

Journal of Business and Economics

Volume 12, Number 6, June 2021



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Subscription Information:

Price: US\$800/year (print)

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Journal of Business and Economics (ISSN 2155-7950) is a refereed journal. All research articles in this journal undergo rigorous peer review, based on initial editor screening and anonymous refereeing by at least two anonymous referees. The review process usually takes 4-6 weeks. Papers are accepted for publication subject to no substantive, stylistic editing. The editor reserves the right to make any necessary changes in the papers, or request the author to do so, or reject the paper submitted.

Database Index:

Journal of Business and Economics (ISSN 2155-7950) is indexed by SSRN, CrossRef and Ulrich now.

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Saladette Tomato Price Forecasts in Mexico With the Application of the Box-Jenkins Methodology

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Abstract: The Box-Jenkins Methodology was used in this work in order to identify an autoregressive integrated moving average (ARIMA) model that might be suitable to the time series of average wholesale prices behavior of Saladette tomato in Mexico in order to predict future values of such product in the supply centers of the 31 states of the Mexican Republic from January 2011 to December 2020. Data was obtained from the National Market Information System of the Federal Government's Ministry of Economy. The data processing was carried out with IBM SPSS V25 software and with Excel 2007 software. Results indicate that there is an increasing positive trend, seasonality, without cyclical effect and with random variations in monthly prices. The regression analysis for tomato prices indicates a correlation coefficient of 0.55, an average association. The analysis of variance rejected the null hypothesis of equality between prices. Once the regression equation has been calculated, it can be verified with the ARIMA Model (1, 0, 1), which firstly allows us to calculate a correlation adjustment, whose results indicate a 0.558 R² value. With this model the average prices per kg of Saladette tomato for the year 2020 were forecasted.

Key words: time series; trend; seasonality; average price

JEL code: C22

1. Introduction

Many phenomena in different sciences, both exact and socioeconomic, can be explained by their behavior over time; for example, oil prices, company sales, weather data, currency variations, vegetable prices and many other administrative processes have this characteristic of being expressed in terms of time series, where future values can have a forecast based on previous data of the same phenomenon.

The publication by G. P. E. Box and G. M. Jenkins "Times Series Analysis: Forecasting and Control" in the 70s generated a new set of forecasting tools, whose procedure was called the Box-Jenkins methodology; also, technically known as ARIMA (Autoregressive Integrated Moving Average) methodology. This forecasting method is based on the analysis of the probabilistic or stochastic properties of the economic time series themselves, since a variable t can be expressed as a function of its past values, which is why they are sometimes called atheoretical models, where there is no causal relationship, unlike the classical regression models (Rosales et al., 2014).

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In the case of products from the agri-food sector and the horticultural sector in particular, their economic characteristic is the variability of prices, this characteristic has two causes, the first is biological and climatic, which determines their productivity and, secondly, the producer cannot set the price of the product, this one is set by the markets supply and demand.

Therefore, there is uncertainty in the setting of prices, in this case applicable to Saladette tomatoes throughout Mexico, which is why, through the time series methodology, the setting or forecasting of future prices that allow a better planning is proposed (Carter et al., 2008).

Tomato productions in Mexico fully (100%) meet the national requirements and world exports have increased by 39.41% in the last decade, which has generated a 90.67% increase in Mexican exports, mainly destined for the United States.

Tomato yields in the US are 484 t/ha (24.2 t in 500 m²) and, in Mexico, 170 t/ha (8.5 t in 500 m²), where a gap that still has to be resolved in Mexico can be observed (FIRA, 2007). In this country, there are 150 thousand tomato producers, who contribute to generate 70 thousand direct jobs related to this activity and the varieties grown are mainly Saladette and ball; in addition, tomato is the third export product after beer and avocado.

National prices are influenced somehow by cycles and festive phenomena throughout the year. December by the Christmas season, May by holidays such as Mother's Day, June by Father's Day, July and August by school closings, September by the National holidays, October by the Day of the Dead and the cycle repeats every year. In 2020 this cyclical behavior may be altered and reflected in a different way in monthly prices, this is due to the Covid-19 pandemic.

The objective of this work is to know the monthly behavior of Saladette tomato prices in the supply centers of the country, the above under the assumption that there is a cyclical and seasonal behavior, which is caused by the characteristics of this vegetable, such as its perishability, in addition to being subject to the seasonality of the sowings, as well as to the climatic influence of the crop. Therefore, this model will allow to obtain indicators that facilitate the implementation of crop planning policies, facilitating to the different agents that participate in the production, distribution and commercialization process of the product in an efficient decision-making process.

In the present work, the Box-Jenkins methodology is applied, using monthly data from a time series of nominal prices, for the wholesale of premium quality Saladette tomatoes from January 2011 to December 2019 in the supply centers of the 31 states of Mexico, in order to know the behavior of such prices and to forecast. The information was obtained from the National Information and Market Integration System (NMIS) of the Federal Government's Ministry of Economy and was processed with IBM SPSS V25 software, and with Excel software. The methodology used for the construction of the ARIMA model was conformed with the steps suggested by Box-Jenkins: identification of the model, estimation of parameters, verification of assumptions (Greene, 2003).

2. Literature Review

For the application of the ARIMA model, Martínez in 2018, suggests the identification of the components of a time series, which he describes as follows:

- 1) Trend. (T). It is the data gradual up-or-down movement over time.
- 2) Seasonality (S). It is the pattern of demand fluctuations above or below the trend line that repeats at regular intervals.
- 3) Cycles (C). They are patterns in the annual data that occur every several years.

4) Random Variation. (R) They are blips in data caused by chance and unusual fluctuations.

Box-Jenkins have developed models for time series that have existing dependence on data, that is, each observation in a given number is a function of the previous values. The analyses are based on an explicit model. The models with the generic name of ARIMA (Autoregressive Integrated Moving Average) whose components are AR (Autoregressive) I (Integrated) and MA (Moving Average).

The ARIMA model allows to describe a value as a linear function of previous data due to chance, in addition, it can include a cyclical or seasonal component. That is to say, the necessary elements to describe the phenomenon. Box and Jenkins recommend at least 90 observations in the time series (De la Fuente, 2019).

Steps of the Model:

- 1) Identification: Identify the possible model.
- 2) Provisional selection and estimation of the ARIMA model.
- 3) Diagnosis and revaluation of the model.
- 4) Forecasting: once the model has been chosen, forecasting starts.

3. Theoretical Concepts

Time series is defined as a sequence of values, records, or observations obtained over time. Prices of a warehouse, the times a schoolboy leaves his/her table, number of cigarettes smoked per day, etc. All of them can be taken continuously or at discrete points of time that can vary in seconds, minutes, hours, days, weeks, months or years.

A time series is continuous when the observations are taken over time and it is symbolized by $Y(t)$. A series is discrete when the observations are in predetermined time and of equal length, in this case it is symbolized by $Y_t = Y_1, Y_2, Y_3 \dots, Y_{t-1}, Y_t$. The study of the description of discrete time series and at equally spaced intervals. It is suggested to build a dynamic model that describes its shape (ARIMA model), that is, building a polynomial fit model.

Therefore, the retroactive change operator ($B(Y) = Y_{t-1}$) as well as the differentiation operator (d) are important since they allow to simplify the algebra of the representation of the models, thus, the higher order ARIMA processes could not be described without these operators.

Since the means, variances and covariances change over time, the analyst must assume restrictive assumptions, since these assumptions determine the concept of stationarity Granger C. W. J. and Newbold P. (1977) the conditions that must be met for the series to be considered stationary (Guttman, 1981).

Condition 1: A stationary process is characterized because both mean and variance do not change in terms of historical time.

