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SPECIAL ISSUE

Article invited

DOI: <http://dx.doi/10.12660/joscmv8n2p36-51>

Characterization of cross-functional integration level: A multi case study in Agribusiness Organizations

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ABSTRACT: A point that has generated discussion in the literature is the level of integration required for the coordination of activities between areas. However, there is a lack of theoretical definitions and field studies that explain this phenomenon in depth. Thus, this study aims to characterize the level of cross-integration, the factors that generate it and the impacts on organizational performance. For this, interviews with managers of Operations, R&D and Marketing/Commercial areas, from two multinational companies based in Minas Gerais were performed. The results indicate that the level of integration can be analyzed as a combination of three factors: 1) absence of overlapping of perceptions about integration factors over the processes, balance between formality and informality, and absence of manifest conflicts of interest. This is a setting that provides a deeper definition than those obtained in the studied literature, which basically present integration mechanisms, without detailing how these should be applied in order to generate higher levels of integration.

Keywords: *Cross-functional integration; Integration level; Operations; R&D; Marketing.*

1. INTRODUCTION

The integration management can help to ensure that there is harmony between organizational functions, so that they can work together (Lawrence & Lorsch, 1967). This is an important factor, as it can improve the sense of interdependence and organizational results (Stank, Daugherty & Ellinger, 1999). There are studies on this issue that address the correlation between generating mechanisms of functional integration and results (Stank *et al.* 1999; Ellinger, 2000; Daugherty, Mattioda & Grawe, 2009). This perspective represents the mainstream in the studied literature, in which, some authors identify important tools to conduct the cross-functional integration (Kahn & Mentzer, 1996; Kahn, 1996; Gimenez & Ventura, 2005; Jüttner, Christopher & Baker, 2007).

An element that has generated discussion in the literature is the level of integration, which corresponds to the intensity in which the areas relate towards the coordination of their activities (Pimenta, 2011). There is, however, a lack of theoretical definitions and field studies explaining, in depth, how this phenomenon operates. Authors such as Kahn (1996) and Gimenez and Ventura (2005) mention the importance of achieving higher levels of integration, since this element denotes strong correlation with the improvement of functional and organizational results. Pagell (2004) elaborates a little further in the practical sense, explaining that the definition of the level of integration is relative, because different managers in different contexts can interpret it in different ways. Thus, characterization should be based on semantic definition of evidence, which is often subjective.

Santos and D'Antone (2014), after conducting a review of literature, argued that it is necessary to verify if integration can have a degree of measurement, and if high levels of integration are necessary and advisable. The authors also propose new topics for further research, revealing, among them, the lack of studies dealing with the level of integration.

Pimenta (2011) identifies characteristics of three integration levels (high, medium and low) in the context of Marketing and Logistics. According to him, high levels of integration are characterized by the balance between formal and informal mechanisms of integration within the points of contact between areas. Basnet (2013) developed a scale for assessing the level of cross-functional integration, and his work is one of the first to measure this element quan-

titatively. However, the study mentioned features integration levels according to the mere presence or absence of mechanisms of integration, not correlating other elements such as: as points of contact and formality and informality of integration.

We believe that a qualitative study can help to improve the understanding about the level of cross-functional integration in order to identify a set of factors beyond the mere presence of integration mechanisms. In this sense, this study aims to characterize different levels of cross-functional integration according to its peculiarities in terms of integration factors (mechanisms), practical perceptions, formality / informality and conflicts between internal functions. Regarding these features, Santos and D'Antone (2014) found no papers dealing with the issues considered here, mainly about differences in the perception between people of the same company in relation to integration factors.

The following section presents a theoretical review about cross-functional integration and level of integration.

2. CROSS-FUNCTIONAL INTEGRATION

The increasing complexity of the competitive environment has required quick decision making and increasing harmony between demand and supply. The management of cross-functional integration can contribute to reach these needs (Silva, Lombardi & Pimenta, 2013). Integration can be defined as "the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment" (Lawrence & Lorsch, 1967, p.11). Thus, it contributes to improve internal cooperation and the competitiveness of the organization (Baofen, 2013).

Pagell (2004) refers to integration as a process in which functions, such as production, purchasing and logistics, work cooperatively to reach acceptable results for the organization. Stank *et al.* (1999) highlight that integration can bring many benefits such as reduced production cycles, successful new product strategies, better understanding of consumer values and also improved service levels.

