded negatively on the convergence dimension, but interactions which add different or new ideas in another direction, but without defeating directly and obviously another interaction, will be considered as neutral regarding the convergence dimension.

Each interaction belonging to the following items on the functional meaning dimension will be coded negatively on the convergence dimension: “Opposes to a decision on the content (DOc)”, “Opposes to a decision on the process (DOp)”.

Examples: “We shouldn’t choose this solution”, “I am not sure it is a good idea”, “We only have 5 minutes, not 10”.

Positive convergence

An interaction will be coded positively on the convergence dimension (Cv+) if it is undoubtedly supporting the immediately previous interaction and any previous interaction which is clearly-related. Any interaction which supports another interaction will be coded positively on the convergence dimension, but interactions which add different or new ideas in the same direction, but without agreeing directly and obviously with another interaction, will be considered as neutral regarding the convergence dimension.

Each interaction belonging to the following items on the functional meaning dimension will be coded positively on the convergence dimension: “Gives his/her agreement on the content (DOAc)”, “Gives his/her agreement on the process (DOAp)”.

Examples: “Your idea is good”, “I prefer Tom’s proposal”, “I agree to do this part of the task”, “That’s right, John also told me it would be done by September 1st”.

All the interactions which do not belong to the items “Opposes to a decision on the content (DOc)”, “Opposes to a decision on the process (DOp)”, “Gives his/her agreement on the content (DOAc)”, “Gives

his/her agreement on the process (DOAp)", can be coded negatively, positively or neutrally on the convergence dimension.

Neutral convergence

If the interaction is not clearly supporting or opposing another interaction, it will be coded as neutral on the convergence dimension. If its position is not obvious, the coder will consider this interaction as neutral on the convergence dimension.

INTERPERSONAL EMOTIONAL MEANING

Negative interpersonal emotional meaning

An interaction will be coded negatively on the interpersonal emotional meaning dimension (IEM-) if it undoubtedly shows signs of irritation, impatience, scorn or aggressiveness. Similarly, an interaction which clearly cuts another interaction (which lasted for a few seconds) is also coded negatively on the interpersonal emotional meaning dimension. An interaction can be coded as negative on the interpersonal emotional meaning dimension regardless its category on the functional meaning dimension or its position on the convergence dimension. For instance, an interaction can be coded neutrally on the convergence dimension and negatively on the interpersonal emotional meaning dimension. Conversely, an interaction can be coded as negative on the convergence dimension, but neutrally on the interpersonal emotional meaning dimension.

Examples: "I already told you twice we had 10 minutes" (with irritation, impatience), "I am fed up of working with you", "You always suggest silly ideas".

Positive interpersonal emotional meaning

An interaction will be coded positively on the interpersonal emotional meaning dimension (IEM+) if it undoubtedly shows signs of support, benevolence or warmth towards a member or his idea, or if it is defending another member who is attacked. An interaction can be coded as positive on the interpersonal emotional meaning dimension regardless its item on the functional meaning dimension or its position on the convergence dimension. For instance, an interaction can be coded neutrally on the convergence dimension and positively on the interpersonal emotional meaning dimension. Conversely, an interaction can be coded as positive on the convergence dimension, but neutrally on the interpersonal emotional meaning dimension.

Examples: "Come on, come on, we will do great" (with encouragement), "I think it is a really nice option, Andy" (with enthusiasm).

Neutral interpersonal emotional meaning

If the interaction is not showing any positive or negative signs of emotion towards another interaction, it will be coded as neutral on the interpersonal emotional meaning dimension. Similarly, if its position is not obvious, the coder will consider this interaction as neutral on the interpersonal emotional meaning dimension.

3. Chapter 3 – Highlighting the Relations between Interaction Types in Meetings and Group Performance

ABSTRACT

Are some types of interactions beneficial or harmful to team performance? Should conflict among members be promoted or avoided in teams to achieve better results? Many questions arise when trying to understand how group dynamics impact its performance. The present study intends to highlight the kinds of verbal interactions which influence the performance of a team during a meeting. A two-phase (design and building) videotaped decision-making experiment was organised with 41 teams. All interactions were then coded with the INSIDE TEAMS^{3D} (IT^{3D}) coding system. Three dimensions of interactions were considered: their functional meaning, the convergence among interactions (including content or process conflict) and their interpersonal emotional meaning (including indications of relational conflict). Performance was measured for each group as an assignment result. It was positively associated with the total number of interactions shared. The results support that some functional meaning categories are positively associated with performance: thus, groups which shared more interactions aiming at offering an opinion or a suggestion on the content, get on average better outcomes. Socialization categories (making jokes, fostering the conversation) were also positively correlated with performance. The study of interactions convergence within groups also provides significant results, showing that disagreements on the content have positive relations with team performance. Negative interpersonal emotional meaning is also showing positive relations with performance, which are discussed in the paper. On top of these considerations on interaction types, the research reveals that the groups with balanced contributions between members during the exercise got higher performance than those facing great heterogeneity. More generally, this paper provides methodological insights about a way to study group dynamics and gather data on interactions and performance.

Key words: group dynamics; interactions; performance; contributions balance; team meetings

3.1. INTRODUCTION

Teams and the way they work have held a central place in the managerial field. Because teams are interdependent social entities and share common aims and outcomes, their members interact to exchange information, diverse opinions, or debate to make a decision (Forsyth, 2010; Guzzo & Dickson, 1996; Parayitam & Dooley, 2007). In a society where performance is omnipresent and hardly an option, interactions, whether they are task-oriented, process-oriented or relationship-oriented ones, must be taken into account as they may have strong consequences on a team and its results (e.g. Gonzalez-Roma & Hernandez, 2014; Watson & Michaelsen, 1988). It is then interesting to focus on group dynamics to diagnose which kinds of interactions can be beneficial or detrimental to the outcomes of a team (Lehmann-Willenbrock, Allen, & Kauffeld, 2013). Being aware of the impact of such interactions may bring new possibilities to develop teams, both on collective and individual levels. Even though the relationship between team interactions and performance is of obvious interest, few studies have approached the links between interactions within teams and the performance of the latter (Jung, 2016; Kauffeld & Lehmann-Willenbrock, 2012). Unfortunately, the nature of the categories differing according to the interaction coding systems did not make it possible to isolate interaction types which were associated with high or low performance (Watson & Michaelsen, 1988).

3.2. THEORETICAL BACKGROUND

3.2.1. Characterization of interaction types

To refine our understanding of the connections between interaction types and performance, three characteristics of verbal interactions are taken into consideration, in accordance with the IT^{3D} coding system (Théry & Verstraeten, 2017). The first one, called *functional meaning*, gives details on both the verbal interactive act and the kind of information shared by the group (e.g. to ask for an opinion, to give a fact) (Théry, 2017b; Thomas et al., 1982). The second one, called *convergence*, shows whether there is convergence, divergence, or no link between one interaction and the previous one. When negative, this characteristic carries information on task-conflict (or cognitive conflict), on potential oppositions, on differences in viewpoints or on disagreements among members on the task content (Badke-Schaub, Goldschmidt, & Meijer, 2010; Behfar, Mannix, Peterson, & Trochim, 2011; Jehn, 1995; Théry & Verstraeten, 2017). It also informs on process conflict, which is involving the way the task is accomplished or even disagreements about assignments of duties, resource allocation, timing or planning (Badke-Schaub et al., 2010; Jehn, 1995, 1997). The third characteristic, called *interpersonal*

emotional meaning, indicates the potential positive, neutral, or negative relational aspects carried out in an interaction. Such relational aspects can be affective support to another member, signs of enthusiasm, benevolence or defending someone or, conversely, signs of irritation, impatience, scorn or aggressiveness towards another team member (Théry & Verstraeten, 2017). Contrary to convergence, the interpersonal emotional meaning does not refer to the task (including process) per se, but is individually or collectively oriented. When negative, it informs about potential tension, hostility, resentment, interpersonal incompatibilities among members or personal disagreements, that is to say relationship conflict (Amason et al., 1995; Jehn, 1995). Growing interest in the relationship between conflict, whether it is content-, process- or relationship-oriented, and performance, was noticed, with a former intuition that task and process conflicts are useful and that relationship conflict is to be avoided for a team to be efficient (Dimas & Lourenço, 2015). Further research showed that the facts are quite different and the relation more complex to apprehend, involving some moderators to be able to conclude. Studying interactions to apprehend their functional meaning, convergence (content and process conflict) and interpersonal emotional meaning (relationship conflict) will shed new light on the impact of interaction characteristics on performance.

3.2.2. Impact of functional meaning on performance

In groups with moderate or high task interdependence, the members need by definition to cooperate and communicate efficiently to achieve their tasks and high performance (Somech, Desivilya, & Lidogoster, 2009). In such interdependent contexts, team members are forced to interact with each other, giving or receiving feedback (information, opinion), coordinating the task and roles (Gonzalez-Roma & Hernandez, 2014; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). Intragroup interactions help plan the team's work and make the targets clear, debate among the team members and make a decision, improve information flow and are necessary to the team's performance (Amason et al., 1995; Campion, Medsker, & Higgs, 1993; Campion, Papper, & Medsker, 1996; Foo et al., 2006; Morgeson, DeRue, & Karam, 2010; Salas, Sims, & Burke, 2005). Especially, teams are expected to be able to achieve higher performance when process-oriented interactions are present. It is especially true when the task is non-routine and involves creativity (Amason et al., 1995).

Furthermore, the interactions which are relationship-sustaining interactions, support among members, socialization, can have a positive impact on performance (Forsyth, 2010). For instance, positive behaviours (e.g. positive humour) in group meetings are likely to contribute to a better communication

and better outcomes (Lehmann-Willenbrock & Allen, 2014). This literature on the functional meaning of interactions and team performance leads to the following hypotheses:

Hypothesis 1a (H1a): Group performance is positively associated with the proportion of process-oriented interactions

Hypothesis 1b (H1b): Group performance is positively associated with the proportion of relationship-oriented interactions (socialization, for instance)

More generally, it is interesting to understand which kinds of functional meanings (such as asking for information, offering an opinion, making a decision on the process to adopt, ...) are correlated with higher performance. Consequently, the following research questions are asked:

- *Research question 1a (RQ1a): Are some types of interactions displayed in teams (intending to offer, ask, decide or socialize) positively related to the performance of teams?*
- *Research question 1b (RQ1b): Are some types of interactions displayed in teams (intending to offer, ask, decide or socialize) negatively related to the performance of teams?*

3.2.3. Impact of convergence (content and process conflict) on performance

Task conflict, as a determinant of performance, has been intensely explored in the literature, with contradictory conclusions (Jehn, 1995; Jung, 2016; Medina, 2016). Task conflict, including conflict on the content and sometimes conflict on the process, can have a beneficial, detrimental or neutral effect on performance, depending on the type of task the group is performing (De Dreu & Weingart, 2003). Within teams performing non-routine tasks or requiring fast decision-making, task conflict, up to a point, is argued to enhance performance as it enables them to confront ideas and points of view, and explore alternative ideas and unconventional solutions (Amason et al., 1995; Choi & Cho, 2011; Jehn, 1995; O'Neill, Allen, & Hastings, 2013; Simons, 1994). For less requiring tasks (no uncertainty or time pressure), some negative effect of task conflict on outcomes was noticed (Bang & Park, 2015). The amount of task conflict is also of interest when understanding the complex association between and performance (Farh, Lee, & Farh, 2010). On the one side, whereas a moderate level of task conflict raises performance and creates new perspectives, a too high level of conflict diverts the members' attention from the task or process and makes it difficult for teams to focus or make a decision (Dimas & Lourenço, 2015). In teams working on non-routine tasks, Jehn found the relationship between task conflict and performance to be an inverted U-shape (Jehn, 1995). On the opposite side, if no task conflict is

occurring, the lack of disagreement, constructive criticism or development of new ideas results in low performance.

Even though process-oriented conflict was often neglected or included in the concept of task conflict without distinguishing its nature from content conflict, it influences the performance of teams. Research on the impact of process conflict on performance provides clearer results than when approaching task conflict. Process conflict, characterized by disagreements about “the logistics of task accomplishment”, “delegation of tasks and responsibilities”, affects team performance (Fitzgerald, Mohammed, & Kremer, 2017; Jehn & Mannix, 2001; Medina, 2016). As the specific literature on associations between process conflict and performance is still limited, the question of process conflict level is not addressed to determine whether there is a threshold below which process conflict is not detrimental, or is even beneficial for performance.

These theoretical elements result in the following hypothesis and research question:

Hypothesis 2a (H2a): The relation between content conflict and team performance is following an inverted U-shape

Research question 2a (RQ2a): Is process conflict related to team performance?

Furthermore, the presence of exchanges related to the content or process and clearly positively marked (positive convergence on the content or process) must be studied to determine if it is associated with performance. The following research questions are then presented:

Research question 2b (RQ2b): Is group performance associated with the level of interactions carrying out positive convergence on the content?

Research question 2c (RQ2c): Is group performance associated with the level of interactions carrying out positive convergence on the process?

3.2.4. Impact of interpersonal emotional meaning (relationship conflict) on performance

Just like task conflict, relationship conflict has been central to research to study whether it is affecting performance and how it should be managed. Negative emotions, such as interpersonal incompatibilities, personal criticism, signs of irritation, frustration, or anger, may be part of many team lives and may seem unavoidable. And yet the studies dealing with the effect of relationship conflict (or relationship conflict) on outcomes are almost unanimous, stressing the negative impact of relationship conflict within groups (Argyris, 1962; Chun & Choi, 2014; De Dreu & Weingart, 2003). Two main explanations to this

detrimental effect of relationship conflict were found. Firstly, relationship conflict deteriorates relationships and interactions among team members. Members are more reluctant to cooperate and to act for the benefit of the group (Jehn & Mannix, 2001). Exchanges of ideas, opinions or knowledge are consequently more limited and of poorer quality because of the negative feelings perceived within the team, and are acting against open communication (He, Xiu-Hao, & Yang, 2014; Solansky, Singh, & Huang, 2014; van Woerkom & van Engel, 2009). Lower quality decisions are then made as less information is processed and discussed during the meetings, harming innovation and performance (Chun & Choi, 2014; He et al., 2014; Quigley, Tekleab, & Tesluk, 2007). Secondly, time and energy are wasted on the relationship conflict and interpersonal issues rather than spent on the task or process (He et al., 2014; Jehn & Bendersky, 2003). relationship conflict diverts attention from the main aims of the team and is harmful to an optimal use of the human and temporal resources, and transitively to the team's performance (He et al., 2014). This literature leads to the following hypothesis:

Hypothesis 3a (H3a): Group performance is negatively associated with relationship conflict

In summary, whereas it seems difficult to eradicate relationship conflicts, it is recommended to keep this type of conflict at the lowest possible level, and simultaneously encourage a moderate level of task conflict to achieve a better performance (Watson, Cooper, & Torres, 2008).

3.2.5. Impact of the balance of members' contributions or the emergence of a predominant speaker within the group on performance

In addition to the types of interactions that are shared, the interactions distribution among team members is also of interest as it impacts their efficiency. Whereas solutions to simple tasks can be found without involving every member of a team, the participation and ideas sharing among the greatest number of members may be a key to better results for tasks or problems with no obvious solution, provided that the team is of reasonable size (Watson & Michaelsen, 1988). If some members of a group bring a disproportionately high contribution, the other ones will not be able or inclined to express themselves and bring something to the equation, which is harmful to the team's performance (Amason et al., 1995; Hoegl & Gemuenden, 2001). Similarly, if someone does not speak, his knowledge will not be beneficial to the team, which can result in a possible loss of performance. The following hypothesis is then formed:

Hypothesis 4a (H4a): Group performance is negatively associated with huge variation between the members' contributions

3.3. METHODOLOGY

3.3.1. Sample

As the aim of the experiment was to understand the associations between team interactions and performance, the process chosen involved a decision-making collaborative design and building work intended to make the team members cooperate to try to achieve optimal performance. The exercise was offered to 264 business and engineering Master students from a Belgian University (175 men, 89 women, mean age at the time of the experiment = 22.66 years, SD = 1.75). The experiment was given as an introduction to a group dynamics course, a context which may insure more involvement from the students as it was part of a class. We did not mention this experiment was part of a research on group dynamics before it took place. The participants had mainly Belgian nationality (90.53% of the sample), the others were nationals from countries all over the world. All were randomly divided into 41 groups of 5 to 7 students ($n_{\text{mean}}=6.44$). The variation in the number of students in each group was due to constraints independent from what was expected (students' unavailability, students who registered but did not turn up for the exercise, organisational constraints). Groups were constituted to get the most mixed distribution (sex and faculty of the students). The composition of the groups was also imposed on the students to prevent them from introducing a bias by choosing close members and creating more artificial interactional dynamics. Information on the degree of acquaintance among team members was gathered at the beginning of the exercise from the participants (mean proportion of the team known: 33.19%, SD=17.48%). No leader was chosen as such before the experiment and no instructions to designate one leader was given to the groups. The goal and assignment of the experiment were explained to the participants before starting it and reminded in written instructions provided to the members.

Each team was asked to design and build a tower based on several requirements:

- The only available equipment consisted of small wooden cubes (all identical, 1000 pieces),
- The tower had to be as high as possible, but also observe the best ratio 'cost on height' (the cost of each available element was known),
- The evaluation would take account of the resistance of the tower too (participants were aware in advance of the resistance test which would be applied to their tower during the last phase of the experiment).

The experiment was divided into the following phases (see Table 3.1):

Phase	Duration (min)	Phase description
0	5	Assignments to the group members
1	20	Design phase
2	10	Building phase
3	5	Resistance test on the tower

Table 3.1: Phases of the experiment

At the beginning of the experiment (phase 0), only ten cubes of wood were provided so that the group became aware of the kind of materials they would deal with. Sheets of paper and pens were also available on the table where the team members were seated. The materials necessary to build the tower (1000 cubes of wood) were introduced just before phase 2. The detailed instructions given to the groups are available in Appendix 1.

