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# Solving the human problem: investigation of a collaboration culture

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## Abstract

*It is often acknowledged that group work efficiency can only be achieved if co-workers adopt an adequate group culture. Collaboration should therefore be supported by the right culture, and tools aiming at enhancing collaboration should also facilitate the adoption of this collaboration culture.*

*This paper therefore explores the underlying concepts involved in the creation of a collaboration culture within a team. It follows a formal approach by drawing on motivation, group building and schema theories to identify the core elements of such a culture. This focus on the social psychological enables the justification that collaboration efficiency can only be reached if groups adopt a learning, communicative culture, and develop values such as trust and respect.*

*The conclusion of this paper could be used to assess the efficiency of collaborative tools and to enable the teaching of collaboration.*

## 1. Introduction

The interoperability domain usually focuses on the technical compatibility of several organisations and in particular on their ability to support meaningful communications between their information systems. This approach is also characteristic of the study of social interoperability within workplaces where the focus is on the integration of work processes at human level. However, preliminary research has demonstrated the core importance of social sciences as a factor of group work efficiency [1]. The ability of enterprises to work efficiently together is therefore not only a technological matter but also depends on the ability of employees to work as a team.

It is generally agreed that the culture of a group impacts greatly on its efficiency. Indeed, co-workers tend to copy each other's working culture in order to increase their feeling of belonging to a team. They do

so even if it does not lead them to efficiency. Being able to create and manage an appropriate group culture is thus of prime importance to group managers.

This research takes a theoretical approach to identify the elements of a collaboration culture. It first proposes a description of the collaboration process before explaining motivation to collaborate from a social psychological perspective. Then, the concept of collaboration culture is defined and some of its required features are further investigated.

## 2. Collaboration

The term collaboration is often used as a synonym of co-operation or group work. However, specialists tend to share a more precise definition of collaboration, whatever their domain of study: social psychology [2], teaching [3], computer sciences [1]... This paper thus starts with a description of collaboration before explaining how motivation acts as a collaborative work enhancer. These will then be used as a starting point for the second part of the paper, which focuses on the components of a collaboration culture.

### 2.1. Definition and description

Montiel-Overall defines collaboration as “a trusting, working relationship between two or more equal participants involved in shared thinking, shared planning and shared creation” [2]. This definition highlights the two main characteristics of collaborative work: it is a type of group work and it aims at building up a shared understanding between its participants. These two features are used hereafter to describe collaboration as a process.

First, collaboration can be considered as a type of group work. It implies that the co-workers must follow a four-phase process before forming a group and achieving efficiency towards a common goal [4]. These phases are called forming, storming, norming

and performing. During these phases, co-workers gain independence over their assigned roles in the project [1]. Instead of being bonded by the organisation structure, they must therefore build strong interpersonal relationships to preserve the unity of their group [1]. The flexibility required by the workers to redefine their roles necessitates that leaders replace managers. Indeed, in collaborative work, leaders must respect the opinions of their colleagues while guiding them. On the opposite side, in co-operation, managers tend to dictate objectives and roles to their subordinates [3]. Ultimately, collaboration should allow the formation of social bonding which appears when groups evolve into teams [3].

Secondly, collaboration aims at sharing an understanding, which implies that the co-workers must build on each other's knowledge. As suggested in social psychology, this knowledge can be represented as mental structures called schemata, which are stored in the long-term memory [5]. These schemata are built through experience by modifying existing schemata. They are reinforced through usage and allow people to react to new situations by identifying analogies with previous experiences. The person schemata [6] are of particular interest for group work because they correspond to the representation each worker has of his/her colleagues. They enable the prediction of others' behaviour and the better understanding of what should be shared with colleagues.

The above description of collaboration demonstrates the importance of human interactions. Indeed, groups must evolve through conflicts [4] and towards non detailed objectives [1] before reaching efficiency. Collaborators must share fate with others [7], and be willing to communicate extensively with each other [3]. It shows the importance of co-workers' motivation, which is the focus of the next part.