Kahn and Mentzer (1996) state that cross-functional integration is practiced by processes of interaction and collaboration, consisting, respectively, in both formal and informal processes that lead to departments acting together towards a cohesive organiza-

tion. To Baofen (2013) as antecedents of integration, it is necessary to exist good relationship, trust and commitment in relationships. Jin, Luo & Eksioglu (2013) established that awareness of the competitive potential that integration can provide is not enough to mobilize resources and mitigate resistance to collaboration, and it takes commitment, which is the key element.

The literature on integration presents analyses of various elements such as: integration factors (Daugherty et al 2009); contact points (Mentzer et al., 2008); formality and informality (Kahn & Mentzer, 1996; Ellinger, Keller & Hansen, 2006); integrating effects (Stanket al. 1999; Gimenez, 2006; Jutnner et al. 2007) and level of integration (Basnet, 2013). Kidron et al. (2013), claim that informal and formal mechanisms may increase the level of integration, especially the informal ones. There is also a sub-theme in this issue that discusses about antecedents and consequences of the level of integration (Basnet, 2013). This sub-theme will be specifically addressed below.

2.1 Integration Level

The level of cross-functional integration is the intensity of the involvement of functions with each other, based on the interaction frequency and on the ability to perform activities that require cooperation (Pimenta, 2011). Stank et al. (1999) noted that organizations with high level of integration, through cooperation, achieve higher performance than the less integrated organizations.

Kahn and Mentzer (1996) argue that not all situations require high levels of integration. For these authors, working with critical products and processes, in turbulent environments, requires high levels of internal integration, which in turn will result in higher administrative costs for such an achievement. On the other hand, when the market is stable and the activity does not demand major efforts from different departments, there may be a low integration level, since a high intensity of integration in this situation could compromise the efficiency of tasks.

Formal integration factors, like mutual evaluation and incentive mechanisms, can increase the level of integration between functions (Kahn, 1996; Gimenez & Ventura, 2005; Jüttnner et al 2007). Griffin and

Hauser (1996) highlight that the difference between the ideal level, which is the necessary integration, and the real one, forms the integration gap. If the difference between the need of integration desired by the organization and effective is large, the joint performance can be compromised because the level of integration achieved is not enough to respond to external demands. If the gap is small, it means that there was the desired integration by the organization, and this can positively affect performance.

Pagell (2004) states that the definition of the level of integration is relative, based on the semantic definition of evidences, which are often subjective. Pimenta and Silva (2012) corroborate this statement and add that, to each organization, a high or low level of integration may have different meanings, even for different people from the same organization. Thus, Pimenta (2011) states that it is important to research about what high, low or medium integration means in the perception of managers. As several different responses may arise, these can be analyzed by content and grouped according to the perception of the agents who work in the integrated functions.

According to Pimenta and Silva (2012), there are different ways of analyzing the level of integration: the amount of integration factors used, the frequency of contact, the perception of the agents about the ease to conduct joint processes and decisions.

To Bellmunt and Torres (2013), most part of the literature covers the theme of internal integration from external integration. Thus, internal and external factors of influence should be considered to measure the integration level. For internal integration, the concept most widely accepted is two-dimensional, which considers the interaction (formal aspects) and collaboration (informal aspects). According to Gupta et al. (1986) and Clark and Fujimoto (1991), these two dimensions form a concept where low levels of integration imply low levels of interaction and collaboration, and vice versa. On the other hand, the one-dimensional concept considers that there is an internal integration component (interaction or cooperation, for example). By studying the integration between Marketing and Logistics, Pimenta (2011) presents a classification of three levels of integration and their respective characteristics, as shown in Table 1.

Table 1: Features of different levels of integration

Integration Level	Characteristics
High	Presence of integration factors formally applied
	Trust, team spirit, and informal elements
	There are management actions to generate integration
Medium*	Great willingness to help other functions to resolve conflicts informally
	Little senior management effort
Low	Lack of integration factors **
	Unwillingness of people to integrate
	Insulation between employees and short-term contact

* There may be great efforts of senior management and unwillingness of people.

** There may be integration factors, but not in a balanced way between formal and informal.

Source: Adapted from Pimenta (2011).

Among the various definitions presented in Table 1, “conflicts” is an element that can interfere in the level of integration, depending on its type and intensity. Authors such as Pondy (1989) and Simons and Peterson (2000) argue that conflicts can disrupt the processes and decisions due to the lack of integration factors.

Pondy (1989) clarifies that organizational conflicts were seen in the past as aberrations that interrupted the normal course of processes, breaking the efficiency of the work flow. In a broader perspective, this author suggests that even the worst conflicts can be avoided with the use of management tools, such as: appropriate organizational structure, training to generate mutual understanding of perceptions and goals, or even to separate members with relationship problems.