3.3.2. Data collection

The exercise was conducted with each group separately so that no competition or external influence came into play and altered the experiment. Participants were asked not to talk about the experiment with other students from other groups to prevent other biases. Likewise, the students were not allowed to keep the written instructions after the experiment. They also knew the experiment was videotaped and recorded but not disseminated, but were recommended to act as naturally as they could.

Measure of performance

Team performance is seen here as the result of the team meeting, exchanges, decisions and actions of the team regarding their initial goals (Kauffeld & Lehmann-Willenbrock, 2012). It is assessed thanks to an equation given to the groups and taking height, cost and resistance of the tower into account. This enables us to measure group outcomes based on an objective criterion (no judgement from observers) and compare the performance of groups more easily. Furthermore, the way performance was measured was chosen to resonate with the participants (business and engineering students used to deal with numbers, equations, challenges), who may find the instructions of the exercise and the short timing more appealing.

Identification of interaction types: Coding with the INSIDE TEAMS^{3D} coding system

We used the INSIDE TEAMS^{3D} (IT^{3D}) coding system to highlight the types of interactions encountered during the experiment (Théry & Verstraeten, 2017). This coding system (reported in Table 3.2) enables a three-dimensional coding of the interactions according to their functional meaning, the convergence among interactions and their interpersonal emotional meaning.

First dimension: functional meaning of the interaction			
Groups of categories		Categories	Categories ID
Offering	Gives information	Gives information on the content	Olc
		Gives information on the process	Olp
	Gives opinion	Gives an opinion on the content	OOc
		Gives an opinion on the process	OOp
	Makes suggestion (proposal)	Makes a suggestion (proposal) on the content	OSc
		Makes a suggestion (proposal) on the process	OSp
Metacommunicates	Gives a feeling, clarification or perception on the group, member or the interaction	OM	
Asking	Asks for information	Asks for information on the content	Alc
		Asks for information on the process	Alp
	Asks for opinion	Asks for an opinion on the content	AOc
		Asks for an opinion on the process	AOp
	Asks for suggestion (proposal)	Asks for a suggestion (proposal) on the content	ASc
		Asks for a suggestion (proposal) on the process	ASp
Asks for metacommunication	Asks for a feeling, clarification or perception on the group, members or the interaction	AM	
Deciding		Decides on the content	Dc
		Decides on the process	Dp
		Synthesizes elements before a decision-making stage	DSyn
		Opposes to a decision on the content	DOc
		Opposes to a decision on the process	DOp
		Gives his/her agreement on the content	DOAc
		Gives his/her agreement on the process	DOAp
		Asks for agreement on the content	DAAc
		Asks for agreement on the process	DAAp
	Undertakes doing a future act	DUnd	
Socializing (phatic function)		Fosters the conversation, fills the silence, digresses	SConv
		Exchanges polite small-talk, apologizes	SPol
		Makes jokes	SJok
Second dimension: convergence or divergence between ideas			
Interaction going in the same direction as the previous one (or the related one)			Cv+
Interaction going in the opposite direction as compared with the previous one (or the related one)			Cv-
Interaction with no related direction vis-à-vis the previous one or any previous one			Cv0

Third dimension: interpersonal emotional meaning of the interaction	
Interaction including a positive feeling toward a member or the group (encourages, supports, defends)	IEM+
Interaction including a negative feeling toward a member or the group (discourages, shows signs of irritation, impatience, scorn or aggressiveness, cuts someone off)	IEM-
Interaction with no clear positive or negative feeling toward a member or the group	IEM0

Table 3.2: INSIDE TEAMS^{3D} (IT^{3D}) Interaction coding system

Each interaction is simultaneously coded on these three separate dimensions, but it can only belong to a single category on each dimension.

The results of the study are presented in the section below. The types of interactions which were encountered in the groups are described and correlations with performance are made to answer our initial research questions and hypotheses.

3.4. RESULTS

To get a better understanding of the impact of inner group dynamics on team performance, we chose to take into account the interactions occurring during the entire exercise, but also to focus particular attention on the design phase. We assumed indeed that different requirements are unique to each stage of the exercise. The design phase (the longest part of the experiment) was meant to force members to interact and exchange ideas on how to achieve maximum results and put in place a plan for the building phase. This is supposed to involve most of the interactions, and in particular most of the ones regarding organization, role distribution and decisions. It is especially true since the second phase (building) is relatively short, dedicated to more practical tasks (e.g. building the wood tower, monitoring time and counts) and may involve less variety in the interaction types (considering the functional meaning dimension).

3.4.1. Performance

Performance was measured for each group thanks to the equation given in Appendix 1. Great variation in group performance was noticed (mean = 14.35, SD = 11.94), explained by differences in the height of the tower after each measurement (H0: mean = 42.78, SD = 16.16; H1: mean = 42.10; SD = 15.83; H2: mean = 41.46; SD = 15.26; H3: mean = 40.10; SD = 16.38), cost (mean = 278.41; SD = 167.19) and precision in the estimation of the cost (mean = 5.54%; SD = 11.95%)

3.4.2. Types of interactions within the groups (n = 41)

Functional meaning

Based on the audio and video recordings of the experience, 27,877 interactions were transcribed and coded by the author for the 41 recorded groups (mean = 679.93 interactions, SD = 136.63). Each group exercise was entered as a list of interactions in a spreadsheet tracking the speaker, the period in which the interaction occurred (part of the design or the building phase), the transcript and three codes of the IT^{3D} dimensions. All the group and individual data were then sent to SPSS for the statistical analyses. As expected, most of the interactions shared within groups belonged to the Offering categories (mean = 63.66%, SD = 4.47%). More than a third of all interactions was dedicated to giving an opinion on the task (content or process) (mean = 34.97%, SD = 6.64%) and 14.89% to giving information on the task (content or process) (SD = 4.66%). Interactions dealing with decisions (Deciding categories) or questions (Asking categories) were far less frequent (respectively mean = 16.48%; SD = 3.21% and mean = 13.30%; SD = 2.88%). The interactions aiming at socializing represented 6.56% of all interactions (SD = 3.67%) (see figure 3.1).

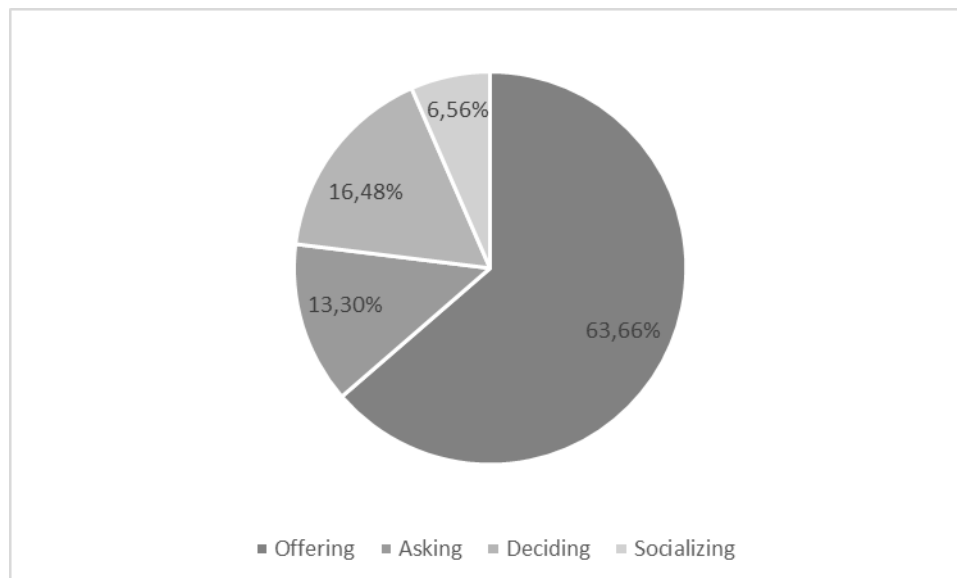


Figure 3.1: Functional meaning of the interactions

The locus of interactions is mainly the content of the task (mean = 86.48%, SD = 4.17%), well ahead of relationships among members, that is to say all interactions dealing with socialization or metacommunication (mean = 8.66%, SD = 4.17%). Most groups mainly focused on the content of the task and on the way to decide for the most efficient design. Relatively few process-oriented interactions (i.e. involving resource allocation, planning, timing, etc.) were exchanged within teams (mean = 4.86%,

SD = 2.78%) (see figure 3.2). The requirements given to the teams ahead of the beginning of the experiment involved time and members self-management. No rule was also given regarding the types of behaviours which were expected in the teams or the designation of a leader and no control related to their organization or decisions was done. All details regarding the functional meaning categories met with the sample are provided in Table 3.3.

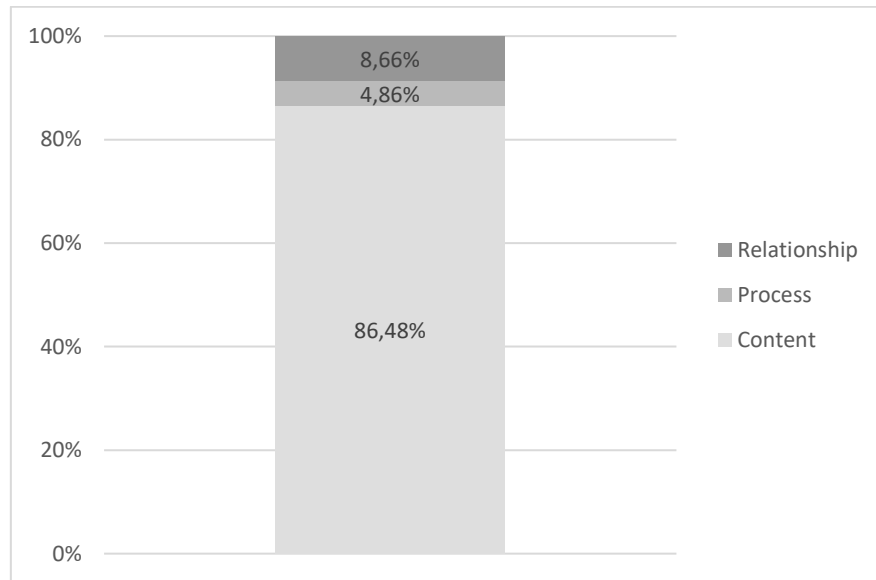


Figure 3.2: Average proportion of interactions on the locus (entire exercise)

Groups of categories		Categories	Mean (%)	St. Dev (%)
Offering	Gives information	Gives information on the content	12.91	4.67
		Gives information on the process	1.98	1.17
	Gives opinion	Gives an opinion on the content	34.65	6.41
		Gives an opinion on the process	0.32	0.57
	Makes suggestion (proposal)	Makes a suggestion (proposal) on the content	11.47	3.10
		Makes a suggestion (proposal) on the process	0.26	0.37
	Metacommunicates	Gives a feeling, clarification or perception on the group, member or the interaction	2.07	1.12
			63.66	4.47
Asking	Asks for information	Asks for information on the content	4.57	1.97
		Asks for information on the process	1.26	0.59
	Asks for opinion	Asks for an opinion on the content	6.68	2.27
		Asks for an opinion on the process	0.06	0.15
	Asks for suggestion (proposal)	Asks for a suggestion (proposal) on the content	0.70	0.55

		Asks for a suggestion (proposal) on the process	0.01	0.04
	Asks for metacommunication	Asks for a feeling, clarification or perception on the group, members or the interaction	0.02	0.06
			13.30	2.88
Deciding		Decides on the content	7.53	2.48
		Decides on the process	0.91	1.18
		Synthesizes elements before a decision-making stage	0.81	0.67
		Opposes to a decision on the content	1.42	0.76
		Opposes to a decision on the process	0.05	0.14
		Gives his/her agreement on the content	4.72	1.74
		Gives his/her agreement on the process	0.01	0.07
		Asks for agreement on the content	1.03	0.51
		Asks for agreement on the process	0.00	0.00
		Undertakes doing a future act	0.00	0.00
			16.48	3.21
Socializing (phatic function)		Fosters the conversation, fills the silence, digresses	1.64	1.44
		Exchanges polite small-talk, apologizes	1.56	0.73
		Makes jokes	3.36	2.60
			6.56	3.67

Table 3.3: Average proportion of functional meaning categories (entire exercise)

The same distribution among the interactions was observed during the design phase alone. However, two distinctions must be made. The first distinction is about the locus of interactions: whereas the content was the most predominant locus on the design phase, as it was also on the entire exercise, the proportion of relationship-oriented interactions (i.e. belonging to the metacommunication or socialization categories) was much higher and the one of process-oriented interactions decreased in the design phase (respectively mean = 7.72%, SD = 4.20%, and mean = 2.88%, SD = 2.04%) (see figure 3.3). The second distinction was related to the functional meaning categories. On average, the proportion of interactions belonging to the offering categories was higher in the design phase than on the entire exercise (mean = 68.50%, SD = 5.19%), more particularly with more opinions and suggestions given on the content (respectively mean = 41.04%, SD = 7.67% and mean = 13.33%, SD = 3.45%). Results are given in Table 3.4.

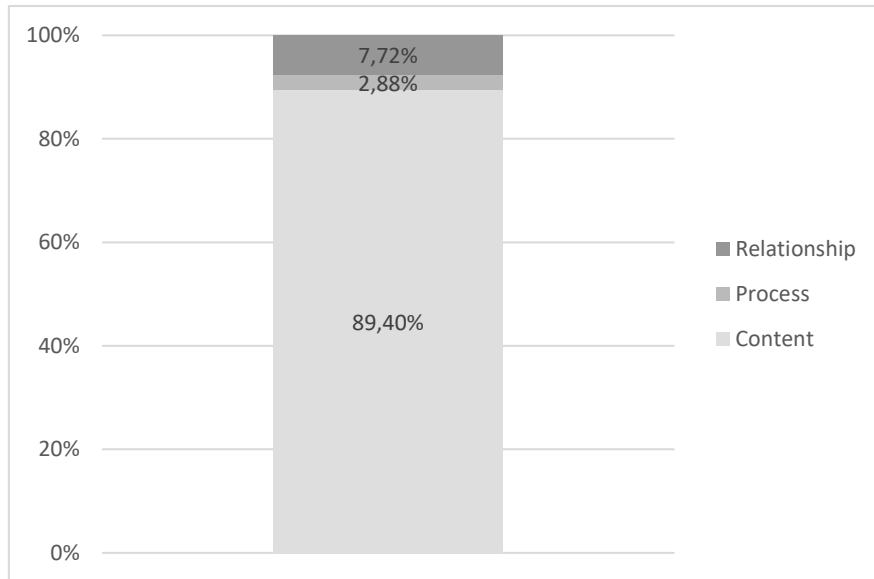


Figure 3.3: Average proportion of interactions on the locus (design phase)

Groups of categories		Categories	Mean (%)	St. Dev (%)
Offering	Gives information	Gives information on the content	10.92	5.19
		Gives information on the process	1.34	1.34
	Gives opinion	Gives an opinion on the content	41.04	7.67
		Gives an opinion on the process	0.13	0.17
	Makes suggestion (proposal)	Makes a suggestion (proposal) on the content	13.33	3.45
		Makes a suggestion (proposal) on the process	0.16	0.28
	Metacommunicates	Gives a feeling, clarification or perception on the group, member or the interaction	1.58	1.04
			68.50	5.19
Asking	Asks for information	Asks for information on the content	3.45	1.75
		Asks for information on the process	0.77	0.57
	Asks for opinion	Asks for an opinion on the content	7.54	2.86
		Asks for an opinion on the process	0.03	0.10
	Asks for suggestion (proposal)	Asks for a suggestion (proposal) on the content	0.93	0.69
		Asks for a suggestion (proposal) on the process	0.01	0.06
	Asks for metacommunication	Asks for a feeling, clarification or perception on the group, members or the interaction	0.03	0.09
			12.76	3.07
Deciding	Decides on the content		4.28	2.07
	Decides on the process		0.40	0.56

	Synthesizes elements before a decision-making stage	1.15	1.02
	Opposes to a decision on the content	1.04	0.63
	Opposes to a decision on the process	0.03	0.08
	Gives his/her agreement on the content	4.68	2.03
	Gives his/her agreement on the process	0.02	0.11
	Asks for agreement on the content	1.04	0.64
	Asks for agreement on the process	0.00	0.00
	Undertakes doing a future act	0.00	0.00
		12.64	3.70
Socializing (phatic function)	Fosters the conversation, fills the silence, digresses	1.50	1.64
	Exchanges polite small-talk, apologizes	1.48	0.83
	Makes jokes	3.13	2.67
		6.11	3.83

Table 3.4: Average percentage of functional meaning categories (Design phase)

Convergence

An overview of all interactions revealed that most interactions were neutral on the convergence dimension: 76.60% of all interactions were not explicitly supporting or disputing previous ideas (SD = 4.34%). 14.28% of all interactions aimed at agreeing to facts or opinions shared within the groups (SD = 3.18%) and only 9.12% were in opposition to previous interactions (SD = 3.20%). Thus, despite the rhythm constrained by the short duration of the experiment, urging the group to interact and act, the bulk of interactions were juxtaposition of interactions on the content, process or relationship-oriented issues (metacommunication or socialization interactions) and not debates of ideas. These interactions did not indicate any clear position of the group regarding decisions to make or task organisation. The same distribution was observed when isolating the design phase, with slightly fewer neutral convergence interactions in favour of positive convergence interactions (see figure 3.4).

