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INTERNAL LOGISTICS, EXTERNAL COMMUNICATION, INFORMATION PROCESSING AND FINANCIAL CONTROL: AN ANALYSIS WITH BRAZILIAN MICRO AND SMALL ENTERPRISES

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ABSTRACT: The aim of this study was to analyze the impact of interaction between external communication, internal information processing and internal logistics in the financial control of Brazilian Micro and Small Enterprises. It was characterized as a survey with a quantitative approach, and the applied statistics consist of confirmatory factor analysis and structural equation models, based on a sample of 183 companies. Considering a significance smaller than 0.05, the main results have presented that internal information processing and internal logistics showed a positive and significant relationship with financial control. Internal logistics and external communication also proved to be positively and significantly correlated.

Keywords: *Operation Strategy, Internal Logistics, Integration.*

1. INTRODUCTION

The area of operations management has devoted much attention to the impact on business performance in relation to issues arising from the various functional relationships in organizations, as well as the interfaces with stakeholders that make up the value chain of operations. Studies analyzing the integration between the operations area and other areas of the company have been presented in recent literature, addressing, for example, integration between manufacturing and marketing (Hausman, Montgomery, & Roth, 2002; O'Leary-Kelly & Flores, 2002) and the integration in the areas of manufacturing, research and development and marketing, with an activity oriented perspective (Paiva, Gavronski, & D'Avila, 2010). The argument would be that integration between business functions provides a positive impact on company performance, as shown in the paper of Vickery, Jayaram, Droge, and Calantone (2003) too.

Despite a significant part of research studies reporting on operations in manufacturing environments, the application of logistics concepts and their relationships in the value chain of operations applied to retail is still incipient in literature. However, it is questionable whether the results of such works are also applicable to the context of Micro and Small Enterprises (MSEs) that operate in the retail and service areas, since the studies are usually performed with samples involving large manufacturing industries. It is in this context, that the present research seeks to provide a contribution to bridge this gap that was identified. To this end, this research was mirrored in the work of Gimenez and Ventura (2005) when they studied the impact on logistics performance from the integration of logistics, production, logistics-marketing and external integration identified in the Spanish food, detergent and perfumery industry. The results claim that high levels of integration between logistics and marketing resulted in high levels of performance.

In this sense, the proposed theoretical model was designed to identify the existence of possible associations of logistics functional interfaces with other constructs such as external communications and internal processing of information and its influence on financial control (it is considered that better financial control leads to better performance). The constructs of external communication and internal processing of information have been inserted to reflect the peculiarities of the retail context, since it is the last link between manufacturer and consumer, whose relationship has been undergoing rapid changes with the adoption of information and communication technologies.

Therefore, the objective of this study was to analyze the impact of interaction between external communication, internal information processing and logistics elements on a company's financial control. The specific objectives intended to be achieved are the following: i) examine whether internal logistics presents a positive relationship with external communication; ii) verify whether internal logistics presents a positive relationship with internal information processing; iii) examine whether external communication and internal information processing are positively related to each other, and iv) examine whether each of the three variables mentioned above show a positive relationship with the financial control. In order to do this, we used a database from Brazilian companies that are located in the city of Uberlândia (State of Minas Gerais). This sample, which is composed of 183 companies, may not represent a Brazilian reality, but it may serve as a estimate.

The results show consistency with the theoretical framework used and report the intensity of the relationships derived from internal logistics in retail companies as well as effects on the financial control. These results are theoretical contributions relevant for academics and managers because it enables them to understand the nature of future decisions involving these concepts more clearly.

Besides the aspects already mentioned, there is considerable justification to consider the application of the theory to MSEs, especially in the Brazilian situation, because: i) in Brazil there are 5.1 million businesses, of which 98% are MSEs (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas de São Paulo [SEBRAE/SP], 2010), ii) because they are small businesses, their efforts to meet competitive challenges is differentiated from large corporations, which shows the need for specific studies in their con-

text (Drumond & Toaldo, 2009), and as outlined by Drummond and Toaldo (2009, p. 2), "in the set of their entrepreneurial characteristics, the decision-making in MSEs is usually inherently simple, random, undisciplined, spontaneous, unstructured and focused on the short term".

Analyses of this type of company are important because of their high sensitivity to sales growth, which is in line with the distinctive characteristics of an emerging economy such as Brazil. The government's proposal to create the Brazilian Ministry of MSEs reveals the importance and relevance of these firms in the economy. Perhaps these considerations present an extreme situation, but this reinforces the need for studies in this context, which is so specific and different from the others. Additionally, it is notable that there is no knowledge, to date, of similar works in national and international literature on the theoretical relationships conceived in this paper.

After the introduction of the relevant aspects and objectives of this work, the paper is structured in four sections with the following format: Section 2 contains the theoretical constructs as the basis for the formulation of hypotheses to be tested. Section 3 describes the characteristics of sample data and data processing procedures. Section 4 discusses the results and presents theories that have arisen from the research. Section 5 closes the paper with concluding remarks.

2. THEORY AND HYPOTHESES

Logistics services for the client are related to place, time and utility, assuring the consumer that "the product is at the right place, at the time the consumer wants it, and in an undamaged condition" (Emerson & Grimm, 1996, p.29). According to Gimenez and Ventura (2005), traditionally, two areas could be highlighted within organizations: production and marketing. Other areas such as logistics are considered as support functions. "Logistics has, in the past, been considered a narrowly-defined functional activity concerned with tasks such as transportation, warehousing, inventory, and materials management" (Stock, Greis, & Kasarda, 1998, p. 38). However, this concept has been undergoing rapid changes as firms respond to external environment pressures, not only in the level of competition, but also in new consumer demands.

