

MENTAL MODELS IMPACTS ON ORGANIZATIONAL PERFORMANCE: A STUDY IN THE METAL-MECHANIC SECTOR

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ABSTRACT

The objective of this study was to analyze the impacts of entrepreneurs' mental models on organizational performance. We identified in the literature that some dimensions form mental models, which are: Knowledge, Emotional Skills, Linear Mind, Relationship, Communication, Strategy, Creativity and Innovation, and Vocation. From quantitative descriptive research, we employed multivariate statistics to analyze the data, using Structural Equation Modeling. By checking the coefficient of determination (R^2), we identified that entrepreneurs' mental models explain 27.1 % of organizational performance. The dimensions that most impacts on organizational performance were: (i) Creativity and Innovation, (ii) Communication, and (iii) Emotional Skills. Among the contributions of this work, we highlight, first, the understanding of how and how much the dimensions influence organizational performance, second, the validation of a scale to measure the entrepreneurs' mental model dimensions and their impacts on organizational performance.

Keywords: Mental models; Entrepreneurs; Organizational Performance.

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RESUMO

O objetivo deste estudo foi analisar os impactos dos modelos mentais dos empreendedores sobre o desempenho organizacional. Na literatura se identificou que parte dos modelos mentais podem ser formados pelas seguintes dimensões: Conhecimentos, Habilidades Emocionais, Mente Linear, Relacionamento, Comunicação, Estratégia, Criatividade e Inovação, e Vocaç o. A partir de uma pesquisa descritiva quantitativa, os dados foram analisados por meio de estatísticas multivariadas, utilizando-se a Modelagem de Equações Estruturais. Mediante a verificação do coeficiente de determinação (R²), identificou-se que 27,1% do desempenho organizacional é explicado pelos modelos mentais dos empreendedores. As dimensões que mais impactaram no desempenho organizacional foram: (i) Criatividade e Inovação; (ii) Comunicação e (iii) Habilidades Emocionais. Dentre as contribuições deste trabalho destaca-se primeiro, a compreensão de como e quanto as dimensões influenciam no desempenho organizacional, segundo, na validação de uma escala para mensurar as dimensões dos modelos mentais dos empreendedores e seus impactos sobre o desempenho organizacional.

Palavras-chave: Modelos Mentais; Empreendedores; Desempenho Organizacional.

1 INTRODUCTION

A mental model is a dynamic representation, a simulation of the world, which establishes a specific way in which the individual understands, compiles, stores, and accesses information (GARDNER, 2005). We shape mental models from childhood, in education and professional experiences in the business field. A person uses processes of representation to build these mental models.

The objective of this study was to analyze the impacts of entrepreneurs' mental models on organizational performance. Based on the researches of De Toni and Milan (2008), De Toni, Milan and Schuler (2009), Milan et al. (2009), Milan et al. (2010), De Toni et al. (2012), Mioranza (2012), this research proposed to empirically analyze the influence of some already proposed dimensions, which are: (i) Knowledge; (ii) Emotional Skills; (iii) Linear Mind; (iv) Relationship; (v) Communication; (vi) Strategy; (vii) Creativity and Innovation and (viii) Vocation; on the performance of organizations.

This study also aimed to validate a scale for measuring the entrepreneurs' mental models. Therefore, to obtain a scale that measures the entrepreneurs' mental model dimensions and that influence organizational performance, as well as the relationship between them, the study took place in four essential phases (DU PREEZ; VISSER; NOORDWYK, 2008).

For this reason, Mioranza's dissertation (2012) served as bases for this study, which applied the Pilot Study 1. In his dissertation, he developed the three phases mentioned by Du Preez, Visser and Noordwyk (2008). Given the arguments and limitations substantiated by Mioranza (2012), this research proposed to continue his research, executing phase four, and applying Pilot Study 2. We applied the study in micro and small companies, in the metal-mechanical sector, operating in the municipality of Caxias do Sul.

Milan et al. (2010) state that specific ways of thinking and acting by entrepreneurs can influence organizational performance through their decisions. As already mentioned, studies developed by De Toni and Milan (2008) and De Toni et al. (2014) affirm that some dimensions form mental models. In this context, we present the following central research question: What are the impacts of mental model dimensions on organizational performance?

2 THEORETICAL FRAMEWORK AND HYPOTHESES PROPOSITIONS

2.1 Mental Models and Organizational Performance

There are different positions assumed to the study of mental models. It can be directed both to the cognitive and sociological fields. In the cognitive field, there are different studies, such as the Theory of Mental Models, presented by Johnson-Laird (1983). This theory defends the idea that mental models are seen as representations of reality, which individuals use to understand certain phenomena. On the other hand, in the social dimension, the Theory of Social Representations, proposed by Moscovici (1978), is presented; this theory seeks to understand how individuals build their world representations to identify the nature of social thought. Therefore, this study refers to the Theory of Mental Models.

The term mental model appeared in 1943 in the book "The Nature of Explanation," which was written by the Scottish psychologist Kenneth Craik. He referred to this expression as a representation of individuals and circumstances of the environment. Psychologists and cognitive scientists have been applying the mental model concept since the forties, and it has gradually entered the field of administration (SENGE, 2012). For Johnson-Laird (1983), mental models are structurally analogous to the systems they represent. The mental models used influence thoughts and attitudes (CHAPMAN; FERFOLJA, 2001; WIND; CROOK; GUNTHER, 2005).

Mental models adapt to the individual's interpretations and responses to the environment. For the development of mental models, processes of representation, and communication with the environment supply the individual. Therefore, the environment sends different messages, and the individual, within cognitive capacity, absorbs, and works on these messages to develop his representation of the world (CHAPMAN; FERFOLJA, 2001).

One of the prominent factors for a better understanding of the strategies adopted by organizations is the understanding of how managers think, the contents and mechanisms of their thoughts. Understanding entrepreneurs' mental models are something little explored and challenging to access, since it is not always possible to access, in a precise way, what is in these people's minds. Therefore, it is necessary to investigate the relationship between entrepreneurs' mental models and the performance of their organizations, which can be integrated with strategies and organizational resources and can contribute to explaining the difference in organizational performance (MACHADO-DA-SILVA; FONSECA; FERNANDES, 2000).