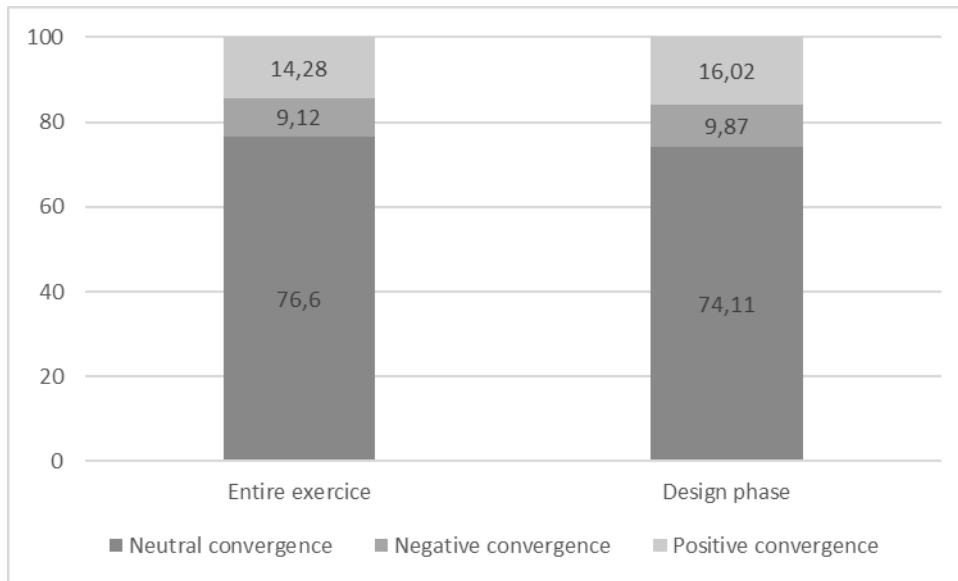


Figure 3.4: Average proportion of interactions on the convergence dimension

Interpersonal emotional meaning

The same trend could be seen for interpersonal emotional meaning as the vast majority of interactions were neutral on this dimension (mean = 91.37%; SD = 3.65%) whereas interactions carrying out negative or positive relational aspects were hardly present (respectively mean = 6.69%; SD = 3.22% and mean = 1.94%; SD = 1.40%). Explanations for these relatively low levels of positive and negative interpersonal emotional meaning are multiple. The awareness that the experiment was recorded and filmed may have influenced the way members interacted (Hawthorne effect) and may have limited the appearance of less socially-accepted behaviours (aggressiveness, hostility, ...) and thus the negative interpersonal emotional meaning level. Then, groups were randomly formed without any knowledge of the degree of acquaintance among the participants before the exercise. Groups were consequently newly formed for a short time, avoiding the effect of former common experiences in the same context and possible emotional tendency. Even when members knew each other (previous works done together, bonds of friendship, ...), no significant impact of the degree of acquaintance on the positive and negative interpersonal emotional meaning levels was observed. In addition, most of the interactions which were coded as negative on the interpersonal emotional meaning dimension involved members who were clearly and indisputably cutting other members short while the latter were already talking for a few seconds. A similar distribution of the interactions was observed during the design phase alone (see figure 3.5).

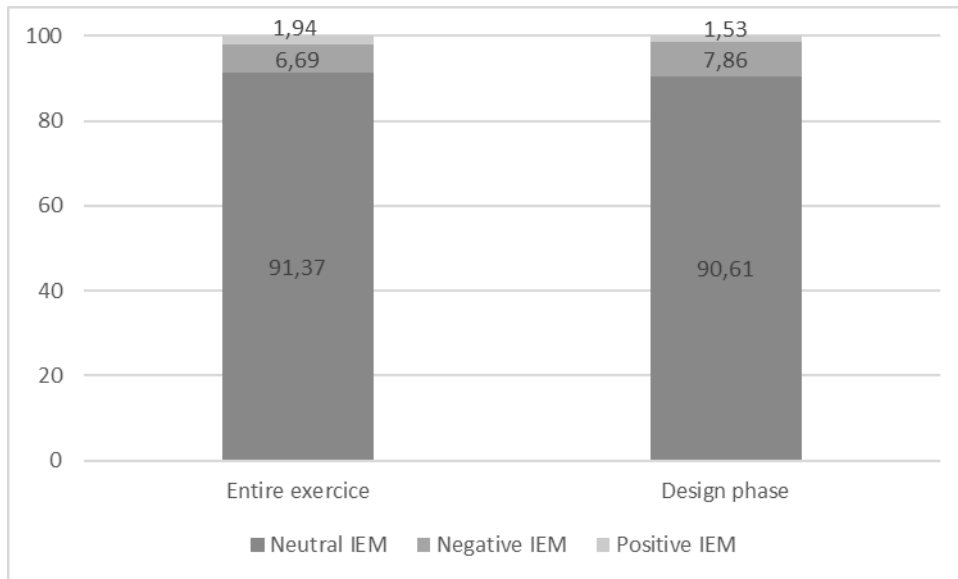


Figure 3.5: Average proportion of interactions on the interpersonal emotional meaning dimension

Correlations between age/nationality and interaction types

No correlation was found between the age of the team member and the type of interactions he played in the group on any of the three dimensions of interactions. Nevertheless, the sample of students was quite homogeneous and did not enable us to conclude of the potential impact of age. The nationality factor on some interaction types could not be evaluated, as the small number of non-Belgian nationals did not enable the statistical tests. In any case, the question of the nationality was difficult to apprehend since it does not provide any information on the culture of the participants.

3.4.3. Correlations between the number of interactions and performance

Regardless of the composition of the teams, the same conditions were provided and the same amount of time was at their disposal. We explored the association between the density of interactions within teams and their measured performance. We observed that the number of interactions appeared to be positively correlated with the outcomes, whether we considered the entire exercise ($r_s = .579$, $p < .001$) or the design phase ($r_s = .535$, $p < .001$).

3.4.4. Correlations between interaction types and performance

As performance measured on our sample was not normally distributed, the assumption of parametric test was violated and all correlation tests between interaction types and performance were done using Spearman's coefficient r_s , with significance value (2-tailed) of less than .05.

Correlations between functional meaning and performance

We examined the correlation between functional meaning (groups of categories, categories, combinations of categories) and performance. Two types of data were taken into account. Firstly, we considered proportions of interactions in each functional meaning category to realize if the distribution among functional meaning categories in groups had an impact on their performance. It may enable us to understand which kinds of interactions are to promote or avoid and in which proportion their effect is noticeable. Secondly, we explored the relationships between the sheer number of interactions distributed among the functional meaning categories and performance. We assume that each interaction per se can be potentially important for performance, regardless of the total number of interactions shared within the group.

Indeed, the impact of a functional category may be underestimated or overestimated due to the total number of interactions in the group if we only look at the proportions of functional meaning categories. For instance, the same functional meaning category including the same number of interactions may represent a certain percentage in one group and half of it or twice as much in another group. This category would then be given different weights depending on the total number of interactions within the group. We consequently relied on the number of interactions in each functional meaning category to evaluate the impact of these categories on performance so that each interaction of each group accounts for the same weight. It also helps consider potential thresholds in the number of interactions (in functional meaning categories) necessary or sufficient to influence performance.

According to our hypothesis, group performance should be positively associated with the proportion of process-oriented interactions (H1a). Unfortunately, our analysis did not support this hypothesis, whether we took into account process-oriented interactions by category (Olp, OOp, OSp, Alp, AOp, ASp, Dp, DOp, DOAp, DAAP), gathered them by groups or all together. We also focused on time divisions of each phase to understand if nevertheless, process-oriented interactions were associated with performance at specific moments of the exercise (beginning, middle or end of the design or building phase). The same results as the entire exercise were found.

Similarly, the association between interactions belonging to Socializing categories and performance was studied (Hypothesis H1b). This hypothesis was partly supported (weak strengths) as the amount of *SConv* interactions in groups (*fosters the conversation, fills the silence, digresses*) was positively

correlated with their performance, both in proportion and number. The amount of *SJok* interactions (*makes jokes*) was also positively correlated with team performance in proportion and number. However, the amount of *SPol* interactions (*exchanges polite small-talk, apologizes*) was not significantly correlated with performance (see Table 3.5 and Table 3.6).

We ran all other correlation tests with other functional meaning categories (or combinations of functional meaning categories). They provided significant results for different functional meaning categories. Firstly, the number of interactions offering opinions on the content (*OOc*) was correlated with performance (regardless of the position on the convergence dimension). The proportion of *OOc* interactions was also positively correlated with performance when these interactions carried out negative convergence. If we isolated the design phase, the number of *OOc* interactions had a positive association with performance, but only the *OOc* interactions with a negative convergence had a positive association with performance (in proportion). Secondly, the number of interactions Offering a suggestion on the content (*OSc*) was also positively correlated with performance, both on the entire exercise and on the design phase.

All relevant results are given in Table 3.5 (entire exercise) and Table 3.6 (design phase).

Functional meaning category (crossed with convergence)	Performance			
	Number of interactions in the functional meaning category		Proportion of interactions in the functional meaning category	
	r_s	p	r_s	p
SConv	.390*	.012	.327*	.037
SJok	.425**	.006	.348*	.026
OOc	.555***	< .001		
OOc with positive convergence Cv+	.378*	.016		
OOc with negative convergence Cv-	.541***	< .001	.378*	.015
OOc with neutral convergence Cv0	.448**	.003		
OSc	.601***	< .001		
* $p < .05$, ** $< .01$, *** $< .001$				

Table 3.5: Correlations between functional meaning categories and performance (entire exercise)

Functional meaning category (crossed with convergence)	Performance			
	Number of interactions in the functional meaning category		Proportion of interactions in the functional meaning category	
	r_s	p	r_s	p
SConv	.361*	.021		
SJok	.375*	.016		
OOc	.425**	.006		
OOc with negative convergence Cv-	.548***	< .001	.449**	.003
OSc	.508**	.001		
* $p < .05$, ** $< .01$, *** $< .001$				

Table 3.6: Correlations between functional meaning categories and performance (design phase)

Correlations between convergence and performance

Potential correlations between convergence and performance were then analysed. Given that we previously found that the number of interactions (regardless their convergence) was positively correlated with performance, results dealing with the number of interactions displaying positive or negative convergence would not be relevant and reliable. It would actually be difficult to conclude on the impact of the sheer convergence type of the interactions and exclude the impact of the number of interactions shared alone. Our study of the associations between convergence and performance then focused on the proportion of interactions with positive or negative convergence displayed in groups. Furthermore, we only evaluated the impact of positive and negative convergence, as neutral convergence is a default coding, which can represent various realities (unconnected interactions, interactions on different subjects, exchanges with no agreement or disagreement).

We stated that content conflict should be following an inverted U-shaped relation with team performance (H2a). The analysis of the scatter plot forced us to reject this hypothesis. Nevertheless, a positive correlation was found between content conflict and team performance, but only on the design phase (see Table 3.7). The level of content conflict in the groups may have been too limited to provide evidence of an inverted U-shaped link. We also analysed the relation between process conflict and performance (RQ2a). No correlation was displayed in our study neither on the entire exercise, nor on the design phase.

Similarly, no association was found between group performance and the level of interactions carrying out positive convergence on the content or the process (RQ2b and RQ2c).

	Performance	
Convergence	Proportion of interactions in the convergence category	
	r_s	p
Functional meaning on the content and negative convergence (design phase)	.311*	.035
*p < .05, ** < .01, *** < .001		

Table 3.7: Correlations between convergence and performance

Correlations between interpersonal emotional meaning and performance

The same choices were made for the study of the associations between interpersonal emotional meaning and performance as we did for the analysis of convergence, namely the use of proportion of interactions on the interpersonal emotional meaning rather than their number, and the neutral position on this dimension being ignored. Hypothesis 3a stated that group performance should be negatively associated with relationship conflict (i.e. negative interpersonal emotional meaning or IEM-). Our results did not support this hypothesis. Conversely, we observed a small positive correlation between the proportion of negative interpersonal meaning and performance on the entire exercise. When investigating deeper, most of the IEM- interactions were coded neutrally on the convergence dimension and corresponded to interactions cutting other interactions off. When isolating the interactions carrying out negative interpersonal emotional meaning according to their convergence coding, we confirmed that only the proportion of interactions which were neutral on the convergence dimension and still negative on the interpersonal emotional meaning dimension was positively correlated with performance. Results are given in Table 3.8.

	Performance	
Interpersonal emotional meaning	Proportion of interactions in the interpersonal emotional meaning category	
	r_s	p
IEM-	.354*	.023
IEM- with Cv0	.360*	.021
*p < .05, ** < .01, *** < .001		

Table 3.8: Correlations between interpersonal emotional meaning and performance (entire exercise)

3.4.5. Correlations between the balance of team members' contributions and performance

Regardless of the interaction types displayed on our three dimensions, we also hypothesized that group performance should be negatively associated with huge variation between the members' contributions

(H4a). Results were consistent with H4a as we found a moderate negative link between this variation among participations (through the measure of the sum of members' standard deviations) and performance (see Table 3.9).

	Performance	
	r_s	p
Variation between the members' contribution (entire exercise)	-.448**	.003
Variation between the members' contribution (design phase)	-.465**	.002
*p < .05, ** < .01, *** < .001		

Table 3.9: Correlations between variation between the members' contributions and performance

3.5. DISCUSSION AND CONCLUSIONS

This research reveals various results on the associations between interactions and performance, confirming that the three dimensions characterizing interactions are to take into consideration when thinking about the impact of group dynamics on performance. The first lesson to be drawn is that the sheer number of interactions exchanged in teams shows a relationship with their performance. It tends to indicate that groups displaying more interactions get better results. When we investigated the impact of the functional meaning of interactions per se on performance, four functional meaning categories were highlighted as the number of interactions belonging to these categories had a significant positive association with performance. Firstly, the categories *Giving an opinion on the content (OOc)* and *Giving a suggestion on the content (OSc)* appeared to help generating exchanges within the groups and fostering new ideas, which is consistent with the literature. When added to negative convergence, the number of interactions belonging to the *OOc* functional meaning category presented a strong association with performance. Thus, it seems to show that groups with open debate and disagreements about ideas on the content, thoughts on advantages and drawbacks of ideas, face better outcomes. Secondly, the assumption that socialization was positively associated with performance was partly checked through the number or proportion of interactions conducive to a relaxed and convivial atmosphere (*SConv*, *SJok*). These findings support the related literature but need to be carefully considered, however, as these functional meaning categories remain rather sparse (on average, proportions of *SConv* and *SJok* accounted each for respectively 1.64% and 3.36% of all interactions). We can easily imagine that the association between these functional meaning categories and performance follows an inverted U-shape and that above a certain proportion or number of interactions

from the *SConv* or *SJok* functional meaning categories, teams would be more distracted from the task or the process and would lose their concentration, harming then their performance.

Whereas process-oriented interactions were expected to be positively correlated with performance, our findings did not confirm this hypothesis. Unfortunately, few interactions in our experiment dealt with process (on the entire exercise, mean = 4.72%, SD = 2.73%) and a possible association with performance could not be detected, whether we considered the entire exercise or specific periods of time in the design and building phases.

Other findings were provided thanks to the analysis of the convergence of interactions. A positive association between content conflict (negative convergence on the content) and performance was found, confirming the importance of disagreements and debate on the content to reach better outcomes. Nevertheless, no inverted U-shape could be once again validated. This may be a consequence of the limited amount of content conflict present in the groups (mean = 9.64%, SD = 3.80%, max = 20.53%) which did not enable us to realize whether the correlation between content conflict and performance reversed above a threshold. Conversely, no result was provided regarding a potential association between process conflict (negative convergence on the process) and performance. Once again, few process-oriented interactions carrying out negative convergence were displayed (mean = 0.16%, SD = 0.24%, max = 1.00%) as groups focused more on the content, which prevented from observing a potential correlation with the groups outcomes ultimately. No association between positive convergence and performance was found, whether we considered content-oriented or process-oriented interactions regardless their functional meaning categories, or interactions in their respective functional meaning categories, groups or combinations of functional meaning categories.

Thanks to the interpersonal emotional meaning dimension, new results emerged, but contrary to our expectations related to the literature. While relationship conflict (negative interpersonal emotional meaning) was supposed to be negatively correlated with performance, our findings suggest that performance and negative interpersonal emotional meaning vary in the same direction. A study of all interactions coded negatively on the interpersonal emotional meaning dimension provides a clearer view on the characteristics of these interactions. The vast majority of them involved interactions which cut other interactions off, whereas very few interactions of this group dealt with signs of interpersonal incompatibilities or negative feelings. The experiment conditions may provide a possible explanation to this association between interrupted interactions and performance. As presented earlier, the quite short

duration of the exercise was thought to promote interactions among members and to require the involvement of every member. Due to the feeling of urgency which may have emerged, a number of interactions superimposed and increased both the total number of interactions and the number of interactions carrying out negative interpersonal emotional meaning. This specific context may have led to more communication in the groups and may benefit their performance, but is quite artificial.

Finally, another practical implication is also the correlation between the balance among members' contributions and team performance. Findings showed that performance was higher in groups where the members were sharing equivalent proportions of total interactions. Thus, when members stood out from the rest of the group, whether by standing back or by playing a dominant part of the total interactions, a breaking off of the balance between members occurred and harmed performance.