Simons and Peterson (2000) identify two types of conflicts: 1) task conflicts (related to the content of managerial decisions due to different standpoints about the process); 2) relationship conflicts: (emotional conflicts due to the perception of personal incompatibility). For these authors, the existence of relationship conflict generates poor quality decisions. According to these authors, trust between team members is essential to avoid relationship conflicts and provide higher quality decisions.

The next section deals with the description of the methodological procedures performed in the preparation of this paper.

3. METHODS

This study is considered qualitative and descriptive. A strategy of multiple case studies was conducted, in order to provide a higher representation than a single case study. According to Yin (2005), after obtaining the characteristics of the object of analysis, the researcher must try to replicate of the results in the analysis of other cases, identifying convergences or differences that will contribute to solving the proposed problem.

Two multinational companies, that develop and produce seeds, were studied. These organizations have processing units of seeds and experimental fields in Minas Gerais State, Brazil. As noted in the interviews, the context of these companies indicates a strong need for cross-functional integration for 1) the development of new cultivars; 2) the improvement of genetics and aspects of plant science; 3) the market positioning. Therefore, it was decided to study new product development processes, because they denote high necessity of cross-functional integration in these companies.

3.1 Data collection

Ten in depth interviews were conducted. The interview guide was based on concepts from the literature, divided into three categories: 1) integration factors (Daugherty et al., 2009; Kidron et al., 2013); 2) perception of the level of integration (Kahn & Mentzer, 1996; Pimenta, 2011; Bellmunt and Torres, 2013; Basnet, 2013); 3) impacts of the integra-

tion level on performance (Stank *et al.* 1999; Pagell, 2004; Gimenez, 2006; Jutnner *et al.* 2007; Baofen, 2013). The questions were developed considering the new product development (NPD) processes, and therefore, the 10 interviewees belong to areas directly involved with the NPD process: Operations, R&D, Sales / Marketing. Table 2 shows the characteristics of the respondents.

Table 2: Characteristics of respondents

Company	Interviewed code	Function
1	TO 1	R&D
1	A2	Production
1	A3	R&D
1	A4	R&D
1	A5	Commercial
2	B1	R&D
2	B2	Production
2	B3	R&D
2	B4	Commercial
2	B5	Commercial

All participants were interviewed in their workplace. The interviews lasted around an hour and were recorded with the consent of the participants, allowing subsequent transcription to better understand the interviews.

3.2 Data analysis

The transcriptions were submitted to the technique of content analysis. Based on the guidelines of Bardin (1979), the following steps were adopted:

- » Pre-analysis of the transcripts: quick read, prior identification;
- » In depth analysis;
- » Coding: the particular significance of each element is highlighted in frames;
- » Categorization: codes are grouped into categories defined in the literature or observed in the context of the subject matter

Through these procedures, four categories of analysis related to the level of functional integration were found:

1. Integration factors: mechanisms that generate integration, related to the culture, interpersonal disposal, or formal managerial actions (Pimenta, 2011; Pimenta and Silva, 2012);
2. Perceptions of overlapping: This element was not present in the interview guide. It consists of the main theoretical contribution of this paper and emerged from the interviews and content analysis. Overlapping occurs when an employee perceives the existence of an integration factor, but another (or many others) employee involved in the same process does not perceive it. In such cases, the perception of integration is not homogeneous.
3. Formality / informality: The way the integration factors are operationalized, i.e., formal or informal processes (Ruekert and Walker, 1987; Kahn, 1996; Kahn and Mentzer, 1998).
4. Conflicts: to reduce/eliminate: conflicts between the areas of Production, Marketing and Logistics (Ballou, 2006; Ellegaard and Koch, 2014); conflicts of interests and conflicts of performance between the internal functions and organization; functional strategies not well defined or not clarified; lack of group vision and misaligned objectives (Pondy, 1989; Moses and Ahlström, 2008; Paiva, 2010); and promote trust as a way to reduce conflicts (Simons and Peterson, 2000)

These categories and their respective relationships with the level of integration are defined in the following topic.

4. RESULTS

The four categories identified in the content analysis, reinforced by quotations from the interviewees are explained in this topic. After the individual definition of each one, a set of characteristics of different levels of cross-functional integration is presented.

4.1 Integration Factors

Table 3 shows the analysis of the integration factors, i.e. mechanisms that generate integration. It also shows how these factors are operationalized in the perception of the respondents. Twenty-one integration factors were perceived in different hierarchical levels and different phases of the studied processes. In addition, the type of application of the integration factors was identified according to their formality or informality.

