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THE IMPACT OF EMPLOYEES' JOB STRESS AND CAREER SATISFACTION OVER CORPORATE ENTREPRENEURSHIP MANAGEMENT LINKED TO SOCIAL RESPONSIBILITY

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Received 19 September 2020; accepted 25 Mayl 2021; published 30 September 2021

Abstract. The purpose of the present study is to analyze how employees' job stress and career satisfaction impact corporate entrepreneurship management linked to social responsibility in a Colombian Information Technology company. For that purpose, we review the evolution of the corporate entrepreneurship concept, as part of innovation models and as an explicit research term, in a specific context, where organizations need to take into account stakeholders' needs. Once completed the review, we present the research methodology with a quantitative approach, where we triangulate or compare the results of an artificial neural network and classification tree, for the job stress and career satisfaction surveys' of 110 employees. The results finally suggest that only the job stress impact the corporate entrepreneurship management linked to social responsibility. At the same time, career satisfaction does not seem to have significant effects over it, in the IT Company.

Keywords: employees; corporate entrepreneurship; innovation; job stress; career satisfaction; social responsibility; machine learning methods; quantitative approach; classification tree; artificial neural network

Reference to this paper should be made as follows: Escobar-Sierra, M., Calderón-Valencia, F. 2021. The impact of employees' job stress and career satisfaction over corporate entrepreneurship management linked to social responsibility. *Entrepreneurship and Sustainability Issues*, 9(1), 87-102. [http://doi.org/10.9770/jesi.2021.9.1\(6\)](http://doi.org/10.9770/jesi.2021.9.1(6))

JEL Classifications: M1, M12, O31, O32

1. Introduction

Current research on business growth strategies, emphasizes corporate entrepreneurship (CE) (Garvin & Levesque, 2006; Morris, Kuratko, & Covin, 2010) that benefits innovation (Freeman & Engel, 2007; Kuratko, 2010). As a result, corporate entrepreneurship being part of entrepreneurship theory, has extended beyond change, strategic management, and innovation (McDougall & Oviatt, 2000). Despite its extension, the corporate entrepreneurship researchers have only focused on the competitive advantages, profitable and sustainable over time (Hornsby, Kuratko, Shepherd, & Bott, 2009; Kuratko, Ireland, Covin, & Hornsby, 2005; Kuratko, Ireland, & Hornsby, 2001; Morris et al., 2010), and on entrepreneurship behaviour (Wales, 2015), missing the opportunity of reviewing the topic as a holistic phenomenon (Ireland, Covin, & Kuratko, 2009; Wales, 2015) and link with the enterprise environment (Kuratko, 2010).