The new concept of logistics environment, should also be considered, as changes in logistics capabilities, technology and management techniques have

enabled logistics to become a significant mechanism for the integration and coordination of activities within the stages of the supply chain (Stock et al., 1998). An adequate logistics management can reduce transaction costs, lower stock levels and provide efficient services (Rollins, Pekkarinen, & Mehtala, 2011). "Implicit in the recognition of the stages of integrated logistics was the notion that benefits, especially cost benefits, will be realized by companies that operate their logistics processes as an integrated system rather than by optimizing functional subsystems" (Stock et al., 1998, p. 45). The positive impacts of collaboration in the logistics management, in the intra-firm context, are well supported by previous works. However, inter-firm collaboration may also positively impact this management, although few studies have focused on this (Rollins et al., 2011).

"Before the existence of the integrated logistics concept (supply-production-distribution), some of the today's logistical responsibilities were under production or marketing control" (Gimenez & Ventura, 2005, p.22). That is, there is an increasing awareness that this function has an impact and participation in strategic decisions of organizations. "The idea that firms might develop logistics capabilities that support basic business or manufacturing objectives is not new. Throughout the 1990s, a number of papers have attempted to uncover typologies of logistics strategy that relate individual firm practices to strategy specifications" (Stock, Greis, & Kasarda, 2000, p.532).

With the changes in the business environment, the concepts of logistics service evolved and include "several value-added operational logistics tasks, such as packaging, third-party inventory management, bar coding, and information systems" (Mentzer, Flint, & Hult, 2001, p. 83). This operational logistics tasks were considered in this paper, and we named them like "internal logistics", and this activities should "interact with other functional areas" (Stock et al., 1998, p. 46). Results from the study of Sakakibara, Flynn, Schroeder, and Morris (1997, p.1256) "suggest that how a firm manages its infrastructure, especially quality management and manufacturing strategy and workforce management, seems to play an important role in manufacturing performance". Besides it, according to Kannan and Tan (2005, p.159), at an operational level, the quality management and practices of supply chain management, among other, "can be deployed together to create value"; while them have "distinct characteristics and goals, there are elements of each that are

common and which can be successfully reinforced by each other".

Thus, we consider "operational" (Swink, Narasimhan, & Wang, 2007) aspects of logistics in our model because we also consider that internal logistics plays an important role (or, at least, an indicative to this) on the companies' performance, especially in the retail context. Based on the arguments presented, we developed the first hypothesis of the study: Hypothesis 1 (H_1) - internal logistics is positively related to financial control (in this paper, financial control indicators serve as a proxy to business performance, as will be explained later).

With the transfer of these responsibilities to a specific area of logistics, it is coherent to consider that Internal Information Processing (IIP) in the organization is positively related to the development of logistics activities, specially to the internal logistics. Internal information processing involves market knowledge, information dissemination within the organization and the process of interpreting this shared information (Hult, Ketchen, & Slater, 2005). In this paper, we analyze IIP in the organization, taking into account the known information about the company's performance, the internal sharing of that information and their ability to interpret and follow it.

Day (1994) comments that IIP may have its beginning, for example, in the search for an explanation as to why performance is declining. The collection of secondary information would also be part of this process, which would lead to the acquisition and distribution (Narver & Slater, 1990) of diagnostic information and possible solutions to the problem, in this case, the decline in performance. In this sense, Lee, Padmanabhan and Whang (1997) note that when a piece of information is transmitted in a distorted way along the supply chain, that can cause huge inefficiencies in the company, such as: excessive inventory investment, terrible customer service, revenue losses and others. The interpretation of this information is also a fundamental part of the process, and can be facilitated when managers have mental models for analysis (Day, 1994). Based on these considerations, we established the second hypothesis of the study: H_2 - internal information processing and internal logistics are positively related.

"As organizations grow and age, part of their market information processing requires search routines that will yield higher levels of knowledge" (Sinkula, 1994, p. 36), that is, the company's experi-

ence, gained over time and its performance in the market, contribute to the improvement of its information processing. "Why do organizations process information? The answer most often given in the literature is that organizations process information to reduce uncertainty" (Daft & Lengel, 1986, p.554). Given a business environment characterized by constant changes and growing needs of analysis of market data, it is understood that information processing is relevant for companies to be able to provide an adequate response to the environment in which they operate (Day, 1994; Hult et al., 2005; Morgan, Vorhies, & Mason, 2009).

As Tushman and Nadler (1978, p.615) states, "organization structure must perform the major functions of facilitating the collection of information from external areas as well as permitting effective processing of information within and between subunits which make up the organization". Thus, it's expected that the better is the organization information processing, the better will be its performance (Jaworski and Kohli, 1993; Morgan et al., 2009), which is the argument behind the third hypothesis of this study: H_3 - internal information processing is positively related to financial control.