Condition 2: A stationary process is characterized by the covariance between two random variables at t and $t+k$ is only a function of the relative lag k , and not of the historical starting point t . In other words, the covariance of the process is independent of historical time. These two conditions are expressed as follows:

$$E(Y_t) = \mu t = \text{mean of } Y_t$$

$$\text{Cov}(Y_t, Y_s) = \lambda_{t,s} = \lambda_k$$

Consequently, a stationary process is one that has a mean and a variance that does not change over time and, at the same time, the covariance between values of the process at two points in time (t and $t+k = s$), depends only on the distance between these two points (λ) and not on the time itself. As stated by Brockwell and Davis (1991),

stationarity as we have defined it here is referred to as weak stationarity, covariance or second-order stationarity.

Thus, first order stationarity is a concept, is a necessary condition for any ARIMA model, although not sufficient.

The second condition refers to the covariance or autocorrelation function (ACF), which is a measure of the correlation between Y_t and Y_{t+k} , at a certain distance k . Variance is estimated from all N of the observations, while covariance is calculated from the Nk pairs of observations, if the series is proactively varied, the following would be obtained:

Lag 0	$Y_1 Y_2 Y_3 \dots Y_N$	
Lag 1	$Y_1 Y_2 \dots Y_{N-1} Y_N$	
Lag 2	$Y_1 \dots Y_{N-2} Y_{N-1} Y_N$	Etc.

In this way, the ACF (0) is the correlation coefficient estimated from the original series related to itself and therefore equal to unity.

The ACF (1) of a lag is the estimated correlation coefficient between the original series (lag 0) and the one-place shifted series (lag 1). ACF (k) is the estimated correlation coefficient between the original series and the series at lag k .

If for a time series $r_k = 0$, then the Model that best fits the process is an ARIMA (0, 0, 0) and it is said that the series follows a white noise process with r_k of $N = (0, 1/N)$ or normal distribution with mean 0 and variance $1/N$.

A second instrument to know the dependency structure of a time series is the partial autocorrelation PACF (k) which uses matrixes for its calculation. Finally, significance limits and their significant difference of zero are calculated.

Stationary time series

Time series are defined as stochastic processes or orderly sequences over time, in a set of random variables. We will track the stationary time series. Remembering that a stationary process is described by a sequence of data that does not present any systematic change in the mean or variance. A process is stationary if for any value of $t_1, t_2, t_3\dots t_n$ and any value of k , the joint probability distribution $F(Y_{t1} \dots Y_m)$ is identical to $F(Y_{n+k} \dots Y_{m+k})$.

White Noise Process

It is a random type process; it is formed by a sequence of mutually independent and identically distributed random variables whose mathematical representation is:

$$Y_t = \mu + a_t \text{ or } Y_t - \mu = a_t$$

With constant means and variances, Wei (1990) highlights that such white noise process plays an important role in the construction of time series models, as a diagnostic tool.

Autoregressive processes of moving averages

Two examples would be: first order autoregressive process and the first order moving average process. The generalization of these two processes are regressive processes of order (p) (AR Models) and moving average processes of order (q) Models (MA).

Autoregressive Moving Average Models (ARIMA)

In these models, average level of the series changes over time, these series are non-stationary so that the data must be differentiated one, two ... (d) times. The differentiation of a series is represented by V :

$$V_t = y_t - y_{t-1}$$

By applying the difference operator (d) once to the observations, the linear trend component is eliminated, by differencing the observations twice, the quadratic trend component is eliminated, and by applying the difference

operator (d) times, (V_{yt}^{dl}) , a polynomial trend component is removed.

In this way, when adding a differentiated series (d) times to an autoregressive process of moving average of order (p, q), the resulting model is called the autoregressive integrated moving average process (p, d, q) and the model is ARIMA (p, d, q). Charfield (1975) points out that most of the series are non-stationary. And delving into the idea, Frederiksen and Rotondo (1979) affirm that, in many longitudinal studies, it is reasonable to expect some degree of growth or trend in the mean of the series. And when the series is not stationary in the mean, we can model it by differentiation and, thus, transform it into a stationary process.

4. Materials and Methods

The type of study was descriptive prospective. The ARIMA model was applied to describe and forecast the series of the monthly production behavior of Saladette tomato reported by the National Market Information System (NMIS) of the Government of Mexico's Ministry of Economy the period January 2011-December 2019.

The records were processed as a monthly time series. The ARIMA processes are applied to stationary series; that is, to time series with constant mean and variance (Box and Jenkins, 1976). This method avoids the use of additional independent variables such as the type of existing farms, number of farms, among others the variable under study, of which only its behavior in the past and the behavior of the error are considered (Vogelbang, 2005).

The design and conformation of an ARIMA model is carried out in three successive stages: identification, estimation and diagnostic review (Box and Jenkins, 1976), all supported by the principle of parsimony. The general form of an autoregressive model of seasonal moving averages (ARMA) according to Asteriou and Hall (2007), is shown in equation 1. It combines the autoregressive processes (AR (p)) and moving averages (MA (q)) and it is accompanied in its definition with the corresponding orders (p, q).

The estimations, hypothesis tests and evaluations were carried out with the help of the econometric software SPSS Version 25 (IBM, 2019) and with the Microsoft Office Excel Software, 2019.

4.1 Applied Model

Once the initial series was identified as an ARIMA Model (1,0,1) (0,1,1), the most important work of the time series modeling with the Box-Jenkins methodology would be carried out. Where the autoregressive factor p = 1, differentiation d = 0 and moving average q = 1 and sp = 0, sd = 1 and sq = 1. The model to be applied according to the theory would be:

The AR (1) part of the regular part comes from the initial rapid decrease and the sinusoidal waves of the ACF added to the fact that the PACF presents a single significant coefficient in most of the periods, with the rest of the coefficients being abruptly canceled.

Q The MA (1) part of the regular part comes from the fact that the ACF presents only one significant lag in most of the periods (except in the first one).

The differentiation part (d) does not differ, it remains d = 0.

5. Results and Discussion

According to one of the first steps, which consists of knowing the behavior of the series, it is described in the figures 1a, 1b, 1c, and 1d. When it is analyzed in Excel, it is found that it presents an increasing positive trend in prices (1a). For seasonality, that is, the fluctuation of prices based on the trend line, the prices do show variation

with respect to the trend line above and below (1b), where December has the highest prices and February the lowest. In this regard, Marroquín and Tovar (2011) found an increasing positive trend in globe tomatoes at the Iztapalapa supply center in Mexico City.

