

FACILITATING ASPECTS OF LEARNING IN MULTI-FUNCTIONAL GROUPS OF INNOVATIVE PROJECTS

ASPECTOS FACILITADORES DA APRENDIZAGEM EM GRUPOS MULTIFUNCIONAIS DE PROJETOS INOVADORES

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ABSTRACT

The main objective of this article is to present the main aspects that facilitate learning in organizations at the group level. We present and discuss the main theoretical postulates on this theme and some reflections on the theoretical tradition of the Group Processes. Methodologically, we opted for qualitative case study research, aiming to understand and interpret the phenomenon of group learning according to the perspective of the participants of the situation under investigation. The data triangulation was the strategy of data collection, which involved interviews, non-participant observation and documentary analysis. Relative to the results, the new Model follows a systemic and cyclical version of inputs, processes and outputs. The main contributions were the discovery of the role of Leader as a Catalyst Agent, the Convergence of Opinions of the group members, the Internal Information Cycle and the reaffirmation of the importance of Psychological Safety for group learning.

KEYWORDS:

Group Learning. Theoretical Model of Group Learning; Mobility of the Group Boundaries. Psychological Safety. Catalyst Agent.

RESUMO

O principal objetivo deste artigo é evidenciar os aspectos facilitadores da aprendizagem nas organizações no âmbito grupal. Apresenta-se e se discute os principais postulados teóricos sobre o tema e algumas reflexões acerca da tradição teórica de Processos Grupais. Metodologicamente, optou-se pela pesquisa qualitativa, que visa compreender e interpretar o fenômeno da aprendizagem grupal segundo a perspectiva do sujeito, ou seja, dos participantes da situação em estudo. A triangulação de dados foi a estratégia de coleta de dados, a qual envolveu entrevistas, observação não participante e análise documental. Em relação aos resultados, o modelo proposto segue uma versão sistêmica e cíclica, de entradas, processos e saídas. As principais contribuições foram a descoberta do papel de Agente Catalisador do Líder, a Convergência de Opiniões dos membros dos grupos, o Ciclo Interno de Informações e a reafirmação da importância da Segurança Psicológica para a aprendizagem grupal.

PALAVRAS-CHAVES:

Aprendizagem Grupal. Modelo Teórico de Aprendizagem Grupal. Mobilidade dos Limites do Grupo. Segurança Psicológica. Agente Catalisador.

INTRODUCTION

Empirical and theoretical production on learning at the group level has increased considerably from 1990s, especially abroad. The aspects that have induced this fact were mentioned by Wilson, Goodman and Cronin (2007) and by Edmondson, Dillon and Roloff (2007). For those authors, the emergence of studies that evaluate group learning have been guided by at least two basic factors: the first one is revealed in the concern over uncovering the real reasons by which some groups are more effective in learning than others, in the most diverse work situations, and the second arises from the discussion about the crucial role of groups in learning, as they are the bridge between individuals and organization. It becomes apparent that studies in Group Learning (GL) are based on conceptual dissimilarities and apply different research methods. Such heterogeneity

can be not only fertile but also confusing. The great challenge has basically been how to characterize what constitutes a group and the learning at the meso-organizational level. Thus, a unified view on the concept might help to further understand this phenomenon.

Despite Wilson, Goodman and Cronin (2007) emphasizing the importance of a more homogeneous definition, advocating the convergence of a single concept, the view of Edmondson, Dillon and Roloff (2007) shows that this conceptual diversity mirrors the current stage of theoretical development about the topic, still incipient when trying to establish a single understanding for such conceptualization. Group learning is still a construct and, as such, its definitions have varied considerably, exposing the existence of conceptual ambiguities which, for some authors,

cause the literature on the subject to suffer from cohesive insufficiency.

In an effort to throw some light on this complex theoretical field, Edmondson, Dillon and Roloff (2007) have published a respectable bibliographical research in which they present the main traditions about learning in groups and work teams. Such complexity and diversity generate perspectives that try to understand this phenomenon from different fundamentals that determine in which conditions group learning happens. The results of empirical studies on the subject clearly highlight three perspectives: outcome improvement, task mastery, and group process.

Among these, group process has proved to be the most fruitful as it is based on models, concepts and methods inherent to Organizational Learning (OL) and group effectiveness through the investigation of genuine work groups in their own organizational environments, reason why this perspective is the focus of this paper.

A study about group effectiveness usually applies a model of Input, Process and Outcome (IPO) in which the processes of group interaction mediate the relationship between inputs (context, structure, composition) and the outcomes (quality, innovation and performance). Besides, these studies try to assess the process of group learning evaluating how they are affected by the management and other contextual factors, such as group atmosphere, goals and identity, and how they influence group performance itself (SILVA, 2013, SILVA; GODOY; BIDO, 2014; FONSECA et al., 2019; FONSECA et al., 2020).

In group learning studies focusing on the group process perspective, the most relevant publication is the classic article

Psychological Safety and Learning Behaviour in Work Teams by Edmondson (1999), which proposes a model of group learning, opportunely discussed here. Google Scholar indicates this article has been cited around six thousand times. In Research Gate, a social networking site for scientists and researchers, citations of Amy Edmondson about Group Learning have reached 16.777 in a total of 94.719 readings made until the date of the final review of this work, in June 2018. However, the model proposed by Edmondson (1999), requires some reflections, especially when under empirical research, once it provides an opportunity for a more detailed analysis.