As a "plant that shows strengths in quality management and manufacturing strategy is very likely to have good practices in other areas" (Sakakibara et al., 1997, p.1256), and as it is expected that information processing will influence the management of internal activities (Narayanan, Jayaraman, Luo and Swaminathan, 2011), we point that the information processing will be positively related to company performance. This argument presents itself mainly due to the fact that with the adoption of active management, for example based on the customer feedback (Morgan & Rego, 2006; Morgan et al., 2009), superior performance is expected. However, this depends on financial management and control activities, and consequently, information generated internally and in due time for decision making. With high levels of information processing, it is understood that the generation of this information and process management can be done more effectively.

As showed by Jaworski and Kohli (1993, pp.55-56), "tension among departments is likely to inhibit a concerted response by the departments to market needs, thereby hampering a market orientation". Also, according to these authors, the greater the interaction between the departments of a company, the greater is its responsiveness. Taking as a basis

that high levels of internal processing of information would be indicative of lower levels of conflict in organizations, and that market orientation is closely related to the company's external communication ability, it is understood that these two variables are positively related, as outlined in the next hypothesis: H_4 - internal information processing is positively related to companies' external communication. This hypothesis have some fundamentals in the Tushman and Nadler (1978) approach, previously commented. Thus, if internal information processing occurs without major impediments, generated by intra-organizational conflicts for example, the company's ability to be market-oriented is positively affected.

The integration of logistics activities beyond the limits of the company has also received special attention in literature (Gimenez & Ventura, 2005). In this work, external integration is related to marketing activities (Kohli, Jaworski, & Kumar, 1993) and communication with the external environment in general, and there are considerable arguments for the positive impact of interaction between marketing and operations in business performance (Emerson & Grimm, 1996). If the company which is in a dynamic and competitive environment (Smith, 1965) cannot adequately monitor and respond to changes occurring in the market, it is possible that it will achieve increasingly inferior performance compared to its competitors, and even to its own historical performance.

Pagell (2004, p.463) presented in his work a model that illustrates the integration of strategic areas in the company and its impact on performance, being such interaction based on external environment. Stock et al. (1998, p.39) also defended an argument that the logistics environment is related to the competitive environment (external). In addition, Pagell (2004) highlights that the interaction is influenced by factors such as formal and informal communication, organizational culture, worker rotation, support of top management, among others.

Communication can also be an important factor to try to get consumer confidence (Carr & Pearson, 1999; Freeland, 1991) as well as generating greater benefits in the integration (Corbett, Blackburn, & Wassenhove, 1999). That is, both internal and external environments presented some relation to logistics activities (Stock et al., 1998; Stock et al., 2000). Since a positive relationship between external communication and internal information processing, and between internal information processing and internal logistics is expected, it is understood that the

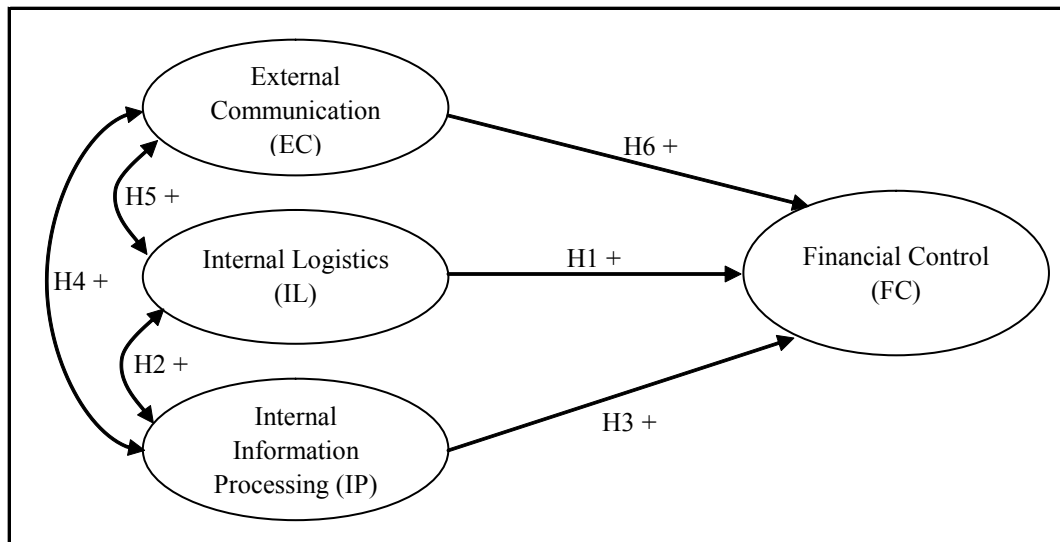
relationship between internal logistics and external communication will be positive, that is, the higher the score of one, the higher the score of the other. In other words, companies that foster a proper management of its external communication are probably also concerned with the proper management of its logistics, as to meet its customer's demands it must provide efficient logistics. Thus, we have H_5 : external communication and internal logistics are positively related.

Finally, we have the last hypothesis of the present study: H_6 - external communication has a positive relation with the company's performance (in this pa-

per, the proxy to represent the performance was the financial control of the companies). The argument to justify the effect on performance which could be related to external communication is in the fact that "organizations that are market-oriented, i.e., those that track and respond to customer needs and preferences can better satisfy customers and, hence, perform at higher levels" (Jaworski & Kohli, 1993, p.57).

Summarizing, the proposition for this work to study the relationships between the constructs of external communication, internal logistics, internal information processing and financial control are represented in the theoretical model showed in Figure 1.