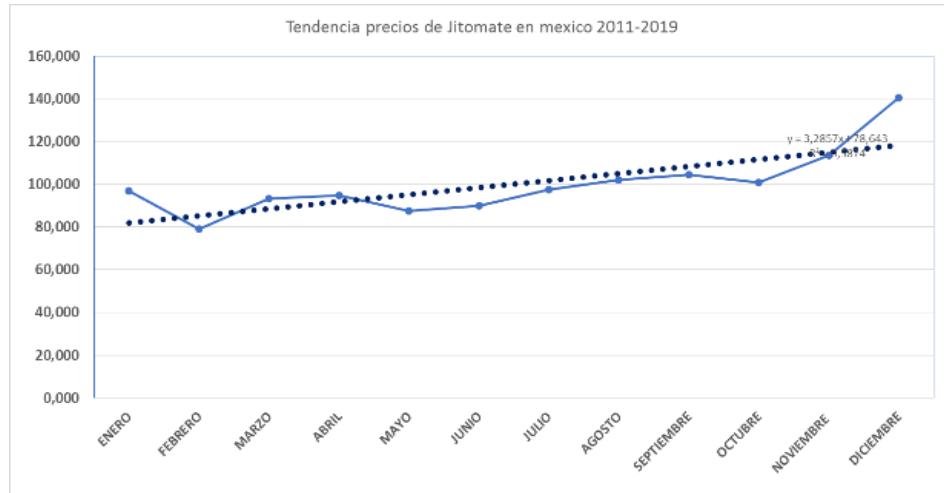


Figure 1a Trend Index in Tomato Saladette Prices, México. 2011-2019

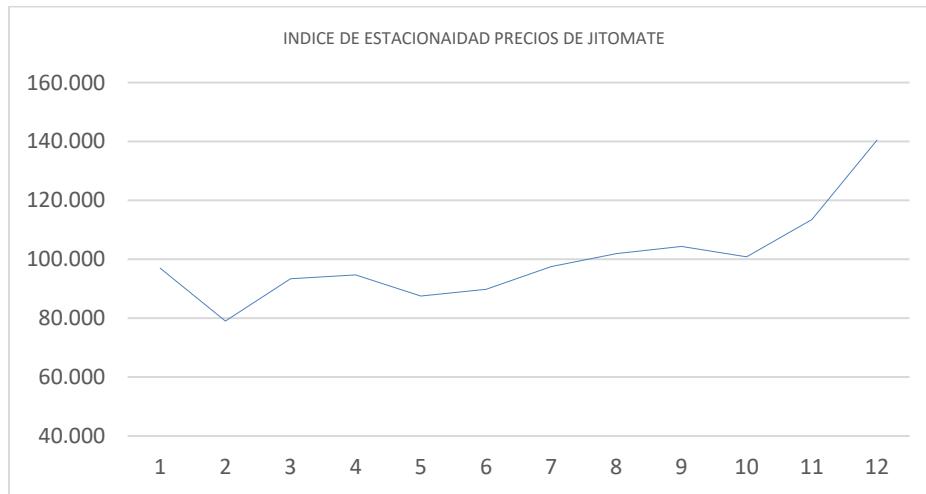
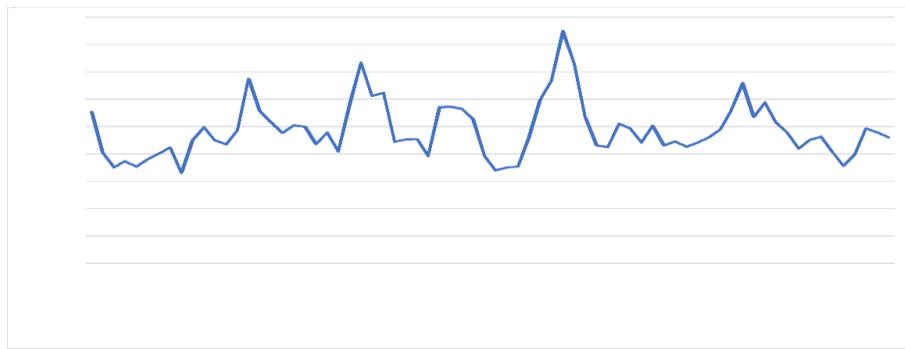


Figure 1b Seasonality Index in Tomato Prices, México, 2011-2019

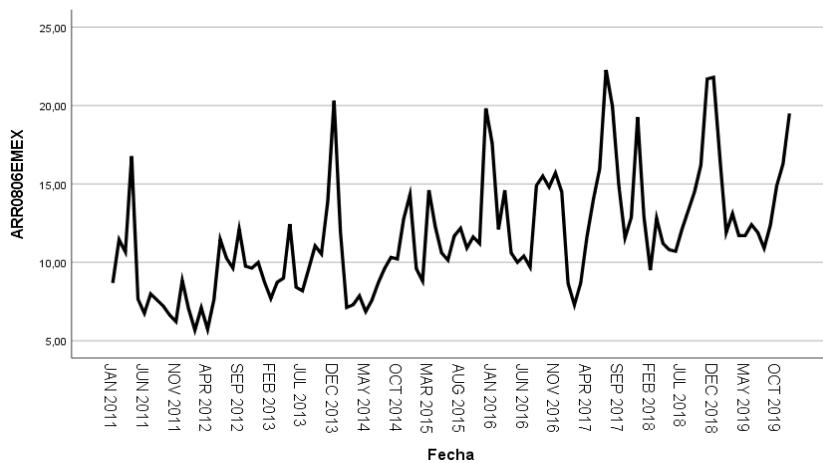


Figure 1c Cyclical Factor in Tomato Prices, Mexico, 2011-2020


Figure 1d Random Variations in Tomato Prices, México, 2011-2019

Cycles, the series does not present marked cycles in its behavior, there is no cyclical factor (1c) and, in terms of random variations, they are jumps in the data caused by chance, considered as normal (1d).

Continuing with the identification of the Model, the graphical way to do it is through the sequence graph, which will show us the seasonality, in Figure 2 this figure is presented, the spacing of prices shows the presence of a periodic behavior of these values.


Figure 2 Saladette Tomato Prices Sequence Chart, Mexico, 2011-2019

The regression analysis for tomato prices indicates a correlation coefficient of 0.55, an average association, the adjusted correlation coefficient drops to 0.30, with 107 observations (Table 1).

Table 1 Statistics of the Regression on Tomato Prices, Mexico. 2011-2019

Regression Statistics	
Multiple correlation coefficient	0.5514
Adjusted R ² Coefficient	0.3040
R ² adjust4ed	0.2974
Typical error	3.1320
Observations	107

The analysis of variance for the tomato time series indicated a value of 45.87 with a F critical value of 0.000000000751, indicating us differences between the monthly prices at 0.05 of significance, so the null hypothesis of equality between prices would be rejected (Table 2).

Table 2 Analysis of Variance for the Time Series in Saladette Tomato, 2011-2019, Mexico 2020

	Degrees of Freedom	Sum of squares	Average of squares	F	Critical value of F
Re Regression	1	449.994863	449.994863	45.8715715	0.000000000751
R Residuals	105	1030.03797	9.80988547		
Total	106	1480.03284			

The regression analysis allows us to calculate the intercept and the price variable forecasting equation in Saladette tomato (Table 3), the upper and lower limits at 95% are indicated in the same table.

Table 3 Time Series Intercept in Tomato, 2011-2019 Mexico

	Coefficients	Typical error	t-statistic	Probability	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8.01826	0.6183	12.9666	1.5700	6.7921	9.2443	6.7221	9.2443
X	0.06639	0.0098	6.7728	7.5083	0.0495	0.0858	0.0469	0.08583

Once the regression equation has been calculated, it can be verified with the ARIMA Model (1,0,1), which first allows us to calculate a correlation adjustment, whose results indicate an R² with a value of 0.558 and an R² of 0.415, that is to say, an average association, with similar values in their percentiles (Table 4). And, in table 5, the normal and adjusted correlation coefficient is expanded, alongside with the percentiles from 5 to 95.

Table 4 Adjustment of the ARIMA model in Tomato in Mexico, 2011-2019

Statistical adjustment	Percentil									
	Mean	Minimum	Maximum	5	10	25	50	75	90	95
Stationary										
R-squared	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534
R-squared	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415

Table 5 Statistical Adjustment of the ARIMA Model in Tomato, Mexico, 2011-2019

Statistical adjustment	Percentil									
	Mean	Min.	Max.	5	10	25	50	75	90	95
Stationary										
R-squared	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534	0.534
R-squared	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415
RMSE	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864
MAPE	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31
MAE	2.098	2.098	2.098	2.098	2.098	2.098	2.098	2.098	2.098	2.098
MaxAE	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89
Normalized BIC	2.294	2.294	2.294	2.294	2.294	2.294	2.294	2.294	2.294	2.294

The parameters of the ARIMA Model for Saladette tomato prices are presented in table 6, in this case with a lag and a significance lower than 0.5, which indicates that the equality of the values tested for the period 2011-2019 is rejected.