This paper brings the results of an empirical research conducted in work situations of several cross-functional groups involved with innovation projects from two large multinational companies in the automotive industry. These results were the bases our General Objective, that is, to present the main aspects that facilitate learning in organizations at the group. Also the elaboration of a new model of Group Learning focusing on the group process perspective, that was able to fill some of the gaps observed in the original model of Edmondson (1999), thus fulfilling our specific objective and being our contribution to the field of organizational learning studies at the group level.

Building a concept of Group Learning

When consulting some significant researches with a literature review on group learning (WILSON; GOODMAN; CRO- NIN, 2007, EDMONDSON; DILLON; ROLOFF, 2007, SESSA; LONDON, 2008A, 2008B), it is possible to identify a set of studies elaborated from different theor-

etical and methodological guidelines that result in findings which are scattered and little systematized. The assessment of such

studies shows that there is little consensus about the definition of group learning itself, as stated in Table 1:

TABLE 1 – Definitions of Group Learning

Paper	Definition
Argote, Gruenfeld and Naquin (1999, p. 354).	The activities through which individuals acquire, share, and combine knowledge through experience with one another.
Edmondson (2002, p. 129).	A process in which a team takes action, obtains and reflects on feedback, and makes changes to adapt or improve.
Sole and Edmondson (2002, p. 18).	The acquisition and application of knowledge that enables a team to address team tasks and issues for which solutions were not previously obvious.
Ellis, Hollenbeck, Ilgen, Porter and West (2003, p. 822).	A relatively permanent change in the team's collective level of knowledge and skill produced by the shared experience of team members.
Gibson, Vermeulen (2003, p. 203-204).	The exploration of knowledge through experimentation, the combination of insights through reflective communication, and the explication and specification of what has been learned through codification.
London; Polzer and Omeregíe (2005, p. 114).	The extent to which members seek opportunities to develop new skills and knowledge, welcome challenging assignments, are willing to take risks on new ideas, and work on tasks that require considerable skill and knowledge.
Wilson, Goodman and Cronin (2007, p. 1043)	A change in the group's repertoire of potential behaviour.
Sessa and London (2008a, p. 555) Sessa and London (2008b, p. 7).	A deepening and broadening of the group's capabilities in (a) (re)structuring to meet changing conditions, (b) adding and using new skills, knowledge, and behaviours, and (c) becoming an increasingly sophisticated system through feedback and reflection about its own actions and consequences.

Source: Updated from Silva (2013).

The group learning concepts of Argote, Gruenfeld, Naquin (1999) and of Gibson and Vermeulen (2003) refer to the classical theoretical approach of Organizational Knowledge Management (NONAKA; TAKEUCHI, 1997), which proposes a model of converting tacit-individual knowledge into explicit-collective knowledge through the processes of Socialization, Externalization, Combination and Internalization (SECI). In contrast, Edmondson (2002) and Sole and Edmondson (2002) refer to the social and negotiable elements of group learning, such as feedback, and the changes resulting from collective and group choices. Finally, Ellis, Hollenbeck, Ilgen, Porter, West (2003), London, Polzer, Omeregíe (2005), Sessa, London (2008a) and Sessa,

London (2008b) approach the theoretical postulates of competences by bringing the role of attributes promoted by the group in terms of knowledge, skills and attitudes.

Group Process Perspective in Group Learning

In its early stage, Edmondson, Dillon and Roloff (2007) confirmed that several studies sought to identify the group learning process in real groups or focus-groups by applying qualitative and exploratory methods. Lately, however, the research concepts have been formalized from legitimized survey metrics. These field studies attempt to describe learning behaviours that could not be identified neither through the logic of learning curves nor through laboratory



experiments. In general, researchers working within the social perspective tend to observe group processes rather than focus on improving group performance as evidence that learning has occurred.

Thus, five main concepts have been analysed within group process perspective, which are: (i) Team climate and learning behaviour of the leader, with focus on the effects of the behaviour of the leader on the group and on team climate and whose main exponents are Brooks (1994) and Sarin and Mcdermott (2003); (ii) Team-members learning behaviour, which seeks to investigate the processes of team-members learning within the group and outside the group boundaries. The main authors are Edmondson (1996, 2002, 2011, 2012); Edmondson, Bohmer and Pisano (2001); Tucker, Nembhard and Edmondson (2009); Ancona, Bresman and Kaeufer (2002); Wong (2004); Schippers, Den Hartog and Koopman (2007); Silva (2013), Silva, Godoy and Bido (2014); Edmondson and Reynolds (2016) and Edmondson and Harvey (2017); (iii) Shared learning goals, which study how common goals or purposes for a team affect their learning behaviour. This concept is represented by Ely and Thomas (2001);

Bunderson and Sutcliffe (2003); Tjosvold, Yu and Hui (2004); (iv) Team identification, presented as an antecedent factor to learning behaviour, such as diversity, group composition, communication and demographic variance. This concept has been discussed by Lau and Murnighan (2005), Van der Vegt and Bunderson (2005); (v) Effects of context, considering the context in which a team operates as a fundamental influence on team learning and whose main exponents are Zellmer-Bruhn, (2003), Zellmer-Bruhn and Gibson (2006), Edmondson (1996, 1999, 2003).

Team Learning Model by Amy Edmondson

The model proposed by Edmondson (1999) suggests learning is a process consisting of four basic elements that, when operating together, are able to explain the team performance in organizations. These elements are: antecedent conditions, team beliefs, team behaviours and the outcome of this systemic dynamics, illustrated in Figure 1.