In this research, we chose to verify the organizational performance through subjective measures. Singh, Darwish and Potocnik (2016) understand that with careful planning, we can successfully use subjective measures to investigate organizational performance. When asked about performance evaluation, entrepreneurs have a holistic view of the organization for accurate assessment and have the knowledge to answer questions about organizational performance.

2.2 Entrepreneurs' Mental Models Dimensions

The Knowledge Dimension is related to technical aspects, environmental aspects, previous experience, and willingness to learn. Fachinelli (2014, p. 2) states that "an organization is no longer seen as a tangible resources eclectic package, but increasingly as a hierarchy of knowledge and intangible processes for knowledge creation." For Takeuchi and Nonaka (2008), knowledge is tied to beliefs and commitments; that is, it relates to the specific attitude, perspective, or intention. The creation of knowledge in the company is directly related to the organizational capacity

to instigate new knowledge, disseminate and incorporate it into their systems, products, and services, which reflects on organizational performance.

H₁ – The entrepreneur’s knowledge related to technical aspects, environmental aspects, previous experience, and willingness to learn has a significant impact on organizational performance.

The Emotional Skills Dimension is directly related to the following characteristics of the entrepreneur: self-esteem, self-confidence, fluency with emotions, and acceptance of uncertainty. “Emotions are a natural way of evaluating our environment and reacting adaptively” (DAMÁSIO, 2004, p. 62). Some factors analyzed by Hess and Bacigalupo (2011) show that each individual and organization share the goal of improving the quality of decision making. The ability to assess potential emotional outcomes and reactions to decisions can enable decision-makers to predict people’s feelings affected by certain attitudes, resulting in organizational performance.

H₂ – The entrepreneur’s emotional skill, related to self-esteem, self-confidence, acceptance of uncertainty, and resilience capacity, has a significant impact on organizational performance.

The Linear Mind Dimension relates to the entrepreneur’s linear intelligence, planning, leadership, and power orientation. Gardner (2007) cites one of the minds for the future, the creative mind, which refers to the ability to reveal and solve new problems, issues, and phenomena. Through the author’s point of view, the creative mind breaks barriers: it presents new ideas, suggests unknown questions, evokes different ways of thinking, and approaches unexpected answers. Well-informed people should receive these creations. It is in this thought that Dornelas (2005) says that a significant part of the success achieved by micro and small companies, at the development stage, can be conferred to the entrepreneur, who through his mind and linear intelligence, evaluated and planned the viability of his business, impacting on organizational performance.

H₃ – The entrepreneur’s linear mind, tied to linear intelligence, organization, planning, leadership, and power orientation, has a significant impact on organizational performance.

The Relationship Dimension is related to the recognition of the other, respect for the other, appreciation of the other, and acceptance of differences. For Vasconcellos (2007), the conservation of relationships or the interaction between people generates opportunities. The right relationship and the harmony developed between individuals create motivation, and in the long term, it accumulates experience, leading to the exchange of information. The association of these elements is what characterizes a bond of trust between the entrepreneur and the organization’s stakeholders, which impacts on organizational performance (MÜSSNICH, 2004).

H₄ – The good relationship of the entrepreneur with his stakeholders, that is, customers, employees, suppliers, and others involved in his environment, has a significant impact on organizational performance.

The Communication Dimension relates to communication orientation. For the entrepreneur to achieve the effectiveness and efficiency of organizational communication, strategic planning of this communication is necessary (KUNSCH, 2003). Gouveia and Grisci (2006) say that one of the characteristics of the entrepreneur is the ability to communicate. The entrepreneur’s mentality must be pronounced and accepted inside and outside the company in order to be effective (HILL; LEVENHAGEN, 1995).

H₅ – The entrepreneur’s ability to communicate with his stakeholders, that is, customers, employees, suppliers, and others involved in his environment, has a significant impact on organizational performance.

The Strategy Dimension relates to practicing with future scenarios, systemic thinking, and strategic competence. Carland, Carland and Hoy (1992), Stewart and Roth (2007) emphasize the importance, for the entrepreneurial mentality, linked to business management, with a strategic nature, and vision for current and future scenarios originated through their systemic vision. In

Veit and Gonçalves Filho's (2007) thought, the entrepreneur has an affinity with the formal planning process and with the analytical thought of the business. He sees a challenge in the success of his enterprise, such as a goal of personal achievement, exposed as a challenge, since it presents defined strategies, which impact organizational performance.

H₆ – The strategies presented by the entrepreneur, when directed to practice with future scenarios, to systemic thinking and strategic competence have a significant impact on organizational performance.

The Creativity and Innovation Dimension is related to innovative behavior, initiative, problem detection, and opportunity detection. The term creativity originated from the Latin "creare," whose meaning is to create, do, elaborate. Based on Izquierdo's thought (2002, p. 91), creativity is extracted from memory, that is, "it is not created from nothing: it is created from what is known and what is known is in our memories." Because of this, it is essential to emphasize that "being creative implies, by definition, the attempt to avoid the conventional routes of thinking and, therefore, the avoidance of the activation of typical associations," reflecting on organizational performance (SASSENBERG; MOSKOWITZ, 2005, p. 507).

H₇ – The entrepreneur's creativity related to innovative behavior, initiative, problem detection, and opportunity detection has a significant impact on organizational performance.

The Vocation Dimension relates to willpower, clarity of purpose, principled orientation, and evolutionary orientation. A person does not choose a vocation, but it would not be correct to state that the individual encounters it, but rather that vocation encounters the individual; consequently, the person discovers it. Thus, "entrepreneurship and specific business type vocation are considered a critical factor for the entrepreneur's success." The will to pursue continuous growth is essential for organizational development (MARÍAS, 1983; GOUVEIA; GRISCI, 2006; MILAN et al., 2010, p. 7).

H₈ – The entrepreneur's vocation, related to willpower, clarity of purpose, principled orientation, and evolutionary business orientation has a significant impact on organizational performance.

When Creativity and Innovation Dimension and Strategy Dimension are related, it is possible to state that when a person is instigated to develop his/her creativity and innovative behavior, he/she will have more ability to develop his/her strategies. Thus, according to a study conducted by Machado-da-Silva and Barbosa (2002), creativity and innovation support organizational strategies that aim to develop new ways to act, to solve problems, and to raise the level of results. Creativity and innovation are some of the background behaviors for successful strategies development (CHRISTO; VEIGA NETO, 2012).