3.6. LIMITATIONS

Despite the practical implications for group performance raised by this research, a few limitations should be pointed out. Firstly, one quarter of the correlations we found approximated Spearman rho values of 0.3, which was a weak correlation strength. The related results provide directions regarding associations but should then be taken cautiously. Secondly, some functional meaning categories sometimes included only a small number of interactions or represented a small proportion of all interactions in groups, which could lead to a partial understanding of their associations with performance, to an underestimation or overestimation of their importance. For instance, correlations were confirmed or infirmed, but no threshold in the number or proportion of specific interactions which would remove or reverse the direction of the association was noticed (whichever the dimension we observed), even though we cannot firmly reject the existence of such thresholds. Thirdly, some choices made on the experiment may have had an impact on the rejected hypotheses, but also on the strength of the correlations. The nature of the exercise involved constraints which were voluntarily implemented for the sake of group dynamics (e.g. short duration, newly formed and mixed groups). This may have created conditions requiring specific interactions rather than others: increased focus on content rather than process due to the short amount of time available, pressure to make a decision quickly, overrepresentation or underrepresentation of some functional meaning categories in comparison with other more common group meetings, or even higher or lower levels of task, process or relational conflict. Our sample was also made up of students meeting once for an artificial project. All these conditions, in addition to shared goals, may have prevented the occurrence of individual underlying stakes. It may be interesting to

duplicate the research on the ground, especially within mature teams in companies. Finally, we had to make a choice about the way performance and perceived conflict were assessed. In the interest of objectivity and comparability, performance was considered as overall achievement of the group experience, measured thanks to a mathematical calculation. We assumed that this assessment of performance depended of course on the way members interacted in their group, but also on other elements independent from their interactions (e.g. ability to display dexterity and precision, ability to evaluate the necessary resistance of the tower to a given weight dropped, ability to calculate by hand). In the same way, perceived conflict was measured thanks to items answered by the members at the end of each phase of the exercise. These measures of conflict indicate a mean value of conflict as it was perceived by the members on the phase, but do not point out the exact moments when conflict was felt or the kind of interactions which generated this feeling. This measure of conflict also does not point out the potential conflict among members prior to the meeting, which would refine the understanding of perceived conflict during the same meeting.

3.7. BIBLIOGRAPHY

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3.8. APPENDIX 1: INSTRUCTIONS GIVEN TO THE GROUPS

Construction d'une tour en bois

Objectif

Vous évoluerez au sein d'une équipe de 5 à 7 personnes, définie de manière aléatoire par nos soins. Votre mission, si vous l'acceptez, sera de concevoir et de construire une tour à base de cubes en bois (1000 cubes de 2 cm de côté à disposition, seul matériel accepté). La performance de votre tour sera évaluée sur considération des critères *Hauteur*, *Coût* et *Stabilité*. En plus d'abaisser au maximum le ratio hauteur sur coût de votre tour, vous devez prendre en compte que votre tour finale est censée ne pas s'effondrer en tout ou partie si on lâche un poids de 1 kg sur la table¹. Le premier test s'effectuera à une hauteur de 15 cm, le deuxième à une hauteur de 35 cm, le troisième et dernier à une hauteur de 50 cm.

Organisation de l'exercice

L'exercice sera articulé en deux phases bien séparées.

Phase 1 : Design de la tour

Vous avez 20 minutes et 10 cubes à votre disposition pour concevoir en équipe le prototype d'une tour maximisant la performance P donnée ci-après :

$$P = H_0 * \frac{1}{3} (2 * H_1 + 1,5 * H_2 + 1,2 * H_3) * \frac{(1 - e)}{c}$$

Avec :

H_0 : hauteur initiale de la tour (avant test de résistance)

H_1 : hauteur de la tour après premier test de résistance

H_2 : hauteur de la tour après deuxième test de résistance

H_3 : hauteur de la tour après troisième test de résistance

e : écart entre coût donné et coût vérifié

c : coût de la tour (nombre de cubes utilisés ; 1 cube=1€)

Comme la formule précédente l'indique, un système de pénalité est appliqué en fonction de la résistance de la tour aux trois tests appliqués et de la précision de votre calcul du nombre de blocs utilisés (terme d'erreur e). De plus, les différents tests de résistance ont une pondération décroissante. Vous pouvez utiliser durant cette phase des feuilles et stylos, mais ni calculatrice, ni connexion Internet.

¹ Le poids sera lâché sur la table à une distance de 15 cm d'un des bords de la tour.

Durant ces 20 minutes, l'animateur n'interviendra sur aucune question et ne se manifestera qu'en fin de première phase pour arrêter l'exercice.

Quelques minutes seront ensuite consacrées à recueillir vos ressentis sur cette première phase.

Phase 2 : Construction de la tour

Vous avez à présent 10 minutes et la totalité des cubes à votre disposition pour construire la tour. Celle-ci doit absolument être construite au centre de la table en vous servant uniquement des cubes en bois.

Les calculatrices et connexions Internet ne sont toujours pas acceptées, et le matériel sur la table (feuilles, stylos) ne doit pas être employé pour faciliter la construction physique de la tour. Nous vous demandons de même de rester dans le champ de la caméra, mais de ne pas lui tourner le dos.

Comme en première phase, l'animateur ne se manifestera que pour signaler la fin des 10 minutes.

Vous devrez dès ces 10 minutes écoulées lui indiquer le nombre de cubes qui constituent la tour.

Les tests de stabilité seront alors appliqués.

Quelques minutes seront ensuite consacrées à recueillir vos ressentis sur cette seconde phase.

4. Chapter 4 – Satisfaction and Perception of Conflict in Teams: Understanding their Relationship and the Importance of Interaction Types

ABSTRACT

This paper aims at understanding how interactions are connected with instrumental and social satisfaction, and perceived task and relationship conflict. Participants were 264 students divided into 41 teams and involved in a design and building group experiment which was videotaped and integrally coded with the IT^{3D} coding system. We highlight the significant positive relationship between socialization interactions and satisfaction. We notice that when interactions carrying task conflict (content) are increasing, instrumental and social satisfactions are lower. In contrast, process conflict and relationship conflict show no relationship with team member satisfaction. We also investigate the relationship between observed conflictual interactions in groups and the perception of conflict by their members. Only the perception of task conflict is related to the proportion of observed interactions opposing ideas in the group, whereas interactions showing signs of weak relationship conflict are not globally perceived as such. Finally, the study of team member satisfaction and perception of conflict confirms that perceived task conflict is harmful to instrumental and social satisfaction, whereas perceived relationship conflict also impacts negatively social satisfaction.

Key words: group dynamics; interactions; team member satisfaction; perceived conflict; contributions balance; team meetings

4.1. INTRODUCTION

Team work has become common practice in most organizations: individuals are asked or intended to gather together in teams with the aim of sharing information, skills or knowledge on projects, achieving common goals, carrying out their tasks or making decisions. In many cases, these groups are imposed on their members, who can widely differ regarding their opinions, communication modes and personality traits. Working together then means 1) some adaptation to the group, 2) the need to share interactions, 3) the obligation sometimes to face disagreements among members, and 4) the need to reach agreements in the end (de la Torre-Ruiz et al., 2014; Pelled et al., 1999). In such circumstances, it is worth wondering what makes team members satisfied with the team or the way it performs, whether we want to improve their well-being, their commitment to the task or future involvement in the team (Furumo, de Pillis, & Green, 2009; Hackman, 1987; Peeters, Rutte, van Tuijl, & Reymen, 2006). Team member satisfaction can in particular be seen as the result of interactions occurring during team meetings, whether these interactions deal with the task or the relationships among members (Behfar, Peterson, Mannix, & Trochim, 2008; Kong, Konczak, & Bottom, 2015). Thus, the study will pay attention to the relationships between team member satisfaction and the types of interactions which are played in teams. More specifically, the question of conflictual interactions in teams, whether it is task- or relationship-oriented, will also be studied. Indeed, conflict is often an integral part of team lives and may have an impact on team satisfaction. The contribution of this study is also to understand the way conflict, as measured through interactions, is consistent with the perception of conflict by team members. Finally, the way disagreements among members, interpersonal tensions or incompatibilities are associated with team member satisfaction, is analysed.

Theoretical elements on interactions, team member satisfaction and conflict are provided to highlight the potential connections among these entities and help form relevant hypotheses and research questions.

4.2. THEORETICAL BACKGROUND

4.2.1. Member satisfaction

Team member satisfaction can be defined as “members’ overall evaluations about working in their current team” (Shaw et al., 2011). Two separate dimensions of member satisfaction are considered. First, member satisfaction can take into account the pleasantness of the team experience based on the interactions shared with the other members, and the desire or willingness of a member to work within

the same team in the future, if this member had a choice. This dimension of satisfaction is called *social satisfaction* (Nerkar, McGrath, & Macmillan, 1996). Then, satisfaction can relate to the meeting outcomes (accomplishments) and process used during the meeting (Reinig, 2003). This second dimension of member satisfaction is also known as *instrumental satisfaction* (Nerkar et al., 1996).

Whether social or instrumental, team member satisfaction is not that easy to measure and almost impossible to assess by an external observer. It then requires involving team members and share their perceptions on the team and meeting, and assess them with given measurement scales (Carey & Kacmar, 1997).

Many factors can impact member satisfaction (Downs & Pickett, 1977; Witteman, 1991). We chose to focus on the types of interactions shared within the team, including clear signs of inner conflict.

Association between social satisfaction and instrumental satisfaction

As satisfaction in the team and satisfaction with performance have not been clearly separated in most related studies or not both taken into account simultaneously, there is no evidence of a correlation between those two facets of team satisfaction. This possibility will be further explored.

Research question RQ0: Are social satisfaction and instrumental satisfaction associated?

Impact of the interaction types on satisfaction

Functional meaning of interactions

To date, few findings about the kinds of interactions which could lead to a better or worse satisfaction in teams are available, neither on the social nor on the instrumental satisfaction. Nevertheless, the link between process-oriented interactions and instrumental satisfaction was mentioned (de Wit, Greer, & Jehn, 2012; Jehn, 1997; Passos & Caetano, 2005; Standifer et al., 2015). This type of interactions involves for instance tasks and roles organization, questions, information or suggestions on the process, establishing priorities, or time management (Lehmann-Willenbrock et al., 2013). Based on the literature findings, we form the following hypothesis:

Hypothesis 1a (H1a): Team member instrumental satisfaction is positively associated with the proportion of process-oriented interactions

Furthermore, we will investigate on the relationship between the functional meaning categories of interactions present in group meetings and team member satisfaction. As described in the previous chapters, the functional meaning of interactions “gives details on both the verbal interactive act and the

kind of information shared by the group (e.g. to ask for an opinion, to give a fact) (Théry, 2017a; Théry & Verstraeten, 2017). We will try to answer the following research questions:

- *RQ1a: Are some functional meaning categories positively or negatively correlated with team member social satisfaction?*
- *RQ1b: Are some functional meaning categories positively or negatively correlated with team member instrumental satisfaction?*

Convergence among interactions

More generally, the importance of communication among members for team satisfaction has often been mentioned in the literature. Cooperation among members, open discussions, and debates of ideas and opinions, were found to have strong correlations with team member satisfaction (Amason et al., 1995; Hoegl & Gemuenden, 2001). A group climate conducive to exchanges, and especially possible disagreements with other ideas or opinions, was perceived to make members more satisfied with the team (social satisfaction) (Amason et al., 1995; de la Torre-Ruiz et al., 2014). Disagreements among members about the task represent what is commonly known as *task conflict* or more specifically, *content conflict* (Jehn, 1995). A large number of studies looked at the issue of content conflict and its effect on team satisfaction. Most of them pointed out moderate to strong negative relationships between content conflict and social or instrumental satisfaction (De Dreu & Weingart, 2003; Dimas & Lourenço, 2015). The same results were enhanced when considering process conflict, involving disagreements about strategical matters, delegation of duties and resources, or responsibilities for instance (Jehn & Chatman, 2000). However, fewer studies dealt with this type of conflict, which has often been seen as included in task conflict or neglected until recently (de Wit et al., 2012; Jehn, 1997; Passos & Caetano, 2005). Based on our measures of content and process conflict (convergence i.e. agreements, disagreements or neutral links between interactions), we will form these hypotheses:

Hypothesis 1b (H1b): Team member instrumental satisfaction is negatively associated with the proportion of content conflict in the group

Hypothesis 1c (H1c): Team member social satisfaction is negatively associated with the proportion of content conflict in the group

Hypothesis 1d (H1d): Team member instrumental satisfaction is negatively associated with the proportion of process conflict in the group

Hypothesis 1e (H1e): Team member social satisfaction is negatively associated with the proportion of process conflict in the group

Interpersonal emotional meaning of interactions

Another interesting aspect of interactions which was mentioned as being connected to team member satisfaction is relationship conflict. Relationship conflict refers to any signs of interpersonal disagreements, incompatibilities, signs of irritation, aggressiveness, frustration or anger, called negative interpersonal emotional meaning (Amason et al., 1995; Jehn, 1995; Théry, 2017a). Relationship conflict is not directly about the task or the process (it can occur independently on task-, process- or relationship-oriented interactions) but corresponds to an additional dimension besides the functional meaning and the possible task or process conflict (Tekleab & Quigley, 2014). Conversely, interactions can carry a positive interpersonal emotional meaning and provide “support to another member, signs of enthusiasm, benevolence” or aiming at supporting someone in the group (Théry, 2017a).

Most studies on this type of conflict report either no effect (at best), or a negative relationship between relationship conflict and team member social satisfaction, as relationship conflict creates tension and leads to a possible decrease in the involvement of team members, who are more reluctant to consider some future work together (De Dreu & Weingart, 2003; Ross, 1989).

Hypothesis 1f (H1f): Team member social satisfaction is negatively associated with the proportion of relationship conflict in the group (measured via the proportion of negative interpersonal emotional meaning)

It will be, moreover, interesting to see if, in contrast, the proportion of interactions with a positive interpersonal emotional meaning may be associated with team member social satisfaction.

Research question RQ1c: Is the proportion of interactions with positive interpersonal emotional meaning associated with team member social satisfaction?

4.2.2. Perceived conflict

We approached content-, process- or relationship-oriented conflict factually, as they emerged from the study and coding of interactions. Regardless these objective measures of conflict, perception of conflict can vary a lot from the level of conflict carried out in the team interactions, and even from one member of the group to another. Conflict can consequently be considered to exist from the time a member perceives tension related to disagreements in the group interactions (Barki & Hartwick, 2004; Dimas & Lourenço, 2015). It will be called *perceived conflict*.

Association between perceived content conflict/process conflict and relationship conflict

Literature highlighted the high correlation between content or process conflict and relationship conflict, seen as two parts of the same conflict entity (Barki & Hartwick, 2004; Pearson, Ensley, & Amason, 2002). One can consider that relationship conflict may sometimes be a cause of task or process disagreements, more often a consequence of content or process conflict (Behfar et al., 2011). The individual perceptions of both types of conflict can also influence each other, especially with content or process conflict generating negative feelings towards team members and then creating a perception of relationship conflict (Behfar et al., 2008; Jehn, 1997; Jehn, Greer, Levine, & Szulanski, 2008). Another explanation for this connection is a misinterpretation of interactions carrying content or process conflict, which generates perceived relationship conflict (De Dreu & van Knippenberg, 2005; Katz & Koenig, 2001; Lindsley, Brass, & Thomas, 1995; Parayitam & Dooley, 2007; Simons & Peterson, 2000).

Hypothesis 2a (H2a): Perceived content conflict is associated with perceived relationship conflict

Hypothesis 2b (H2b): Perceived process conflict is associated with perceived relationship conflict

These perceptions of content, process and relationship conflict will be assessed through individual measurements.

Impact of the interaction types on perceived conflict

Given that the analysis of conflict through its perception by members during team meetings seems relatively new, no result regarding the types of interactions associated with this feeling of conflict has been identified yet. We will then investigate the possible connection between interactions carrying content or process conflict (functional meaning combined with the convergence dimension) and the assessment of content or process conflict by the team members.

Research questions:

- *RQ2a: Is the proportion of interactions with negative convergence on the content associated with team member perception of content conflict?*
- *RQ2b: Is the proportion of interactions with negative convergence on the process associated with team member perception of process conflict?*

Similarly, we will look at the association between the types of interactions displayed during group meetings (on the interpersonal emotional meaning dimension) and perception of relationship conflict by team members.

Research question RQ2c: Is the proportion of interactions with negative interpersonal emotional meaning associated with team member perception of relationship conflict?

Association between perceived conflict and satisfaction

Previously, we mentioned that content, process and relationship conflicts, as they are identified thanks to interaction coding, may have a connection with instrumental or social satisfaction. Another complementary perspective is to look at the relationship between conflict and satisfaction by studying conflict as it is actually perceived by team members, as their perception of disagreements and personal tensions in meetings can be quite different from what was “objectively” coded. As hypothesized for conflict carried out in interactions, perceived conflict is supposed to have a negative relationship with satisfaction (Wall, Galanes, & Love, 1987). Working on data coming directly from members will provide an opportunity to realize whether the conflict they experienced is also related to their satisfaction and in the same way as it was with conflict measured with negative convergence or negative interpersonal emotional meaning of interactions.

Hypothesis 2c (H2c): Team member instrumental satisfaction is negatively associated with perceived content conflict in the group

Hypothesis 2d (H2d): Team member social satisfaction is negatively associated with perceived content conflict in the group

Hypothesis 2e (H2e): Team member instrumental satisfaction is negatively associated with perceived process conflict in the group

Hypothesis 2f (H2f): Team member social satisfaction is negatively associated with perceived process conflict in the group

Hypothesis 2g (H2g): Team member social satisfaction is negatively associated with perceived relationship conflict in the group

All our hypotheses and research questions are summarized in Figure 4.1.