The antecedent condition: encompasses team structures based on context support and team leader coaching. Context support involves reward and recognition systems, in-

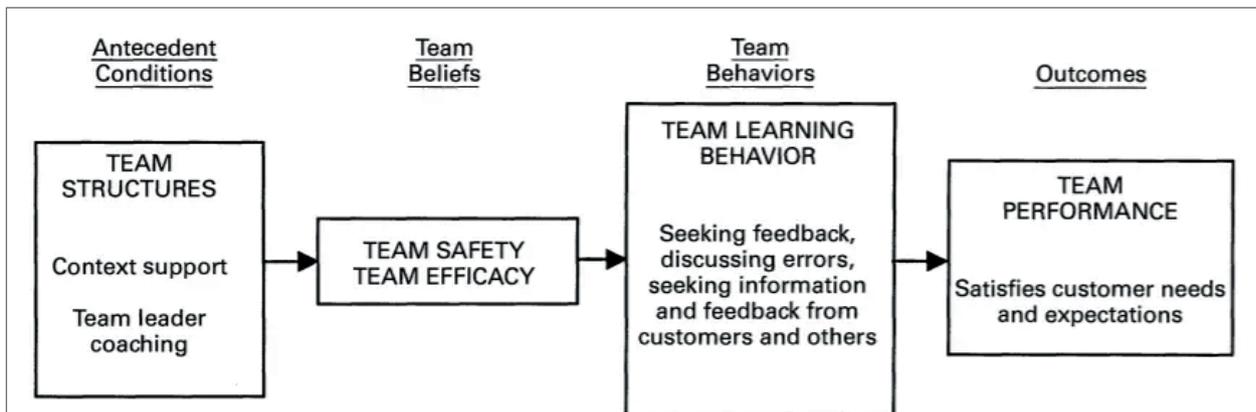


FIGURE 1 – A model of work-team learning

Source: Edmondson (1999, p. 357).

formation systems and available resources. The coaching behavior of the team leader guides the group through typical coaching activities, such as guidance and leadership. The coaching assignments refer to the direct interaction between the manager (leader) and team members, aiming to develop individual and collective skills to achieve the expected results. Team beliefs: encompass shared mental models that guide or hinder learning behaviour. The setting of such beliefs requires team psychological safety and team efficacy. Psychological safety (2019), allows value and perspective sharing, reinforcing interpersonal relationships of trust and increasing the level of team cohesion and the ability of members to work together. Team learning behaviour: refers to those activities performed by members in order to obtain and process data and transform them into information to allow a better adaptation to the environment. For instance, seeking feedback, sharing information, asking for help and discussing mistakes made. The Outcomes: with those behaviours, teams can detect climate changes, learn about customer needs, preferences and demands, and satisfactorily deal with unexpected consequences of preceding actions, improving the understanding of the current situation. Nevertheless, high levels of learning are not always present, once the individuals have pre-conceived mental models, i.e., ready answers to errors, problems and conflicts that vary from team to team, even within the same organization. (CANNON; EDMONDSON, 2001).

METHOD

It's important to clarify that some elements of the literature review and the results are part of a larger research pre-

sented as a doctoral thesis of one of the authors. The research was developed from a qualitative perspective aiming to understand and interpret the phenomenon of group learning from the point of view of the individual, i.e., the participants of the situation under investigation (GODOY, 1995). Given the characteristics of the qualitative approach, the method chosen for this research was a qualitative case study (GODOY, 1995; 2006) seeking to observe, explore, interpret, understand and discuss the aspects related to the learning process of cross-functional groups in two automotive organizations, denominated here Company Alpha and Company Beta.

These two organizations were chosen on the grounds that they are both large multinational companies, recognized by the national and international automotive industry not only for their quality but also their solutions and innovation in products, services and processes, which are developed internally by their project groups and now focus of this research. By the date of completion of this investigation, both maintained an annual average of at least a dozen patent registrations at NIIP (National Institute of Intellectual Property). One of them was co-responsible for several innovations that made the design of the hybrid combustion engine viable. Another reason was because both maintain a matrix structure based on cross-functional groups. This implies that there are several group formations formally constituted which work concurrently in the most diverse projects of full or incremental innovation in products, services and/or processes. Besides the diversity of professionals, one of the main characteristics of a matrix structure based on cross-functional groups is the fact that they allow any mem-

ber to become a leader, provided they show competence to lead. This was the case, for instance, of a group whose leader was an intern and his subordinate a department director of the company.

Data collection involved three very distinct parts. First, semi-structured interviews (GODOY, 2006) were applied to collect descriptive data in the subject's own language, which gives the researchers an idea about how the subjects interpret aspects of the world. Members of six cross-functional groups in each automotive organization (Alpha and Beta) were interviewed, totalling nineteen interviewees.

Regarding the demographic profile of the interviewees, the largest age group consisted of 30 to 39 years old, representing 42.5% of the group respondents. The second largest consisted of 20 to 29 years old, representing 37%. The age group of 40 to 49 years old contributed with 18.5% of group formation. Finally, the smallest contribution was the age group of 50 to 59 years old, with only one member. About fields of knowledge, three major areas were present among the individuals integrating the cross-functional groups. They were: 22.7% from applied social sciences (Management and Economics), 75.45% from exact sciences (all Engineering and Computer Science) – the largest group, and human sciences (Psychology) with only one member. As for time working in the company, data demonstrated that two extremes showed the lowest values. In the range of 0 to 1 year of company were only 7.4% of the members and in the range above 15 years there was 9.25% of the composition of the groups. In the middle range, from 2 to 10 years of company, 55% of the total of individuals were allocated. The range of 1 to 2 years and 10 to 15 years of work comprised 16.6% and 11.6%, respectively.