H₉ – Creativity tied to the entrepreneur's innovative spirit has a significant impact on his strategies development.

Relating the Creativity and Innovation Dimension to the Relationship Dimension, Alencar (1995) comments that creativity needs a person who wants to accomplish something new for himself or others. Bruno-Faria and Alencar (1998) cite factors that stimulate creativity in the organizational environment. It is through the relationship that individuals are instigated to: develop new ideas, exchange experiences, create, and maintain an environment of trust and respect. It is in this way that the organization members expose what they think, exchange experiences, and consider innovation as one of the goals, reflecting on organizational performance. For Anderson, Potocnik and Zhou (2014), creativity and innovation in any organization are vital to their successful performance.

H₁₀ – Creativity tied to the entrepreneur's innovative spirit has a significant impact on his relationship with the stakeholders.

Relating the Strategy Dimension with the Communication Dimension, Mioranza (2012) says that we must incorporate communication in creating organizational strategies. It is based on this systemic thinking, grounded in the quality of communication, that the other strategies

harmonize at all levels. The dimensions that support them are: personal domain; mental models; shared vision; and team learning (SENGE, 2012). Marchiori and Bulgacov (2012) comment that individuals constitute their strategies communicatively, through interaction and social practices that involve the whole organization and its environment.

H₁₁ – The entrepreneur’s interaction strategies with the organization and its environment have a significant impact on organizational communication.

Relating the Emotional Skills Dimension to the Communication Dimension, by understanding Goleman (2001), individuals with well-developed emotional practice are more likely to feel satisfied and to be efficient in the functions they perform, maintaining control over their mental habits and fostering their productivity. Based on the emotional skills, the entrepreneur can deal with his feelings and other people’s emotions. He presents quality in communication, which allows him a better relationship with his environment.

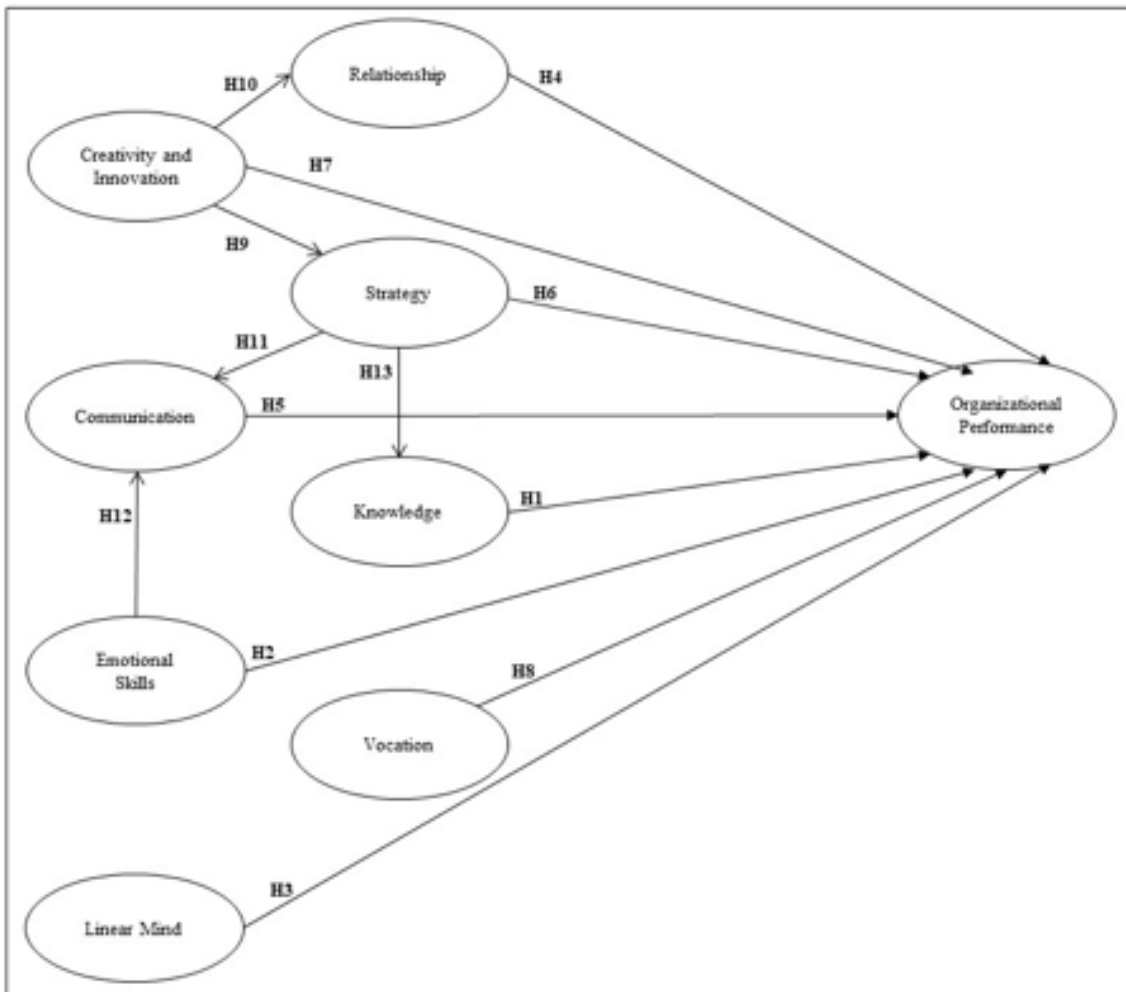
H₁₂ – The entrepreneur’s emotional skills have a significant impact on the quality of communication and interaction with his environment.

Relating the Strategy Dimension to the Knowledge Dimension, through the understanding of Ponchirolli and Fialho (2005), drawing up strategies constitutes the process of intertwining everything necessary to manage a company. Therefore, it becomes fundamental that organizations direct their strategies to the intellectual and services core competencies and leverage knowledge-based strategies.

H₁₃ – Strategy design has a significant impact on the entrepreneur knowledge.