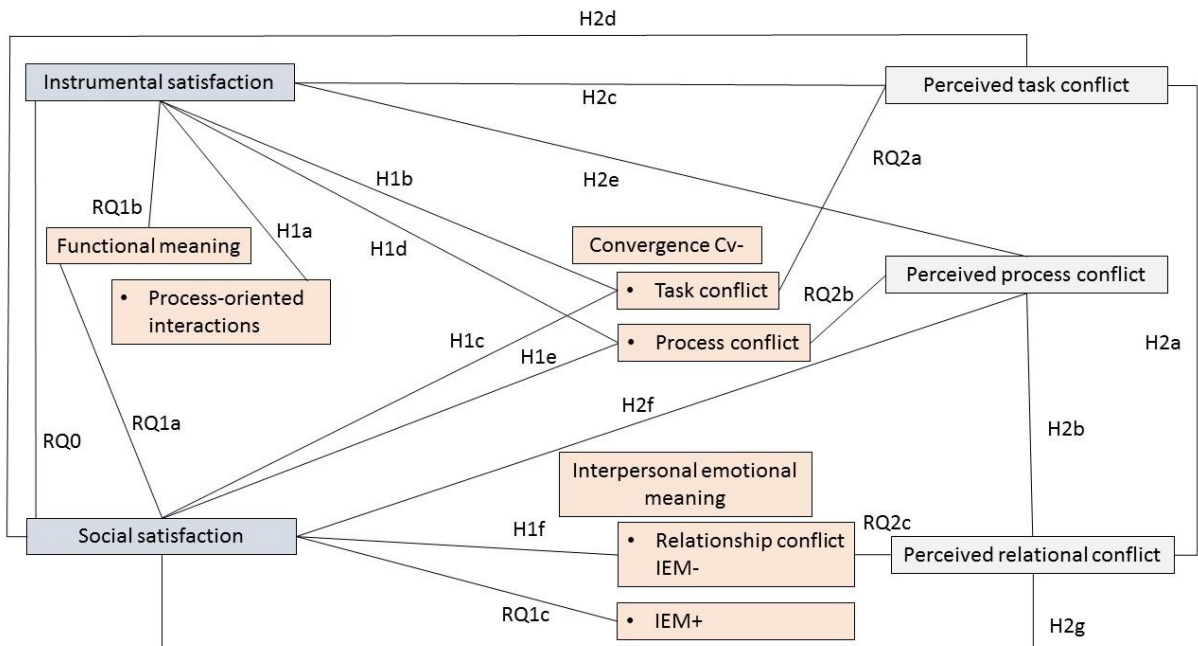


Figure 4.1: Hypotheses and research questions about interactions, satisfaction and perceived conflict

4.3. METHODOLOGY

4.3.1. Sample and data collection

A study including 264 students (175 men, 89 women) were divided into 41 groups of 5 to 7 students ($n_{\text{mean}}=6.44$). Details regarding the distribution of participants, experience and aims, were given in a previous paper (Théry, 2017a). All interactions were recorded and videotaped. Measures of team member satisfaction and perception of conflict were collected after each phase of the experiment (design and building).

4.3.2. Identification of interaction types

All interactions were coded thanks to the INSIDE TEAMS^{3D} (IT^{3D}) coding system on three interaction dimensions: their functional meaning, convergence and interpersonal emotional meaning (Théry & Verstraeten, 2017).

4.3.3. Measures

Team member satisfaction

In accordance with both facets of satisfaction that we wanted to investigate, two scales of satisfaction were used with five Likert-type response options ranging from “Strongly disagree” to “Strongly agree”.

To measure social satisfaction, three items were selected from the indicators for team member satisfaction (Gevers & Peeters, 2009; Peeters et al., 2006) and two others were added from other

satisfaction items (Rockmann & Northcraft, 2010), to offer more details about the relationship satisfaction (see Table 4.1).

Item ID	Item	Origin
SAT_01	Taken as a whole, I was satisfied with the composition of the team	Gevers et al.
SAT_02	Taken as a whole, things went pleasantly within the team	Gevers et al.
SAT_03	If I ever had to participate in a similar project again, I would like to do it with this team	Gevers et al.
SAT_04	I am satisfied with how my fellow group members and I worked together on the exercise	Rockman et al.
SAT_05	I am satisfied with how my fellow group members performed during the exercise	Rockman et al.

Table 4.1: Scale assessing social satisfaction

Similarly, the assessment of instrumental satisfaction (individual satisfaction with the team's performance) was based on two indicators (Peeters et al., 2006) and on another one (Rockmann & Northcraft, 2010) exploring the members' perceptions of task or team's performance (see Table 4.2).

Item ID	Item	Origin
SAT_06	I am satisfied with the performance of the team	Gevers et al.
SAT_07	I felt our group effectively coordinated to complete the exercise	Rockman et al.
SAT_08	I am satisfied with the quality of the exercise output	Gevers et al.

Table 4.2: Scale assessing instrumental satisfaction

For each scale, an exploratory Principal Component Analysis (PCA) was conducted to confirm that its items reflected the same unique underlying construct.

Validation of the social satisfaction scale

An exploratory PCA was first run on the 5 items of the scale assessing social satisfaction and involved 264 respondents. The Kaiser-Meyer-Olkin measure (KMO) validated the sampling adequacy for the analysis (Field, 2009), all communalities for individual items were > .46, which is acceptable. Bartlett's test of sphericity verified that the correlations between items were sufficiently large to apply PCA. One component had an eigenvalue greater than 1, respecting Kaiser's criterion and explained 58.24% of the variance. A measure of scale reliability is given with a very satisfactory Cronbach's alpha ($\alpha = .818$). All results are detailed in Table 4.3.

KMO measure		.817
Bartlett's test of sphericity χ^2	432.92	p < .001
Item	Communalities	Factor loading
SAT_01	.661	.813
SAT_02	.456	.675
SAT_03	.645	.803
SAT_04	.571	.756
SAT_05	.578	.760

Table 4.3: PCA on social satisfaction scale

A Confirmatory Factor Analysis (CFA) was then processed in SPSS AMOS to check the theoretical models emerging from the exploratory factor analysis. Another sample of 264 respondents was used to run the CFA on the satisfaction scale assessing social satisfaction. Model fit summary is given in Table 4.4.

	CMIN/df	GFI	AGFI	RMR	RMSEA	TLI	CFI
5-item model	4.982	.942	.891	.061	.123	.922	.938
Acceptable threshold	<5	>.95	>.80	<.09	<0.10	>.90	>.90

Table 4.4: Model fit summary - Social satisfaction scale

All metrics are good or almost, except for the RMSEA value which is a little high (RMSEA = .123). This can be explained by the low df of the model and the non-normal distributions of our variables. RMSEA does not seem to be relevant under these conditions and should be set aside (Kenny, Kaniskan, & McCoach, 2015). Consequently, the model is validated through this CFA.

Validation of the instrumental satisfaction scale

The same methodology was applied to validate the scale assessing instrumental satisfaction. An exploratory PCA on the 3 items of the scale was done with 264 respondents. The Kaiser-Meyer-Olkin measure (KMO), Bartlett's test of sphericity and communalities for individual items validated the use of a PCA. One component emerged (eigenvalue > 1) and explained 71.13% of the variance. Scale reliability is measured and validated (Cronbach's alpha α = .795). All results are detailed in Table 4.5.

KMO measure		.700
Bartlett's test of sphericity χ^2	243.95	p < .001
Item	Communalities	Factor loading
SAT_06	.675	.821
SAT_07	.703	.838
SAT_08	.756	.870

Table 4.5: PCA on scale assessing instrumental satisfaction

A Confirmatory Factor Analysis (CFA) on the instrumental satisfaction scale was also processed with another sample of 264 respondents. Model fit criteria are given in Table 4.6.

	CMIN/df	GFI	AGFI	RMR	RMSEA	TLI	CFI
3-item model	4.631	.976	.929	.066	.117	.963	.976
Acceptable threshold	<5	>.95	>.80	<.09	<0.10	>.90	>.90

Table 4.6: Model fit summary - Instrumental satisfaction scale

As for the social satisfaction scale, all metrics are satisfying. For the same reason, RMSEA is not considered (df = 2).

Perceived conflict

5 items were chosen to indicate the level of conflict perceived by members of the group during the exercise. 3 items derived from the Intragroup Conflicts Items (Jehn, 1995) and 2 new items were added to take into account conflict on the task (see Tables 4.7, 4.8 and 4.9). A factor analysis (ACP) was conducted to determine whether the 3 items chosen to assess relationship conflict reflected a single component or if different factors existed within this conflict scale.

Item ID	Item
CONF_01	There was friction in the team
CONF_02	Some personalities were opposed to others in the team
CONF_03	Some tensions or signs of irritation were perceptible

Table 4.7: Scale assessing relationship conflict

Item ID	Item
CONF_04	Some members of the team disagreed on the content of the task

Table 4.8: Item assessing task conflict (content)

Item ID	Item
CONF_05	Some members of the team disagreed on the organization

Table 4.9: Item assessing task conflict (process)

Validation of the conflict scales

We subjected the 264 responses to the scale assessing relationship conflict to a PCA, as the KMO, Bartlett's test of sphericity and communalities values supported it. This analysis indicated a single component (which explained 62.21% of the variance) and validated the 3-item conflict scale (see Table 4.10). The reliability of the scale is also ensured (Cronbach's $\alpha = .766$).

KMO measure		.669
Bartlett's test of sphericity χ^2	134.51	p < .001
Item	Communalities	Factor loading
CONF_01	.592	.770
CONF_02	.623	.789
CONF_03	.651	.807

Table 4.10: PCA on relationship conflict scale

A Confirmatory Factor Analysis (CFA) was processed with another sample of 264 respondents. To evaluate model fit, fit indices were measured. Results are provided in Table 4.11.

	CMIN/df	GFI	AGFI	RMR	RMSEA	TLI	CFI
3-item model	.166	1.000	.997	.008	.000	1.010	1.000
Acceptable threshold	<5	>.95	>.80	<.09	<0.10	>.90	>.90

Table 4.11: Model fit - Relationship conflict scale

The metrics related to the model fit for relationship conflict are also all validated. The scale used to measure relationship conflict is then acceptable.

4.4. RESULTS

Various factors were partly used as control to refine our understanding of team member satisfaction and perceived conflict. Thus, the distribution of interactions, the sex of participants and the degree of acquaintance among team members are observed throughout the analysis.

4.4.1. Interactions

Sex of team members

One first question was to focus on interactions and see if men's and women's interactions were different, whether we considered functional meaning, convergence among interactions or interpersonal emotional meaning. Regarding the functional meaning, men and women differ significantly on their proportion of four categories. Men (Mdn = 0.345) were found to use more interactions dealing with offering an opinion on the content (*OOc*) than women (Mdn = .321, $U = 6582.00$, $p = .040$, $r = -.127$). Similarly, men (Mdn = .115) showed a higher proportion of interactions offering a suggestion on the content (*OSc*) than women (Mdn = .100, $U = 6544.00$, $p = .034$, $r = -.131$). Conversely, the proportion of interactions offering metacommunication (*OM*) was significantly higher for women (Mdn = .024) than men (Mdn = .015), $U = 6139.5$, $p = .004$, $r = -.175$. The same result was found on the interactions asking for an opinion on the content (*AOc*), with women (Mdn = .071) displaying a significantly higher proportion of these interactions in comparison with men (Mdn = .054, $U = 6273.50$, $p = .010$, $r = -.159$). However, as the r values pointed it out, the effect of sex on the functional meaning proportions was rather low.

Mann-Whitney tests were also run to determine if the sex of the team members had a correlation with the proportion of convergence in their interactions. Proportion of positive convergence (*Cv+*) in women's interactions (Mdn = .150) was significantly higher than men's (Mdn = .129, $U = 6422.50$, $p = .020$, $r = -.143$). Nevertheless, the proportion of negative convergence did not differ significantly according to the sex of the speaker.

In the same way, interpersonal emotional meaning was explored to consider differences between men and women. No significant result indicated a difference of proportion in the interactions carrying interpersonal emotional meaning regarding the sex.

Degree of acquaintance

One second question was to explore possible differences in the functional meaning, convergence and interpersonal emotional meaning displayed by members depending on their degree of acquaintance with the rest of the group. Regarding functional meaning categories, members with a higher degree of

acquaintance of the group interacted significantly and proportionally more on the categories “Offers metacommunication (*OM*)” ($r_s = .312, p < .001$), “Fosters the conversation, fills the silence, digresses (*SConv*)” ($r_s = .245, p < .001$), “Exchanges polite small-talk, apologizes (*SPol*)” ($r_s = .157, p = .015$) and “Makes jokes (*SJok*)” ($r_s = .128, p = .047$). Nevertheless, these correlations are weak. No other distinction was highlighted.

4.4.2. Satisfaction

Team member participation and balance among members

Regarding team member satisfaction, it was worth comprehending if the proportion of interactions offered by the members themselves impacted their degree of satisfaction. No correlation between the total number of interactions of an individual or the proportion of his interactions in the group, and instrumental or social satisfaction was found, neither on the design phase, nor on the building phase. Nevertheless, the balance in the distribution of the interactions seemed more important: a correlation appeared between social satisfaction and mean standard deviation in the proportion of members interactions ($r_s = -.442, p = .004$ for the entire exercise). No causality can be strictly validated with this correlation test, even though satisfaction is thought as the result of the exercise and its interactions balance (Behfar et al., 2008; Kong et al., 2015). Thus, groups where there was a balance among the members participation were more socially satisfied on average than groups facing a huge disparity in the members proportion of interactions, whether a member spoke far more than the other team members or shared very few interactions. When investigating at the item level in social satisfaction, we noticed that groups with higher differences in interaction proportions were less satisfied regarding the team composition ($r_s = -.405, p = .009$), found the exercise less pleasant ($r_s = -.457, p = .009$), showed less willingness to stay with the same group for a similar exercise in the future ($r_s = -.331, p = .035$) and were less satisfied with the behaviours of the other members ($r_s = -.362, p = .020$). Dissatisfaction can indeed be felt if members are very passive considering the interactions and do not talk much, giving the impression they do not really make a contribution in the group. Conversely, a member who dominates the interactions proportion can be perceived as monopolizing the discussion and may rightly or wrongly create an atmosphere hardly conducive to a free exchange of ideas, preventing other members from talking. In both cases, this may create an imbalance impacting negatively social satisfaction. We therefore should be careful about understanding this relation as no causality can be strongly affirmed.

Sex of team members

No significant difference in satisfaction was noticed between men and women, whether we isolated social satisfaction or instrumental satisfaction.

Degree of acquaintance

The impact of the degree of acquaintance was also taken into account to realize whether a member with previous connections with other members faced significantly different levels of satisfaction in comparison with members discovering the entire group or most of it. No result could be highlighted regarding satisfaction and the degree of acquaintance among members. Furthermore, the degree of acquaintance among members did not provide information about the relationships and kindness between members, which may have provided complementary information.

Performance and Satisfaction

Even though the participants had no level of performance to reach (no target was given, as the aim was to get the highest performance), they may have felt more or less satisfied about the outcomes (instrumental satisfaction after the building phase). A correlation test between individual instrumental satisfaction (building phase) and measured performance was then done. A low correlation was found ($r_s = .320, p < .001$).

As the result of performance may be difficult to evaluate, abstract in the eyes of the participants and hard to translate in terms of quality of the outcomes, we also considered the associations between instrumental satisfaction and initial height, cost, initial height on cost, and ratio H_3 on H_0 (height after the last resistance test on the initial height seen as an indicator of resistance of the tower). Low correlations were found between instrumental satisfaction and initial height H_0 ($r_s = .244, p < .001$) and between instrumental satisfaction and the ratio initial height on cost ($r_s = .231, p < .001$). This may indicate that members based on the initial height and the ratio initial height on cost to assess their performance, regardless of the stability factor. As the groups were provided with no reference for the height or cost considered as good or for a maximum performance, the performance representation remains hard to understand and analyse further.

Interaction types and Satisfaction

Functional meaning

As asked in our research questions RQ1a and RQ1b, we wanted to identify the functional meaning categories played in the groups whose proportion was related to social or instrumental satisfaction.

Correlations were significant only for the building phase and on the Socialization categories. For instrumental satisfaction, correlations were found only with the proportion of interactions belonging to the *SConv* categories (“Fosters the conversation, fills the silence, digresses”) ($r_s = .431$, $p = .005$). For social satisfaction, correlations emerged for the categories *SConv* ($r_s = .520$, $p < .001$) and *SJok* (“Makes jokes”) ($r_s = .311$, $p = .048$). Interactions in these categories are likely to contribute to a more relaxed environment to perform and influence positively the assessment of social relationships. Conversely, groups which were more confident with their outcomes may have contributed to more interactions belonging to the Socializing categories.

The positive association between instrumental satisfaction and the proportion of process-oriented interactions was also stated (H1a). This hypothesis is rejected, whether on the design phase or the building phase. Tests were also done when isolating process-oriented interactions depending on whether they belong to the Asking, Offering or Deciding categories, and gave the same results.

Convergence

We stated that task conflict (both content and process) may be negatively related to instrumental and social satisfaction in the group (hypotheses H1b to H1e). On the design phase, no hypothesis could be validated. On the building phase, a significant negative correlation between group social satisfaction and content conflict (interactions dealing with the content of the task and coded as Cv- on the convergence dimension) was raised ($r_s = -.355$, $p = .023$), which confirmed H1c: when more interactions were in opposition during the building phase, the level of social satisfaction was lower. However, no correlation was found between process conflict (interactions dealing with the process and coded as Cv- on the convergence dimension) and social satisfaction. Hypothesis H1e is rejected. Regarding the instrumental satisfaction, a correlation was significant with the proportion of interactions carrying negative convergence on the content ($r_s = -.314$, $p = .046$). H1b is confirmed. Thus, exchanges of divergent information or points of view were correlated with lower satisfaction on the team and on the task, and may be harmful to an efficient team work and its outcomes, but no causality can be proven in this relationship. Once again, no result emerged regarding the process conflict: H1d is not supported, but this type of conflict is quite rare in the groups (mean = .165%, maximum = 1.000% for the design phase, mean = .371%, maximum = 3.960% for the building phase). This could explain why process conflict was ignored from the participants and its limited effect on group dynamics.

Conversely, the proportion of interactions carrying positive convergence (Cv+) was not associated with social or instrumental satisfaction, neither on the design phase, nor on the building phase.

Interpersonal emotional meaning

Contrary to what was stated in hypothesis H1f, team member social satisfaction was not correlated to the proportion of interactions carrying a negative interpersonal emotional meaning. This can mean on one hand that negative interpersonal emotional meaning is not perceived as something unpleasant or harmful to the team work climate (essentially members cutting each other off), maybe due to the short amount of time to debate, make decisions and then carry out the building task. On the other hand, this result may also show that less satisfied groups did not use more interactions with negative interpersonal emotional meaning. We come to the same conclusion while observing a possible correlation between team member social satisfaction after the design phase and his use of negative interpersonal emotional meaning during the building phase.