Some researchers recognized the holistic comprehension of the phenomenon, as necessary, and suggest their approach (Escobar-Sierra, Valencia-DeLara, & Vera-Acevedo, 2018). Fang (2013), for example, proposed the topic as a system with backgrounds or inputs (Zahra, 1986), transformations or process (Kuratko & Audretsch, 2013) and outputs or effects (Cao, Simsek, & Jansen, 2015; Zortea-Johnston, Darroch, & Matear, 2012). For him, the system is encouraged by the market triggers i.e., competition, dynamism and heterogeneity in market demands (Zahra, 1991)-, and the stakeholders' needs (Amaeshi, Nnodim, & Osuji, 2013; Carroll, 1999; Casson, 1982; Schwartz & Carroll, 2003; Shanne & Venkataraman, 2000). A context that turns on the system inputs, related to the organizational strategies i.e., governance policies (Bird, 1988), and organizational factors (Burgelman, 1983a) –i.e., culture, human resources practices (Hornsby et al., 2009), capacities and resources (Kuratko, Montagno, & Hornsby, 1990), leadership characteristics (Ling, Simsek, Lubatkin, & Veiga, 2008), information system (Kuratko, 2010), technological capabilities (Martín-Rojas, Fernández-Pérez, & García-Sánchez, 2016) and company features (Álvarez-Herranz, Valencia-De-Lara, & Martínez-Ruiz, 2011). Meanwhile, the process itself is related to the orientation or entrepreneurial behaviour, associated with innovation, risk-taking, and proactivity (Escobar-Sierra et al., 2018). Finally, the system outputs, associated with the stakeholders' satisfaction (Bedoya-Villa & Escobar-Sierra, 2018; Cao et al., 2015; Fang, 2013; Hernández Perlines, 2015; Zortea-Johnston et al., 2012), the main goal of social responsibility (Schwartz & Carroll, 2003). Once discussed the conceptualization of the corporate entrepreneurship, next we review the future recommendations of some authors that recently analyzed the topic. Among them are Franco & Haase (2017) who found that participative leadership style and job satisfaction has a significant effect over the collective entrepreneurship i.e., a conceptually more specific and detailed construct within the realm of corporate entrepreneurship. Moreover, he suggested it study into other geographical areas, paying particular attention to intercultural aspects. Urban & Wood (2015) that highlight the importance of fostering opportunity recognition behaviours within an organization and motivating employees to act innovatively. Kuratko, McMullen, Hornsby, & Jackson (2017) who first proposed and then suggested future validation of a new instrument that measures organizational antecedents for corporate social entrepreneurship. Hughes & Mustafa (2017) that provide an incipient depiction of the internal environment for corporate entrepreneurship in emerging economy SMEs, finding that cultural and contextual factors influence the extent to which they can produce corporate entrepreneurship activity. Chebbi, Yahiaoui, Sellami, Papasolomou, & Melanthiou (2019) that highlighted the vital role of internal stakeholders and internal marketing themes, as prerequisites for organizational change and the adoption of corporate entrepreneurship. Furthermore, Luu (2017) who relates corporate social responsibility, organizational citizenship behaviour for the environment, and corporate entrepreneurship as moderation mechanisms, finally suggests its future analysis, including value-based HR practices, among other things. Rexhepi, Abazi, Rahdari, & Angelova (2019) suggest the future inclusion of entities, identified as “helices” in the innovation models. Because the organization is an open system, thus it creates benefits for others but also can use benefits from others.

In this context, we question about how employees' job stress and career satisfaction impact the corporate entrepreneurship management linked to social responsibility in an IT Colombian company – classified as a big company - with presence in different countries. To that effect, the present study analyzes how employees' job stress and career satisfaction impact the corporate entrepreneurship management linked to social responsibility and present the findings in stages. This stage introduces the research context, the theoretical background, the problem, and the research question. The second stage presents a literature review and selection of the theoretical framework. The third section presents the methodological approach, where we compare or triangulate the results of artificial neural network and classification tree, and on the fourth stage presents the results and analysis. Finally, the fifth and sixth stages discuss the results with that of other authors and present the conclusions.

2. Literature review and selection of the theoretical framework

Despite the remote origin of entrepreneurship, that possibly emerge in the 16th century, only in the 20th century the official discussion about the concept began (Radović-Marković & Salamzadeh, 2012). It can be said that this recent discussion and the theoretical development of corporate entrepreneurship has two significant milestones. The first milestone was the implicit inclusion of the term while referring to innovation models, as Freeman and Engel (2007) suggest when dividing innovation models between startups and mature companies. Moreover, the second one, related to the explicit adoption of corporate entrepreneurship as a research term (Peterson and Berger, 1971), and its consolidation as a research field (Kuratko, 2010). In this context, next, we propose a literature review that begins with some innovation models that include mature companies process in its definition – the first milestone, to end with a tour through the concept of CE –the second milestone.