Figure 1 presents the proposed theoretical model and the research hypotheses. Although this is a customized model, it differentiates in the relations between dimensions. Hypotheses 1 to 8 propose the influence that each dimension has on organizational performance, while hypotheses 9 to 13 propose the relation between dimensions.

Figure 1 – Proposed Theoretical Model and Research Hypotheses



Source: Adapted from De Toni & Milan (2008), De Toni, Milan, & Schuler (2009), Milan et al. (2009), Milan et al. (2010), De Toni et al. (2012), Mioranza (2012) and De Toni et al. (2014).

3 RESEARCH METHOD

We defined this research stage as descriptive research of a quantitative nature. Aiming to achieve the study’s general objective, this stage had the purpose of validating a scale that measures entrepreneurs’ mental models. According to Du Preez, Visser, Noordwyk (2008), to obtain a measurement scale, the study must go through four phases.

Phase 1 is related to the construction of the conceptual model, that is, the literature review and conceptual proposal of the theoretical model of the entrepreneurs’ mental model dimensions. **Phase 2** is related to the generation and judgment of the measurement items, that is, the judgment by the experts, generation of the measurement items, and judgment of the measurement items by the experts and the sample. **Phase 3** is related to the purification of the entrepreneurs’ mental models dimensions’ scale - Pilot Study 1: definition and description of the population sample, data collection, and statistical analysis. **Phase 4** is related to the scale reliability and validity evaluation and identification of the configuration of the mental models dimensions of micro and small enterprises in the metal-mechanical sector - Pilot Study 2: research method; judgment of the measurement items by the experts and the sample; definition of the

sample; data collection and statistical analysis.

We used the research carried out by Mioranza (2012) as a basis to propose the refinement and validation of a measurement scale, which encompassed the three research phases already mentioned. Therefore, his study highlighted the development up to Pilot Study 1: (i) construction of the conceptual model; (ii) generation and judgment of the measurement items; (iii) purification of the mental models' dimensions' scale.

Based on the results achieved by Mioranza studies (2012), from 113 respondents, the eight dimensions studied by him were: Knowledge; Emotional Skills; Linear Mind; Relationship; Communication and Ethics; Mission and Strategy; Creativity; and Vocation. Of these, only three stood out as significant in explaining organizational performance (MIORANZA, 2012). Therefore, to continue in phase four, following the necessary order for the development of Pilot Study 2, this study resumes the literature review, aggregates new research hypotheses, and the relationship between dimensions.

We applied the study in the metal-mechanical segment, the sample under investigation was composed of micro, and small companies, operating in the city of Caxias do Sul. The owners or leading managers of organizations registered in the database of the Union of Metallurgical, Mechanical, and Electrical Material Industries of Caxias do Sul (SIMECS)

answered the questionnaire.

This research considered the data collection instrument, which was composed of 78 variables, to determine the sample size. So, initially, we used, as a rule, five cases per variable. However, this investigation obtained a total sample of 287 respondents. After analysis procedures, 263 valid cases remained, which corresponds to approximately three cases for each variable, and according to the literature, it is the minimum to run Structural Equation Modeling. This sample size is close to that suggested by Hair Jr. et al. (2009), regarding the application of Structural Equation Modeling (200 respondents).

4 DATA ANALYSIS

4.1 Data Preparation

Data analysis covered descriptive statistics procedures (absolute and relative frequencies) and inferential statistics employing (i) tests to analyze the model assumptions (atypical observations by z-test and Mahalanobis; normality using kurtosis and asymmetry coefficients; homoscedasticity by Levene test; linearity by linear regression analysis and; multicollinearity by the variance and tolerance inflation factor); (ii) instrument validation and reliability tests (factor analysis with extraction of the model by principal components and Varimax rotation and internal consistency analysis by Cronbach's Alpha coefficient) and; (iii) multivariate data analysis, using the Structural Equation Modeling (SEM) technique.

Therefore, a combination of univariate and multivariate analysis was employed to detect atypical observations. In the first step, for univariate analysis, with a total n of 287, each variable was decomposed into a standard score, and subsequently, the values above $|3|$ were pointed out in each variable (Hair Jr. et al., 2009). Based on the results of the univariate tests, this study chose to exclude 24 cases, since they had standardized values greater than $|3|$.

The second step identified the atypical multivariate observations by calculating the Mahalanobis distance (D^2) applied to the sample with 263 entrepreneurs, which was the result of applying the univariate test. The evaluation of the D^2 value, Mahalanobis/degrees of freedom ($df = 83$), includes the recording of atypical observations through a close examination of statistical

significance. Accordingly, Hair Jr. et al. (2009) guide the use of cautious reference levels for D^2/df (0.005 or 0.001), proceeding with values 2.5 for small samples, and 3 or 4 when applied to larger samples, using as criteria in this study values > 3 . However, after performing the test, the D^2/df measure values were 0.20 to 1.94 for the set of variables, where no case was excluded.

In the exploratory factor analysis, we observed in each dimension: reduction in only one factor, KMO, factor load, commonalities, explained variance, and Cronbach's Alpha. In this phase of the tests, the Linear Mind dimension was excluded because it did not meet the minimum values of factor analysis, as presented in Table 1, which justifies testing only 12 hypotheses of the 13 presented. Since, as indicated in the literature, factor loads greater than $|0.30|$ reach the minimum level with statistical significance, while loads with values of $|0.40|$ are evaluated as essential and those greater than $|0.50|$ are ideal, especially for samples more significant than 120 observations. For explained variance, the minimum value should be above $|60\%|$ (HAIR Jr. et al., 2009).

For the KMO test, which represents the degree of adjustment to factor analysis, we considered Fávero et al. (2009) rule, according to them, values between $|0.6|$ and $|0.7|$ points to a correlation between variables. Regarding the commonality analysis, the researcher should analyze the commonality of each variable to assess whether it meets the acceptable levels of explanation, that is, commonalities above $|0.50|$ are good indicators of explanation. To determine the Cronbach's Alpha, the ideal value for the test should be between $|0.7|$ and $|0.8|$ (HAIR Jr. et al., 2009).