Regarding the level of education of the members of cross-functional groups, because it is a collective formation whose focus is the development of products, services and/or processes, having higher education becomes imperative. The studied groups consisted of 31.48% of bachelors, 18.5% with a high school graduation, 37% of specialists – the most common level of education in the investigated groups –, 9.25% with master's degree and 3.77% with Phd degree. In other words, 81.5% of the respondents have a higher education degree. Finally, as for gender, there was a higher concentration of man in cross-functional groups, representing 64.8% against 35.20% of women. In general, the groups are subdivided in individuals belonging to technical sectors (such as engineering) and in individuals belonging to bureaucratic sectors (such as management). There is also a subdivision between individuals who exercise some external leadership role and the other members who are subordinate to them.

The second part of the research was the non-participant observation at the time when cross-functional groups met. Moreover, it was possible to assess the productive processes, physical and architectural structures and other aspects that corroborated the analysis of the results.

The third and last part consisted of documentary analysis. Data were collected in the Human Resources sector from both companies. For example, it was possible to verify the Training and Development Policy (T&D), Annual Plan of T&D (APTD), the Professional Multipurpose Matrix for workers (PMM); the organization's intranet; the Strategic Planning (SP), and also to photograph some posters and notices about training, among other documents. For the last two parts, a field journal was used, where all observations and

perceptions were noted. All the interviews were previously scheduled, and recordings added up to 600 minutes of electronic audio. The average time spent in each interview was approximately 31 minutes, which were later transcribed, generating more than 200 pages of material. Including field notes and photographs, there were almost 250 pages of data.

Data Analysis

The process of data description and interpretation was based on King (1998), Gil Flores (1994) and Merriam (1998) and three steps were key to the analytical process: (i) template analysis which, according to King (1998), consists of identifying the main categories subsided to the constituent categories (subcategories). Essentially, what differentiates template analysis from other phenomenological interpretive approaches is the use of *a priori* codes that can be evenly applied in case study situations, which can be understood as the very flexibility that such strategy allows; (ii) repeated reading of interview texts and categorization: analysing the interview data from the

initial template made of fifteen categories through analytical codes, the next step was to identify response patterns that were able to aggregate information to conglomerates. This first attempt at data analysis allowed the initial template to reduce the number of categories, leading it to its completion. As repetitions occurred, more patterns of similarity emerged, making the template less redundant and more robust, as suggested by Merriam (1998); (iii) finalization of the template: the final template (Figure 2) resulted in five categories: the first (CAT.01 – Groups Formation), which is divided into three main subcategories; the second (CAT.02 – Operation of Groups and Learning Processes Identified), which is divided into four main subcategories and three secondary subcategories; the third (CAT.03 – Aspects that Hinder Operation and Learning at Group Level), divided into 12 subcategories; the fourth (CAT.04 – Aspects that Facilitate Operation and Learning at Group Level), organized into 14 subcategories, and finally the fifth (CAT.05 – Evidences of Learning), with only two subcategories.

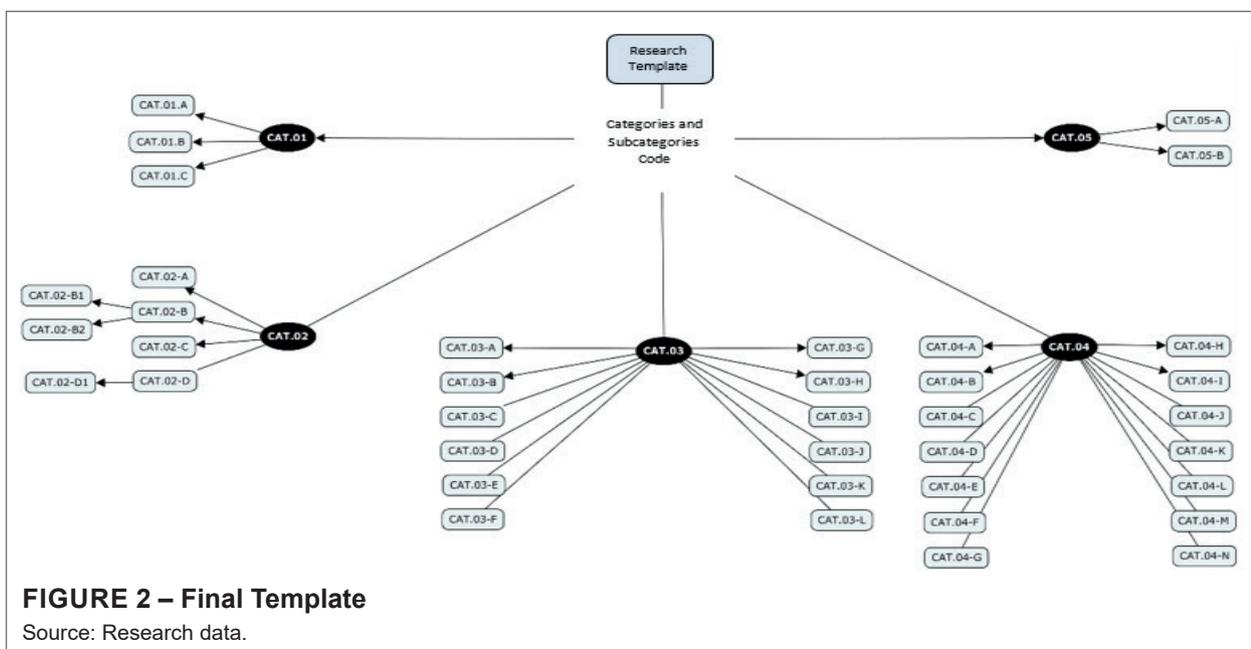


FIGURE 2 – Final Template
Source: Research data.