- Clark (1968) while analyzed institutionalization of innovations in higher education, criticized the traditional models -i.e., the organic growth model, the differentiation model, or the diffusion model-. To finally proposed the combined-process model that suggests as more appropriate for many situations.
- Langrish, Gibbons, Evans, & Jevons (1972) while studying innovation in the industry, present a general discussion about the topic, some quantitative results, and several case studies. They finalize with the proposal of the innovation push model - related to discovery, and the pull model - related to demand.
- Mulkay (1975) discuss three models of the processes by which science develops –i.e., the model of openness, of closure, and of branching-. And argue that the third model provides social factors to scientific knowledge.
- Von Hippel (1978) propose the ‘manufacturer-active’ paradigm for which the manufacturer has the role of assessing customer needs and developing a responsive product idea. And the ‘customer-active’ paradigm in which the customer develops the new product idea and takes the initiative to transfer it to an interested manufacturer.
- Tornatzky et al. (1983) defined the ‘technology source-centred models’, i.e. based on basic research, applied research, development, testing or evaluating, manufacturing or packaging and marketing or dissemination, and the ‘technology user-centred models’, i.e. related to awareness, matching-selection, adoption-commitment, implementation and routinization.
- Saren (1984) discusses the problems of a generalized innovation model, and review the advantages and disadvantages of the (a) Departmental-stage models, (b) Activity-stage models, (c) Decision-stage models, (d) Conversion process models, and (e) Response models. To conclude that more research needs to be concentrated on the nature of the innovation process within the firm itself.
- Pinch & Bijker (1984) outlined the need for a social constructivist approach towards the study of science and technology. To finally, describe in more detail the two approaches, one in the sociology of scientific knowledge (EPOR), and one in the field of sociology of technology (SCOT).
- Kline & Rosenberg (1986) criticized the models that consider innovation as a smooth and well-behaved linear process. To end, proposing innovation as a series of changes in a complete system not only of hardware, but also of market environment, production and knowledge facilities, and the social context of the organizational innovation.

- Ziman (1991) criticized the general discourse about innovation exclusively based on the linear model. He also proposed another way of viewing the situation with a neural net model which allows for 'learning' to take place much as in the human brain.
- Rothwell (1992) traces developments in the models of industrial innovation from (1) the linear 'technology push' and 'need pull' model, (2) the 'coupling model', (3) the 'integrated model'. Until (4) the 4th Generation innovation process that perceived innovation as a parallel process. And, (5) the 5th generation model that involves inter-company networking, and employs a new electronic toolkit.
- Newby (1992) qualify as incomplete the so-called 'linear model' of science and propose an interactive model that takes into account as multidirectional the relationship between science, technology, and society.
- Freeman (1996) argues that world economy can move to a new and sustainable pattern of growth, through a new innovation model that combine some features of the much-criticized linear model - common in mature companies - with features of the systemic innovation model.
- Tait & Williams (1999) defend the linear model of innovation as an essential driver of research and technology development (RTD) policies. And propose a linear-plus model which is reflected in policy initiatives such as (1) the promotion of industry-academic links, (2) special support for small and medium-sized firms and the (3) encouragement of more interdisciplinary approaches in the RTD process.
- Marinova & Phillimore (2003) presents a historical examination of models used to explain innovation. Their overview includes six generations of models, namely black box, linear, interactive, systems, evolutionary models and innovative milieux. For each one, they presented the conceptualization background, the model itself and its elements, explanatory power, related models and concepts, and further research directions.
- Hargrave & Van De (2006), when referring to institutional innovation, introduce a collective action model. That view institutional change as a dialectical process in which actors espouse conflicting views confront each other and engage in political behaviours to create and change institutions.
- Caraça, Lundvall, & Mendonça (2009) they showed the change from a linear to the chain-linked model. To finally proposed a new model that summarizes the current research on the nature of economically useful knowledge, the diversity of intervening players in learning and the outcomes of innovation.
- Doloreux et al. (2019) evidenced that there is relatively little that is genuinely new in the different 'Territorial Innovation Models' in terms of theory-building and related concepts. This kind of models is also known as industrial districts, innovative milieu, learning regions, clusters, regional innovation systems, local production systems and new industrial spaces.
- Rexhepi, Abazi, Rahdari, & Angelova (2019) described the triple helix that represents innovation system model where interact three 'helices' in knowledge production: universities-industry-governments.
- Soliman, Moge-fors, & Bergmann (2020) proposed what they called "problem-driven innovation models" to refer a more evidence-based and empirical mindset to drive valuable innovations with increased efficiency ultimately.