Similarly, the ARIMA analysis of variance for outliers is presented in Table 7, with values lower than 0.05.

In addition to being set with the periodogram, seasonality can also be detected with the autocorrelation function, thus, from Table 8, the ACF autocorrelation coefficients meet the conditions for seasonality to exist,

given that these coefficients for multiple lags of different periods 1, 12, 24 and 36 of the series are significantly different from zero. Similarly, Marroquin (2011), states that once it was verified that the series subject of stationary analysis, the model is to be identified by analyzing the correlograms. The autocorrelations decrease until lag 3, then only lags 12 and 23 are significant. The partial autocorrelations show peaks in lags 1, 11 and 23, which seem to be statistically significant, in globe tomato.

Table 6 Parameters of the ARIMA Model, Tomato, Mexico, 2011-2019

			Estimation	SE	T	Sig.
ARO3JIT EDOMEX MODEL 1	Mex	Seasonal difference Seasonal MA	Lag 1	0.974	1.187	0.831 0.414

Table 7 Outliers, ARIMA, Saladette Tomato, Mexico 2011-2019

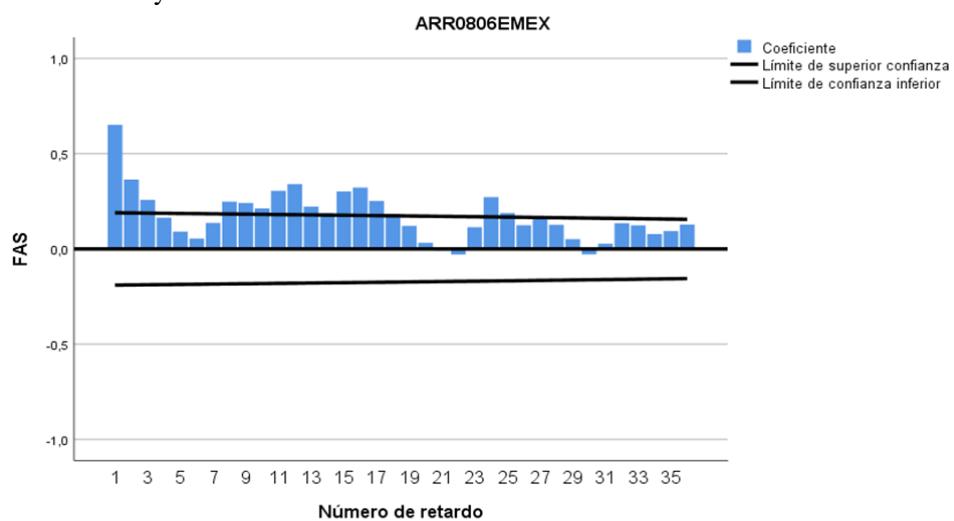
			Estimation	SE	t	Sig.
AR03JITEDOMEX- Model_1	Apr-12	Aditivo estacional	-9.252	2.63	-3.518	0.001
	Mar-15	Cambio de nivel	3.997	0.489	8.171	0
	Jul-17	Aditivo	10.103	2.64	3.827	0

Table 8 Autocorrelations in Saladette Tomato Prices, Mexico, 2020

Lag	Autocorrelation	Dev. Error ^a	Box-Ljung Statistic		
			Value	Degree of freedom	Sig. ^b
1	0.652	0.095	47.181	1	.000
6	0.055	0.093	73.898	6	.000
12	0.340	0.090	121.710	12	.000
18	0.184	0.087	170.115	18	.000
24	0.272	0.084	184.628	24	.000
32	0.135	0.080	202.025	32	.000
36	0.128	0.078	209.589	36	.000

a. The underlying process assumed is independent (white noise). b. It is based on the asymptotic chi-squared approximation.

In the same way, graphically, the autocorrelation coefficients of the series do not decrease rapidly (Figure 3), indicating lack of seasonality.


Figure 3 Graph of Autocorrelations, Regular Differentiation of the Time Series of Saladette Tomatoes, Mexico 2020

Once the initial phases of the ARIMA process have been completed, the last phase focuses mainly on this methodology, in the forecasting of the values of prices for the year 2020, these are shown in the table and in graph 2 they are also observed graphically.

It is important to note that these predictions, in order to be verified, must be obtained from the average prices of kg of tomato, from the 31 entities and their supply centers, the values seem low compared to market prices, since they were estimated based on averages at the end of the month of each of the supply centers of the 31 entities recorded by the NMIS of the Federal Government's Ministry of Economy. Where we can see that two months are the lowest regarding these averages, February with \$ 15.59 kg⁻¹ and April with \$ 15.82 kg⁻¹, and the highest month with \$ 22.58 kg⁻¹.

Table 9 Forecast Average Prices of Saladette Tomato With the Box-Jenkins Methodology, Mexico, 2011-2020

Year	Month	Forecasted Price \$ kg ⁻¹
2019	January	17.48
2019	February	15.53
2019	March	16.90
2019	April	15.82
2019	May	16.33
2019	June	16.52
2019	July	16.43
2019	August	18.45
2019	September	18.41
2019	October	17.76
2019	November	19.35
2019	December	22.45
2020	January	17.86
2020	February	15.59
2020	March	16.93
2020	April	15.82
2020	May	16.27
2020	June	16.52
2020	July	16.39
2020	August	18.06
2020	September	18.20
2020	October	17.90
2020	November	19.47
2020	December	22.58

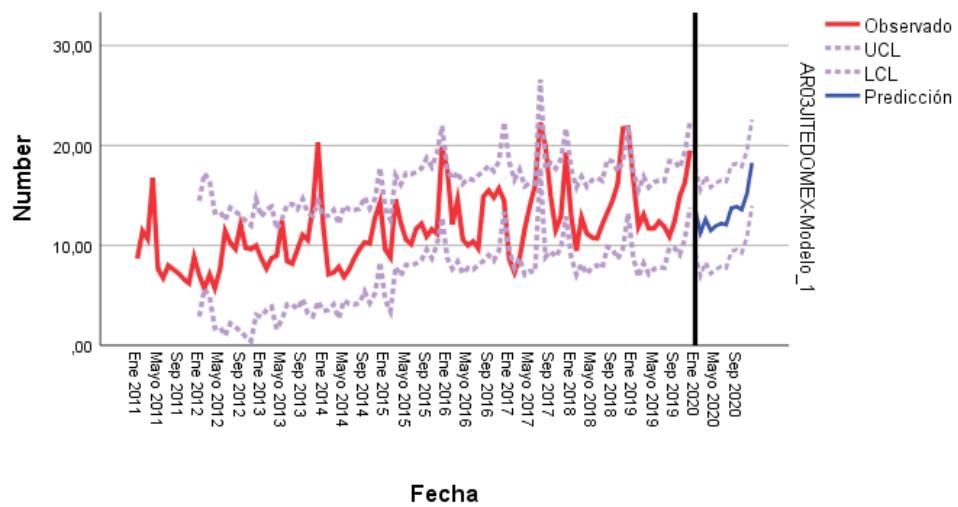


Figure 4 Graph About Forecasted Prices In Saladette Tomato, Mexico, 2011-2020

6. Conclusion

In the present work it is concluded, according to results, that the time series of average prices of Saladette tomato in Mexico, conforms to an ARIMA model, the model used was $(1, 0, 1)$ $(0, 1, 1)$. The current and future prices of this vegetable can be explained by its prices in the past. With the model, forecasts are obtained for 12 months, from January 2020 to December 2020.