Figure 1: Theoretical model of the study



The performance's companies in other papers (such as: Kannan and Tan, 2005; Morgan and Rego, 2006; Swink et al., 2007; and Morgan et al., 2009) was measure by return on assets, return on sales, net operating cash flows, annual sales growth, among others. In the database that we have access, there was not information such those, but there was information about financial control of the firms. As the main job of financial managers is to maximize the wealth of its shareholders (Brigham & Ehrhardt, 2007), and the maximization of this wealth undergoes management processes and result assessments, we consider the financial control as a proxy to financial performance of the companies that we analyzed.

Thus, it is noteworthy that in this article the way in which the perception of the executives reflects the control and financial management of the company was used as a proxy to represent the company's per-

formance. "The relationship between information and decision is narrow, since decisions are made in the present regarding events that will happen in the future" (Almeida, 2006, p. 315). That is, if the company keeps proper management of its operations, control would be facilitated and the probability of having positive performance would be higher than in a situation where the level of management and control are minimal. In this article, therefore, it is assumed that firms with higher levels of financial control have a greater ability to achieve higher performance than companies with lower levels of financial control.

3. PROCEDURES AND METHODS

This research was characterized as a survey with a quantitative approach because the goal was to measure association bonds between variables. For

this work, the analysis was developed in a primary database. A team of teachers belonging to a Business School in the city of Belo Horizonte (State of Minas Gerais, Brazil), was hired by SEBRAE/MG to develop a data collection meta-instrument covering the organizational elements most relevant to the management of Micro and Small Enterprises. There were created 18 scales that contain a total of 210 questions separated into different types of organizational aspects of the company, like marketing and sales, information technology, finance and accounting aspects, customer focus, divulgation of the company, logistics etc. Each of the questions that composed the questionnaire could be answered by selecting items on a scale with labels ranging from 0 to 4 and N.A. (Not Applicable).

The final version of each of these scales, after a pre-test was performed, was applied by instructors on managers and owners of micro and small enterprises in the retail sector located in the city of Uberlândia (State of Minas Gerais, Brazil), in the period between May/2005 August/2005. All MSEs business owners of the city were invited through the media to participate in this project. In part, this ensured equal probability for all to be part of the sample (some business owners did not participate of the research for different reasons, and as a consequence this presented some limitations in the conclusions of this study). Out of a total of 506 companies from many different lines of business that joined the study, 183 completed questionnaires were obtained, although some contained missing values. This represented a response rate of approximately 36%, which can be considered a fairly high value compared to the percentage analyzed by Malhotra and Grover (1998). We estimated that, in 2005, there were around 18,000 MSEs in the city of Uberlândia (SEBRAE, 2007; IBGE, 2011). The average age of the companies (until 2005) was 9.5 years and they had an average of 6 employees.

Regarding missing values, they can occur for reasons such as filling errors, and their impact can negatively affect the analysis by increasing the occurrence of undercurrents in the results and also by reducing of sample size, making it, as the case may be, inappropriate for analysis (Hair, Anderson, Tatham, & Black, 2005). Also according to Hair et al. (2005) procedures such as assigning values by the method of total availability, the substitution method, using only complete data, among others can be used in the treatment of lost data. In the case of this research, we chose to replace the missing values by the general

average attributed to the question by the respondent firms; this procedure also represents a limitation to the results and conclusions of the study.

Content, construct and nomological validity were verified as methodological procedures. Content validity was ensured through extensive literature review on the exogenous variables and the constructs of interest. The other forms of validity were verified throughout the work, where the nomological validation was performed by the observation of the consistency of the results obtained with the study and the initial relations among the constructs predicted by the literature review.

After the selection of the questions that better represent the four constructs of this study, we perform a confirmatory factor analysis (CFA), to analyze if the questions selected were adequate allocated in their respective constructs. For hypothesis testing, we used structural equation modeling (SEM), because representing the model data through multiple simultaneous regression relationships between independent and dependent variables enables the researcher to evaluate the effects between the observed variables and constructs with greater robustness (Byrne, 2001). The multivariate normality test of the data was performed by the analysis of the Mardia's coefficient.

"A set of variables presumed to measure the same construct shows convergent validity if their intercorrelations are at least moderate in magnitude. In contrast, a set of variables presumed to measure different constructs shows discriminant validity if their intercorrelations are not too high" (Kline, 2011, pp.71-72). Thus, to analyze the convergent validity, we calculated the Composite Reliability and Cronbach's Alpha; the variance extracted was calculated too (Hair et al., 2005). In order to analyze the discriminant validity, we used the chi-square difference test to verify if the proposed models showed statistically significant differences when compared with a model in which the correlation between the constructs was fixed at 1 (Paiva, Roth, & Fensterseifer, 2008). Following Paiva et al. (2008), we repeated this procedure for all the six pairs of constructs present in the model. If the chi-square test shows statistically significant differences, there will be evidence of discriminant validity (Kline, 2011).

4. RESULTS

4.1 Confirmatory Factor Analysis

Of the 18 instruments (questionnaires) available in the database, we analyzed the 210 questions according to the theory presented in the theoretical framework of this research. All questions were coded into potential constructs; after that, 147 questions were selected, which were closest to the four constructs of this study. After a new analysis, comparing the text of the questions with the theoretical framework, we selected those that were more closest to the con-

structs, where 12 questions were selected, which are available in Appendix A of this work. Table 1 shows the descriptive statistics of these 12 questions. At this point, a relevant factor that could limit the conclusions of this paper is the questions that represent the internal logistics concepts (and the other constructs), but it was the better options available on the database that was consulted and that have support by the context of this paper.