Table 3: Description of the integration factors and presence of formality and informality

Integration Factors	Type of Application Company 1	Type of Application Company 2	Company 1	Company 2
Adequate communication structure	Formal	Formal	There is an excess in the use of communication tools.	There is a well-defined structure.
Consideration of informal groups	Formal	Informal	Managers recognize the need to work in an integrated manner, and encourage this practice.	Managers recognize the voluntary willingness to work in an integrated manner.
Cross-functional meetings	Formal	Formal	There are too many meetings.	There are formal meetings.
Cross-functional teams	Formal	Formal and informal	Meetings are held periodically with the specific group, for alignment between areas.	There are support teams for the process to happen. There are also informal adjustments.
Cross-functional training	Formal	Formal	There is training for related areas. These sometimes occur as meetings for the development of new products.	There is training about the content of the areas and about relationship.
Goals aligned with strategy	Formal	Formal	Individual goals and departments are aligned to the objective of the company.	The employees are encouraged to think of the whole company, towards a common goal.
Group spirit	-	Informal		There is a climate of cooperation, facilitating conflict resolution.
Informal communication	-	Informal	The communication related to all processes is formalized.	People are always available for informal communication.
Information Sharing	Formal	Informal	There is information sharing by equipment and software.	People are not shy about sharing information.
Information technology	Formal	Formal and informal	The company provides modern communication mechanisms, but its use, however, is not satisfactory, which becomes a barrier.	There are ample mechanisms of information, but sometimes they hamper integration. Willingness to share helps integrate.
Integration by hierarchy	Formal	-	There are formal meetings and rules to be followed; besides, some functions depend on marketing to perform their duties.	The functions have independent managers.

Job rotation	Formal	Formal	Job rotation provides necessary skills to integrate areas.	There is job rotation, it is central to the company's development.
Joint planning	Formal	Formal	Formal processes, involving different functions in different stages of product development.	Planning together provides efficiency in the activities to be performed.
Longevity of relationships	Formal and Informal	Formal and informal	Managers acknowledge that a low turnover of employees helps to integrate functions. But there are no initiatives to reduce turnover.	The company has older employees, who create trust and integration between people.
Mutual reward / evaluation systems	Formal	Formal	There are differences in rewards but this does not generate discomfort among the areas.	The performance evaluation and reward systems and commission do not generate discomfort. There is transparency.
Mutual understanding	Formal	Informal	There is a good mechanism for information, but sometimes when there is a change of policy it is not well notified to all functions.	It happens mainly in managerial levels. Somewhat lacking in operational levels.
Non-conflicting goals	Formal	Formal	There are conflicting goals and it generates duplicate tasks.	There are common goals, based on the final customer, but the perspectives are conflicting.
Physical proximity	Formal and informal	Informal	Physical proximity is related to the company's infrastructure and encourages informal communication, which facilitates discussion and understanding of the activities.	Physical proximity is related to the company's infrastructure that facilitates integration and communication between areas.
Recognition of Interdependence	Formal	Informal	There is planning between these teams, respecting the knowledge of other areas.	There is recognition of interdependence, which facilitates cooperation.
Top management support	Formal	Formal	Top management supports the integration process.	Top management is integrated with all areas, all of which account for the risks.

Trust	Formal and informal	Formal and informal	There is trust, but some people act inappropriately. When this happens, meetings to resolve the conflict are conducted.	There is trust, but some people act inappropriately. When this happens, meetings to resolve the conflict are conducted.
Willingness to resolve conflicts	Formal	Informal	There are meetings to get in touch with other departments and discuss solutions to resolve the conflict.	There is something structured to resolve conflicts, but people end up solving them by themselves.

Among the factors above, we can highlight the planning together as fundamental to the smooth running of activities in both companies, since these factors end up encouraging other informal mechanisms. This planning often happens in the form of cross-functional meetings.

There is a meeting to evaluate the product promotion and the new molecule requests. Too many meetings, this Company lives for meetings (A4). The impact of the planning is direct, you can optimize time, resources and get maximum efficiency in the activity that you are doing (B3). There are systematic meetings with set agendas (B4).

In both companies, goals are aligned with the strategy. "We can criticize or not the goals that the company has, but since the goals are outlined, they call people to trace the individual goals in accordance with the company's goal "(A3). For Company 2, the alignment of objectives helps to eliminate conflicts of interest. "It is explained to each employee, from when he or she starts to work here, so the company induces them to think not as an individual, but as a whole company"(B3). The meetings are also opportunities to reduce misunderstandings.

In the annual conventions, there is opportunity to better know each other and to understand the objectives of each other (A3). People

understand the interdependence. Most part of the teams respects the knowledge of other area (A4); The cooperative work between the teams is very strong, because they acknowledge interdependence "(B3).