## 2.2 Motivation

The motivation of collaborators comes from their desire to fulfil personal needs [8]. These needs are classified by Maslow in a five-level hierarchy which is formed, from bottom to top, by (Figure 1): biological and physiological, safety and security, love and belongingness, esteem, and self-actualisation needs [8]. The needs in the higher levels only act as motivators if the lower levels are already fulfilled. After a level of needs is fulfilled, lower needs become less important and higher ones are predominant.

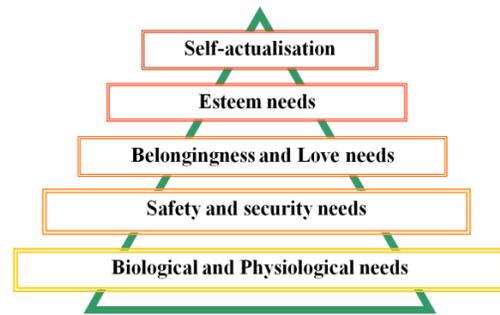


Figure 1. Maslow's hierarchy of needs [8]

It can be assumed that the salary of a worker should be enough to fulfil biological and physiological needs. These needs are therefore fulfilled as soon as a person gets a job, so that they do not act as motivators during collaboration. Salary can still impact on the motivation of the worker, but it is more likely to address higher level needs, such as belongingness and esteem [9].

The safety and security needs are thus the first to be addressed by collaborators, by protecting themselves and performing at work (Figure 2). Since knowledge sharing is at the core of collaboration, co-workers must protect themselves by limiting the knowledge and skills they share. Indeed, these originally correspond to their added value to the group and their protection ensure the continuous importance of the workers for the project [7].

Moreover, workers constantly adapt their person schemata by ongoing assessments of their colleagues' work and behaviour. As shown by behavioural and motivation studies in social psychology, co-workers must thus act as expected by their colleagues: to achieve the common group objectives associated to their roles in the project [7] and behave in accordance with others' norms, even if they result in breaking the organisational management rules [10]. Trust increases the safety and security feelings. It allows collaborators to share sensible knowledge and to build up a more complete and accurate shared understanding.

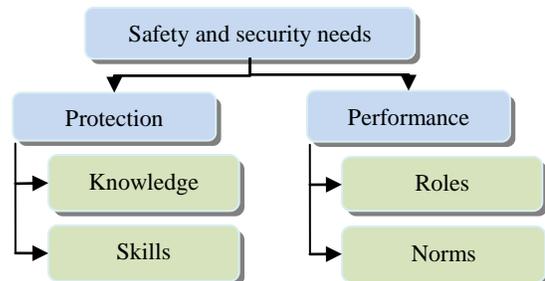
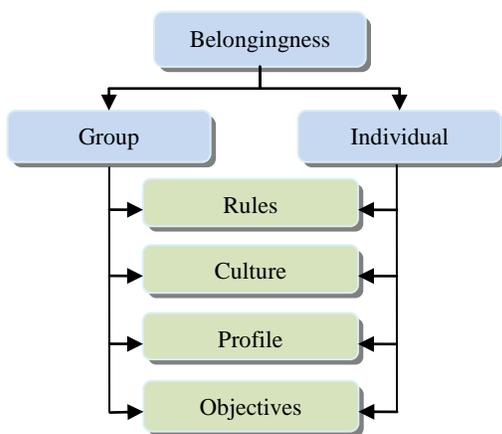


Figure 2. The safety and security needs

Once the safety and security needs have been fulfilled, co-workers become more motivated by their

love and belongingness needs [8]. Therefore, they try to become part of their working group. They can become part of a group in two ways (Figure 3): by assimilation or integration [11]. The assimilation process consists in adapting individuals' behaviours so that they are accepted by the group. Indeed, psychological studies have demonstrated that look-alike people tend to be attracted to one another, so that increasing our apparent similarities within a group also raises our chances to be well accepted by its members [12]. We develop our abilities to adapt to a group from an early age, and continue to use the same imitation techniques during our whole life. At work, this is for example shown by the influence groups have on individuals in decision making contexts [13].