Table 1: Descriptive statistics of the questions

| Questions | N | Mean | Std. Deviation | Questions | N | Mean | Std. Deviation |
|-----------|-----|------|----------------|-----------|-----|------|----------------|
| EC1 | 183 | 1.60 | 0.76 | IL1 | 183 | 1.84 | 0.97 |
| EC2 | 183 | 1.25 | 0.96 | IL2 | 183 | 1.80 | 1.10 |
| EC3 | 183 | 1.07 | 1.03 | IL3 | 183 | 1.76 | 1.04 |
| FC1 | 183 | 1.33 | 1.01 | IP1 | 183 | 1.17 | 0.96 |
| FC2 | 183 | 1.54 | 0.93 | IP2 | 183 | 1.60 | 0.89 |
| FC3 | 183 | 1.40 | 0.96 | IP3 | 183 | 1.44 | 0.87 |

The CFA was made with these 12 questions (and the four constructs), and the results showed adequate indicators in relation to that recommended in the literature (Byrne, 2001; Hair et al., 2005). For example, each question had a nonzero loading on its respective construct and measurement errors were not correlated. Furthermore, the analysis of the modification indices did not indicate that relevant reduction in the qui-square statistics would be obtained in response to new specifications on the model.

Based on this analysis, we considered that the four constructs created were measured based on questions that have the capacity to differentiate them. This may refer to specific aspects of these constructs, but this is what was obtained after performing the previously explained analysis; thus, the results should be interpreted with prudence. With this new database, we proceeded to calculate the Composite Reliability and Cronbach's Alpha of the scale, for analysis of its reliability and internal consistency. The results are presented in Table 2.

Table 2: Composite Reliability and Cronbach's Alpha of the scale

| Construct | N° Items | N° Companies | Cronbach's Alpha | Composite Reliability | Variance Extracted |
|--------------------------------------|----------|--------------|------------------|-----------------------|--------------------|
| External Communication (EC) | 3 | 183 | 0.80 | 0.84 | 0.64 |
| Internal Logistics (IL) | 3 | 183 | 0.92 | 0.88 | 0.72 |
| Internal Information Processing (IP) | 3 | 183 | 0.81 | 0.90 | 0.76 |
| Financial Control (FC) | 3 | 183 | 0.90 | 0.91 | 0.78 |

As Table 2 shows, the reliability of the instrument of data collection is high, because the Composite Reliability and the Cronbach's Alpha were above 70% in all constructs (Hair et al., 2005), which indicates convergent validity. This shows that the intra-company responses are consistent and that there are differences in responses between them. In relation to

the variance extracted (the complementary measure of reliability that we used), the indicators also show good measures, because the four constructs have presented indexes above the minimum of 0.50 recommended by Hair et al. (2005). Table 3 contains the results to the discriminant validity.

Table 3: Discriminant validity tests of the measurement scale

| Construct Scale Pairs | Unconstrained | | Constrained | | Chi-Square Difference | |
|--------------------------------------|---------------|------|-------------|------|-----------------------|-------------------|
| | Chi-Square | d.f. | Chi-Square | d.f. | Difference | Probability Level |
| External Communication (EC) | | | | | | |
| Internal Logistics (IL) | 11.81 | 8 | 71.74 | 9 | 59.94 | < 0.01 |
| Internal Information Processing (IP) | 28.23 | 8 | 131.48 | 9 | 103.26 | < 0.01 |
| Financial Control (FC) | 10.61 | 8 | 56.52 | 9 | 45.92 | < 0.01 |
| Internal Logistics (IL) | | | | | | |
| Internal Information Processing (IP) | 27.49 | 8 | 162.82 | 9 | 135.34 | < 0.01 |
| Financial Control (FC) | 8.93 | 8 | 35.34 | 9 | 26.41 | < 0.01 |
| Internal Information Processing (IP) | | | | | | |
| Financial Control (FC) | 12.29 | 8 | 62.42 | 9 | 50.13 | < 0.01 |

Table 3 indicates that the model seems to have discriminant validity, because the unconstrained model shows better chi-square statistics than the constrained model (in which the correlation between the constructs was fixed at 1). The difference in the chi-square statistics was significant in all the pairs of the combined constructs. The next section describes the procedures related to testing the robustness of the proposed model in Figure 1.

4.2 Adjustments in the structural model

Based on the model shown in Figure 1, the proposed model was developed in the software Amos 18.0, whose data were analyzed by structural equation. The verification of the overall degree of fit of the model was performed using a set of measures, as suggested by Byrne (2001) and Hair et al. (2005) in numbers that reflect the degree of fit of the estimated model. Some of the model fits are shown in Table 4, below, and the standardized coefficients of the model are presented in Appendix B.