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The Effects of Financial Globalization on Brazil (1999-2002)

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Abstract: The twenty-first century was a transition that allowed us to identify a particular moment in Brazilian Economic History, the convergence between the orientation of neoliberalism and of the Real Plan. This perspective that acted as an interpretive key of the paradigm of the “New Economy”, after the technological Revolution that characterized this period. This context led our research theme to relate the effects of financial globalization on Brazil, accordingly to the perspective of the editorial agenda of the newspaper “O Estado de S. Paulo” (1999-2002). The methodology of documentary research allowed to classify, under “analysis and synthesis”, more than 1,400 editorials. The results revealed an editorial agenda that was constituted in the exercise of elaborating discourses on the Brazilian reality as part of a narrative that was consolidated from XIX century on the history of Brazil Republic.

Key words: economic history of Brazil republic; new republic; globalization; real plan; “o estado de S. Paulo”

JEL codes: B, F, N

1. Introduction

The twentieth century marked a structural transition in the Brazilian economy. From the condition of agro-exporting semicolonial in the late nineteenth century, following the Proclamation of the Republic in 1889, Brazil closed the last century occupying a place among the ten largest world economies, according to the International Monetary Fund (IMF).

These economic transformations involved social effects that were accentuated in the late 20th century, largely due to the impact caused by the technological financial globalization on the labor market, accentuating the structural social inequalities of the country.

This social impact somewhat compromised the change in the economic model proposed by the Real Plan from 1995, after five economic plans from 1980 that failed. The Real Plan came with the proposal to ease the country’s inflationary escalation, also to replace the old economic model, “of import substitution, of forced industrialization and development”¹.

The old model was considered the “malignant triad” (Campos, 1999), for the combination of “inflation, protectionism and exchange devaluation”. In contrast, the Real Plan would be the “benign triad” as it combines “monetary stability, openness and structural reforms”².

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¹ “O que faltou para completar o real”, *O Estado de S. Paulo. Notas & Informações*, 03 jan. 1999, p. A3.

² “O que faltou para completar o real”, *O Estado de S. Paulo. Notas & Informações*, 03 jan. 1999, p. A3.

However, this transformation of the economic model in Brazil proposed by the Real Plan also involved taking on the global challenges that were in progress. This was accentuated by the shift to the system of globalized volatile capital markets, which translated into internal risks of great magnitude due to the effect that the international financial crises had on emerging economies, as was the case of the Brazilian economy in this period.

This moment in the history of contemporary Brazil involved dimensioning the challenges of reorganizing a new development model for the country when financial globalization organized a new operating system in integrated markets. The geopolitical agenda that became evident with the creation of economic blocs such as NAFTA, the European and Asian Common Market. This led Brazil to seek hemispheric insertion with the southern countries, with Argentina as its main partner of the regional economic bloc in the creation of Mercosur in 1994.

The force of this moment of transition has become much more decisive by the changes of digital technological paradigm of the volatile monetary pattern of the international financial market that has impacted on systemic crises in emerging countries, whose deeper effects have been translated into currency devaluation, rising foreign debt and economical stagnation.

The convergence of these two ongoing phenomena in Brazil in the transition to the 21st century, the change in the economic development model proposed by the Real Plan and the impact of financial globalization at the end of the last century were the foundations of the main hypotheses elaborated by this research.

The research was based on following the thematic and editorial agenda of the newspaper *O Estado de S. Paulo* (1999-2002) because it considered the historical collection of the newspaper on the History of Contemporary Brazil, from the Proclamation of the Republic to the present day.

The editorial line of the newspaper defines in Brazil an influential point of view since the end of the nineteenth century, part of the coffee economy, founded in 1875 and turned into a herald of republican ideas. In addition to opinionated journalism, the newspaper stands out for its commitment to report on the daily facts that characterize Brazil's economic agenda today. In this way, it constituted a privileged place to observe the impact of global facts on the local sphere and the unfolding of the applicability of the Real Plan in seeking to overcome structural inequalities in the combination of economic and social by the power of journalism to narrate facts.

This research's objective in the field of the Economic History of the Republic in Brazil considered that the point of view of the newspaper *O Estado de S. Paulo* has been distinguished by the republican tradition. This narrative marked in the country a symbolic place, on the one hand by the action of reporting reality, on the other, by the power to organize an influential economic agenda.

In formulating a set of hypotheses, the research considered the new economic context of Brazil, a period that was characterized as the transition to the new Millennium. What was marked by determining factors reorganized this new economic context. That is, the impact of the new international financial system, strongly marked by the influence of the neoliberal orientation that was largely determinant in the new model, the Real Plan.

This neoliberal tendency was almost hegemonic in the late twentieth century and functioned as a kind of operating standard to adapt to the economic structures of the globalizing world for the New Economy, which ran on a total immaterial financial operating system from end of last century. Thus, the research sought to map aspects of this process about Brazil in the newspaper pages in search of comprehensive links of the new ideological and economic format of the world. This was shaped by the realignment of the world after the end of the period known as the Cold War, due to the predominance of ideological tendencies that manifested themselves during the geopolitical changes of the international economy after 1980, an influence that was decisive in Brazil.

2. The Perspective of O Estado de S Paulo Newspaper About the Real Plan

In essence, the newspaper did not fail to report and comment in the public sphere on what involved in this period (1999-2002) the central macroeconomic proposal of the Real Plan. The priority was based on a new economic structure for the pursuit of currency stability with inflationary control through targeting policies for state reorganization. These guidelines were part of an economic model based on a tripod of reform, structural adjustment, and openness of the state apparatus economy to private enterprise.

In many moments, the newspaper considered the international context converging with national transformations, or modernization of the country to the current global standard, commenting on the new orientation of the world system, essentially coincident with the neoliberal orientation. This was decisive in the opening and preponderance of market power over economies. This fact was accompanied by the new globalizing technological paradigm, reorganizing the world system in new media, which evidenced the capacity of the integrated financial markets that, in real time, were acting on state economies.

3. The Effect of the International Financial Market on the Real

Brazil had not yet overcome the impact of the international financial crisis of 1998, when in the middle of January of the following year, 1999, came the crisis of devaluation of its new currency, the real. In a wide aspect all assets and contracts were devaluated, a loss still incalculable at the beginning of 1999. But it was not for the business of monetary compensation, that is, in US dollars.

In an editorial³, the newspaper followed Banco do Brasil's effort to sell dollars and hold the Real at any price, which fell 28.75%, according to the headline of "OESP" on January 22, 1999. The variations in the US currency caused, for example, ten days after the devaluation, a field of tension in the market, which was reflected in the São Paulo Stock Exchange, closing down 4.59%. The appreciation of the dollar was around 40.36%. Losses from this devaluation of the Real should also be assessed against what Brazil had already lost six months earlier, with the international financial crisis. Brazilian reserves ended 1998 with a current account deficit of US\$ 34.9 billion, the deficit equivalent to 4.48% of GDP, as a result of trade and services operations that the country did abroad. According to "OESP", these operations meant "the worst annual performance of these accounts since the beginning of the Real Plan", ending 1998, at one of its lowest levels of this decade, as the balance pointed to a deficit of US\$ 35.232 billion, as editorial.

These data provide a dimension of the effects of the capital markets crisis in Brazil, since in April 1998, four months before the crisis, Brazilian reserves totalized US \$ 74.6 billion. At the end of 1998 it was US \$ 35 billion, we went back to the 1994 level, that is, the Real Plan lost large assets in its first and main years of progress due to the effects of globalization in Brazil during this period. It was noted that this performance meant the worst annual turnover of these accounts since the beginning of the Real Plan at a time when Brazil was promoting one of the largest privatization processes in the world this year. Still, it ended 1998 with international reserves at one of the lowest levels of this decade.