Table 1 – Exploratory Factor Analysis of the Linear Mind Dimension

Construct	Observed Variable (V _i)	Rotating Component Matrix Factor 1 Factor 2	KMO	Explained Variance	Cronbach's Alpha
Linear Mind	V ₁₅	0.716	0.665	31.77%	0.693
	V ₁₆	0.674		57.05%	
	V ₁₇	0.550			
	V ₁₈	0.772			
	V ₁₉	0.893			
	V ₂₀	0.748			

Source: Data from research (2014).

4.2 Testing of the Multivariate Analysis Assumptions

We analyzed normality in the multivariate analysis assumptions test. The rule cited by Kline (2011) corresponds to variables with absolute skewness values, that is, values exposed in the module above $|3|$ can be interpreted as intensely asymmetric. For kurtosis, the author considers that values above $|10|$ may indicate some problems. According to the application of the rule suggested by Kline (2011), the values found did not present any problems.

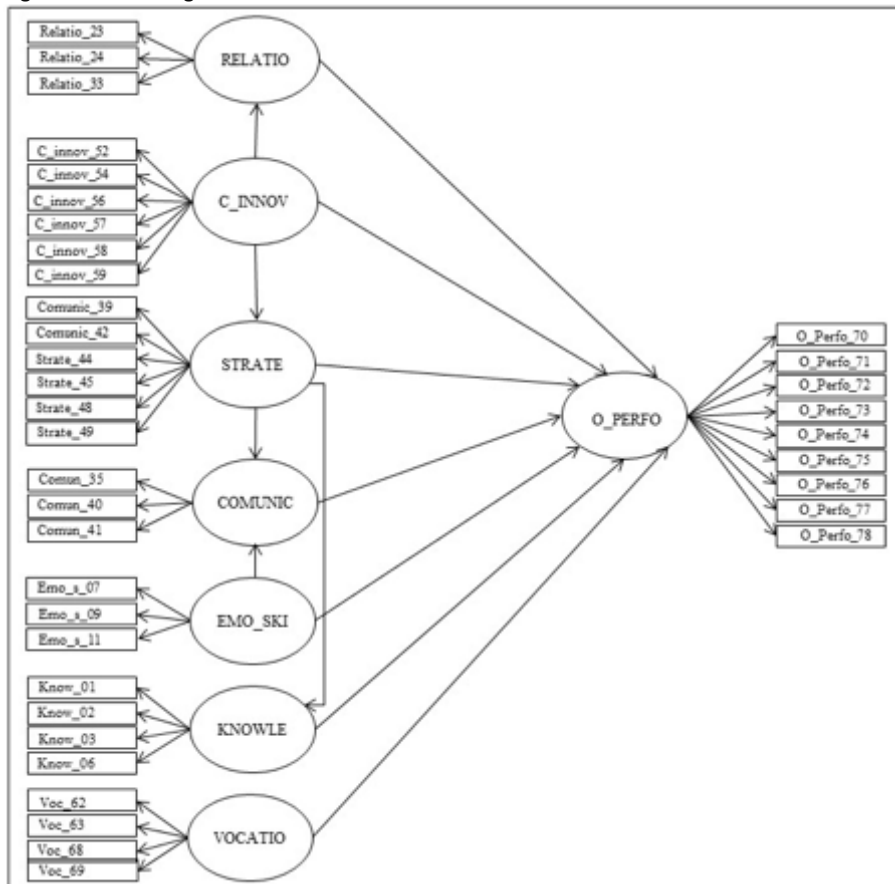
Regarding the Homoscedasticity analysis, we applied the Levene test, where it was related to the categorical variables: company time, import, and profit, as independent variables. Through this analysis, this research verified that the six metric variables presented significance levels lower than 0.050 in the verification of variance dispersion of non-metric or categorical variables. However, at this stage of the study, it was chosen not to exclude these variables, proceeding with the following tests.

Concerning linearity, we use this test to express the concept that a model presents the properties of additivity and homogeneity. One of the ways to evaluate linearity is by analyzing variable dispersion diagrams and identifying nonlinear patterns in the data. Therefore, an alternative standardized residual treatment is proposed, classified as $Y = Z_{resid}$ and $X = Z_{pred}$, named as a standardized dependent variable. The linearity condition was evaluated based on the standardized residuals chart. By checking the scatterplots, we found that all dimensions of the studied model presented linear relationships (HAIR Jr. et al., 2009).

When it comes to multicollinearity, its purpose is to verify the extent to which others can justify a variable in the analysis. That is, it refers to the degree to which any effect of a variable can be predicted or clarified by other variables (KLINE, 2011). For Tolerance Value: up to $|1|$ without multicollinearity; from $|0.10|$ to $|1|$ with acceptable multicollinearity; below $|0.10|$ with problematic multicollinearity. Concerning the Variance Inflation Factor (VIF), the rule is: values up to $|1|$ correspond to no multicollinearity; values from $|1|$ to $|10|$ show acceptable multicollinearity; values above $|10|$ present problematic multicollinearity (HAIR Jr. et al., 2009; GUJARATI, 2000). Based on the application of these tests, no multicollinearity problems were detected.

Based on the results of the tests applied, it was necessary to align each dimension with its proper constructs. Thus, of the 78 variables proposed in the instrument for data collection, its refinement was indispensable, resulting in 38 variables. In Figure 2, we present the path diagram of the tested model.

Figure 2 – Path diagram of the tested model



Source: Elaborated by the authors (2014).

4.3 Convergent and Discriminant Validity

By analyzing the convergent validity, we can affirm that all the standardized factor loads met the minimum required value, and the lowest load occurred for V_{49} (0.611), in the strategy dimension. Regarding the extracted variance, the only dimension that meets the minimum index $[0.50]$, proposed by Hair Jr. et al. (2009), is the relationship dimension (0.51), the other dimensions have indexes below that suggested by the literature. The lowest variance extracted loads were for emotional skills (0.43) and strategy (0.43). Concerning the composed reliability of the constructs, the emotional skills dimension presented a validity indicator considered adequate (0.69). The other dimensions presented indexes higher than those required in the literature. Regarding endogenous variables, this analysis found that the lowest standardized factor load is for V_{78} (0.663), all of which met the minimum required in the literature. The extracted variance and the composite reliability were higher than the minimum indicated in the literature.