Meanwhile, and concerning the second milestone, next, we present a general tour through the clear concept of CE that begin in 1970. A period where researchers devoted to understanding the entrepreneurship within organizations and the risk team involved in its process. Then, during the 80's decade, the efforts were focused on the design and redesign of CE in the company (Burgelman, 1983b, 1983a, 1984). On the '90s the researches, study the skills that promoted innovation (Zahra, 1991). And finally, during the last two decades, the researches have focused on the combination of previously developed approaches, to understand how organizations obtain sustainable, profitable and competitive advantages over time (Hornsby et al., 2009; Morris et al., 2010; Lichtarski et al., 2020; Laužikas, Miliūtė, 2020).

3. Methodology

Once defined the research problem and completed the literature review and selection of the theoretical framework, we present the research protocol proposed to solve the mentioned research question.

Table 1. Research protocol for the empirical verification.

Criteria	Quantitative approach
Role of the theory	Deductive
Research strategy	Case study
Unit of Analysis	Job stress and career satisfaction
Sample	110 employees of an IT company in Colombia
Variables	Dependent variable –i.e., y- (Idea quality measure related to company stakeholder's needs (in the social responsibility framework)) and independent variables –i.e., x- (employees' job stress, career satisfaction and other demographic variables).
Gathering of data	Variables: education level (Pernelle, Carron, Elkadiri, Bissay, & Marty, 2014:323–332), Quality metric for generated ideas (Reinig & Briggs, 2013:943–973) (Likert scale for SR criteria), gender, age and years of service (Chiavenato, 2008). Instrument: Shukla & Srivastava (2016) survey of job stress and Greenhaus, Parasuraman, & Wormley (1990) survey of career satisfaction.
Analysis of results	Machine learning methods: Artificial neural network (Nisbet, Miner, & Elder, 2009) Classification tree (Bramer, 2007)
Results	Employees' job stress and career satisfaction factors that influence idea quality related to social responsibility.

Source: created by the authors

The data was collected in 2018, between 110 employees of an IT company in Medellín-Colombia-South America, born between 1963 to 2001. 56.4% of the respondents have a professional career, and 60.9% correspond with men. During the fieldwork, all employees were asked a real problem of the company creatively, while other data was gathered.

4. Results and analysis

For the analysis of the results, we apply a triangulation, i.e. an alternative of validation where can combine multiple methods, empirical materials, perspectives and observers in a single study as a strategy that adds rigour, breadth, and depth to any investigation (Denzin & Lincoln, 2008, p. 3; Flick, 1992). Specifically, a method triangulation where we compare the results of an artificial neural network (ANN) and the classification or decision trees. Two techniques that deliver the importance of each one of the variables as results, once verified the significance and accuracy of the models.

The artificial neural network (ANN) is a computational system that works like the human brain, passing impulses from neuron to neuron across synapses (Nisbet et al., 2009). This technique can be configured to function as a binary classifier (yes/no or 1/0) or as a regression index (for numerical outputs) or and also to contain multiple output nodes for estimation, classification or even as a clustering algorithm (Nisbet et al., 2009). While the decision or classification trees, the most popular technique in data mining, help to generate classification rules through a treelike structure (Bramer, 2007), used to predict and compress data (Bramer, 2007). Next, we present the results of each technique.