The newspaper followed the processes of financial openness that intensified with the Real Plan and reported that the country experienced moments of great inflow of international financial capital and significant participation in major privatization processes. Like those in the banking system and the telephone system, as was

³ Desvalorização excessiva, *O Estado de S. Paulo. Notas & Informações*, 21 Jan. 1999, A3.

the case with Telebrás, it considers the largest privatization of a state system to occur in the world to date.

The combination of these facts and their impacts were factors that had a direct impact on the rates of increase of unemployment already above 10%, when the value of the minimum wage for Brazilians in 1999 was R\$ 130.00, lower than necessary to buy a basic food basket, budgeted at R\$ 130.83. At the same time there were waves of protests and a tendency towards local and global movements against financial globalization. The editorial line of the newspaper was considering that the new Brazilian economic policy was consistent⁴. The emphasis of this analysis was on the government's political and economic orientation, "which needs to inspire confidence abroad and have political support within it". And he drew attention to one fundamental caveat in this whole crisis scenario: "By the way, it should be noted that banks have not lost money in Brazil, unlike in Asia and Russia".

By the way, the article by journalist Joelmir Beting, who evaluated the performance of foreign banks in 1998, which had a gain of around 15.45% in shareholders' equity in Brazil, is commented very little compared to profits obtained from the devaluation of the Real, as they were stored in US dollars. On the same day, March 11, 1999, the Brazilian Institute of Geography and Statistics (IBGE) released a survey, a Summary of Social Indicators in Brazil. The statement by IBGE President Sergio Besserman, a specialist in Brazilian economy, drew attention by stating that Brazil was an unfair country, with poor income distribution, but that the new indicators pointed to improvements in its social conditions, motivated the choice of Brazil. editorial theme "A glass in half"⁵.

For the newspaper, "the worst news contained in the IBGE Synthesis of Social Indicators, was not exactly the extreme inequality in the distribution of wealth, the well-known national characteristic that, in 1994, made the then candidate, Fernando Henrique Cardoso, open his government program with a harsh diagnosis: "Brazil is no longer an underdeveloped country, it is unfair", but the knowledge that this statement still remains very current. And that nothing or almost nothing has changed for the portion of Brazilians living in the so-called low poverty line (monthly income of R\$ 45 per capita at 1996 prices).

To interpret these diagnoses about the Brazilian situation. The National Household Sample Survey (PNAD) showed that the richest 10% of the population earned almost 47 times what the poorest 10% receive — a unique contrast in the group of the World's ten largest economies, of which Brazil was a part. "A glass in half", was an image related to the affirmation of a logic of opposites, Brazil has problems that are typical of developed and underdeveloped countries which aggravates inequalities⁶.

4. A Synthesis of the Effects of Financial Globalization on the Real Plan (1999-2002)

The moment at the end of 1999 was a protest against the effects of globalization on underdeveloped countries. The newspaper reported on its front page the Seattle downtown occupation movement to prevent 135 delegates from moving to the World Trade Organization (WTO) meeting for the Millennium Round. At the time, many writers even commented that these movements resembled "May 1968 in Paris".⁷

In Brazil, social movements, especially the Landless and opposition parties, have forced discussions on issues such as the low value of the minimum wage, the increase in foreign debt and the commitment of social programs by this new model.

With each new edition of the newspaper the effects of globalization became even more evident. The

⁴ "A consistent politics", *O Estado de S. Paulo. Notas & Informações*, 10 Mar. 1999, p. A3.

⁵ "A glass half full", *O Estado de S. Paulo. Notas & Informações*, 12 Mar. 1999, p. A3.

⁶ "Um copo pela metade", *O Estado de S. Paulo. Notas & Informações*, 12 Mar. 1999, p. A3.

⁷ "A batalha campal de Seattle", *O Estado de S. Paulo. Notas & Informações*, 2 Dez. 1999, p. A3.

repercussions of this new system were mapped by the newspaper in several editorials. Some of these dimensioned that “the more a country integrates into world trade and finance flows the greater its exposure to the effects of crises”, as the period was marked by cascading systems crises as a result of international financial crises⁸.

Thus, the new Millennium in Brazil began with the devaluation crisis of the Real in January 1999, days after the reflection of President Fernando Henrique Cardoso. Brazil had just turned to the IMF in December 1998 to secure a \$ 41.9 billion loan to secure the financial imbalance as a result of the foreign exchange flight of the August 1998 international crisis.

In this period of transition to the new century, the crises in Brazil followed and culminated in that of the electric system in 2001, when the country experienced a blackout. Which would not be so impactful if the country did not have the largest hydroelectric complex in Latin America and one of the largest systems based on clean energy, coming from its hydroelectric potential, also among the largest in the world.

This movement forced privatization into large system structures. The newspaper provided occasion for the thematic debate, where in addition to ideological and economic factors were set trends for trade partnerships to new alternative sources of energy. This occasion made room for neighboring countries, among which it led to the construction of the Brazil-Bolivia gas pipeline, which has become one of Bolivia's most important sources of income. The intention was to rethink the energy base, and in this sense, the newspaper supported the movement of opening the state sector for privatization, traditional companies of the old economic model were privatized or auctioned for concessions for long years.

This period was also characterized by Brazil's successive trips to the International Monetary Fund to seek financing capable of balancing the impact of currency fluctuations. The movement of speculative capital caused the unregulated flow and influx of international financial capital, which ran in real time in search of good rates, a factor in which Brazil stood out for being one of the most attractive markets in the world in this period. And so, in 2001, the worsening of the internal crisis and its most important trading partner, Argentina, prompted speculation about a new currency crisis in Brazil, factors that again forced an agreement with the IMF.

This whole Brazilian panorama evidenced disputed political fields, which reflected a scenario that was interpreted as “alert” to speculative capital. It warns that it was at the root of the currency crisis that resurfaced in 2002. In the last half of this year the economic team resorted to the IMF several times; As a result, more than 60% of Brazil's Gross Domestic Product (GDP) would be committed to public and foreign debt.

The editorial newspaper supported the government's attitude to use the IMF to remedy the impact of recurring crisis in the international financial system. It considered that the renewal of the agreement with the International Monetary Fund was the most prudent way for Brazil. The signing of new agreements, with redemption for 2003, would, to some extent, require that the new president elected in October 2002, Luiz Inácio Lula da Silva, from the Workers Party (PT), who would assume the presidency of Brazil in Commitment to the IMF's orientation, taking forward the neoliberal orientation reforms already underway in the country.

In this context, the newspaper “O Estado de S. Paulo” commented that the “outstanding agreement” signed with the IMF was “the recognition of how much Brazil has changed under the leadership of Fernando Henrique Cardoso” in implementing the Real Plan and “A proof of confidence in its role as guarantor and the maturation of democracy” in Brazil⁹.

⁸ “Crises financeiras Internacionais”, *O Estado de S. Paulo. Notas & Informações*, 30 dez. 2000, p. A3.

⁹ “The President and the guarantor of the democracy”, *O Estado de S. Paulo. Notas & Informações*, 9 ago. 2002, p. A3.



Figure 1 Methodological Procedure

This research was based on the analysis and synthesis of 1460 editorials of the newspaper “O Estado de S. Paulo” between 1999 and 2002. This period coincides with the last government of President Fernando Henrique Cardoso. Our overall objective was to map the “OESP” agenda and its editorial narrative, aiming at a more detailed panorama of Brazil during this period.