**Figure 3. The belongingness needs**

The integration process corresponds to the adaptation of the group to newcomers [11]. It may encounter psychological barriers because changing behaviours, determined by schemata, requires motivation [5]. It is also easier for newcomers to build a new role schema [6] representing the group rather than requiring the whole group to change its shared role schema. Ultimately, integration can result in some issues within the group, like the rejection of newcomers or conflicts with the hierarchy [14].

As described above, the assimilation and integration processes involve the synchronisation of co-workers' existing role schemata. Since schemata can be difficult to modify, this process can be shortened if co-workers already have similar cultures and values before the project: it allows them to understand each other better, to communicate more effectively and thus to build up shared schemata more rapidly. In the end, these shared schemata correspond to a new group culture as it describes what is seen as acceptable behaviours by collaborators.

If co-workers have different schemata before joining the group, they might have difficulties

understanding each other. Trust is therefore limited, as collaborators cannot foresee others' reactions. Knowledge and skills exchanges are thus limited and interdependence of fate [7] cannot be reached. A mediator, or coach, might then be necessary to solve conflicts and create a more communicative environment.

The group becomes a team when co-workers develop extra-professional relationships with their colleagues. They learn as a group, therefore the esteem and self-actualisation needs of co-workers are automatically fulfilled.

### 3. Collaboration culture

As previously shown, the first phases of collaborative work aim to adopt a group culture through the development of shared schemata. This process is facilitated by similarities between the workers' pre-existing schemata, which means that teaching collaboration would accelerate the team building process.

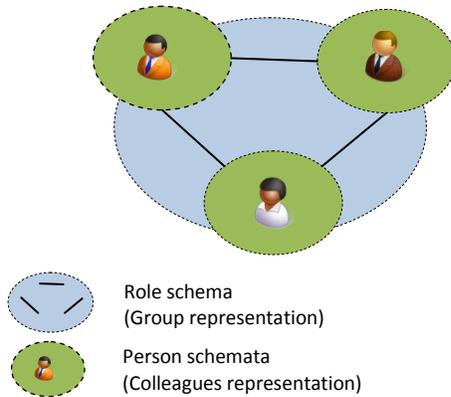
The first part of this section aims at identifying the existence of a universal collaboration culture. Indeed, the literature is not clear whether every group have to adopt a specific culture based on the profiles of their members or if successful collaborations are always based on similar working cultures. Once this existence has been proven, some primary elements of what should form a collaboration culture are presented.

#### 3.1. Description

A group culture describes the behaviours that are acceptable for the co-workers [3]. To be accepted by a group, the co-worker must follow the behaviour described by this culture, so that a group culture dictates more a way of behaving than a way of thinking [3]. It can be assumed that a good collaboration culture should enhance collaborative work, so that studying a collaboration culture corresponds to investigating behavioural rules that enhance collaborative work.

Since human behaviours are determined by their schemata, the group culture is represented in every worker's mind as a set of interconnected role and person schemata (Figure 4). The person schemata are representations of colleagues, while role schemata correspond to behaviours expected from people having particular roles or profiles, such as the belongingness to a group. These schemata need to be made explicit when describing the collaborators' working cultures. But human minds are too complex to provide a complete and accurate analysis of co-workers' schemata. To reduce complexity, this paper focuses on

investigating the most relevant schemata for collaboration: the main ones influencing social behaviours in group work and knowledge sharing. Since several studies have been able to classify co-workers according to generic group working profiles [15], it shows that co-workers' behaviours are at least partially predictable. Since human behaviours are dictated by their schemata, this means that a limited number of core schemata influence human behaviours in group work.