4.1 Results and analysis of the artificial neural networks

The artificial neural network is configured as follow:

- The objective of the model is to discover how employees’ job stress, measured with the test of Shukla & Srivastava (2016), and career satisfaction, measured with the test of Greenhaus, Parasuraman, & Wormley (1990), impact the quality of the idea, scores of Likert scale proposed by Reinig and Briggs (2013) related to social responsibility. Model in which job stress and career satisfaction act as independent variables, while the idea quality related to social responsibility acts as the dependent variable.
- Artificial neural network (ANN): multilayer perceptron.
- Sample: 110 employees
- The ANN configuration has 114 units, with 1 hidden layer and 15 units in the hidden layers. The activation function corresponds to the hyperbolic tangent with one dependent variable. The number of units is 4, the activation function is softmax, and the error function is a cross-entropy.
- Dependent variables: a measure of idea quality (Reinig & Briggs, 2013) defined as a Likert scale associated with social responsibility issues (denoted by the letter Y).
- Independent variables: 21 items of Shukla & Srivastava’s (2016) test (denoted by the letter X) and five items of Greenhaus, Parasuraman, & Wormley’s (1990) test (denoted by the letter Z).
- Demographic variables such as age, gender, education level and years of service.

Table 1 shows the results of the ANN that has a cross-entropy error of 37.497 during the training; the percentage of the incorrect forecast is 17.3%, and the stop rule is one time.

Table 1. Percentage of correct results that reaches the artificial neural network for each quality measure during the training

Quality measure	Correct percentage
Null	77.8%
Low	83.3%
Medium	86.7%
High	66.7%
Global	82.7%

Source: created by the authors using SPSS®

As a useful measure of accuracy, Figure 1 shows the plot of sensitivity versus 1- Specificity, known as receiver operating characteristic (ROC) curve (Hajian-Tilaki, 2013).

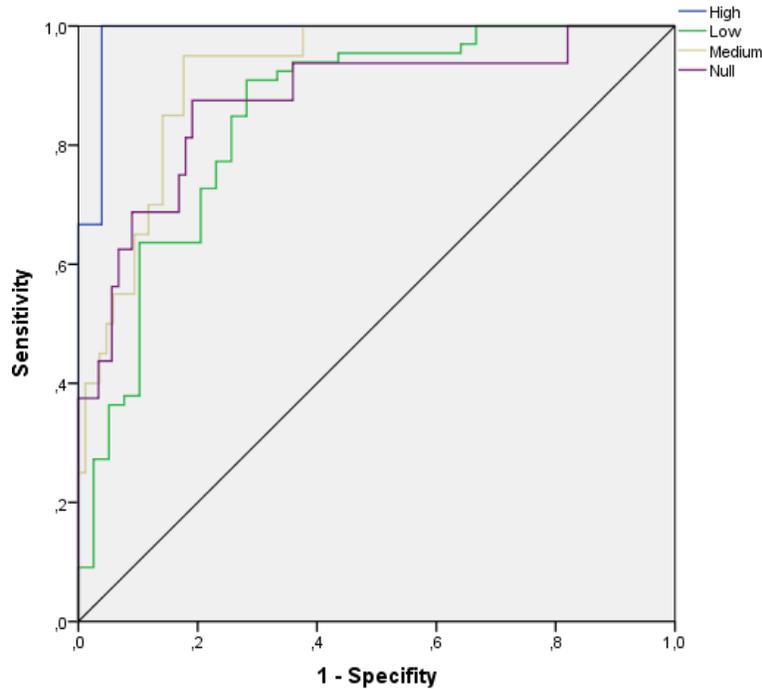


Figure 1. ROC curve for the artificial neural network
 Source: created by the authors using SPSS®

Next, in Table 2, we present the area under the curve, shown in Figure 1, for each of the quality measures (null, low, medium and high).

Table 2. Area down the curve for each quality measure

Quality measure	Area down the curve
Null	.847
Low	.850
Medium	.918
High	.987

Source: created by the authors using SPSS®

Once verified the accuracy of the model, next, we present in Table 3, the estimated importance of each independent variable in the ANN.