Table 4: Statistics for goodness of fit of the model

| Stand Alone Indices | |
|---------------------------------|--------|
| Chi-square | 86.792 |
| Degrees of freedom | 48 |
| Probability level | 0.000 |
| Chi-square/Degrees of freedom | 1.808 |
| Goodness of Fit (GFI) | 0.929 |
| Adjusted goodness of fit (AGFI) | 0.885 |
| Standardized RMR | 0.054 |
| RMSEA | 0.066 |
| RMSEA (Lower Bound - 90%) | 0.043 |
| RMSEA (Upper Bound - 90%) | 0.088 |
| Incremental Indices | |
| Normed fit index (NFI) | 0.943 |
| Incremental fit index (IFI) | 0.974 |
| Comparative fit index (CFI) | 0.973 |
| Tucker-Lewis coefficient (TLI) | 0.963 |

The fit indicator, as assessed by chi-square statistic, is outside the conservative range of 0.10 or 0.20 (Hair et. al., 2005). However, this statistic may be influenced by sample size, which is more than one hundred (183 companies) and thus it is understood that it is necessary to see if the other model fits are at an acceptable level. The goodness of fit index (GFI)

indicates a good fit of the model (0.930), and such index, when calibrated (AGFI), shows a fit that is next the level recommended by Hair et. al. (2005), which is 0.90. The Root Mean Square Error of Approximation (RMSEA) is next 5%, as suggested by Hair et. al. (2005), and the upper bound 90% confidence interval don't exceeds 0.10 (Kline, 2011). As for other indicators (NFI, IFI, CFI and TLI), all are above the recommended level of 0.9, indicating again a good fit of the model analyzed.

With these results in hand, which show the adequacy of the model for the analysis that was proposed, we passed on to the verification of the hypotheses developed in the theoretical framework. Comments of which are available in the next section.

4.3 Analysis of the proposed hypotheses

According to the model being analyzed, we checked the signals obtained for proposed relations, and Table 5 summarizes the expected and the observed signs, along with their corresponding p-value. Before testing the hypothesis, we analyzed the multivariate normality of data. The Mardia's coefficient stayed above the critical ratio, indicating nonnormality. Like Byrne (2001) suggests, the bootstrap procedure was performed, in which 500 bootstrap samples were generated using the ML estimator (bias-corrected confidence intervals: 90%). With the significance of 5%, the results were similar to other previously (Table 5) obtained results for all the hypothesis tested, with exception of H6 where the positive relation presented a significance equal to 0.055.

Table 5: Results for the proposed hypothesis in the paper

| Hypothesis | Analyzed relationship | Expected Sign | Observed Sign | Probability Level (Observed Sign) | Result |
|------------|-----------------------------------|---------------|---------------|-----------------------------------|----------|
| H1 | Int. Log. --> Fin. Control | + | + | 0.000 | Accepted |
| H2 | Int. Inf. Proc. <--> Int. Log. | + | - | 0.061 | Rejected |
| H3 | Int. Inf. Proc. --> Fin. Control | + | + | 0.000 | Accepted |
| H4 | Ext. Commun. <--> Int. Inf. Proc. | + | + | 0.016 | Accepted |
| H5 | Int. Log. <--> Ext. Commun. | + | + | 0.000 | Accepted |
| H6 | Ext. Commun. --> Fin. Control | + | + | 0.029 | Accepted |

As can be seen in Table 5, out of the six hypotheses proposed, five of them presented behavior that had been suggested in the theoretical framework, with a statistical significance level of 5% (0.1% for some), being such hypotheses: H₁, H₃, H₄, H₅ and H₆. As expected, we detect that for the micro and small enterprises analyzed the management of logistics activities proved to be positively related to enterprise performance management, which may indicate that entrepreneurs who worry about the proper management of the logistics activities have better performance because of their better performance management and control of results. Internal information processing was also positively related to performance management, also foreseen by the related theory. This may indicate that concern with the internal flow of information is relevant for the micro and

small businesses analyzed to develop their management activities properly.

Based on previous studies (eg Corbett et al. 1999; Carr & Pearson, 1999; Stock et al., 2000) an argument was developed that external communication would be positively related to internal logistics, because of concern to cater well to customers, for example, the concern to make the product available in a timely manner and in good condition. The established hypothesis was confirmed, indicating that high levels of interaction with the external environment, represented by the external communication, also result in high levels of management of logistics activities. In other words, entrepreneurs who are

concerned about maintaining adequate communication with the external environment, are also concerned about managing their logistics activities accordingly.

With a significance level of 5%, we can consider that internal information processing proved to be positively related to external communication. This indicates that the flow of information within the company, organizational culture, employee interaction, etc. are variables that positively influence the manner in which the company communicates with the external environment, that is, the higher the level of internal information processing, the greater the possibilities of high levels of communication with the

external environment, which is also consistent with the theory studied.