**Figure 4. Group representation through schemata**

The limited number of core behavioural rules at work shows that co-workers' behaviours can often be predicted. It shows that, in theory, the working culture of a collaborator can be modelled and that computer systems should be able to capture and use collaborators' cultures to improve collaborative tools.

### 3.2 Elements description

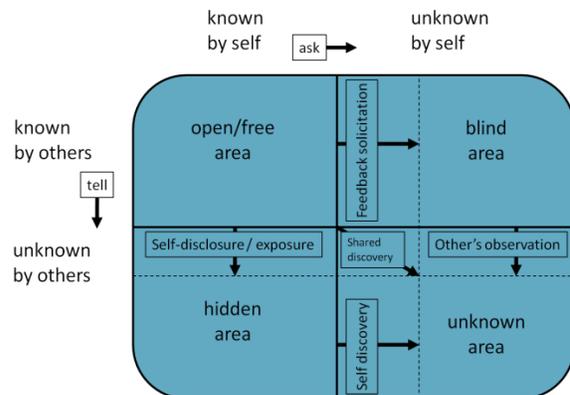
As previously explained, a collaboration culture should enhance the efficiency of co-workers. According to the main characteristics of collaboration, this culture should support group work as well as knowledge sharing. The willingness to share knowledge and to learn should therefore be at the core of collaborative groups values. As a consequence, rules of a collaboration culture should include rules from a learning culture. This section therefore starts with a description of some components of learning cultures.

**3.2.1. Learning.** From a cognitive sciences viewpoint, learning corresponds to the modification of existing schemata. For learning to take place, workers must therefore have the willingness to develop their knowledge. Their motivation comes from clear objectives coupled with personal gain, and in the long term, motivation must be intrinsic [16]. It means that workers should aim at fulfilling needs, such as love

and belongingness [16], that can be addressed by helping others or being recognised as an essential part of the team. These examples illustrate the importance of a collective drive in collaborative learning [3].

Learning is often achieved through new experiences, as expressed by schema theories. Co-workers should thus be willing to leave their comfort zone and try new things [3]. But these new experiences will probably lead to failure from time to time. So that workers should not be blamed for their mistakes, but recognised for having brought experience into the group. A blame culture could prohibit further intents to gain experience and must therefore be avoided. Instead, workers should feel confident about sharing their failures with others, so that the group can improve and become more successful in the future. Respect and trust are thus critical features of collaborators' relationships.

Leaders should also replace managers in learning groups [3]. Indeed, the group should be given guidance when defining its objectives, but these objectives should not be completely imposed by the hierarchy. This freedom allows collaborators to partially own the objectives of the project, or at least own the group outputs in terms of quality of work. The pride related to the achievement of a co-worker is then shared with the whole group because everyone is intrinsically motivated by the project and any progress towards its final goal.

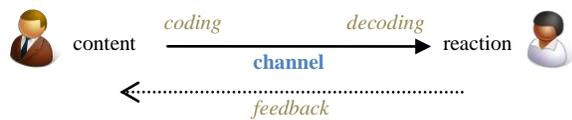


**Figure 5. The Johari window [17]**

The Johari window [17] illustrates the available learning processes when working within a group (Figure 5). The learning could be individual, by self-discovery. It could be done through knowledge sharing during discussions with colleagues. Besides, co-workers could mutually learn when talking together. Indeed, they could make connections between their schemata and acquire knowledge that none of them could have learnt independently. Two of these learning processes are thus linked to the efficiency of

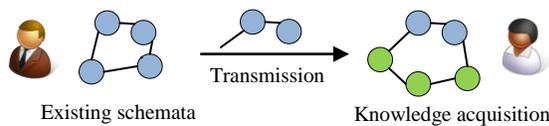
communication within the group. It denotes the importance of communication in collaborative work.