The dimensions that did not present discriminant validity because they did not correspond to the literature were: (i) strategy with creativity - the extracted variance was $[0.45]$, whereas the shared variance presented a higher index $[0.70]$; (ii) strategy with communication - the extracted variance was $[0.47]$, whereas the shared variance presented a higher index $[0.55]$; (iii) vocation with relationship - the extracted variance was $[0.51]$, whereas the shared variance presented a higher index $[0.55]$. In order to comply with the literature, the extracted variances must be higher than the shared ones (FORNELL; LARCKER, 1981). Considering this statement and the results found, this study states that except for the dimensions cited, in the rest of them, there is discriminant validity.

4.4 Results Analyses

As far as the sample profile is concerned, the age predominance of entrepreneurs in the metal-mechanical sector in Caxias do Sul was between 40 and 59 years old (59%), with at least completed high school education (80.6%). Regarding the company profile, it was possible to observe that most companies have between 1 and 10 employees (66.6%), above ten years of foundation (64.3%), and do not perform either import (83.7%) or exports (91.3%). More than 70% of the companies had gross revenue in the year 2013 up to R\$ 1 million. As for the sales forecast for the year 2014, most entrepreneurs (55.5%) estimated that the increase in sales in 2014 would be up to 10% compared to the previous year. Regarding the estimated net profit margin for the year 2014, more than 50% of the entrepreneurs believed it would be between 0 and 10%.

4.5 ANOVA Bivariate Test

We also verified the relationship between the dependent variable, organizational performance, compared to the independent variables. The independent variables considered are the entrepreneur age group, the entrepreneur education, number of employees of the company, company time of founding, if it operates with import, if it operates with export, percentage of exported products, total sales in 2013, percentage of sales projection for the year 2014, and the net profit margin practiced.

This investigation occurred through the Analysis of Variance (ANOVA), application of a bivariate test. Initially, the ANOVA was studied by Fisher, aiming to compare the relevance of var-

iations between two or more groups. The acronym ANOVA comes from the expression Analysis of Variance, being called an f-test, in honor of Fisher (AYRES et al., 2007).

According to Pestana and Gageiro (2005), the ANOVA confronts variations from specific sources, with variations between groups, which should be similar. The authors say that the One-Way ANOVA investigates the effect of a factor on the endogenous variable, examining whether or not the means of the endogenous variable in each category of the factor are the same. In this study, we verified the significant relationships between particular variables with the application of this test. The rule was to verify if there was or not a significant difference ($p < 0.05$) between the groups, later it was examined the means differences.

Thus, we compared the independent variables with the dependent variable, organizational performance (group composed of nine questions), in the following order: entrepreneur education versus organizational performance; export versus organizational performance; percentage of exported products versus organizational performance; total revenues in 2013 versus organizational performance; and net profit margin versus organizational performance. The conclusion was that in these groups, there were no significant differences ($p < 0.05$).

Therefore, when observed the entrepreneur's age group versus organizational performance, we perceived that two variables, within the organizational performance group, presented significance ($p < 0.05$). These variables are O_PERFO_72 and O_PERFO_77.

The variable O_PERFO_72 relates to the total number of products in line in the last three years. When analyzing the variable cited, it was possible to observe that for the age group of 20 to 29 years, the average was 4.90. For the age group from 60 years, the average was 5.65 - a significant difference in the level of 0.05. The result may indicate that older entrepreneurs usually have more products in line than those with less age. One of the possible justifications for interpreting this result is that the older entrepreneur usually has more professional experience than the younger entrepreneur. Also, it may be related to his company's superior time in the market. Consequently, this results in a higher number of products in line.

The variable O_PERFO_77 relates to the company's profitability over the last three years. When analyzing this variable cited, we could observe that for the age group of 20 to 29 years, the average was 5.41. For the age group 50 to 59 years, the average was 4.63 - a significant difference in the level of 0.05. The result may indicate that entrepreneurs with less age say they have higher profitability than those with more age. A possible justification for these results may be because the younger entrepreneurs are daring and continuously seek to outperform the competition through innovations.

Therefore, another examined comparison was the time of company foundation versus organizational performance. In this case, two variables presented significance ($p < 0.05$). These variables are O_PERFO_76 and O_PERFO_77.

The variable O_PERFO_76 relates to the company contribution margin for the last three years. When analyzing the variable mentioned, it was possible to observe that for the foundation time of 11 to 15 years (1999 - 2003), the average was 5.04. For the foundation time above 20 years (1993 for minor), the average was 4.48 - a significant difference in the level of 0.05. The result may indicate that organizations with less time in the market have a higher contribution margin than companies with more time in the market. Some of the possible reasons that justify this result may be related to organizational management, the launch of new products, and the degree of innovation.

The variable O_PERFO_77 is related to profitability for the last three years. When analyzing the variable cited, it was possible to observe that for the foundation time of 11 to 15 years (1999 - 2003), the average was 5.08. For the foundation time above 20 years (1993 for minor), the average was 4.50 - a significant difference in the level of 0.05. The result may indicate that

organizations with less time in the market presented higher profitability in the last three years than companies with more time in the market.

One of the possible justifications for the results found may be related to planning, market research, sales projection, and strategic management. To the fact that these companies may be using better planning, investing in market research, making sales projections, and putting into practice different strategies.

Finally, we examined the relationship between sales projection for the year 2014 versus organizational performance. Thus three variables were significant ($p < 0.05$). These variables are O_PERFO_70; O_PERFO_73; O_PERFO_74.

The variable O_PERFO_70 relates to the sales volume (sales, revenues) in the last three years. When examining the variable under study, we could observe that for the sales projection of 0 to 5%, the average was 4.67. On the other hand, for sales projection from 16 to 20%, the average was 5.33 - a significant difference in the 0.05 level. The result may indicate that for the companies that planned a sales projection for the following year, it reflected in the effective increase in their sales volume. The organizations that did planning, setting a higher goal to achieve in their sales, consequently showed an increase in their revenues.