We then addressed the issue of positive interpersonal emotional meaning to see if its proportion in the groups interactions affected the social satisfaction of their members (RQ1c). This study showed no evidence of higher social satisfaction when more interactions carrying positive interpersonal emotional meaning were proportionally shared. However, the level of positive interpersonal emotional meaning was particularly low in our groups (mean = 1.529%, maximum = 16.667% on the design phase, mean = 2.693%, maximum = 17.949% on the building phase). Therefore, it may not have been hugely perceived by team members (especially with the rhythm of the exercise) and may not have led to a particularly pleasant feeling in the team or higher social satisfaction.

Correlations between both types of satisfaction

Previous authors emphasized a correlation between team member instrumental satisfaction and social satisfaction (De Dreu & Weingart, 2003). Our study provided findings which were consistent with previous researches ($r_s = .546$, $p < .001$ on the design phase, $r_s = .636$, $p < .001$ on the building phase).

4.4.3. Perceived conflict

Sex of team members

No difference between men and women was noticed in the perception of task conflict (content or process) or relationship conflict.

Degree of acquaintance

The perception of task and relationship conflict in the team did not significantly differ either according to the degree of acquaintance a member shared with the rest of the group.

Correlations between perceived task conflict and perceived relationship conflict

As stated in the hypotheses H2a and H2b, the individual perceptions of content or process conflict, and relationship conflict were quite highly correlated on both phases of the exercise. We got r_s values of .517 (design) and .633 (building) for content conflict and relationship conflict ($p < .001$) and r_s values of .470 (design) and .681 (building) for process conflict and relationship conflict ($p < .001$).

Interaction types and perceived conflict

We confronted the measure of conflict level (negative convergence, negative interpersonal emotional meaning) and the perception of conflict in groups (RQ2a and RQ2b). Thus, links were considered between the proportion of content or process interactions carrying negative convergence, and perception of content or process conflict. An intermediate correlation was found for content conflict ($r_s = .369$, $p = .018$ for design, $r_s = .418$, $p = .007$ for building), but none for process conflict.

The same tests were run with interactions carrying negative interpersonal emotional meaning and relationship conflict (RQ2c), with no significant result. It may result from the small amount of interactions carrying relationship conflict, and the fact that members may not have perceived interruptions in their interactions as something conflictual, but just something usual or inherent to the exercise.

4.4.4. Satisfaction and perceived conflict

Finally, it was worth studying the connections between perceived conflict and team member satisfaction. As mentioned theoretically and stated previously, we suggested that the more the perception of task or relationship conflict was high, the more it generated worse team member instrumental and social satisfaction. All our hypotheses (H2c to H2g) were confirmed, as all correlations were negative, moderate to high, and significant. All results are synthesized in Table 4.12.

	Instrumental satisfaction				Social satisfaction			
	Design		Building		Design		Building	
	r _s	p	r _s	p	r _s	p	r _s	p
Perceived content conflict	-.472**	.002	-.407**	.008	-.513***	.001	-.729***	<.001
Perceived process conflict	-.540***	<.001	-.455**	.003	-.378*	.015	-.669***	<.001
Perceived relationship conflict					-.522***	<.001	-.734***	<.001
*p < .05, ** < .01, *** < .001								

Table 4.12: Correlations between satisfaction and perceived conflict

These results were particularly interesting but did not enable us to validate the causality between perceived conflict and satisfaction. As satisfaction is seen as a consequence of group dynamics, we can easily consider that conflict, as it is perceived, directly impacts satisfaction. However, the implications among these phenomena are difficult to extract: perceived content or process conflict may be an intermediate in the relationship between perceived relationship conflict and instrumental satisfaction, as well as perceived relationship conflict may be mediating the connection between perceived content or process conflict and social satisfaction.

A summary of all the correlations we validated are provided in figures 4.2 and 4.3.

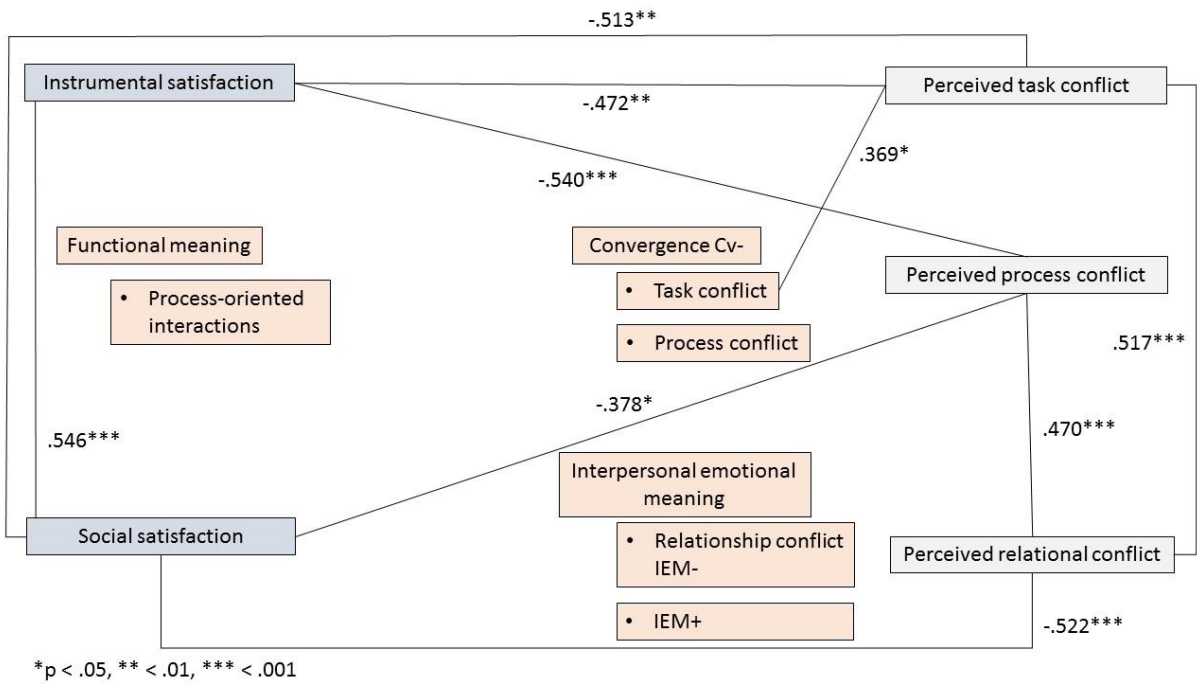


Figure 4.2: Correlations on the design phase

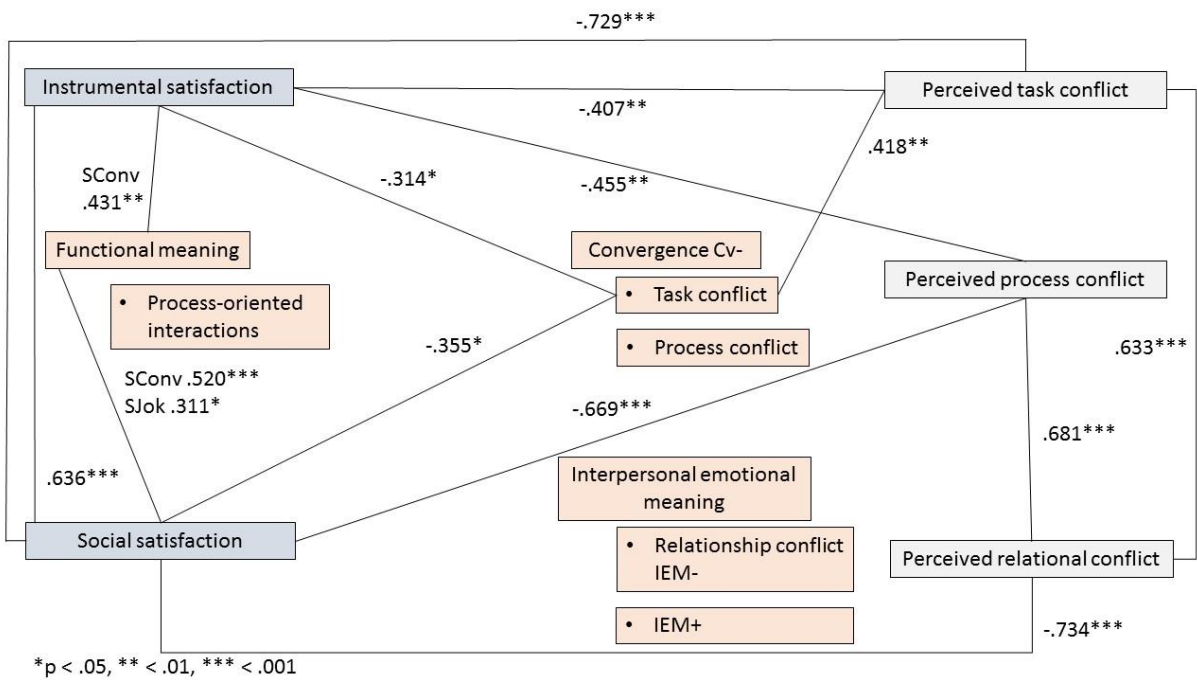


Figure 4.3: Correlations on the building phase

4.5. DISCUSSION

In the present study, we examined the influence of interactions on team member satisfaction. One finding was the importance of interactions coded in socialization categories (functional meaning) for both instrumental and social satisfaction. The link between socialization interactions and social satisfaction is quite obvious: as the atmosphere was friendly, members found the exercise more pleasant and may

be more willing to work with the same team in the future, for instance, or on the other way, they may socialize more if they feel satisfied about the team. The link with instrumental satisfaction is more difficult to explain. Do socialization interactions have a positive impact on instrumental satisfaction by creating a climate considered as effective? Conversely, does the instrumental satisfaction encourage a member to socialize? Or does the correlation between social and instrumental satisfaction play a role in the association between socialization interactions and instrumental satisfaction?

Furthermore, we found that negative convergence on the content was negatively correlated with instrumental and social satisfaction (building phase), in accordance with the idea that content conflict created discomfort which made members not feel like working with the same group again (DeChurch & Marks, 2001; Hackman, 1987; Pelled, 1996; Shaw et al., 2011; Wageman, Hackman, & Lehman, 2005). No result appeared for negative convergence on the process. Regarding the design phase which did not highlight any results, it would be interesting to think about the way instrumental satisfaction was assessed by team members. After the design phase, participants were asked to assess their satisfaction towards the team performance, the quality of the output, and the team coordination. As the exercise was not over yet and the ultimate goal was to build the best tower ever, most participants found it difficult to assess performance after the design phase. Performance was then experienced as an abstract concept whose assessment may have been somehow random. Observed relationship conflict was, contrary to our expectations, not negatively correlated to social satisfaction, which may be due to the low level of negative interpersonal emotional meaning, and especially the limited number of interactions revealing interpersonal tension or incompatibilities.

We then associated interactions in groups and the perception of conflict by team members. We confirmed that perceived content conflict was correlated with the proportion of content interactions carrying negative convergence. The observation of content conflict (negative convergence on the content) may then be a reliable predictor of perceived conflict. However, perceived process conflict showed no correlation with the proportion of opposed process interactions. Again, few process interactions with negative convergence were displayed during the exercise, and the latter may have gone unnoticed. Similarly, observed relationship conflict was confronted by the proportion of interactions carrying a negative interpersonal emotional meaning, and no significant correlation appeared, which can again be understood by the very few number of interpersonal tensions in the groups (short exercise, videotaped experiment, low stakes for the participants).

Finally, the impact of perceived conflict on satisfaction was considered. As expected, the perceptions of content and process conflict were negatively correlated with both instrumental and social satisfaction, and the perception of relationship conflict was negatively correlated with social satisfaction. These findings confirm that perceived conflict, in any kind, results in lower satisfaction of team members.

4.6. IMPLICATIONS

Our study involves some practical implications. First of all, socialization interactions are associated with higher satisfaction, but also better outcomes (Théry, 2017a). This highlights the importance of promoting a pleasant climate during meetings, which will benefit both team members and performance. Secondly, perceived task and relationship conflicts seem to be associated with lower team member satisfaction. As task conflict (up to a certain level) was found to be beneficial to performance (Théry, 2017a), a balance must be found to increase performance, but also to mitigate the negative effect of task conflict on satisfaction, particularly through conflict management (Bang & Park, 2015). It also points out the importance of accepting confrontation of ideas and make sure that this confrontation is as benevolent as possible. Furthermore, further research is needed to understand how perceived conflict is consistent with the measured conflict (negative convergence, negative interpersonal emotional meaning) and which factors impact the perception of conflict in team meetings. Finally, special attention must be paid to the distribution of interactions and ensure a balance between members to get better member satisfaction.

4.7. LIMITATIONS

First, the formulation of the items chosen for the conflict scales is quite factual: global disagreements on the content or the process in the group, perception of relational issues, tensions, irritation or friction, whether the member is involved or not. This formulation may put the member who answers in a position of observer, as if he was evaluating conflict from the outside. The evaluation of conflict could benefit from a formulation including a more personal view from the member, taking into account the conflict as he personally perceived it inside the group. Then, the exercise intended to recreate a team meeting situation (task to carry out, decision to make, role distribution required, ...) but involved a tight time constraint which may have impacted group dynamics, group interactions and even the satisfaction and perception of conflict by team members. Furthermore, due to the artificial nature of the experiment involving students who met only for one meeting, it may be interesting to replicate the study with different conditions (employees in companies, observations of real meetings, longitudinal studies of the same

groups, ...) and observe the possible differences. Moreover, a better understanding of the expectations of team members regarding meetings (behaviours, organization, ...) is necessary to be able to improve teams functioning, their satisfaction and longevity. More generally, it would be worth investigating other criteria influencing team member satisfaction (such as previous affinities between members, interest in the task, context in which the meeting is set up) as satisfaction is not the sole result of interactions in the team, as put forward with the correlation tests. Similarly, the perception of conflict is not entirely explained by the types of interactions played in groups. Further research is then needed to get a bigger picture of the criteria generating or reducing perceived conflict. The environment and the history of the groups may be explored to understand what creates this conflict perception, as well as obtaining information from members themselves (interviews, personality tests, for instance). The impact of culture may also be taken into account as perception of conflict and the associations between perceived conflict and member satisfaction differ according to the culture of the member (Bisseling & Sobral, 2011; Parayitam et al., 2010). Finally, the definition of the interaction units, focusing on their content regardless their duration, is well accepted in the field of group dynamics, but has a shortcoming for the study of the correlations between interactions and their results. For instance, if we consider the importance of a balance in the members contributions in a meeting for higher satisfaction (number of interactions), the importance of a balanced time distribution among the members is also to consider.

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Conclusions

Cette thèse apporte différentes contributions à l'étude des interactions, aussi bien théoriques qu'empiriques.

1. RÉSUMÉ DES CONTRIBUTIONS THÉORIQUES

1.1. Interactions

Le premier objectif de cette recherche était, compte tenu des limites conséquentes des grilles de codage des interactions recensées dans le chapitre 1, de créer un nouveau modèle de codage des interactions assurant une utilisation facile et adaptée à tous les contextes de réunions de travail, et un codage multidimensionnel, rendant ainsi compte de la richesse contenue dans les interactions de groupe. La grille de codage INSIDE TEAMS^{3D} (IT^{3D}), développée dans le chapitre 2, se présente comme un outil à la prise en main rapide, ce grâce au guide de codage très détaillé qui lui est associé, et approprié à l'analyse des interactions en temps réel.

Un second objectif, au cœur de l'étude était la compréhension des liens entre la dynamique de groupe (observée via les interactions) et la performance de l'équipe, la satisfaction de ses membres, ou le conflit ressenti, qui restait à ce jour peu étudiée.

1.2. Performance

Tout d'abord, le chapitre 3 a mis en évidence l'existence de liens entre les types d'interactions joués dans les réunions d'équipes et la performance de celles-ci. Les analyses effectuées sur la nature des interactions (*functional meaning*) indiquent clairement que les groupes pour lesquels la proportion d'interactions apportant une opinion ou une suggestion sur le contenu est plus importante, ont obtenu une performance plus élevée. Les résultats sont similaires en ce qui concerne les interactions de type socialisation : en moyenne, de meilleurs résultats ont été rencontrés dans les groupes ayant partagé proportionnellement davantage d'échanges contribuant à une atmosphère détendue. Ceci tend à indiquer que ces types d'interactions sont à favoriser lors des réunions d'équipe pour tendre à de meilleurs résultats.

1.3. Satisfaction

Parallèlement à la quête de performance au sein des équipes de travail, le souci de la satisfaction des membres, que ce soit par rapport à la tâche et aux résultats (satisfaction instrumentale) ou par rapport à l'équipe (satisfaction sociale), est également à considérer, et à envisager de même sous l'angle des interactions. Tout comme pour la performance, les interactions de type socialisation sont associées positivement à la satisfaction des membres. Un climat agréable et convivial dans les réunions de travail semblerait donc, assez logiquement, favoriser une meilleure satisfaction des participants. En ce qui concerne les interactions liées plus spécifiquement aux échanges sur la tâche ou le processus, aucun lien n'a pu être mis en évidence. Ainsi, rien n'indique notamment que davantage d'interactions relatives à la prise de décision influencerait la satisfaction du groupe. L'observation de la dimension convergence des interactions a aussi généré des résultats intéressants, à savoir que la présence de conflit sur la tâche (convergence négative) est associée à une satisfaction moindre dans le groupe. La présence d'interactions de convergence négative est par ailleurs corrélée à la perception du conflit sur la tâche par les groupes. Le dispositif n'a par contre pas mis en lumière de lien entre satisfaction et conflit relationnel (composante socio-émotionnelle négative), ce qui pourrait être dû au faible taux de conflit relationnel moyen dans les groupes et au fait que les interactions codées négativement sur la dimension socio-émotionnelle n'aient pas été perçues comme des marques de conflit relationnel par les membres des groupes.