**3.2.2. Communication.** Figure 6 illustrates how two participants communicate [18]. First, the sender chooses a transmission channel according to the current working context. This context is formed by anything that influences the quality of the exchange, such as distance, noise, time, or the available media. Then, the sender encodes the transmitted knowledge or information in order to adapt it to the channel and the receiver. When the message reaches the receiver, it must be decoded and linked to current knowledge. The receiver can then react by, for example, assimilating knowledge or giving feedback.



**Figure 6. The communication process**

The encoding of the message depends on the kind of information being transmitted. If it is related to the long-term knowledge of the sender, the message has to be made understandable to the receiver by linking with his/her existing mental structures (Figure 7). As a consequence, a team should share a common language, or jargon [3], whatever their skills are. It should also share an accurate representation of group members, so that the person schemata can be referred to when encoding and decoding the message. Participants can then link the message to each other's knowledge and have a deeper understanding of its meaning and its relation to current knowledge.



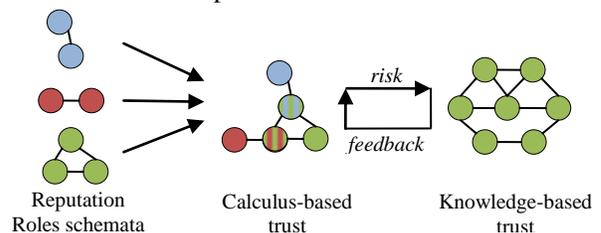
**Figure 7. Transmission of knowledge from long-term memory**

Having a common understanding of the project also enables team members to communicate more effectively. Indeed, they can use this shared knowledge to transmit information to their colleagues. When workers are at the same location, the shared knowledge includes information about their physical environment. The sender can then use visual clues or verbal references to surrounding elements in order to enhance the understanding of the receiver [19]. Among these clues, body language plays an important part during the exchange. Of course, the channels used for the

discussion impact on the richness of the messages, and thus on the communication efficiency [18].

People communicate when they foresee a gain in exchanging information, so that the workers' understanding of their colleagues enables them to select the right people for the discussion. This selection is based on the content of the information to be shared, and on the foreseen gain of linking this information with others' knowledge and skills. Besides, social relationships between co-workers can also influence the selection. The building of trust and respect is thus essential to group communication.

**3.2.3. Trust.** Trust is the "belief or confidence in the honesty, goodness, skills and safety of a person" [20]. In group work, trust is therefore an expression of the person schemata, developed through on-going assessment of colleagues' behaviours (Figure 8). Workers can start building trust before interacting with their colleagues. They develop person schemata based on their colleagues' reputation, as expressed by calculus-base trust [21], and on their role schemata, which describe the expected behaviour corresponding to specific roles or profiles [22]. These schemata represent more the confidence of a worker to engage in a trusting relationship than the confidence that this relationship will be successful. Such confidence is then submitted to the potential gain compared to the potential loss in case of failure [21] before the worker starts the relationship.



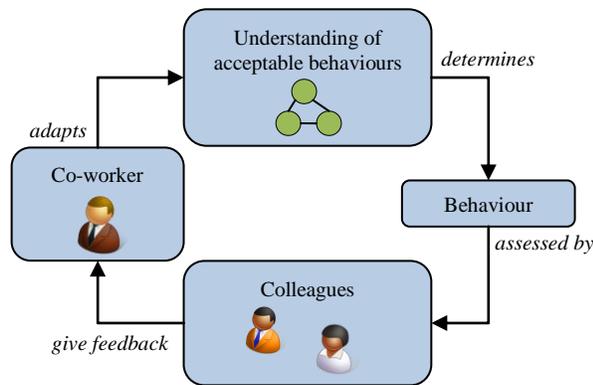
**Figure 8. Trust building process**

To develop trust, the worker must interact directly with colleagues. He/she engages in a process aiming at gradually increasing risks and builds up knowledge-based trust [21] (Figure 8). If the response of the assessed colleagues is appropriate, the trust of the worker increases and the process can continue. An appropriate response would be for the colleagues to take equal risk with the worker, or at least not to take advantage of his/her disadvantaged situation. Each positive answer results in the reinforcement or development of the worker's schemata [22], so that the worker is able to predict his/her colleagues' behaviours by the end of the process.