The variable O_PERFO_73 relates to the number of new customers in the last three years. When analyzing this variable, it was possible to observe that for the sales projection of 0 to 5%, the average was 4.84. For sales projection above 20%, the average was 5.49 - a significant difference in the level of 0.05. The result may mean that the companies that planned, projected a more significant percentage in their sales for the following year, presented a higher number of new clients than the companies that have not adopted a long term planning. When an organization makes a higher sales projection, there is possibly a coupled planning to increase its number of customers.

The variable O_PERFO_74 relates to the total number of active customers for the last three years. When investigating this variable, we observed that for the sales projection of 0 to 5%, the average was 4.98. For the sales projection above 20%, the average was 5.46 - a significant difference in the level of 0.05. This result may point out that the entrepreneurs who projected their sales in advance, managed to obtain a more significant number of active customers. The sales projection can be the basis for specific plans of the company since without sales, it is difficult for an organization to continue operating in the market.

Therefore, through the analyses performed by ANOVA, which aims to identify the differences between the averages of the analyzed constructs, this study concludes that the organizational performance can vary from the different characteristics of the organizations. Specifically, in this study, these characteristics pointed to the entrepreneur's age, the time of the company's performance in the market, and its long-term sales projection. We also emphasize that the justifications presented in this chapter, to explain the results found, are only assumptions.

4.6 Structural Model Validation

The process of developing the structural model validity follows general guidelines, with the constructs adequacy and the identification of the quality of the adjustments (Goodness of Fit - GOF), since the validation of the structural model happens based on the quality of the GOFs. Table 2 shows the adjustments indexes achieved based on the ML estimation method, also representing the results of the studies of the estimated and observed covariance matrices. Thus, the general adjustment can be analyzed using the same premises of the measurement model: using an integrating value of χ^2 for the structural model, an absolute index, an incremental index, an indicator of the quality of the adjustment, and one of poor quality of the adjustment.

Table 2 – CFA model fit indexes

Indexes	Analized Dimen- sion							
	Knowle	Emo_Ski	Relatio	Comunic	Strate	C_Innov	Vocati	O_Perfo
χ^2/df (CMIN/DF) (< 5)	16.944	5.867	0.555	6.233	3.101	1.867	0.192	7.633
GFI (> 0.9)	0.853	0.973	0.997	0.968	0.946	0.968	0.998	0.827
AGFI (> 0.9)	0.707	0.918	0.991	0.904	0.919	0.951	0.996	0.777
RMSEA (0.05 to 0.08)	0.247	0.136	0.000	0.141	0.090	0.058	0.000	0.159
NFI (> 0.9)	0.758	0.914	0.994	0.926	0.912	0.947	0.997	0.816
TLI (> 0.9)	0.722	0.891	1.000	0.905	0.934	0.973	1.000	0.831
CFI (> 0.9)	0.768	0.927	1.000	0.937	0.938	0.975	1.000	0.836

Source: Data from research (2014).

Table 3 – Structural model fit indexes

Analized Indexes	Results
χ^2/df (CMIN/DF) (< 5)	1.692
GFI (> 0.9)	0.823
AGFI (> 0.9)	0.796
RMSEA (0.05 to 0.08)	0.051
NFI (> 0.9)	0.788
TLI (> 0.9)	0.891
CFI (> 0.9)	0.900

Source: Data from research (2014).

Therefore, by analyzing the GOFs of each dimension and the structural model, as illustrated in Table 2 and Table 3, this research showed that the results were satisfactory, and most of the dimensions include the reference values, meeting the recommendations in the literature, according to what is indicated by Hair Jr. et al. (2009) and Arbuckle (2009). We note that although some dimensions presented some indexes values not recommended, this does not invalidate them since Hair Jr. et al. (2009) say that the use of three or four adjustment indexes provides adequate evidence of model adjustments.

Among the indexes analyzed in the structural model, we notice that the results obtained for CMIN/DF, RMSEA and CFI meet the indications in the literature. However, for the GFI, AGFI, NFI, and TLI indexes, this investigation observed that their results were at the borderline level since the literature suggests 0.9 value. We note that this is the validation of the scale for measuring entrepreneurs' mental models, so several adjustments should still be made.

4.7 Hypotheses Test

The significance and amplitude of the estimated regression coefficients were analyzed to test the hypotheses related to the proposed theoretical model. Table 4 shows the results of these diagnoses described in sequence.

Table 4 – Hypotheses test

H _i	Causal Relation			Estimate	S.E.	C.R. (β)	Significance	Result
H ₁	KNOWLE	--->	O_PERFO	-0.003	0.079	-0.039	p = 0.969	Not Supported
H ₂	EMO_SKI	--->	O_PERFO	0.510	0.236	2.157	p = 0.031	Supported
H ₃	RELATIO	--->	O_PERFO	-0.777	0.381	-2.040	p = 0.041	Not Supported
H ₄	COMUNIC	--->	O_PERFO	0.651	0.278	2.344	p = 0.019	Supported
H ₅	STRATE	--->	O_PERFO	-0.949	0.418	-2.270	p = 0.023	Not Supported
H ₆	C_INNOV	--->	O_PERFO	0.960	0.354	2.710	p = 0.007	Supported
H ₇	VOCATI	--->	O_PERFO	0.277	0.319	0.870	p = 0.384	Not Supported
H ₈	C_INNOV	--->	STRATE	0.857	0.120	7.151	p < 0.001	Supported
H ₉	C_INNOV	--->	RELATIO	0.454	0.077	5.862	p < 0.001	Supported
H ₁₀	STRATE	--->	COMUNIC	0.464	0.112	4.135	p < 0.001	Supported
H ₁₁	EMO_SKI	--->	COMUNIC	0.275	0.100	2.741	p = 0.006	Supported
H ₁₂	STRATE	--->	KNOWLE	0.576	0.134	4.311	p < 0.001	Supported

Source: Data from research (2014).

For Hair Jr. et al. (2009), a significant regression coefficient informs that the relationship between two variables is empirically shown. Therefore, the hypotheses, structural paths, non-standardized coefficients, standardized errors, and the significance test, illustrated in Table 4, prove the values of the results of the empirical study. As already presented, of the 12 hypotheses under study, seven tested their impact on organizational performance, and the other five hypotheses tested the relationship between the dimensions.