Table 3. Importance of each independent variable in the artificial neural network

Independent variables	Importance
Gender	.026
Age	.057
Education level	.038
Years of service	.044
X1	.038
X2	.031
X3	.040
X4	.053
X5	.025
X6	.027
X7	.021

Independent variables	Importance
X8	,034
X9	,025
X10	,023
X11	,035
X12	,027
X13	,046
X14	,043
X15	,022
X16	,043
X17	,019
X18	,029
X19	,034
X20	,038
X21	,020
Z1	,039
Z2	,033
Z3	,036
Z4	,026
Z5	,028

Source: created by the authors using SPSS®

X1 - "I have much work, and I am afraid there is very little time to do it." X2 - "I feel so overwhelmed that even a day without work seems bad." X3 - "I feel like I never leave my job." X4 - "Many people in my office are tired of the company's demand." X5 - "My job makes me nervous." X6 - "The effect of my work on me is too high. Many times, my work becomes too much of a burden." X7 - "Sometimes, when I think about my work, I get a feeling that my chest is being squeezed." X8 - "I feel bad when I leave my job." X9 - "I am not able to satisfy the different requests of my bosses." X10 - "I cannot solve the conflicts with my colleagues." X11 - "I cannot satisfy my customers' requests, because they are opposite to each other" X12 - "My bosses' expectations are different from my subordinates" X13 - "I am concerned about the expectations of different people." X14 - "My co-workers share information with me, they explain." X15 - "My co-workers understand me. They give me advice." X16 - "I have received clear and useful recommendations about my work." X17 - "I have received help in my work." X18 - "I can balance time at work and time in other activities." X19 - "I have difficulty balancing my work and other activities". X20 - "I feel that work and other activities are currently balanced." X21 - "In general, I think my work and other activities are balanced." And Z1 - "I am satisfied with the success I have achieved in my career." Z2 - "I am satisfied with the progress I have made in achieving my professional goals." Z3 - "I am pleased with the progress I have made in achieving my income goals." Z4 - "I am pleased with the progress I have made toward my career goals." Z5 - "I am pleased with the progress I have made in achieving my goals for new skill development."

The first ten independent variables or demographic data (listed in Table 3 in italics font) represent the most critical variables, those that more contribute to the idea quality metric in the ANN analysis. These ten most influential variables of the ANN will be compared or triangulated with the ten most influential variables of the classification tree, in the next section.

4.2. Results and analysis of the classification trees

The classification tree is configured as follow:

- The objective of the model is to discover how employees' job stress, measured with the test of Shukla & Srivastava (2016), and career satisfaction, measured with the test of Greenhaus, Parasuraman, & Wormley (1990), impact the quality of the idea, scores of Likert scale proposed by Reinig and Briggs (2013) related to social responsibility. Model in which job stress and career satisfaction act as independent variables, while the idea quality related to social responsibility acts as the dependent variable.
- Growing method for the classification tree: CRT
- Sample: 110 employees
- Maximum tree depth, 10; minimum number of cases in a final node, 8; minimum number of cases in a parental node, 2.
- Dependent variables: a measure of idea quality (Reinig & Briggs, 2013) defined as a Likert scale associated with social responsibility issues (denoted by the letter Y).
- Independent variables: 21 items of Shukla & Srivastava's (2016) test (denoted by the letter X) and five items of Greenhaus, Parasuraman, & Wormley's (1990) test (denoted by the letter Z).
- Demographic variables such as age, gender, education level and years of service.

Finally, this stage presents the resulting classification tree that has 25 nodes, 13 terminal nodes and a depth of 6 and reaches correct results in the 79,1% of times, as is shown in Table 4, which shows the percentage of correct results reached for each quality measure.

Table 4. Percentage of correct results that reach the classification tree for each quality measure

Quality measure	Correct percentage
Null	50.0%
Low	91.3%
Medium	63.6%
High	66.7%
Global	79.1%

Source: created by the authors using SPSS®

Once verified the accuracy of the model, we present in Table 5, the estimated importance of each independent variable in the classification tree.