Based on these descriptions, one can see that, to a greater or lesser extent, the two companies have positive aspects with respect to how integration factors are applied. However, within a same company, respondents showed antagonistic perceptions with regard to the occurrence of these factors. These distortions may signal a drop in the level of integration. The next topic deals with this issue.

4.2 Overlapping of perceptions on the integration factors

There are perceptions of overlaps with regard to the existence of integration factors. For example, while an interviewee from a given company has recognized a factor, another one who has a different, opposite view, cannot recognize it. Table 4 presents all factors that have overlaps in the two companies studied. For this analysis, it was found that when a respondent perceives an integration factor within the company (Present), and the other does not (Missing), there is an overlap of perception (marked in gray). When all respondents indicate that certain factor is present or missing within the company, it means that there is no overlap of perception.

Table 4: Grouped perception showing overlap between presence and absence of integration factors

	Company 1	Company 2		
Factors	Present	Missing	Present	Missing
Adequate communication structure	X	X	X	
Consideration of informal groups	X		X	X
Cross-functional meetings	X	X	X	
Cross-functional teams	X	X	X	
Cross-functional training	X	X	X	X
Goals aligned with strategy	X	X	X	
Group spirit	X	X	X	X
Informal communication	X	X	X	X
Information sharing	X	X	X	X
Information technology	X	X	X	X
Integration by hierarchy	X	X	X	X
Job rotation	X	X	X	X
Joint Planning	X		X	
Longevity of relationships	X	X	X	X
Mutual evaluation/ rewards systems	X	X	X	
Mutual understanding	X	X	X	
Non-conflicting goals	X	X	X	X
Physical proximity	X	X	X	X
Recognition of Interdependence	X	X	X	
Top management support	X	X	X	
Trust	X	X	X	X
Willingness to resolve conflicts	X	X	X	X

It is necessary to highlight that the factor “Joint Planning” did not present overlapping perceptions in any of the companies. All respondents claimed that this factor is present within companies. To Company 1, the consideration to informal groups, is another factor present. In Company 2, the respondents highlighted eight factors: Hierarchical dependence between functions; Top management support; Adequate communication structure; Cross-functional teams; Mutual evaluation/ rewards system; Cross-functional meetings; Mutual understanding; Goals aligned with strategy.

To Company 1, three of the respondents said that the company values the longevity of relationships, contrary to respondent A4’s reply, which states that

Today we have a large number of rotating people within the company. So we have a certain

age gap, where we have the older people, average people we do not see much, and the younger staff. This newer staff has a very high turnover, so we’re losing some of this expertise of information exchange (A4).

The same happens with Company 2, where interviewee B4 said that the organization “has a very old staff, but we have a point where the company is extremely dynamic, to move people to seek diversity, but the well-defined processes can guide us” (B2).

This overlap also happens when you ask about the top management support for integration processes. For interviewee A5 “We have done a great job to integrate various events to provide mutual understanding.” However, for interviewee A3, “there is a real difficulty to integrate the team’s base and the leadership does not cooperate with it”.

When asked about the existence of cross-functional teams, three of the respondents from Company 1 claim that it exists. However, interviewee A3 said that “the concept is very well implemented, but in practice there is a difficulty in demanded resources and investment in time” (A3); “In the past there were temporary teams, that now are specific groups” (A4); “It existed in the past, not now” (A5).

Overlapping perceptions are even more visible when questioned on cross-functional meetings. Interviewee A3 said that “there are too many meetings, it is a negative thing, they are excessive”; while participant A5 reports that “it is not common, but it exists in the company”.

Another divergence noted was about the system of evaluations/ rewards. Interviewee A2 stated that “people from an area do not aim to harm the performance of other areas” but he said that there are differences of reward policies among areas. This point of difference is also highlighted by other respondents. However, it also indicates that there are discomforts with this issue.

The major discomfort is not the competition between the areas, but the difference between the awards. The commercial area has a prize almost six times greater than the R&D area or a marketing area (A4). Discomfort, and some actually have privileges (A3). There is a certain jealousy of the commercial part ... Then the other departments see us organizing parties, traveling... So, our award, in general, our remuneration, is far superior to other departments (A5).

Considering the willingness to resolve conflicts in Company 1, four respondents said that teams work together. However, it is important to note the response of interviewee A3, in which he states that:

If I'm not from that area and choose to respond, and is not successful, I can be reprimanded for it. So, most of the people are shy to provide help at some points (A3).

In Company 2, interviewed B4, stated that “we have business teams, who make it very easy for problem and conflict solving”. As for the B3:

This integration exists, but when there is any more difficult problem it is directed to lead managers. However, it occurs, but only in cases where the problem is broader (B3).