Therefore, we systematically observe the organization of guidelines, thematic selection criteria and the journalistic principles that underpinned choices about this transition period from Brazil to a new Millennium. Our specific objective was Brazil at this crucial time in the New Republic during the implementation of the Real Plan, the dominant theme on the 52.53% editorial agenda, in the period 1999-2002, according to the survey data presented above.

Thus, the research interpreted that the editorials analyzed the Real Plan as a structure from which the economic effects of globalization on Brazil were most manifested; thus understanding that the structural model of the Real Plan meant a key to access to globalization by resembling the proposals of the New Economy and structural reforms in the state functioned as a microsystem of integration with the macro model of financial globalization.

5. Conclusion

The national context analyzed by the newspaper indicated that the first term of President Fernando Henrique Cardoso (1995-1998) as head of the administration of the Real Plan [...] was the proposition of the most comprehensive set of reforms conceived in Brazil since the years. 1930 and 1940 [...] This picture of normality in the context of the inauguration of a reelected president would change completely with the impact of the devaluation of the Real after the first half of January 1999. This will allow us to state that the following period (1999-2002) was of turbulence and financial instability largely due to the factors that influenced this Brazilian moment, related to the effects of the international market disorder.

At the end of his second government, President Fernando Henrique Cardoso occupied an important space on the front page of the studied newspaper, not because the election of the next president, Luís Inácio Lula da Silva,

was already defined, but by the effect of risk rating agencies and financial market weight on Brazilian domestic policy. For President FHC, “the financial market acted in a wrong way in relation to Brazil, fantasizing about it.” For the president, the financial instability that was experienced in Brazil between 1999 and 2002 was due to the “cognitive dissonance of the markets, due to the difficulty of perceiving positive indicators” in the Real's performance. What to produce “self-fulfilling and crisis-induced prophecies”. The president suggested that this strategy of crisis was the power and performance of the press.

In a way, President Fernando Henrique Cardoso ended his second term by administering a Real Plan that suffers profound deviations from intentionality. And he makes one of his last speeches addressing the financial market and its surroundings by the context of producing “fictions”, which would later be called Fake News, referring to the effect the market has on cutting production, knocking down jobs and derailing it. prices, “who gets the heaviest account are Brazilians who barely know what finances are”, said the president.

By making a specific cut about the first devaluation of the real we seek to characterize a determining period in the economic formation of Contemporary Brazil under the New Republic, within the scope of the Real Plan (1999-2002), when the transition to the 21st century. The economic effects of financial globalization on Brazil were presented by the press economic agenda as an impact factor on the country's political and economic structure with serious and deep financial commitments.

In this sense, the material worked showed that the propagation of these effects goes through the power and understanding of the media in the sphere of the press, in the specific case of the worked newspaper, “O Estado São Paulo”, by the power to articulate discourses that consolidated social and economic realities. through the historically constructed narratives in Brazilian society. To understand the impact of the financial globalization's effects on the consolidation period means understanding Brazil's 21st century.

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Available online at: <https://acervo.estadao.com.br/>.

Matching Technological Bid in Smart Cities Initiatives: A Case Study of Innovation Fairs at Research Institute in Brazil

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Abstract: The main objective of this work was to present a general framework of the technology roadmap from a central competence of Nuclear and Energy Research Institute from Brazil. The approach provides a structured to strength the join to market mechanism design to survive in complex environment trends to shape the future. The technological innovation impact measures depend from (1) quality of diversified technology knowledge and (2) quality of diversified country industry knowledge. From this big view picture, the Technology Transfer Office took these two general dimensions of impact into account and divided them into four (4) sub-categories that explain potential benefits and performance results in areas such as: a) Current Projects and Programs, b) Patents, c) Education and Teaching and d) Scientific Publications. The sampling contemplated the big picture of performance related in National Management Information System and a repository proper in response to institutional performance growth and plans, programs and projects associated in Innovation key indicators and policy disclosure. The taxonomy to roadmapping innovation impact measure was centered in terms in two potential fields to shape the future: i) Nuclear Research Reactors and/or ii) Nanotechnology.

Key words: research reactors; innovation trajectories; insertion areas; technology and innovation management roadmap; nanotechnology social economic networks

JEL codes: O1, O2

1. Introduction

Many countries have developed standardization of roadmaps in various areas reported in intelligent systems, identifying significant opportunities and challenges associated with standardization in complex areas (OECD, 1997; 2002; 2005). To roadmapping from a central competence of Nuclear and Energy Research Institute in numbers is an inspirational approach engine and large influence in cultural and Institutional policymaking in Science, Technology and Innovation (S&T&I).

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To learn the demand for solutions from big cities and improve the possibilities of creative solutions to the urban problems are one of goals from R&D Institute (Coase, 1960; Batty et al., 2009). A combined relational and cultural approach to the Transnational Nuclear and Energy Research Institute and the most representative academic institution of Brazil, University of São Paulo (USP), and other arrangements and possible formats on beginners, start-ups, spin-offs, business incubators, focusing on alignments and construction of cooperation network to the demand of smart cities.

Based on this work it's possible to express and establish a sustainable normative culture in innovation. Learning the city and social networks should be possible to determine arrangements and formats for innovation, like technology transfer, matching mechanisms and technological routes.

The object of the case study was the Nuclear and Energy Research Institute (IPEN-CNEN/SP) is held at São Paulo, Capital, one of the 10 biggest cities of the globe with high density on population and market demand for a response to urban growth and regional plans associated. The Nuclear and Energy Research Institute is an autarchy linked to the Secretariat of Economic Development, Science, Technology and Innovation of the Government of the State of São Paulo and managed technically and administratively by the National Energy Commission (CNEN), an agency of the Ministry of Science, Technology and Innovation (MCTI) of the Federal Government.

The fields of Research Reactors and/or Nanotechnology at Nuclear and Energy Research Institute (IPEN-CNEN/SP) evidence the key technologies in convergence in the initial stage, whose economy is heavy based on natural resource and a potential emerging park (Allen et al., 2000; Rocco et al., 2011; Ayhan et al., 2017; Blind et al., 2009; Daim et al., 2008).

The Nuclear and Energy Research Institute (IPEN-CNEN/SP) are Among University of São Paulo the research and development and are strongly associate with the dimensional to educational and teaching in areas that matches every eleven (11) research centers of Nuclear and Energy Institute such as: 1) Biotechnology Center, 2) Fuel Cells and Hydrogen, 3) Materials Science and Technology, 4) Nuclear Fuel Center, 5) Nuclear Engineering Center, 6) Laser Center and Applications, 7) Radiation Metrology Center, 8) Center for Chemistry and Environment, 9) Radiopharmacy Center, 10) Research Reactor Center, 11) Radiation Technology Center.

This paper contributes to introducing reforms both through changes in public academic system and instruments for research funding. The National Intelligent Innovation System presents the possibility to improve policymaking process toward general and integrated conceptual framework on the role of different types of standards in the research processes and technology life cycle. The research reactors and/or nanotechnology, however, it is a central competence and was the purpose of its foundation and regarding as a core business of the future key technologies, especially in convergence stage to response smart cities solutions to development countries.

To aggregate and to deliver value in National Intelligent Innovation System, plans, strategies and Policies must be relating to Intellectual Property, building symmetry and isometry to policy disclosure to boost reach and internationalization prestige. Those fields depend very much on the development of corresponding standards, which clarify not only terminology, measuring and testing methods, but also regulate safety, security and specify interfaces, to bases the next generation of technology in a sustainable economic networking (Hazelkorn et al., 2017; OCDE, 2005; OCDE, 2015; WIPO, 2017).