RESULTS

The required structure of this paper did not allow space for clipping of the interviewees' speeches nor the detailed discussion of the identified categories and subcategories (main or secondary). Nevertheless, all discussions listed here result from the opinion of the majority of the 19 interviewees, the observations and the documentary analysis. Therefore, only those categories that were essential to directly subsidize the construction and conformation of the proposed Theoretical Model were elected. Thus, the third and fifth categories are not discussed in this paper.

Group Formation

The formation of a cross-functional group (Table 2) starts from the moment the car manufacturer (client) introduces a new project to their supplier and them, in turn, check the possibility to make it or not. In this negotiation process, many aspects are taken into consideration, like the specific requirements for each project, the international rules and conventions, applicable laws in each country that buys the piece that will compose a car. Furthermore, there is also the setting of goals for products, services and/or processes, such as: costs, human resources and technological investments. In Company Beta, for instance, any previous negotiation to establish tactics for group formation must have extensive legal support, technical documents, well-planned budgets, contractual

signature registered in a notary's office or in international arbitration chambers, in addition to the new patent registration with the INPI (Brazilian National Institute of Industrial Property), as most projects developed by this organization are breakthroughs, whereas in Company Alpha they are incremental innovations.

Members from both Alpha and Beta companies do not work endogenously, i.e., focused strictly on the internal group microprocess. With few exceptions, in general there is great intergroup interaction, so a member is not exclusive of a certain group, being concomitantly and actively part of several other groups with the same work profile as his original group. Probably a group will never be totally new or made up of inexperienced people. In the group formation process there will be people from other and more mature groups whose function resembles the new project.

Both companies allow their members to apply their technical and conceptual skills to perform related tasks in various groups formed within the organization. This dynamic movement involving group boundaries will be described as Intergroup Mobility, i.e., the ability of a member from a certain group to move and work beyond the limits of his own group, allowing new group formations and, thus, sharing information with other realities. This dynamic movement can be an element of the very tactics of forming and operating a cross-functional group, receiving a natural support from the organ-

TABLE 2 – Group Formation

Category	Code and description of main subcategories	
CAT.01	CAT.01-A	Why a cross-functional group is formed and what its basic characteristics are.
	CAT.01-B	Intergroup mobility.
	CAT.01-C	Criteria for member selection

Source: research data.

ization provided that it does not fall into the customer’s requirement for exclusivity, which can occasionally happen.

Regarding the criteria for member selection that will form a cross-functional group, three main aspects were identified in both companies Alpha and Beta. The first aspect is the Formal Education, i.e., the learning acquired through technical courses in secondary or higher education. All interviewees informed having one or more formal courses that helped them perform their jobs in the company and within the cross-functional group. The second aspect is the experience acquired by working in this and/or other organizations. From 19 interviewees, 16 referred to this aspect. The third, and perhaps the most relevant aspect, is the predisposition to learn. Twelve interviewees revealed that the learning acquired formally or through experience is not always enough to ensure the selection of a member to a cross-functional group. It is indispensable for the worker to show interest in the tasks to be performed in a project group. This aspect involves the effort undertaken by the future manager to analyse, identify and value the positive behavioural characteristics to learning.

When leaders were questioned about the criteria adopted to select new members to form a work group, they mentioned terms like sparkling eyes, determination, humility in knowing how to listen and take on mistakes.

Operation of Groups

According to Table 3 – data collected from Company Alpha –, when a cross-functional group is created it is common for the first meetings to follow a strict systematic. At this stage, a greater punctuality is required from all the members involved, and the duration of meetings is longer as the main goals for the start-up project will be defined, like the setting of a master schedule and the increase of the various tools for management and control. The informality and festive tone occurs mainly at the inaugural meeting, when the main objective is not only the socialization of members, but also the creation of a group identity. After this stage, group members will promote their own meetings as negotiated at previous meetings or as required by the project. Although there are fewer and less systematic meetings, it is interesting to notice that such meetings will always be necessary, even with the goals up to date and on schedule, demonstrating that information shared by e-mail or telephone is not so effective as when people meet face to face.

Observations made in Company Beta show that the redundancy verified in the activity of transmission and sharing of information in meetings is an important means of ensuring the effectiveness of the group learning process. However, in Company Alpha this aspect was not observed, as the time spent on repeating activities and rechecking information is not a reality given the tight internal schedules. At the tip of the feverish

TABLE 3 – Operation of Groups and Learning Processes Identified

Category	Code and description of main subcategories		Code and description of secondary subcategories	
CAT.02	CAT.02-A	Hierarchical aspects and the role of the manager.	-	-
	CAT.02-C	Systematics of meetings.	-	-
	CAT.02-D	Dissemination of information.	CAT.02-D4	Existence of conflicts

Source: research data.



dynamics for greater production emerges the indispensable role of the leader, here denominated Catalyst Agent. In other words, by playing the leadership role, the project manager avoids wasting time, thus allowing the group to learn more dynamically.

The research data shows that, as a Catalyst Agent, the team leader is not necessarily required to possess a highly technical and specialized knowledge of operational procedures related to product/service or process to be developed. Such knowledge is mainly expected from other members, such as workers, assistants, analysts and engineers. The leader must understand and dominate the information flux which streamlines the process of group learning. May not lack some human skills, such as: the ability to mediate discussions, counteract confrontations, use the relevant information to the group, know how to identify and discard useless information, discern about the mistakes made by individuals and correctly guide them in the occurrence of deviations, and use suitable (accessible) language to the group.