Table 5. Importance of each independent variable in the classification tree

Independent variables	Importance
X3	,046
X7	,045
Age	,045
X11	,038
X18	,034
X2	,031
X21	,031
Z1	,028
Years of service	,027
X19	,027
X16	,026
X9	,025
Education level	,025
X6	,025
X5	,024
X13	,024
Z5	,023
X4	,019
Z3	,014
Z2	,013
X1	,012
X14	,011
X12	,010
X17	,007
X10	,004
Z4	,003
X15	,001

Source: created by the authors using SPSS®

X1 - "I have much work, and I am afraid there is very little time to do it." X2 - "I feel so overwhelmed that even a day without work seems bad." X3 - "I feel like I never leave my job." X4 - "Many people in my office are tired of the company's demand." X5 - "My job makes me nervous." X6 - "The effect of my work on me is too high. Many times, my work becomes too much of a burden." X7 - "Sometimes, when I think about my work, I get a feeling that my chest is being squeezed." X8 - "I feel bad when I leave my job." X9 - "I am not able to satisfy the different requests of my bosses." X10 - "I cannot solve the conflicts with my colleagues." X11 - "I cannot satisfy my customers' requests, because they are opposite to each other" X12 - "My bosses' expectations are different from my subordinates'" X13 - "I am concerned about the expectations of different people." X14 - "My co-workers share information with me, they explain." X15 - "My co-workers understand me. They give me advice." X16 - "I have received clear and useful recommendations about my work." X17 - "I have received help in my work." X18 - "I can balance time at work and time in other activities." X19 - "I have difficulty balancing my work and other activities". X20 - "I feel that work and other activities are currently balanced." X21 - "In general, I think my work and other activities are balanced." And Z1 - "I am satisfied with the success I have achieved in my career." Z2 - "I am satisfied with the progress I have made in achieving my professional goals." Z3 - "I am pleased with the progress I have made in achieving my income goals." Z4 - "I am pleased with the progress I have made toward my career goals." Z5 - "I am pleased with the progress I have made in achieving my goals for new skill development."

The first ten independent variables or demographic data (listed in Table 6 in italics font) are the most influential, those that contribute the maximum to the dependent variable in the classification tree analysis. Five of these 10 influential variables are common or recurrent between ANN results and classification tree results (green highlighted variables of Table 3 and Table 5). Methodological triangulation that suggests the following independent or demographic variables (1) X3 “I feel that I never take a leave”. (2) X7 “Many times, my job becomes a big burden”. (3) Age. (4) X2 “I feel so burdened that even a day without work seems bad”. Moreover, (5) years of service as the most influential variables over the idea quality associated with social responsibility issues.

Where we can highlight the incidence of job stress i.e., with three of the five commons, and most influential variables- and the absence of career satisfaction factors on idea quality. The job stress survey that we applied was proposed by Shukla & Srivastava (2016, p. 10). It is divided into different scales, as follows (a.) job stress, (b.) role expectation conflict, (c.) co-worker support and (d.) work-life balance. The most influential variables are all on the first scale, related to the job stress. And, concerning the demographic variables, age and years of service acts as an inhibitor or promoter of the corporate entrepreneurship, showing a real influence.

5. Discussion with other authors

The present study focuses on the innovation process within the firm itself, as Saren (1984) suggests, and consider the social context of the organizational innovation that highlights Kline & Rosenberg (1986). Our analysis of the impact of job stress and career satisfaction over the corporate entrepreneurship management linked to social responsibility agrees with the recent recommendations of Franco & Haase (2017) that proposed the future inclusion of intercultural aspects while analyzed the job satisfaction. Kuratko, McMullen, Hornsby, & Jackson (2017) that talked about corporate social entrepreneurship, bridging this kind of entrepreneurship with the social context. Chebbi, Yahiaoui, Sellami, Papisolomou, & Melanthiou (2019) that highlighted the important role of internal stakeholders as employees, also recognizing the externals (Rexhepi et al., 2019). Caraça, Lundvall, & Mendonça (2009) that promoted the diversity of intervening players in learning and the outcomes of innovation. And Luu (2017) that has also related social responsibility with corporate entrepreneurship. Our methodological proposal responses to Ziman (1991) recommendation of modelling innovation through a neural net model. And, the independent variable also attends to Soliman, Mogefors, & Bergmann (2020) recommendation, of including a problem-driven innovation.