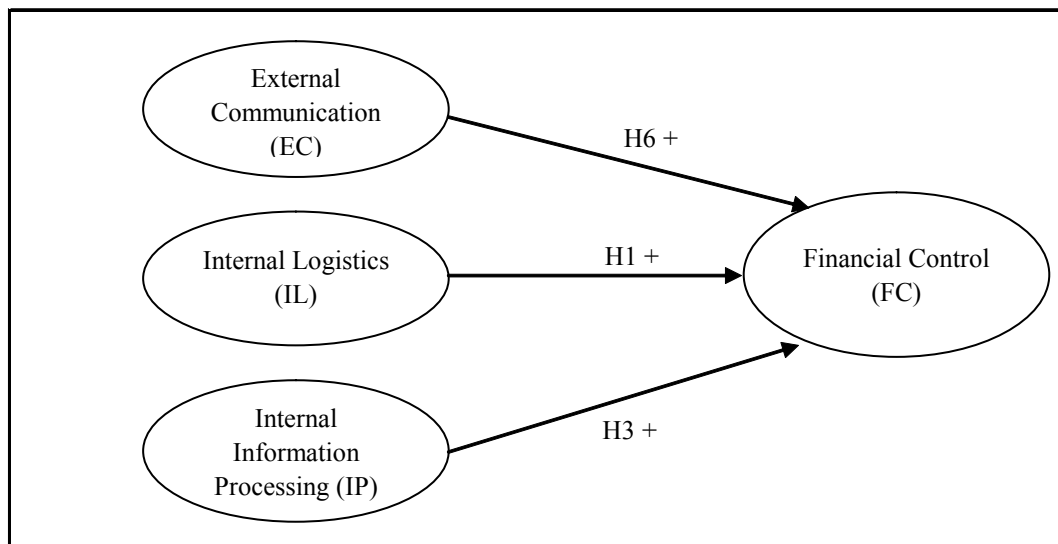
Regarding H_2 , that internal information processing is positively related to the management of logistics activities, with a cautious level of significance of 10%, we can reject the hypothesis established, that is, information processing proved to be negatively related to the management of logistics activities. One rationale for this inverse relationship, or in a more conservative view, for the lack of a positive and significant relationship between the two constructs analyzed, might be due to the very context analyzed. Despite internal logistics being positively related to external communication and performance, actions related to internal information processing don't seem to be focused on the management of lo-

gistics activities. This suggests that it would require a greater integration among the internal activities of firms, which could lead to improved performance levels.

As for H_6 , at 5%, there is evidence to confirm that external communication has a positive and significant relation with performance, or rather with the management of the company's performance. Companies that have higher levels of concern for external communication also seem to turn their attention to the impact of this communication on company results.

As done by other authors (Vickery, Droge, Stank, Goldsby & Markland, 2004, p.1116), an alternative model was developed to check the robustness of the results, as show in Figure 2.

Figure 2: Alternative theoretical model tested



In this new model (Figure 2), the correlate between the constructs $IL \times IP$; $IL \times EC$; and $IP \times EC$ was excluded (although it was supported by the theory framework). The statistics for goodness of fit showed satisfactory values (except for the Standardized RMR, which was between 0.08 and 0.10), and the tests of Hypotesis 1, 3 and 6 (available in this alternative model) continued in the same direction as pointed in the results of Table 5, with a significance lower than 0.001 (with the bootstrap procedure in this alternative model, the significance was less than 0.01).

5. FINAL REMARKS

This research was developed to analyze the impact

of the interaction between external communication, internal information processing and internal logistics on the financial control of some Brazilian Micro and Small Enterprises, with a sample of companies located in the city of Uberlândia. We proposed a theoretical model, based on previous studies that have not been developed in the context of MSEs. The results indicated the acceptance of half of the hypotheses established and are also consistent with the theory presented in literature review when considering a significance lower than 0.001. This indicates that, in large part, the theory (Tushman & Nadler, 1978; Day, 1994; Emerson & Grimm, 1996; Stock et al., 1998; Stock et al., 2000; Pagell, 2004; Hult et al., 2005; Gimenez & Ventura, 2005; Narayanan et

al., 2011) seems to be also applicable in the context of the MSEs, although such companies have a management situation which is different from what happens in large manufacturing organizations.

In the construction of theory, we consider that one of the contributions of this study is the fact that we did not find an expected relationship for one of the hypotheses, H_2 , which refers to the relationship between internal information processing and internal logistics (this hypothesis was based on the work of Lee, Padmanabhan, & Whang, 1997). New quantitative and qualitative studies, for example, conducting interviews, may provide explanations for the observed results, and can give rise to new hypotheses to be tested in the future. One of the possible explanations would be the particular context in which company managers develop their activities.

We should note that, in this paper, the answers of the questions represent the opinion/view of the business owner. This fact does not necessarily indicate that other members of the same company have the same perception, so this represents another limitation to this research. There were approximately 64% of the contacted companies that did not participate of the study. Thus, this work may be subject to non-respondent bias, which represents another limitation to generalization of its results.

As we stated before, the items of the questionnaire used in this paper to represent internal logistics refer to operational aspects (Kannan and Tan, 2005; Swink et al., 2007); other studies could be conducted to analyze the strategic aspects (Vickery et al., 2003; Sakakibara et al., 1997) related to logistics and its impact on performance. Finally, we emphasize that further analysis in the context of Micro and Small Enterprises must be done to additionally check if the constructs addressed in this study show themselves adequately represented by the questions that were identified as the most relevant. We also suggest: i) a geographic expansion of the research, covering other Brazilian regions; and ii) the inclusion of other constructs in the model, like financial performance (in place of financial control) and marketing.