These attitudes will open precedents so that other individuals may actually participate in the group process, learning within the community and not necessarily expecting someone to teach them. These elements found in the research have already been investigated in the concept of Psychological Safety, defended by Edmondson (1999).

Figure 3 illustrates the dynamics of information flow within a cross-functional group. It was designed based on the research data and includes all the perceived elements in both companies. From this figure it is possible to notice, once again, the relevance of Formal Education and Acquired Experience of members as appro-

priate professional attributes to maintain richer discussions at the internal level, thus increasing the cycle of information available to the group, continuously supplied by its external environment. Predisposition to learn is also highlighted for being the main propulsion factor of the Internal Information Cycle. At the centre of this process is the concept of Psychological Safety of the group members, permeating and allowing the project manager to exercise his essential role as Catalyst Agent.

The observation from both companies demonstrated that the project manager, usually identified in the interviews as leader, plays the leading role within the group. He will not only take charge of the project, starting the activities, but will also follow all the phases of the group process through the standardization of information, as well as determine the closure of group activities or lead them to the latency phase, a process in which the main objectives have already been met and the group rests without major activities. Nevertheless, the group remains watchful, following the market performance of the product and/or service it developed.

Another important aspect observed in both companies was that groups must be prepared to face some conflicts, once it would be difficult to gather individuals from different backgrounds and expect them to have a calm and harmonious work environment. On the contrary, as noted, if there is indulgence within cross-functional groups it may be a sign that something needs to be done to stir it. The feeling of apathy on the part of members is not interesting for group learning. The fact that there is a great diversity of people should also mean the emergence of conflicts and controversies, now regarded as something natural.

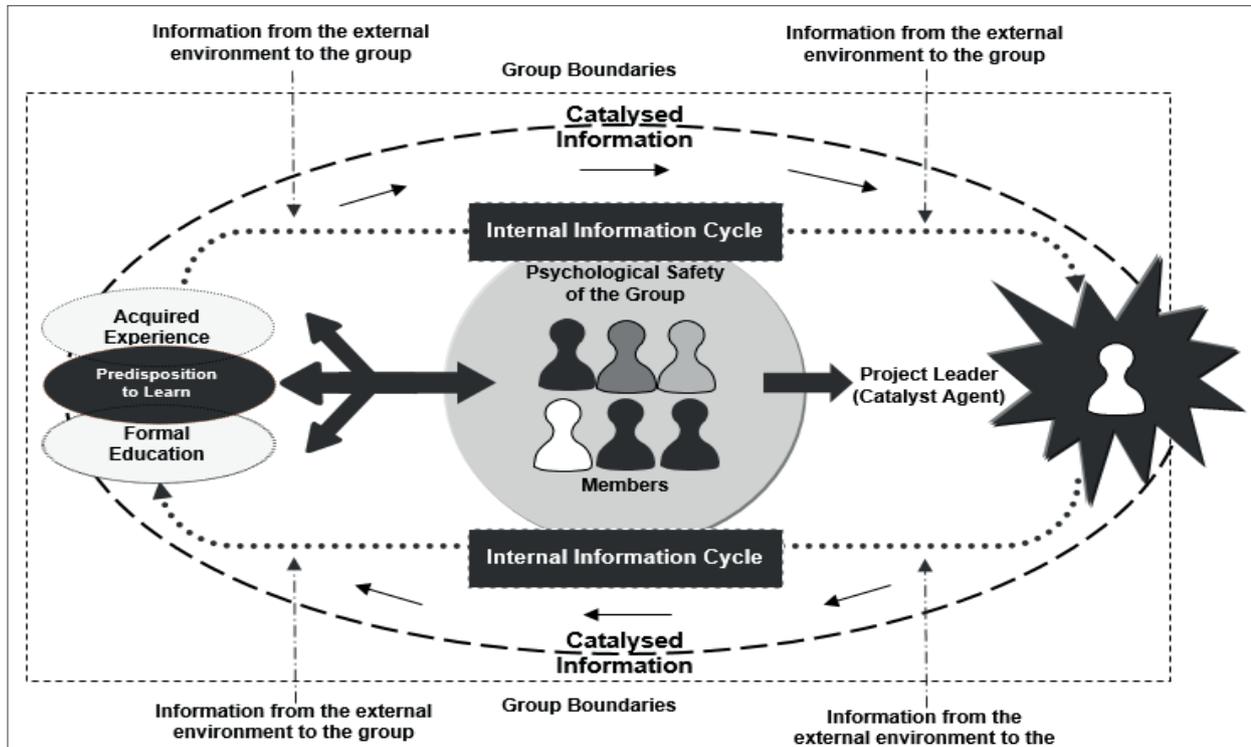


FIGURE 3 – Internal Information Cycle

Source: research data.

In order to solve problems (here considered as opportunities) resulting from controversies it would take members to safely express their diverse and divergent points of view, without fearing sanctions from leaders or colleagues. Psychological Safety will permeate this whole process because, as this concept establishes, it is in a safe environment that individuals will feel free to express what they really think. Despite that, for the group to choose the most relevant points of discussion capable of solving the problems, it will take a lot of thought and a good deal of common sense, although this does not always happen.

The observation showed that for groups in both companies the occurrence of conflicts demonstrates its members are being able to act and process the information that derive from their working environment. This translates into the assurance that the inter-

nal information cycle does not stand still or in a homeostatic state. On the other hand, the project manager will have the opportunity to practice their conceptual skills, intermediating the discussions and guiding the group to find the best answers to the questions that will arise, thus preventing conflicts to become confrontations and leading the divergent parts to the process we call Opinion Convergence.