The knowledge-base trust tends to be extended with identification-based trust [21] that is developed

through a profitability assessment process. The objective of such an assessment is no longer to ensure/address the safety and security needs of the worker, but to enable him/her to fulfil higher needs, such as the esteem and self-actualisation ones (Figure 1). This type of trust is often seen as the one supporting group work because the workers' behaviours are dictated by colleagues' needs as well as personal ones [21].

**3.2.4. Respect.** Respect corresponds to a non defiant attitude towards someone or something. As a consequence, co-workers' respect is built on their perception of what forms an offensive behaviour [3]. Co-workers become conscious about differences between their perceptions when they experience clashes or conflicts. It is therefore essential for group members to be willing to learn by mistake so that they can adapt their behaviours to their colleagues. Consequently, feedbacks must be given in a honest, objective and diplomatic manner in order to motivate workers to change their schemata (Figure 9).

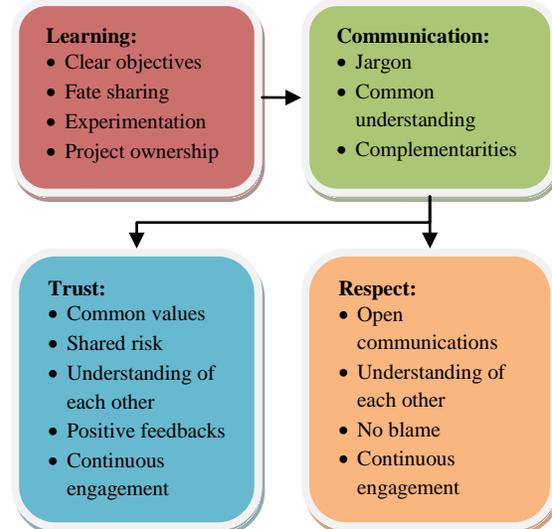


**Figure 9. Respect building process**

Moreover, workers should not be blamed for reproducing the same mistakes several times because it can mean that additional help is required to change existing schemata. It could also be that the group did not explain well enough why or where there was a problem. The group should take responsibility for the problem and support the behavioural change. Of course, feedback should be acted-upon [3] to allow healthier relationships in the future. An escalation process above the group can also be implemented to solve problems outside of the group capabilities, so that replication of error is allowable as long as it is recognised.

**3.2.5. Summary.** The identification of requirements that enable learning, communication, trust and respect in groups permits the identification of requirements for

a collaboration culture (Figure 10). As seen above, these requirements actually represent the ones for a learning culture, but it can be argued that a learning culture is nothing more than a collaboration culture [3]. This question will be the subject of further research.



**Figure 10. Requirements of a collaboration culture**

## 4. Conclusion

The theoretical justification for the existence of a collaboration culture, presented above, enables the identification of minimum requirements to support collaboration efficiently (Figure 10). These requirements can be classified in four categories corresponding to the requirements for the creation of a learning and communicative culture, as well as for the built of trust and respect.

This paper also gives a theoretical explanation of the influence of each requirement on group work efficiency. So that the limits of computing tools aiming at supporting collaboration can be partially explained by referring to the requirements listed in Figure 10.

Organisations can also use the above requirements to determine which factors of collaboration efficiency must be addressed during particular project. They can then decide on which requirements can be fulfilled by technologies, and which ones must be addressed by other means, such as management [23].

However, additional work is needed to understand in details the elements that form a collaboration culture. They will be the subject of future research aiming at investigating the teaching methodologies that enable the assimilation of collaboration cultures, at least partially. Moreover, the theoretical study presented here will also be validated by experimental research in the industrial and academics domains.

Indeed, even if some previous studies seem to support the findings presented here [24], additional use cases should be considered for a more complete and definitive validation.

## 6. Acknowledgment

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