4.8 Determination Coefficients

The determination coefficient (R^2) role is to inform the proportion of variance of a dependent variable, which is justified by the independent variables. However, this study states that 27.1% of the variance of the organizational performance, the dependent variable, is explained by its independent variables, which are: Knowledge; Emotional Skills; Relationship; Communication; Strategy; Creativity and Innovation; and Vocation.

Based on the results found, the contribution of the allusive factors to the judgment and significance in explaining the dependent variable (organizational performance) was 27.1%, which, according to Cohen (1992), is considered a significant effect. The author assures that the interpretation given for the statistical significance of the coefficient of determination of a regression (R^2) in the area of behavioral sciences is considered 2% as a small effect, 13% as a medium effect, and from 26% as a substantial effect.

To propose a comparison with Mioranza's study (2012), this research highlights that the coefficient of determination (R^2) found in Pilot Study 1 identified that the entrepreneurs' mental models could explain 27.4 % of organizational performance. This fact can be considered relevant because of the several variables that can affect the performance of companies (MIORANZA, 2012).

5 FINAL CONSIDERATIONS

Based on the application of the ANOVA bivariate test, we observed the entrepreneur age group versus organizational performance. In which it was possible to notice that two variables, within the organizational performance group, presented significance ($p < 0.05$), these variables were O_PERFO_72 and O_PERFO_77. For the variable O_PERFO_72, linked to the total number of

products in line, in the last three years, this finding may indicate that older entrepreneurs (from 60 years) used to have more products in line than those with less age (20 to 29 years). Regarding variable O_PERFO_77, which is related to the firm profitability, in the last three years, the result found pointed out that younger entrepreneurs (20 to 29 years) said they had higher profitability than the older ones (50 to 59 years).

As a result, we tested the company's founding time versus organizational performance. In this case, two variables presented significance ($p < 0.05$); these variables are O_PERFO_76 and O_PERFO_77. Regarding variable O_PERFO_76, which is related to the contribution margin of the company, in the last three years, the values pointed out that the organizations with less time of performance in the market (11 to 15 years) presented a higher contribution margin than the companies with more time of performance (above 20 years). For the variable O_PERFO_77, related to the profitability of the last three years, the results indicated that the organizations with less time of performance in the market (11 to 15 years) presented higher profitability in the last three years than the companies with more time of performance (above 20 years).

At the end of the ANOVA bivariate test, we tested the sales projection for the year 2014 versus organizational performance. In this case, three variables showed significance ($p < 0.05$); these variables are O_PERFO_70; O_PERFO_73 and O_PERFO_74. When analyzing the variable O_PERFO_70, which is related to sales volume (sales, revenues) in the last three years, this study found that the organizations that planned a sales projection for the following year influenced the increase of their sales volume. Regarding the variable O_PERFO_73, which is related to the number of new customers, in the last three years, it was possible to verify that the companies that did a planning, projected a higher percentage in their sales for the following year, presented a higher number of new customers, than the organizations that did not adopt a long-term planning. In the variable O_PERFO_74, which relates to the total number of active customers, for the last three years, the results showed that entrepreneurs who projected their sales in advance were able to obtain a more significant number of active customers.

In the test of the proposed hypotheses, those that were not supported are Knowledge with Organizational Performance, Relationship with Organizational Performance, Strategy with Organizational Performance, and Vocation with Organizational Performance. We note that the Relationship (-0.777) and Strategy (-0.949) dimensions presented an estimate with a negative index. Thus, this study concludes that the dimensions have a significant impact on organizational performance, but negatively. Therefore, in this investigation, these hypotheses were rejected.

This research examined the coefficient of determination (R^2), where it was possible to observe that 27.1% of the organizational performance, the dependent variable, is explained by its independent variables: (i) Creativity and Innovation; (ii) Communication; (iii) Emotional Skills; (iv) Relationship, and (v) Strategy. Once, they were the ones that most impact organizational performance. The percentage found is considered a significant effect, as understood by Cohen (1992). Therefore, studies directed to the organizations' performance should also be conducted to show how managers' mental models influence companies (DANIELS; JOHNSON; CHERNATONY, 2002).

Among this study contributions, the first is an understanding of how the dimensions collaborate to organizational performance. Thus, in the hypothesis test, it was possible to observe that the supported dimensions were: (i) Creativity and Innovation; (ii) Communication; and (iii) Emotional Skills. Four were not confirmed, Knowledge, Relationship, Strategy, and Vocation. In the hypothesis test of the relationship between the dimensions, all proposed hypotheses were confirmed: Creativity and Innovation and Strategy; Creativity and Innovation and Relationship; Strategy and Communication; Emotional Skills and Communication; and Strategy and Knowledge. This result confirms that there is a relationship between the dimensions, and together they impact the company performance.

The second research contribution, of an academic nature, regards the validation of a scale that measures entrepreneurs' mental models and their impacts on organizational performance. The first pilot test of this scale was applied by Mioranza (2012), and based on his study, as well as his suggestions and limitations, that in this research we performed adjustments to the scale, observing its validity and reliability, and applied the second pilot test. Also, there is a need for maturation and improvement of the scale tested, since it has undergone only two pilot tests.

As managerial implications, this study can contribute by stating that all people have their mental models, which are formed throughout their lives, whether through personal or professional experiences. These experiences are transformed into perceptions, which influence the entrepreneur in his decision making. In some cases, the more different situations experienced, the higher the learning, which contributes to the manager's professional experiences. It is also based on this learning that the entrepreneur will make his decisions, reflecting on the organization's performance.

Based on this study's limitations, the opportunity arises to adapt the data collection instrument, applying it to specific markets within the metal-mechanic sector. Also, adapting it and applying it to other market segments, in order to verify how much of the entrepreneurs' mental models dimensions, explain the performance of the organizations investigated.

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Contribution of authors

Contribution	[Author 1]	[Author 2]
1. Definition of research problem	√	√
2. Development of hypotheses or research questions (empirical studies)	√	√
3. Development of theoretical propositions (theoretical work)	√	√
4. Theoretical foundation / Literature review	√	√
5. Definition of methodological procedures	√	√
6. Data collection	√	
7. Statistical analysis	√	√
8. Analysis and interpretation of data	√	√
9. Critical revision of the manuscript	√	√
10. Manuscript writing	√	√
11. Other (please specify)		