Those conditions can be exemplified by a respondent from company Beta. According to him, the meetings are used as evidence of discrepancies in tests, promoting heated internal discussions where some members will have a position not necessarily aligned with the opinions of others. However, both parties should find answers to the inconsistencies identified, for instance, in a certain physicochemical phenomenon and, as a result, improve group learning.



Such discussions are beneficial. Besides dealing with day-to-day work issues, they also promote experience sharing and democratize arguments within the group. Often, members step into meetings already knowing they should face any divergent results that may appear in graphs, control reports or according to the opinion of workers in the production lines. For most respondents, divergences represent an essential factor conducive to the learning process as they must implicitly contain information-rich content. In contrast, the psychologically safe environment is critical to the clash of opinions that will be followed by careful reflection from both opposing parties. In the event of convergence of opinions through debate and reflection, decision-making or change can be understood as the very group learning.

Aspects that Facilitate Operation and Learning at Group Level

According to Table 4 (EDMONDSON, 2004), moral support is a strong facilitating factor to group learning due to its cooperative nature. Moral support ensures the exchange of values and perspectives of greater affection and trust in interpersonal relationships, elevating the level of cohesion and synergistic capacity of the group. For an interviewee, leader of a group from Company Alpha, one option for the organization

to support its members is through the freedom provided to them during the formation of cross-functional groups. On the other hand, this internal freedom also requires some responsibilities. Freedom can be defined as the free circulation of members outside the group, stating honest opinions and not keeping silent about failures and errors observed in the execution of the project.

Certainly, it is not enough to circulate from group to group or from one area to another within the company for information. When the information needed is acquired, group members must take decisions based on bureaucratic rationality, on plausible arguments and correct information approved by the group to justify decision-making, which should be sanctioned by the Internal Information Cycle. An interviewee from Company Beta also believes an environment where people are more receptive to say what they think is important, so they can express their points of view to the group and receive feedback from colleagues and superiors. He also states that this process should be weighed because the knowledge acquired by sharing information must promote to the creative individual the due merits derived from his creative capacity.

Based on the observations made at Company Alpha, the recognition of the capacity of others within a group may be fundamental to its proper functioning. Because of

TABLE 4 – facilitating factors

Category	Code and description of main subcategories	
	CAT.04-D	Moral support
	CAT.04-F	Recognition of other people's knowledge
	CAT.04-I	Predisposition to learn
	CAT.04-K	Convergence of opinions
	CAT.04-L	Recognition of collective results
	CAT.04-N	Use of hallways to share ideas

Source: research data.



its variety, sometimes members can value a specific professional segment within the group, based on technical, hierarchical or even corporate issues. However, the more democratic and decentralised the internal environment is, the greater are the chances for learning.

Predisposition to learn emerges as an essential factor so that an individual can join a cross-functional group through the evaluation that will be made by the project manager. Such behavioural characteristic must also be favourable to the functioning of the group, as formal education or (practical) experience is not always enough to maintain the Internal Information Cycle. Although predisposition to learn is related to continuous learning, its occurrence requires the individual to be constantly instigated by (internal and external) the environment and learning to cope with work pressure, as stated by one of the interviewees from company Alpha who managed to meet his individual goals thanks to the support of his colleagues and so could take a course offered by *SENAI* (Brazilian National Service of Industrial Learning).

Individual achievements are reflected in the acquisition of collective goals, making the group not the sum of individuals but a dynamic cell. One of the factors that feeds this cell can be described as the way in which collective results are recognized and valued by the organization.

The observations, especially those made at Company Beta, showed that it does not matter if the results of the performance of the cross-functional group are positive or negative, but whether all the members are equally involved, as the group should be regarded as an absolute unit rather than a fragmented one. In case of failures, there

must be a reflection process on the part of all group members, conducted by the project manager, as an opportunity to learn.

Finally, the organization hallways are also places where learning can occur. For instance, an interviewee from Company Beta explained that on some occasions members may be shy about talking. This does not always mean the inner environment does not favour their expression, but that it may be a characteristic of the members' behaviour. Whenever that happens, the company hallway is the ideal place for the shy to have more freedom to express their views. Besides, as commonly observed in Company Beta, totems placed in the hallways and in the areas of coexistence of employees promote the supply of the Transitory Memory System (TMS) which, according to Silva, Godoy e Bido (2014) and Rozenfeld et al. (2006), has the primary function of allowing access and use (application) of ideas and information in case of problems occurring during the project stages from the repository of ideas in an electronic storage system. Such ideas will serve as an inspiring source to ensure the maintenance of the group's portfolio of projects.

Proposal and discussion for a new model of group learning

Naturally, the present model was inspired by Edmondson (1999). Nevertheless, our proposal is a synthesis based on the behavioural elements of Group Learning. Below is a non-linear IPO format. The concept of Psychological Safety is at the centre of the system as the most important element of the process. It is still relevant, as it subsidizes all the behavioural issues present in the GL phenomenon, such as: moral support, recognition of other people's knowledge, con-

flicts, convergence of opinions, recognition of collective results, use of hallways to share ideas and the catalyst agent. We assume the accumulated information and knowledge are transposed to the internal social process, composing the Internal Information Cycle that will be fed by all the group's endogenous and exogenous information. As problems or the need to meet objectives arise, it will be necessary for members to convert their controversies into convergent opinions. That requires reflection on different opinions, which translates into a factor for learning. Such occurrence will only be conferred to consensual decision making, providing any kind of change that may occur. The technical elements can be checked in the input and / or output of the system.