Interviewee A4 said that information sharing “frequently occurs in the meetings.” However, interviewees A2 and A3 informed that there is a lack of time to perform it, “the scarce time limits people, but people are willing to share, sometimes with some barriers” (A2). “The level of activities that each person manages within a private company is high. You are pressed for a result, you are very busy, so the time you have for parallel problems is scarce” (A3). The overlap also happens in Company 2, where respondent B4 says he has “open access”, i.e. has no problems in sharing information. However, B3 states that “there are certain sectors within the company who work with absolute secrecy. It will only be diffused when you are very sure about the impact that such information will bring to the company's own image” (B3).

With regard to the knowledge that an area has about another, interviewee A1 states that it occurs through communication. However, A4 states: “often we have new people in the area, that do not know what is the real function of the area is. Thus, there are conflicts in which an area does the same thing as another. Then you need to have an adjustment here”. The lack of mutual understanding within a given area also seems to generate difficulties in the alignment of the goals with the organization:

The company demands what we should do, but conflicts between functions often emerge. The person does not understand his/ her function, and ends up doing duplicate work, doing the same that other teams are doing (A4). Sometimes there is a lack of clarity in the description of each function to avoid these conflicts (A2).

Taking into account the training conducted within Company 2, interviewee B3 said that this “is highly valued and encouraged.” However, B2 reports:

We have, for example, leadership training, which has several modules. People from various fields gather for a yearly meeting of company managers. Strategies are explained, sales plans, however, we don't have a specific training for Product Development, or integration (B2).

When asked if physical proximity encourages informal communication, Interviewee B3 stated that: “it happens primarily in newly built offices, where the entire space was designed to facilitate integration”. However, for B2, Company 2 “has several research centers and production plants throughout Brazil, I

would say that this geographic distance inhibits integration”.

About the influence of hierarchy on integration in Company 2, B3 states: “this happens because hierarchical relationships are very clear and highly respected”. In spite of this, B1 does not agree with that, “because the company is very horizontal and stimulates us to overcome barriers. There are few barriers, we do not see much value in it” (B1).

About Group spirit within Company 2, three interviewees stated that it exists and is well stimulated.

However, B2 opposes this view: “if all goes well, ok, however, if there is a crisis situation with regard to the area, then it simply disappears (Group spirit)” (B2).

Company 1 has more overlaps than Company 2. This irregular perception of respondents shows that cross-functional integration does not occur uniformly over the processes or between different hierarchical levels. Table 5 shows the hierarchical levels and stages of the studied processes. It was also highlights the perception about formality and informality, as well as the integration factor that corresponds to these states.

Table 5: Differences of perception of integration at different hierarchical levels at different stages of product development

		Occurrence of integration in the phases of product development		
		Early stage	Intermediate phase	Final phase
Hierarchical levels	Management	A1 - formal (cross-functional meetings, planning) Formal establishing informal (exchange of experience)	B2 - formal establishing informal (Top management support); Formal (hierarchical dependency between functions)	A5 - formal (information sharing) B4 - informal (Group spirit) Formal establishing informal (information sharing)
	Operational Level	A2 - formal (functional meetings) A3 - formal (lack of confidence, objectives sharing) A4 - formal (cross-functional meetings)	B1 - formal establishing informal (meetings creating ties through forums for discussion) B3 - formal (cross-functional teams)	B5- informal (Group spirit) Formal establishing informal (information sharing)

It is important to note that, according to the hierarchical position of the interviewee and phase in Product Development, perceptions of integration and occurrence of integration factors may differ. There may be integration factors in a hierarchical level and not in others. Or, these factors exist in a part of the process, and in others, no.

This is clear within Table 5, in which the functions of the interviewees A4, A3 and A2 are at the operational level. These three people presented a large volume of missing integration factors. This group also complained about the excess of formality, especially in cross-functional meetings. As for Company 2, the highlight comes from Interviewee B2, who presented more missing factors, and signs for the majority of formal processes. In addition, B2 is at the management level, which differs from Company 1, in which the interviewees that perceive lack of factors are at operating levels.

Thus, it can be considered that, a high level of cross-functional integration is related to a homogeneous existence of integration factors in all levels and at all stages of the process.

4.3 formality and informality

For Kidron et al. (2013) informal and formal mechanisms may increase the level of integration, especially the informal atmosphere. But a balance between the two is necessary. The analysis of field data revealed a complaint by respondents from Company 1 on the excessive formality, as seen in the following excerpts:

No, we have nothing informal within the company. All is well formalized. Emails, communications, everything is registered, nothing is informal. Because you can be here today, tomorrow you're in another area, and someone

else comes and takes what was your decision and leaves. Then informality does not exist in the company (A5). I do not see very informal communication, but formal communication between the teams (A4). We have ground rules, there are several formal meetings or created environments to induce interaction between areas, i.e. the hierarchy operates asking us to have formal moments for it (A3).