D'un point de vue scientifique, la recherche menée ouvre la voie à de nouvelles perspectives concernant l'analyse des interactions, courant qui ne peut être ignoré pour la compréhension et l'encadrement des groupes. Les résultats obtenus montrent à quel point les interactions sont révélatrices du fonctionnement du groupe et fournissent des informations sur des leviers potentiels d'action sur la performance des équipes, la satisfaction et la gestion du conflit. Comme énoncé précédemment, des répliques de l'observation des groupes sont à prévoir pour confirmer ou contraster les résultats obtenus dans le cadre de notre exercice de groupe.

2. IMPLICATIONS EN GESTION

Au-delà des apports théoriques, la thèse présente des implications utiles dans le domaine de la gestion des équipes. Cette recherche a permis le développement d'un nouvel outil destiné à la compréhension de la dynamique de groupe. Alors que peu d'informations objectives sont habituellement extraites concernant le déroulement des réunions de travail, la grille de codage INSIDE TEAMS^{3D} offre la

possibilité de coder en temps réel les interactions échangées dans les groupes et d'ainsi rendre visible la dynamique du groupe. Cette visualisation possible des interactions intra-groupe est attractive à différents niveaux.

Tout d'abord, les membres des groupes pourraient rapidement obtenir du feedback quant aux comportements qu'ils adoptent lors des réunions d'équipe, que ce soit en termes de participation, ou surtout en termes de types d'interactions joués sur les trois dimensions de la grille de codage (via de la consultance, par exemple). On peut ainsi imaginer que le codage tridimensionnel des interactions pourrait facilement permettre de mettre en lumière les types de comportement les plus utilisés et ceux qui sont rarement employés, que ce soit dans l'absolu ou par rapport au reste du groupe. Indépendamment des questions de performance et de satisfaction, ceci aide à la prise de conscience de ses propres comportements et de ceux du reste du groupe, et des éventuels autres types d'interactions peu joués, mais qui pourraient être développés (par exemple, poser davantage de questions, participer aux prises de décisions, apporter plus d'attention au processus plutôt qu'au contenu, oser contrer une idée évoquée). Ce type de grille de codage peut donc aussi être envisagé comme un outil de développement individuel au travail.

L'analyse des interactions présente naturellement des implications fortes également au niveau du groupe. Le même type de retours d'informations proposés suite aux réunions peut ainsi être envisagé à l'échelle groupale, ce qui présente différents avantages, en particulier pour les équipes dont les membres sont amenés à évoluer au sein des mêmes groupes et à se réunir régulièrement. Envisager à l'échelle de l'équipe des débriefings des interactions ayant eu lieu en réunions, de manière neutre, objective et sans jugement, permettrait aux équipes de prendre conscience factuellement de la dynamique du groupe, et d'être capable par la suite de lui porter une attention plus forte lors des futures réunions. Ceci pourrait aussi conduire à un environnement propice à des échanges sur les ressentis, mais aussi sur les attentes vis-à-vis du déroulement et du contenu de la réunion (tâche et processus, éventuellement aspects relationnels). Nous y reviendrons dans la partie dédiée aux pistes de développement futur. Pour ce faire, l'accent doit être mis sur la possibilité d'échanger librement lors de ces feedbacks, dans un cadre bienveillant et visant à une amélioration du fonctionnement groupal, sans crainte de conséquences futures. Ainsi, de tels débriefings indiqueront les points d'attention à porter sur certains types d'interactions qui seraient à intégrer plus fréquemment dans les discussions d'équipe

(dons d'opinions et de suggestions, interactions de type socialisation) dans un souci d'amélioration de la performance d'équipe et de la satisfaction de ses membres.

La prise en compte des interactions effectivement échangées fait également naître l'opportunité d'évoquer le conflit présent dans le groupe, en mettant en lumière son locus (conflit sur le contenu de la tâche, le processus ou les relations interpersonnelles) et son intensité. Ainsi, les débriefings en équipe sur l'analyse des interactions favoriseront une meilleure représentation du conflit dans le groupe, tel que quantifié via la grille de codage. Ils permettront de réaliser l'importance donnée aux débats d'idées (interactions codées négativement sur la dimension convergence) et d'échanger éventuellement sur leur perception au sein du groupe. Les associations validées empiriquement entre conflit sur la tâche et respectivement performance et satisfaction du groupe, ouvrent la voie à des réflexions sur les comportements à adopter ou éviter pour instaurer de meilleures conditions de travail, plus favorables à la fois aux résultats (ou à l'efficacité) des réunions et à la satisfaction des membres impliqués. Les résultats relatifs au conflit relationnel étant moins évidents (la perception du conflit relationnel n'étant pas corrélée à la présence d'interactions codées comme négatives sur la dimension socio-émotionnelle), de plus amples recherches seront nécessaires pour orienter les équipes quant à la gestion du conflit relationnel. Enfin, bien qu'elle ne soit pas au cœur de la recherche, la question de la résolution des conflits apparaissant durant les réunions devrait de même être discutée lors des débriefings en équipe, comme présenté ultérieurement dans les pistes de développement futur.

3. LIMITES DE LA RECHERCHE

En dépit des implications théoriques et managériales de cette recherche, un certain nombre de limites méritent d'être évoquées.

3.1. Découpage des interactions

Comme l'ont montré les recherches relatives à l'analyse des interactions, plusieurs possibilités se présentent lorsque l'on souhaite décomposer les interactions en unités. Lors de la création de la grille de codage INSIDE TEAMS^{3D}, le choix s'est porté sur un découpage des interactions impliquant une intervention d'un individu, portant une nature, une convergence et une composante socio-émotionnelle constantes. Dès lors que l'intervention changeait de locuteur ou de type selon l'une de ces trois dimensions, cela signifiait la fin de l'interaction et le début de la suivante. Compte-tenu de cette règle utilisée fréquemment dans les recherches en analyse des interactions, la durée de l'interaction ou le nombre de mots employés n'ont pas été pris en considération. Bien que la définition des interactions

retenue semble pertinente et justifiée, répliquer l'analyse sur base du temps de parole pourrait apporter des résultats complémentaires, notamment en termes de liens entre équilibre dans les interventions dans le groupe et satisfaction sociale (contributions peut-être perçues différemment en fonction de la répartition du temps de parole entre les membres).

3.2. Ordre et séquence des interactions

Dans le cadre de l'analyse des interactions jouées, seuls les nombres et proportions d'interactions par membre dans les groupes ont été exploités. Une subdivision avait été faite entre les deux parties de l'expérience, de même qu'un découpage supplémentaire dans le temps pour comprendre si l'occurrence d'interactions dans des phases spécifiques de l'expérience était corrélée à la performance, la satisfaction ou le conflit perçu. Une approche complémentaire consisterait à étudier les séquences d'interactions (enchaînement d'interactions dans le groupe mesurées sur les trois dimensions de la grille IT^{3D}) et leurs liens éventuels avec la performance, la satisfaction et le conflit perçu dans les groupes. En effet, au-delà des types d'interactions pris isolément (sur une dimension ou plusieurs dimensions simultanément), on peut se demander si l'apparition de certaines séquences ou cycles d'interactions est corrélée à une performance ou une satisfaction moindre ou meilleure, ou à une perception du conflit plus faible ou plus importante. Dès lors, ceci nous apporterait une meilleure connaissance de la dynamique de groupe à privilégier ou à éviter. On peut s'interroger par exemple sur l'impact de séquences d'interactions porteuses d'une nature unique, de convergence systématiquement neutre ou systématiquement négative, ou systématiquement de composante socio-émotionnelle négative.

3.3. Mesure de la performance

Un point d'attention important à soulever relève du concept même de performance, dont le choix de la mesure reste particulièrement complexe à effectuer. Dans le cadre de cette thèse, la volonté de pouvoir comparer les groupes et lier la performance aux types d'interactions, a conduit à opter pour une mesure de la performance objective, obtenue comme résultat d'une équation mathématique à l'issue de la phase de construction de la tour par les groupes. Ce choix de recherche implique néanmoins des limites, compte tenu du fait que la performance, telle que mesurée ici, fait intervenir d'autres facteurs que les types d'interactions. On peut noter notamment la capacité des participants à assembler des cubes (dextérité et précision) ou à calculer précisément le nombre de cubes utilisés.

Hors de ce type de contextes expérimentaux, d'autres possibilités de mesure de la performance s'offrent aux groupes, mais nécessitent de réfléchir à la définition de la performance que l'on souhaite observer.

En effet, l'absence de mesure unique ou uniforme de la performance dans les équipes s'explique aussi par la variété de sens qui peuvent être contenus dans la notion de performance (Guzzo & Dickson, 1996). Dans des domaines spécifiques, la performance est directement mesurable (résultats ou classement à une compétition sportive, nombre de pièces assemblées sur une chaîne de production, nombre de colis expédiés, etc.) : la performance est alors envisagée comme la capacité d'une équipe à atteindre les objectifs fixés (qualité des résultats, coût, temps). Néanmoins, son adaptation au cadre de réunions est délicate, les objectifs des réunions pouvant présenter une grande variété (comités de direction, réunions impliquant des prises de décisions, validations d'informations, phases de brainstorming, etc.) et ces objectifs n'étant pas toujours bien définis à l'avance. L'évaluation de cette performance en équipe manque souvent de critères objectifs et mesurables, et dépend en partie de la perception même des résultats de la réunion par les membres du groupe ou même par des personnes extérieures au groupe (Guzzo & Dickson, 1996; Hoegl & Gemuenden, 2001). La performance pourrait dans certains cas être mesurée quantitativement (durée de la réunion, traitement de tous les points à l'ordre du jour, prises de décisions validées, mesure sur le terrain des avantages ou conséquences des décisions prises en réunion, etc.), si tant est que des objectifs aient été fixés avant la réunion. Dans d'autres cas, une approche de la performance, plus subjective, par les attentes des membres, semble inévitable pour éclairer sur une approximation de la performance des réunions. La partie relative aux pistes de développement futur approfondira cette question des attentes des membres vis-à-vis des réunions.

Malgré l'intérêt que présentent la définition et la mesure de la performance dans la recherche en gestion, une certaine modestie est ainsi requise quant à la capacité à caractériser la performance et lier celle-ci aux phénomènes groupaux (types d'interactions, en particulier).

3.4. Validité écologique

Échantillon

Compte-tenu de la volonté de comparaison entre groupes sur un même exercice (en termes de satisfaction et de performance, en particulier) et du nombre de groupes et d'individus requis pour être en mesure de valider les résultats, l'échantillon s'est composé d'étudiants, ce qui favorisait par là même l'accès au terrain de recherche. Le type de profils constituant les groupes soulève cependant une première interrogation quant à la représentativité de l'échantillon. Les participants étaient certes assez habitués des réunions dans le cadre de leurs études, mais étaient en moyenne plus jeunes que les

membres d'équipe se réunissant habituellement pour des raisons professionnelles, et avec des profils de formation très uniformes de type ingénieur de gestion ou ingénieur civil (Poitras, 2012). On peut ainsi s'interroger sur la transposition des types d'interactions rencontrés (sur les trois dimensions de l'IT^{3D}) avec des échantillons d'étudiants à ceux qui correspondraient à un milieu professionnel. L'essentiel des recherches relatives à l'étude des interactions ayant été menées avec des étudiants, il est difficile d'inférer à ce stade une quelconque différence entre les types d'interactions joués dans des équipes d'étudiants (équipes souvent créées artificiellement dans un but de recherche) et ceux concernant des équipes professionnelles réelles, qu'elles soient face à des tâches réelles ou imaginées pour des études en dynamique de groupe.

Expérience

Milieu universitaire

Le contexte universitaire joue également un rôle dans les types d'interactions qui ont été rencontrés, favorisant dans une certaine mesure l'apparition de conflit sur la tâche et son acceptation. Ceci est d'autant plus vrai que les exercices n'amenaient pas de conséquences potentielles pour les participants et que les groupes ne se réunissaient qu'une seule fois pour l'exercice, limitant l'impact du conflit éventuel, que ce soit sur la tâche ou la relation (Dobbins, 1988; Poitras, 2012). Un travail de groupe était requis suite à l'exercice, mais l'exercice en tant que tel n'était pas soumis à évaluation, sanction ou récompense.

Nature de l'expérience

L'expérience même a créé des conditions utiles à la démarche de recherche, mais s'éloignant dans une certaine mesure des cas réels de réunions (McGrath, 1991). Elle comportait en effet des consignes très claires sur ce qui était attendu en termes de tâches et d'organisation (division du temps, objectif final), et une indication précise de la manière dont serait mesurée la performance, ce qui est rarement le cas dans des contextes réels.

Absence de suivi des équipes au cours du temps

De même, la conduite de l'exercice nécessitait une seule et unique rencontre, alors que de nombreux groupes de travail sont amenés à se réunir régulièrement tout au long d'un projet, d'une mission ou d'un mandat. Cette multiplicité des réunions impliquant les mêmes membres a un impact sur la dynamique qui s'y déroule et en particulier sur les types d'interactions échangés. On imagine aisément que les relations entre les membres évoluent au fil du temps et que le conflit, qu'il soit lié au contenu, au

processus ou aux relations interpersonnelles, pourrait influencer aussi bien la réunion dans laquelle le conflit se joue, que les réunions futures. Ainsi, la présence de conflits relationnels forts entre membres se ferait certainement ressentir d'une réunion sur l'autre, créant une forme de conflit relationnel hérité, fragilisant potentiellement les relations entre membres d'entrée de jeu. Pour ce qui est de la convergence entre les interactions, un groupe ayant l'habitude de se réunir aura probablement davantage de facilité à exprimer des avis divergents que face à des membres inconnus. En ce qui concerne la nature des interactions jouées, la proximité éventuelle entre membres, là encore créée au fil des réunions, pourrait impacter le type d'interactions produites par les membres (par exemple, plus d'interactions de type socialisation ou de convergence non neutre). De manière plus générale, le caractère fréquent des réunions d'une équipe pourrait être associé à sa capacité à employer des natures d'interactions différentes d'une réunion à l'autre, si l'on considère qu'elle peut se rendre compte des dysfonctionnements rencontrés (peu d'interactions de type processus, générant ainsi un manque d'organisation, absence de prise de décisions, trop de temps passé à socialiser au détriment de la tâche, ...). Inversement, d'autres équipes ont naturellement peu de recul quant à leur dynamique de groupe, ce qui justifie la nécessité de pouvoir fournir des retours d'informations sur les types d'interactions observés et leurs liens avec la performance des équipes et la satisfaction de leurs membres, comme évoqué plus tôt.

Type de réunions

De plus, les résultats qui ont été obtenus sur les liens entre types d'interactions, satisfaction et conflit perçu, sont associés au contexte de l'expérience, c'est-à-dire une réunion visant spécifiquement une prise de décisions et impliquant des interactions multiples non orientées (toutes les combinaisons membre-membre ou membre-groupe sont en effet possibles). Dans des contextes autres (coordination d'équipes, suivi de projets, communication d'informations, ...), des phénomènes différents pourraient être constatés de par les sens des échanges attendus : échanges exclusivement entre l'animateur ou le leader et les membres, avec peu d'interactions entre membres, ou réciproquement, échanges entre membres encadrés et favorisés par un animateur, mais qui ne prend pas part aux discussions occupant les autres membres.

L'échantillon et l'exercice choisis ont permis de rendre compte des liens entre interactions, performance, satisfaction et conflit perçu, et de fournir des résultats intéressants. Néanmoins, pour répondre à un souci de validité externe, l'étude mériterait d'être approfondie sur des réunions de groupes dans un

milieu professionnel et sur des données longitudinales (Martinez-Moreno, Ganzalez-Navarro, Zornoza, & Ripoll, 2009). Suivre des comités de direction, conseils d'administration, etc. amènerait des précisions complémentaires sur l'évolution des types d'interactions au cours du temps, et notamment l'évolution du conflit. Ceci nécessiterait néanmoins d'obtenir l'accord des membres ou de l'organisation pour enregistrer ces réunions et prendre des mesures de satisfaction, de performance et de conflit ressenti. De plus, il faudrait veiller à se montrer discret dans l'enregistrement des réunions (ou l'observation par un membre extérieur, si l'on considère qu'un codage en temps réel est envisageable), en particulier pour ne pas perturber le déroulement naturel des interactions.

Interactions

Pour effectuer une analyse des liens entre types d'interactions et respectivement performance, satisfaction et conflit perçu, nous nous sommes appuyés sur les interactions réellement jouées dans les équipes. Les types d'interactions mis en évidence dans les corrélations (que celles-ci aient été validées ou rejetées) n'ont pu l'être que du fait de la présence de ces types d'interactions dans les groupes. Ainsi, l'effet possible de certains types d'interactions ont pu être sous-estimés s'ils n'ont pas été joués dans les groupes (interactions liées au processus ou de nature « décision », par exemple). La question de l'impact de la proportion des interactions appartenant à un type ou un autre d'interactions est essentielle également : certaines corrélations pourraient avoir été observées, alors que de plus grandes proportions de ce même type d'interactions pourraient inverser une corrélation, sans que cela n'ait pu être visible ici (présence d'associations entre variables en forme de U ou U inversé qui n'auraient donc pas pu être établies, par exemple). Une nouvelle fois, une étude plus approfondie sur d'autres contextes permettrait de généraliser ou de contraster les conclusions obtenues.

4. PISTES DE DÉVELOPPEMENT FUTUR

Différentes réflexions relatives à la dynamique de groupe n'ont pas été évoquées au sein de cette recherche, mais méritent d'être considérées comme des pistes de développement utiles pour les équipes, aussi bien théoriquement que pratiquement.