Analysing Figure 4, it from left to right, the input represents the basic elements for the learning process, which can be adapted according to the social reality of each group or company. Above all, the inputs are situa-

tional and descriptive. In our specific case, we observed the way in which a cross-functional group is formed and what its basic characteristics are. Furthermore, we noticed a dynamic agitation, that seek new elements in the context of the company and even outside it, denominated Intergroup Mobility.

There is also the relevance of the criteria adopted by the leaders as ways to guide the selection of new members, in which the acquired experience, predisposition to learn and formal education of the candidates are evaluated. Such elements remind us the basic attributes of competence, based on knowledge, skills and attitudes (KSA).

About the input, there is also the dynamism of the hallways and a type of knowledge acquired there by group members that is clearly different from GL. It is a type of collective knowledge, resulting from the mobility of members between groups and outside the company (SILVA, 2013), obtained in informal situations and recorded

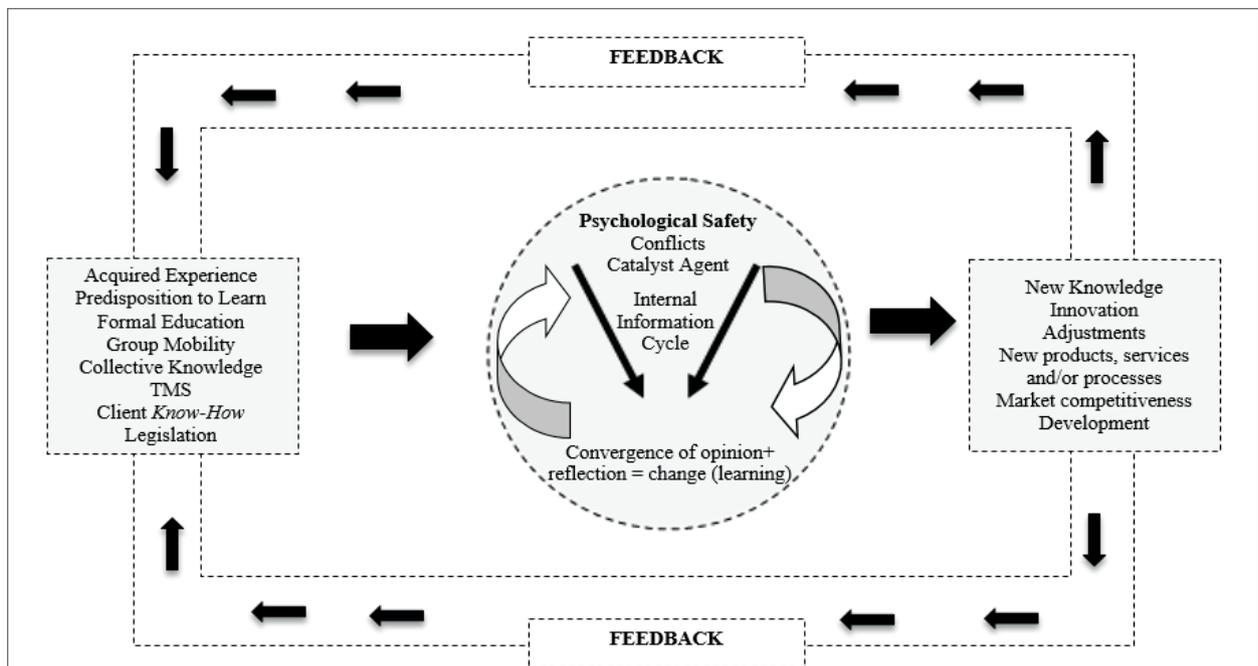


FIGURE 4 – Model of Group Learning

Source: inspired by Fonseca et al (2020)

in the internal organizational memory, subsidized by the TMS. Moreover, it allows the input of the transplanted knowledge from the know-how of clients, who often dictate the rules and scope of the project, into the group. Last but not least, there are the legal factors, since automobile manufacturing is one of the greatest symbols of globalization and, as such, each destination country has specific legislation that the group must be aware of in order not to suffer sanctions and fines from the purchasing countries.

Finally, the second square represents the systems' output, with the acquisition of new knowledge that will be applied to the scope of the group. As a result of learning, innovative products will emerge, processes will be improved, and some type of change can be introduced in the reality of companies, thus promoting their competitiveness in the face of the fierce competitive market. Knowledge acquisition will also serve as a tool for continuous learning. Such knowledge will feedback the system, restoring the cyclic, dynamic and constant flow of GL.

CONCLUSION

It is believed that the contribution was provided, and the objective of the article

was met. This proposal of a model for Group Learning differs from the one proposed by Edmondson (1999) mainly for reinforcing the idea of a cyclical and non-linear learning process. Both models are dynamic since they refer to a dynamic situational and relative system. There are common factors like acquisition and sharing of knowledge through the convergence of opinions in an internal environment marked by Psychological Safety.

However, the innovation rests on the discovery of the Internal Information Cycle and the leader's role as a Catalyst Agent rather than a Coach as verified by Edmondson (1999). Although our literature review refers to the importance of context, the cultural problems that are intrinsic to the Group Learning process seem to have received little attention by some authors and could bring some relevant information for a better understanding of this subject complexity. Therefore, as suggestions for future research, the cultural and the diversity subjects could be deeper investigated as to understand to which extent such aspects are essential for group learning. Furthermore, the proposed model must be validated. Perhaps future empirical researches can shed some light on the yet intricate Group Learning process.

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