Interviewee A3 stated: “there is a bureaucratic issue, it requires various departments interacting to solve bureaucracies and to generate confidence between areas. I would say a lot of formality is necessary within the processes to tie confidence” (A3). The same respondent states that “it is easy to share information, informally. Because we have *communicator* (a instant messenger tool) inside the company, where no formality is required for the exchange of information” (A3).

Considering this issue of informal communication and the mechanisms of information technology, participant A4 states that “often the person ends up not having a personal conversation, they prefer sending an email than to call or stop in the hall to talk. In my view, this IT issue ends up generating more formal communication than informal” (A4).

In an opposite view from Company 1, Company 2 presents more informality in their processes:

The company has a lot of informality, it has no problems in this kind of relationship. It is not bureaucratic, we can talk, talk, no problem (B2). Certainly, the company encourages it enough (B1). However, depending on the information we are seeking, communication is formal (B4). There is formal integration, but informal integration also exists and it is constant, there is a big incentive for people from different areas to seek information of what is happening in the other areas (B3).

Thus, when there are formal processes, that stimulates informal collaborative behavior, the interaction between departments and even between people. It happens in a more harmonious way, generating a high level of integration.

4.4 Conflicts

Although the two surveyed companies promote actions to manage relations between areas efficiently,

some conflicts may arise and affect negatively both the cross-functional integration and the progress of new product development processes. In Company 1, conflicts can occur for lack of planning, or when “planning is not considered in the field phases. It also happens when communication is not clear about updates of the project’s progress” (A1). Conflicts can happen in the transition from one stage of NPD to another, because “some issue that occurs in the earlier stages can impact the next phase” (A2). According to interviewee A5, this creates conflicts between the functions that are part of NDP.

This type of conflict in NPD processes may also generate mistrust between the areas:

If I work in the third phase and receive a product from the second phase that has quality problems or delay, it does not reach expectations, and then you do not really believe anymore in what the area delivers, there is a distrust” (A3).

The respondent used the term *distrust* to refer to this problem, when an area does not deliver its part as it should, resulting in conflicts between them. The lack of trust is an element related to relationship conflicts and may generate management decisions of poor quality, as cited by Simons and Peterson (2000).

Interviewee A4 mentioned another conflict highlighted within Company 1:

Is the conflict of interest, they push the problems to the other department. So, a conflict of interest arises between areas. One area gains more responsibility than the other. It also happens because the areas don’t know the responsibilities of each other, so, an earlier problem may affect the next phase of NPD. (A4),

In Company 2, the main problems are related to the lack of alignment between functional goals and market positioning of products.

Self-centeredness, they think that their goals are more important than the other functions (B1). There is conflict of interest in positioning of some products in the market, because today the company works with a number of different products within the agricultural line (B3).

A likely explanation for these conflicts of interest may be the system of evaluation and rewards that the company adopts. Interviewee B2, with this regard, said: “I think that indicators inhibit coop-

eration, sometimes it conflicts somewhat with our greater goal, which is customer service” (B2).

Considering the above, it becomes clear that conflicts can be useful elements to improve the relationship and collaboration between people. But when they turn to manifest conflicts, based on personal interest, they can lead to unilateral decisions. Relationship conflicts, as quoted by Simons and Peterson (2000), may also culminate in the same situation. These types of conflicts are perceived as being difficult to solve and may reduce the level of integration. Moreover, as cited by Pondy (1989), conflicts can be a source of enhancement, and thus contribute to the increased integration level. However, they must be managed through integration factors, such as training to generate mutual understanding of perceptions and goals, or even separating members with relationship problems.

4.5 Characterization of the level of integration

The level of cross-functional integration can be analyzed as a combination of three factors: homogeneous perception of integration factors throughout the stages of the process (as opposed to overlapping), balance between formality and informality, lack of manifest conflicts of interest, as described in the topics above.

With regard to the homogeneous perception of integration factors, Company 1 displays the highest

level of overlap. Considering the formality and informality, again, this Company presents excessive formality, as highlighted by the interviewees. The lack of balance between formal and informal integration factors indicates that the level of integration should not be high.

For Company 2, one of the most important elements to characterize its integration level is the existence of informality, encouraged by formal factors like cross-functional teams and top management support. In this company, the cross-functional teams are considered very important for the smooth running of the NPD, mainly because it facilitates the sharing of information between the areas, and reduces the incidence of manifest conflict of interest.