4.1. Approfondissement des liens entre types d'interactions et performance

Au-delà de l'étude effectuée entre types d'interactions et performance, les résultats obtenus sont à confirmer dans d'autres contextes de travail, impliquant des prises de décisions ou d'autres finalités (conseils de direction, par exemple). En plus de la question des types d'interactions à privilégier ou à

limiter, la présence d'un effet seuil sera à envisager afin de mettre en évidence d'éventuels renversements de tendance (on peut imaginer par exemple que la présence d'interactions de type socialisation jouerait positivement sur la performance jusqu'à un seuil au-delà duquel elle pourrait avoir des conséquences néfastes sur le fonctionnement de l'équipe et ses résultats). Le taux modéré d'interactions de type socialisation dans notre expérience n'a pas permis de valider ou rejeter l'idée d'un effet de seuil. Reproduire l'expérience en contrôlant davantage la proportion d'interactions de socialisation (en provenance d'un membre du groupe « acteur » à qui l'on aurait demandé d'interagir particulièrement selon cette catégorie d'interactions) apporterait plus d'informations sur les liens entre interactions de nature socialisation et performance.

Si l'on se penche sur la dimension *convergence* des interactions, la présence de conflit observé sur la tâche (convergence négative ou Cv-) dans les groupes est bien liée à une performance plus élevée, conformément à l'essentiel de la littérature sur le sujet. Néanmoins, l'expérience menée n'a pas pu là encore mettre en évidence un effet seuil, seuil au-delà duquel la performance serait potentiellement impactée négativement par un taux de conflit sur la tâche trop élevé. Le contrôle d'un apport plus important d'interactions de convergence négative par un membre, pourrait là encore préciser davantage les liens entre proportion de conflit sur la tâche et performance.

De même, l'impact éventuel de la *composante socio-émotionnelle des interactions* (conflit relationnel ou IEM-) sur la performance va à l'encontre de la littérature sur le sujet (dès lors qu'un lien positif a été recensé entre performance et conflit relationnel). Des répliques relatives à cette question mériteraient d'être menées lors d'observations de groupes (suivi de mêmes groupes sur différentes réunions, dans des contextes requérant des échanges variés ou répondant à des objectifs différents). Ceci aiderait à mieux identifier les types de comportements utiles ou freinant la performance selon les contextes (selon les trois dimensions des interactions), et ainsi préconiser une orientation des interactions plutôt qu'une autre dans les équipes de travail.

4.2. Approfondissement des liens entre types d'interactions et satisfaction

La question des liens entre interactions de type « Décision » (dimension nature de la grille IT^{3D}) et satisfaction dans l'équipe reste à creuser, en particulier dans des contextes plus spécifiques dans lesquels le fait de prendre des décisions est au cœur des préoccupations et éventuellement, l'objectif même de la réunion.

En ce qui concerne les interactions sur la dimension « composante socio-émotionnelle » et leurs associations avec la satisfaction sociale, de plus amples recherches tenant compte de réunions plus longues ou étalées dans le temps pourraient approfondir cette question et statuer sur l'existence éventuelle de liens entre conflit relationnel et satisfaction sociale dans le groupe.

4.3. Prise en compte des destinataires des interactions

A ce stade, les informations sur les interactions jouées se résumaient à l'identification du locuteur, de la phase dans laquelle apparaissait l'interaction, et au codage selon les trois dimensions de la grille INSIDE TEAMS^{3D}. La récolte de ces données avait été effectuée sur base des enregistrements audio et vidéo des expériences de groupes menées. Bien que ces sources aient été de bonne qualité et aient permis une retranscription fine des interactions et de leurs locuteurs, l'identification des destinataires des interactions (membre spécifique, locuteur lui-même, tout ou partie du groupe) n'a pas été retenue car impliquant beaucoup trop d'incertitude et de divination de la part du codeur. Le développement de technologies de capture à 360° et de suivi des mouvements oculaires dans un champ donné permettra à l'avenir l'identification plus précise des destinataires des interactions, en plus des déductions logiques sur base du contenu des interactions. Cette information visera à affiner les conclusions obtenues en particulier sur les liens entre conflit et satisfaction. Nous avons auparavant évalué la corrélation entre satisfaction et conflit dans l'équipe (au niveau groupal). La connaissance du destinataire de l'interaction aidera à déterminer au niveau individuel si la satisfaction d'un membre est associée au niveau de conflit auquel il fait face directement, c'est-à-dire à la proportion d'interactions conflictuelles (convergence négative et/ou composante socio-émotionnelle négative) liées directement à ses propres interactions.

4.4. Suivi continu de la satisfaction et du conflit perçu lors de la réunion

Au lieu d'effectuer, comme dans le cadre de cette expérience, une mesure de satisfaction et de perception du conflit à la fin de chaque phase, un monitoring continu de la satisfaction et du conflit perçu par les membres pourrait être envisagé. Les membres des groupes pourraient avoir chacun à disposition durant la durée de la réunion un outil permettant un feedback sur la satisfaction (instrumentale ou sociale) et le conflit perçu (sur le contenu, le processus ou la relation). Ainsi, lorsqu'ils ressentent une forme de satisfaction ou de conflit, les membres pourraient le signaler en temps quasi réel, plutôt que d'évaluer en moyenne leur satisfaction à la suite d'une phase de la réunion ou à l'issue de la réunion, ajoutant des informations sur la variation de la satisfaction et du conflit perçu au fil de la réunion. Ceci présenterait de multiples avantages. Tout d'abord, ceci assurerait une identification plus

facile et fiable des types d'interactions jouant sur la satisfaction et la perception du conflit par les membres. De plus, dès lors que les destinataires des interactions seraient connus, la mesure en direct de la satisfaction et du conflit permettrait d'affiner ce qui provoque ce sentiment chez les membres : le conflit est-il davantage perceptible par un membre lorsque les interactions s'opposent au membre lui-même ? La satisfaction est-elle de même liée à la réception par un membre d'interactions positives ou négatives, que ce soit sur la dimension convergence ou la dimension socio-émotionnelle ?

4.5. Gestion du conflit

Tout au long de la recherche, la question du conflit a été évoquée en termes de types d'interactions observés (convergence négative et/ou composante socio-émotionnelle négative) ou de perception du conflit par les membres (questionnaires de perception du conflit sur le contenu, le processus ou la relation). Au-delà des liens découverts entre conflit et performance, et entre conflit et satisfaction, la question de la gestion du conflit reste un élément important à considérer. De nombreuses recherches indiquent que les comportements des membres vis-à-vis de l'apparition de conflit, son appréhension ou sa résolution, influencent aussi la performance et la satisfaction du groupe (Jehn, 1997; Somech et al., 2009; Wall et al., 1987). Deux caractéristiques de la gestion du conflit peuvent être étudiées pour mieux la décrire : le caractère « actif » d'un membre dans la gestion du conflit – soit la capacité à répondre de manière directe et ouverte au conflit, de discuter les points de désaccord et les différences d'opinions, et le caractère « agréable » d'un membre dans la gestion du conflit – soit la capacité à gérer le conflit de manière plaisante et détendue, en laissant une place aux idées de chacun et en trouvant des compromis (DeChurch & Marks, 2001). Des recherches pointent en effet qu'une résolution de conflit active et agréable favorise une meilleure performance et une plus grande satisfaction (Ayoko & Callan, 2010; DeChurch & Marks, 2001). Cette prise en considération de la gestion du conflit a trait aux interactions entre membres, mais ne peut être étudiée directement avec la grille de codage des interactions INSIDE TEAMS^{3D} ou avec les questionnaires de perception du conflit employés dans le cadre de cette recherche. Des outils dédiés doivent par conséquent être envisagés en plus du codage des interactions et de la mesure de la perception du conflit (28-item Rahim Organizational Conflict Inventory – ROCI-II, par exemple).

4.6. Prise en compte de la configuration spatiale de la réunion

Un autre élément qui pourrait impacter la dynamique de groupe et la proportion d'interactions donnée ou reçue est lié à la configuration spatiale dans laquelle la réunion a lieu. Ainsi, la question de la distance

physique entre les places où siègent les membres et les échanges effectués se pose. Une fois les destinataires des interactions identifiés, il serait intéressant de se pencher sur les éventuelles corrélations entre la distance entre deux membres et la proportion d'interactions échangées. Cela pourrait permettre de conclure quant à la nécessité de placer les membres selon un schéma plus logique selon les interactions escomptées (deux membres devant interagir en fonction des thèmes des réunions, des compétences mobilisées, par exemple) ou même d'organiser les réunions dans une configuration plus adaptée selon les besoins (distance variable selon le nombre de personnes, mais aussi la taille et la forme de la table, emploi de microphones, etc.).

4.7. Considérations sociométriques

Le relevé des taux de connaissance des membres à l'intérieur d'un même groupe avait notamment permis d'étudier les liens éventuels entre le taux de connaissance et les types d'interactions jouées. En affinant cette information au niveau des affinités entre membres, d'autres résultats, complémentaires, pourraient être mis en avant. En effet, le niveau d'appréciation entre les membres (qui pourrait être mesuré avant la réunion) influence la dynamique du groupe, le type d'interactions faites et leurs destinataires, mais pourrait également impacter la satisfaction sociale, la perception individuelle du conflit, mais aussi la performance. La sociométrie, telle que développée par Jacob Moreno dans les années 1930, vise à évaluer l'analyse structurale des groupes en termes de relations interpersonnelles, soit les liens de proximité, exclusion ou indifférence entre les individus. Des tests sociométriques ont été développés par Moreno pour collecter pour chaque membre d'un groupe, des informations sur les membres qu'il appréciait le plus ou le moins dans le groupe, ceux par lesquels il pensait être apprécié ou non, et ceux avec lesquels il souhaiterait travailler si le choix lui était donné (Forsyth, 2010). Ces informations visaient à pouvoir optimiser la composition des groupes en associant des personnes selon leurs affinités. Compte-tenu du fait que la composition des groupes n'est pas souvent laissée à la libre appréciation des membres (comités de direction, personnes réunies selon leurs compétences, responsabilités, fonctions, équipes d'appartenance, etc.), il n'est pas question d'envisager ici l'utilisation des tests sociométriques (sociogrammes, par exemple) dans leur objectif premier. Cependant, leur emploi pour cartographier les relations à l'intérieur des groupes, couplé à l'identification des destinataires des interactions, pourrait ouvrir de nouvelles perspectives de recherche : les individus interagissent-ils davantage avec les membres « préférés » dans le groupe et évitent-ils les échanges avec les personnes moins connues ou appréciées ? Les individus échangent-ils des types d'interactions

différents en fonction de la qualité des relations qu'ils entretiennent avec les destinataires de leurs interactions ? En particulier, les interactions conflictuelles (tâche, processus, relation) varient-elles en proportion selon les affinités avec le destinataire ?

4.8. Leadership : positionnement des leaders et identification de leaders informels

Dans le cadre de cette thèse, nous avons fait le choix de ne pas imposer de structure quant au leadership dans le groupe : aucun leader n'était désigné, ni même requis, ce qui permettait une plus grande liberté dans le groupe en termes d'organisation, mais aussi en termes de types d'interactions possibles. Les membres des groupes ont occupé des emplacements physiques qui ont spontanément évolué au cours de l'exercice, et ont interagi selon des types variés – en particulier sur la dimension *nature*, occupant des rôles diversifiés également (ce qui était particulièrement visible durant la phase de construction, au cours de laquelle de nombreux groupes ont procédé à une distribution des tâches et des rôles). Bien qu'aucun leader officiel n'ait été annoncé et qu'aucun feedback n'ait été demandé à ce sujet aux membres, on devine qu'une forme de leadership a pu apparaître et être ressentie dans les groupes, certains membres ayant peut-être été plus suivis, plus influents ou considérés comme tels dans leurs groupes. Une question utile à ajouter aux questionnaires de fin d'exercice aurait été de savoir si, selon le répondant, un membre avait pris le leadership du groupe, et si tel était le cas, lequel.

La première intuition quant à l'émergence d'un membre perçu comme leader pourrait être associée à la proportion d'interactions (ou la proportion en temps de parole) importante d'un membre spécifiquement (Levine & Hogg, 2010). Une seconde idée à tester quant à l'émergence de leadership informel impliquera les types d'interactions qui sont joués. En effet, des éléments de littérature indiquent que trois types de comportements sont interprétés comme révélateurs d'une forme de leadership pour la personne qui les adopte. Tout d'abord, assurer une forme d'harmonie ou de bonne humeur dans le groupe est perçue comme une des fonctions liées au leader (Brown, 2000; Lippitt & White, 1943). Il sera intéressant de confirmer que la présence ou la proportion d'interactions de nature « socialisation » ou de composante socio-émotionnelle positive, est corrélée à la perception de leadership chez un même membre. Ensuite, un des rôles fondamentaux du leader est d'organiser les tâches du groupe, de donner des méthodes de travail, de fournir des informations quant à la planification des tâches, le timing de la réunion, etc. (Brown, 2000; Morgeson et al., 2010), ce qui correspond à des interactions de type processus sur la dimension *nature*. Enfin, le leader doit être en mesure de prendre

des décisions ou de faire que des décisions aient été prises à l'issue de la réunion (interactions de type « Décision » sur la dimension *nature*). Ces types de comportements, liés dans la représentation des membres d'une équipe au leadership, constituent des attentes de rôle vis-à-vis d'un leader, mais la détermination d'un éventuel leader informel implique peut-être d'autres caractéristiques de comportements. Inversement, le fait de jouer selon ces normes de comportement attendu (garantir une ambiance agréable, organiser le processus, prendre des décisions) ne garantit en rien que le membre sera perçu comme un leader, cela dépendant également des interactions des autres membres, et de leur niveau d'attention et leur réceptivité vis-à-vis des interactions de ce membre. Les attentes de rôle liées au rôle de leader nécessitent donc d'être étudiées plus en détail, en procédant à des entretiens non directifs auprès de membres d'équipe, par exemple (recherche qualitative).

4.9. Approfondissement de la compréhension des attentes individuelles vis-à-vis des réunions

Comme discuté précédemment, réfléchir à des pistes d'amélioration de la performance ou de la satisfaction suite aux réunions nécessite de mieux comprendre les mécanismes sous-jacents à ces résultats. Pour ce qui est de la satisfaction instrumentale des membres, et donc leur perception de la performance, il semble opportun d'approfondir notre connaissance de ce qui constitue les attentes des membres vis-à-vis des réunions en fonction de leur contexte. Une meilleure appréhension des attentes quant aux réunions (contenu, structure des échanges, organisation, gestion du temps, aspects logistiques, finalisation de la réunion, fait que des décisions aient été prises ou des problèmes tranchés, caractère constructif de la réunion, comportements des autres membres, etc.), voire même l'absence d'attentes, est souhaitable. Elle permettrait d'une part de proposer une évaluation de la performance par les membres en fin de réunion, mais aussi de disposer de leviers sur lesquels travailler pour améliorer cette performance et par là même, la satisfaction instrumentale, lors de réunions d'équipe. De plus, bien que la satisfaction soit mesurée en fin de réunion, il faut garder à l'esprit que la satisfaction est une résultante de la réunion d'une part, mais aussi d'autres facteurs initiaux à la réunion et qu'elle peut présenter un caractère dynamique tout au long de la réunion d'autre part. Ainsi, pour amener un regard nouveau sur la satisfaction des membres par rapport aux réunions, il faudra également tenir compte de l'état d'esprit des membres du groupe préalablement à la réunion : réunion vécue comme inintéressante ou comme une contrainte dans un emploi du temps individuel surchargé, horaire de la réunion jugé inadapté, présence imposée mais non utile, etc. De même, le contexte dans lequel se

déroule une réunion d'équipe a une importance lorsqu'il s'agit de mieux appréhender la satisfaction des membres : contexte tendu à cause d'une restructuration ou de licenciements, d'un changement majeur annoncé ou prévu dans l'entreprise, incompatibilités entre individus, etc.

4.10. Développement d'outils améliorant l'analyse en temps réel des interactions et le feedback aux groupes

Différentes applications de la grille de codage INSIDE TEAMS^{3D} et, plus généralement, de l'analyse de la dynamique de groupe, se présentent. Cependant, pour répondre à une utilisation facile et adaptée aux besoins, un outil complémentaire permettant de consigner les observations des interactions sera nécessaire. Ceci est d'autant plus vrai lorsque l'on souhaite coder et visualiser en temps réel les interactions et être en mesure de fournir un feedback aux groupes rapidement, ou lorsqu'on effectue un suivi de groupes lors de multiples réunions et qu'on opte pour une étude approfondie des interactions (avec retranscription de tout ou partie des interactions). Certains logiciels informatiques ont été développés par des entreprises ou des universités dans l'optique d'analyser les interactions, notamment sur base d'enregistrements (annotation possible des fichiers vidéo), mais restent limités (Brundell et al., 2008). Les principaux inconvénients rencontrés concernent la non prise en charge d'un codage en temps réel, la limitation des outils à une ou des grilles de codage des interactions spécifiques (pas de possibilité d'ajouter une nouvelle grille) et le manque de flexibilité dans les options proposées, ces outils répondant souvent à des besoins donnés comme des recherches spécifiques dans une université, par exemple (Brundell et al., 2008). La mise en place d'un nouvel outil informatique pourra donc faire l'objet de prochains développements, intégrant une solution de codage en temps réel, mais aussi la génération automatique de dashboards individuels et groupaux pour un feedback consécutif aux réunions. Il s'agira alors de rendre plus accessible et moins coûteuse en temps l'analyse des interactions en équipe, ce qui pourrait par la même occasion relancer l'intérêt qu'elle suscite dès lors qu'elle peut être facilement mise en œuvre.

L'évolution technologique récente fournira aussi des pistes intéressantes pour ce qui est de l'observation des groupes en réunion. On peut citer par exemple les caméras à 360°, rendant possible l'identification des locuteurs, des destinataires des interactions et peut-être même des mouvements oculaires. Un outil plus sophistiqué permettrait même une retranscription automatique des interactions. Cela permettra d'une part d'accéder à de plus grandes quantités de données de groupes dans un but

de recherche, et facilitera d'autre part la visualisation des interactions jouées lors des réunions d'équipes et comités de direction, ce avec une relative facilité de déploiement du matériel.

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