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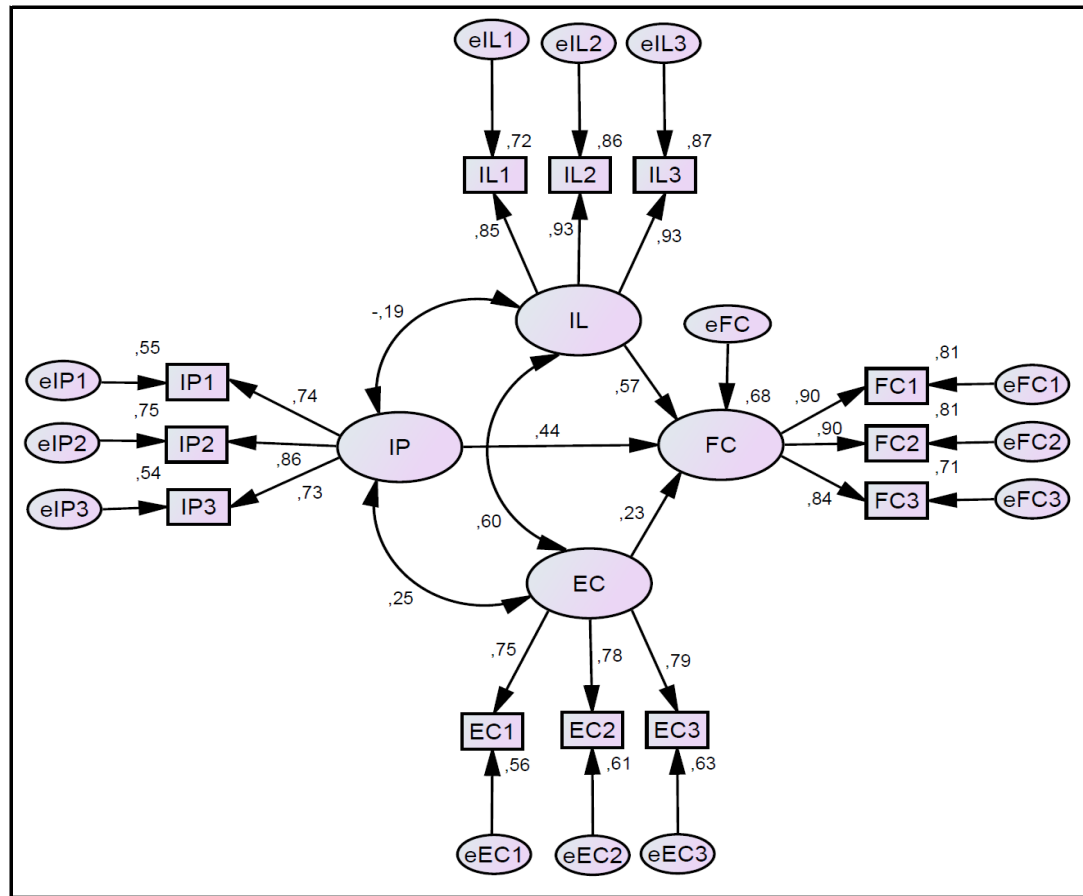
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Appendix A: Questionnaire used for analysis

| External Communication (EC) | | Main references |
|--|--|---|
| EC1 | Are communication efforts and product promotions carried out properly? | Kohli et al. (1993, p.476) Morgan et al. (2009, p.919) Kannan and Tan (2005, p.160) |
| EC2 | Does the company advertise its products with the objective of increasing its credibility in the market? | Smith (1965, p.430) Morgan et al. (2009, p.919) |
| EC3 | Does the company advertise through gifts and/or participate in, or sponsor events? | Smith (1965, p.430) Morgan et al. (2009, p.919) |
| Internal Logistics (IL) | | Main references |
| IL1 | Is there an adequate system in terms of services and installation? | Swink et al. (2007, p.150) Schemenner and Swink (1998, p.110) Sakakibara et al. (1997, p.1252) |
| IL2 | Is the dispatch area in an adequate level of 5S (Disposal, Organization, Cleaning, Hygiene and Order), flows and layout? | Nassimbeni (2003, p.169) Sakakibara et al. (1997, p.1252) |
| IL3 | Does the dispatch area have an adequate layout? | Nassimbeni (2003, p.169) Sakakibara et al. (1997, p.1252) |
| Internal Information Processing (IP) | | Main references |
| IP1 | Is the information system available to all the company? | Narver and Slater (1990, p.22) Farrell and Oczkowski (1997, p.10) Hult et al. (2005, p.1180) |
| IP2 | Is there management technology for the processes of marketing and sales, finance and accounting, production, etc? | Narver and Slater (1990, p.22) Farrell and Oczkowski (1997, p.10) Hult et al. (2005, p.1180) |
| IP3 | Are tools and practices utilized for the management of existing processes? | Narver and Slater (1990, p.22) Farrell and Oczkowski (1997, p.10) Hult et al. (2005, p.1180) |
| Financial Control (FC) | | Main references (but the authors used financial performance, and we used financial control) |
| FC1 | Does the company have financial controls that show the profit or loss for the month? | Morgan and Rego (2006, p.428) Kannan and Tan (2005, p.160) Swink et al. (2007, p.162) Morgan et al. (2009, p. 920) |
| FC2 | Does the company have financial controls that show the expenditures for the month? | Morgan and Rego (2006, p.428) Kannan and Tan (2005, p.160) Morgan et al. (2009, pp. 919-920) |
| FC3 | Does the company formulate and practice retail price adequately? | Morgan and Rego (2006, p.428) Kannan and Tan (2005, p.160) Morgan et al. (2009, pp. 919-920) |
| Labels of the possible answers: 0: does not meet the requirement which is completely unknown; 1: meets the requirements partially, there is partial knowledge but it is not applied; 2: meets the requirements but there is some evidence missing; 3: meets the requirements and there is evidence besides having knowledge and applying it perfectly; 4: meets the requirements completely and there are proactive practical evidences; n.a.: not applicable. | | |

Appendix B: Observed coefficients in the structural equation analysis
(standardized estimates)



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