Based on field data, Company 2 has more consistency of its activities related to integration than Company 1, because it aligns formal and informal aspects that are critical for integration. The perception of integration factors is also more homogeneous in Company 2 than Company 1. In addition, respondents from Company 2 identify fewer situations of manifest conflicts of interest related to functional relationships than Company 1. Such evidences indicate that the level of integration in Company 2 is higher than in Company 1.

Based on the conclusions reached at the end of each subtopic of the results, we propose a definition of different levels of cross-functional integration and their respective characteristics, as shown in Table 6.

Table 6: Characteristics of functional integration levels

Integration functional level	Characteristics
High	Integration factors are perceived homogeneously by the different functions involved in the implementation of processes, throughout their initial, intermediate and final stages; Integration factors are perceived homogeneously at different hierarchical levels: strategic, managerial and operational, when the processes depend on decisions made at different levels; Existence of formal and informal integration factors that can generate collaboration without excessive bureaucracy and rigid structures; Absence of manifest conflicts of interest that are often difficult to solve through mutual cooperation between the integrated functions. The existence of team spirit and mutual understanding between the functions contributes to the solution of conflicts, strengthening the relationships. The functions are more concerned with organizational results and therefore are willing to sacrifice functional privileges.

Medium	<p>There is some overlap about the perception of absence/presence of integration factors along different stages of the process, but that is not enough to hinder cooperation toward the common goals;</p> <p>There is some overlap about the perception of absence/presence of integration factors at different hierarchical levels, but that is not enough to hinder cooperation toward the common goals;</p> <p>Integration is achieved primarily by formal factors. There are more formal than informal factors - or - Integration is achieved primarily by informal factors. There are more informal than formal factors. There is not a balance between formality and informality. There are no formal factors that stimulate the existence of informal collaborative behaviors.</p> <p>There are conflicts of interest, difficult to solve, which are sometimes resolved through mutual cooperation between the integrated functions, or hierarchical order impositions.</p>
Low	<p>The integration factors may exist at some stages of the process, but are missing at others;</p> <p>There is too much formality in the application of integration factors, generating excessive bureaucracy and waste of time in meetings and standardized tasks - or - there is over-reliance on informalities to achieve integration, in which case the management does not define formal integration factors such as: meetings, planning together and cross-functional teams;</p> <p>Existence of manifest conflicts of interest that are often difficult to solve through cooperation between the functions. Group spirit and mutual understanding are not perceived between the functions, creating an environment in which each function is more concerned with functional results than with the result of the organization as a whole.</p>

5. FINAL CONSIDERATIONS

This study proposes a set of characteristics to define different levels of cross-functional integration based on: homogeneous perception about integration factors throughout the stages of the process, balance between formality and informality, absence of manifest conflicts of interest. The case studies helped to identify different situations involving each of these three elements in order to define the characteristics of the three different integration levels: high, medium and low, as detailed in Table 6.

About the theoretical contribution, one relevant point of this study was to verify the existence of overlapping perceptions about integration factors, i.e., different respondents had opposing opinions on the existence or not of the same factor. When there is overlapping, integration is not perceived homogeneously among people in the same process, and that fact may indicate low level of integration. Another element related to low levels of integration is the presence of manifest conflicts. In the companies studied, the main integration problems are related to conflicts of interest and difficulty to understand its real function.

From a practical point of view, managers should observe activities in which a high level of integration can generate improvements in processes and outcomes. Firstly, they should manage the relation-

ships between the integrated functions based on the presence of integration factors over all the phases of the process in analysis. Secondly, managers should observe the existence of balance between formal and informal integration factors. Formal factors may stimulate the existence of spontaneous cooperative behaviors. Thirdly, managers should pay attention to the motives that generate manifest conflicts of interest, once they can reduce the integration level due to their particular point of view in prejudice of the whole company's perspective. Finally, excessive application of formal factors can create a barrier to integration. Interviewees from the two surveyed companies explained that Information Technology in excess makes it difficult to integrate, since it excessively formalizes processes and cuts people from informal communications.

Due to the method of case study, this research has limitations of coverage, since its conclusions cannot be generalized. Future studies may suggest the construction of a scale for assessing the level of integration, based on each of the three defined levels and their respective characteristics. Thus, these studies may test correlations among the elements here suggested in order to identify levels of integration in different stages of several processes that require cooperation among internal functions. Especially when these processes involve decisions of different hierarchical levels for its implementation.

ACKNOWLEDGMENTS

We would like to thank the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for financial assistance through Project APQ2518-15

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