Nevertheless, the obtained results disagree with the proposals of other authors like Urban & Wood (2015) that favours only the opportunity recognition behaviours among employees. Hughes & Mustafa (2017) that study emergence economies – like the Colombian one, but only focused on the corporate entrepreneurship in SMEs. Hargrave & Van De (2006) for whom innovation is a dialectical process in which actors espouse conflicting views confront each other. And Von Hippel (1978) who propose the ‘manufacturer-active’ paradigm i.e., for which the manufacturer has the role of assessing customer needs and developing a responsive product idea, and the ‘customer-active’ paradigm, i.e., in which the customer develops the new product idea and takes the initiative to transfer it to an interested manufacturer.

6. Conclusions and recommendations

Only the job stress impact the corporate entrepreneurship management linked to social responsibility, while career satisfaction does not seem to have significant effects over it, in the IT Company. The job stress mentioned refers, in this case, to the physical stress derived from the work, not to the stress resulting from the role expectation conflict, the co-worker support, and the work-life balance. In the selected case of the IT Colombian company, the corporate entrepreneurship management linked to social responsibility also seems related to demographic variables like the age and the years of service. A meaningful finding for the corporate entrepreneurship and social responsibility field that can be taken into account in future meta-analysis reviews. Furthermore, a useful finding for managers that believe in employees as the main actor of cooperative innovation models.

The methodological triangulation - like the one applied - where can be combined, between others, multiple methods, results as an efficient strategy to add rigour, breadth, and depth to research. In our case, we compare the results of the artificial neural network (ANN) and the classification or decision trees, once verified the significance and accuracy of the models. During this triangulation, we compare the ten most important independent variable in the artificial neural network model with the ten of the classification trees, where we find five common variables in both models.

Despite the remote origin of entrepreneurship, that possibly emerge in the 16th century, only in the 20th century the official discussion about the concept took place. This discussion about the topic has two big milestones, the first one related to the implicit inclusion of the term while referring to innovation models, where it is important to highlight the absence of a generalized model. And the second one related to the explicit adoption of corporate entrepreneurship as a research term, where the focus is on understanding how organizations obtain sustainable, profitable and competitive advantages over time.

The link that we propose between corporate entrepreneurship management and social responsibility consider the different stakeholders' needs during the idea generation process, as part of a problem-driven innovation. Our conception of social responsibility takes into account legal, economic and environmental issues, in a particular context where ethical and sustainability values are essential in the resolution of stakeholders' needs. However, in our research, the evaluation of social responsibility only considers the idea generation process, so for future research, it could be taken into account other corporate entrepreneurship phases, as design, production, commercialization, after-sales, and disposal phases. Another gap in our research relates to the inclusion of only one stakeholder, the employees, who tried to solve different stakeholders' needs. In the future, we can consider the perspective of different stakeholders.

For future researches, we suggest the verification of other backgrounds of corporate entrepreneurship related, for example, with organizational strategies, and with different organizational factors to those analyzed here. In this sense, it would also be possible to review the corporate entrepreneurship process with behaviours associated with the risk-taking and proactivity. And with the corporate entrepreneurship outcomes, related to the organizational performance link to the satisfaction of different stakeholders. Finally, we highlighted the inclusion of different stakeholders in the corporate entrepreneurship management, for example, the shareholders, the suppliers, the clients, the academies, and the state.

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ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

ISSN 2345-0282 (online) <http://jssidoi.org/jesi/>

2021 Volume 9 Number 1 (September)

[http://doi.org/10.9770/jesi.2021.9.1\(6\)](http://doi.org/10.9770/jesi.2021.9.1(6))

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