For this study all the data collected came from the Nuclear and Energy Research Institute, with longitudinal analyses, analyzing data from 2012 to 2016. It was used the SIGEPI — Management and Information System, it establishes the programming and counts the performance of the activities-ends in the three finalistic functions,

namely: Research & Development & Engineering, Products & Services and Teaching. Also having the Institutional Director Plan as a source of information. At senior working level to gather information to respond to the question in the audit system, in response with interviews. In advance, the roadmapping was carried out in upper level to Superintendent to advance. This paper has been produced as part of an applied research project.

Patents have been presents as a core of an output in innovation system (Stav, 2016). Otherwise, Innovation indicators presents reflections on limitations and potentialities on quality, symmetry and isometry of information among networking (Hoffman, 2006; Hoffman, 2007; Ho, et al., 2017.) This paper spreading the boarding of Innovation assessment converting intangible assets into tangible outcomes (Kaplan et al., 2003), abroad the overview perspective into four distinctive categories like a) Human Resources, b) Teach and Education, c) Products & Services, d) Scientific Technological Research.

Questions that motivated this work shapes and sizes changed drastically over time. These changes are mainly due to the transformations in the social, technological, economic, environmental, political and vale system (OECD, 2002; Narasawa et al., 2009). Regarding the future, between a “complex irregular warfare” (Hoffman, 2006, 2007), auditing mechanism and tools is useful to provide a clean comprehensive strategy and the link with objectives of the system delivery (Viotti, 2007; WIPO, 2017). Such data and analyses are a precondition for defining realistically attainable economic and development objectives to suitable safe and security technological absorption.

Therefore, the present study aims to create a specific roadmap to the Manager of Technology Transference Office to better understanding the phenomes of innovation dynamic marketing, explore, share thru networking and boost an integrated view of institutional performance growth and plans, programs and projects associated in Innovation key indicators and policy disclosure. The future in advance is expecting to investigating innovations in nuclear reactors and/or nanotechnology to build-to-suit new perspectives to technologically qualified bid purpose and new opportunities for R&D, collaborations and future foresight studies applied to gauge smart cities solutions within the context of a developing country.

The multiple aspects of key variables involved in systemic analysis surely require a strong culture in quality, but sometimes simple straightforward rules of thumb that used to guide Science and Technology in the past in linear model (Lazega et al., 2017). Identifying disruptive technology and surviving in disruptive markets is not easy but roadmaps can help for policy makers, technology and innovation management, industry, leaders and researchers (Phaal, et al., 2004a, 2004b, 2009).

Universities and Public Research institutions occupied the center stage of The Science, Innovation and Technological. It's a presence preceptor of high-quality knowledge and technologies (Decter, et al., 2007; Dube et al., 2011). The innovation and technology impact pool perspective in Research Reactors is a natural consequence of investments in Research and Development (R&D), between and among Universities and Public Research Institutions and multiple benefits arising from results, towards Awards in Science and Policy disclosure.

The roadmapping approach provided integration through Science, Technology and Innovation (S,T&I) and Institutional Stagey and Business Model. The benefits bring together past and lead with integrated of technology, product and commercial perspectives, including internal and external sources, hence provides integrated a stakeholder's link (Phaal et al., 2004a, 2004b, 2009).

The geographical localization and graphical form of the roadmap is a powerful communication mechanism; however, it can present information in a highly synthesizes and condensed form to strengthen link between Science, Technology and Innovation (S,T&I) and Smart Cities Solution.

The central competence framework aimed at advancing knowledge necessary that would eventually lead to innovation trajectories and with strong security and safe cultural insertion gauge to country succeed in international competition through innovation and growth, high-quality products and services, and research and education areas. The unique strengthen link can be matched from the S,T&I policy in term “technology transfer” in capacity building from push or/and pull innovation models.

2. Methodology

The methodology applied to the present study consists of three main stages. The first stage looks on and identify the central competence business of Nuclear and Energy Research Institute and the methodology to assessment the strategies of innovation impact and reach. From this big view picture, the workgroup presented a general framework for the technology roadmap for the centre of competence of nuclear and energy research. Because of foundation historic, research reactor field remain sixty year of experience and nanotechnology emerge as a potential field among all research centres of Nuclear and Energy Research Institute. It was understanding as a cross-sectional area and potential to shape the future in biotechnology, chemistry, food and agriculture, health, environment, social, economics, informatics, entertainment and arts.

Similar work to customize roadmap was found in Germany, Turkey, EUA and in the International Energy Agency. Blind and Gauch (2008) applied a customized roadmapping in nanoscience and nanotechnology in Germany, they affirmed that the market success of nanotechnology applications depends very much on the development of corresponding standards. European and international standardization organizations have launched first initiatives into a leading position in standardization initiatives, which pave the way for future commercialization of nanotechnology and also the basis for the next generation of research activities.

Tugrul et al. (2007) seeking alternative energy sources, they implemented a technology planning for roadmapping future technology portfolios for the government sector of EUA. They found challenges into networking thru chain to delivery service when they defined “Technology Gap Analysis” tracking the transmission, renewables and energy efficiency to those that are implementing the technology planning process for the first time. Identify key candidates, evaluation, allocation of resources to the R&D — Research & Development programs are fundamentals to have the planning implemented at federal agency.

Ayhan et al. (2017) on marketing focus, developed a roadmap study for the Turkish defense industry to address new demands and provide further opportunities of potential application of nanotechnologies. They also use bibliometric analysis aim to identify the trends to reveal the commercialization.

The second stage, to assessment quality of strategy innovation, the authors mention that these fields would be analyzed under 4 subcategories to converting intangible assets into tangible outcomes:

A = Human Resources: includes government officials versus fellows and trainees, participants from other institutions and volunteers.

B = Teacher & Education: includes the amount of economic fund and number of conclude projects of Mastering and doctoral students.

C = Products & Services: includes the sum of economic fund and the number of all institutional projects and programs under development.

D = Scientific & Technological: is includes the sum of patents, technological products, scientific publication in own database in the online library of the Nuclear and Energy Research Institute.

Bibliometric methods have contributed to science and technology studies for decades, it allows finding hidden patterns by classifying information, including counting simple document word frequency analysis, co-join word analysis, collaboration analysis and involving the construction of the roadmap for the Nuclear and Energy Research Institute.

The sampling was provided by a Nuclear and Energy Research Institute and was based in data collected from 2012 to 2016 and contained multiple activities reported in the Institute Director Plan, and was related as: i) Engineering of Reactors and Energy Systems, ii) Experimental nuclear and condensed matter, iii) Activation analysis with neutrons, iv) Operation and use of Research Reactors.

To complete the sample, the data collection on Nanotechnology occurred from in labeled activities on nanotechnology. The taxonomy rooted “Nano” was the central term. Were identified co-join nanotechnology, nanoparticles, nano particulate, nanostructures, nanotubes, nano compounds, nanomaterial and among others. The root “nano” was widely applied to address the sum of distinctive categories to mapping independent variables of impact technology innovation.

Finally, the third stage was characterized by the roadmap construction at Nuclear and Energy Research Institute Level to explore applications, development and audited tool. To the standard approach focused on firm level contributed with an integrated vision with the organizational matrix boosting an integrated view of institutional performance growth and plans, programs and projects associated in Innovation key indicators and policy disclosure. The systematic plan and strategy thru distinctive research centers in synergy with marketing activities.

The unique strengthen link can be matched from the Science, Technology and Innovation (S,T&I) policy in term “technology transfer” in capacity building from push or/and pull innovation models in trends of complex environments. The lean strategy deployment be-duty bound to align Institutional link to both pull and push innovation roadmapping management system to accurate reality on time. This work is under development, in the initial stage, the complete datamining compilation regarding in the last 60 years of production. The vision pictured were taylor-made-design to a better comprehension of how the many variables are linked together and how we optimize this relation to have better measurement of innovation social impact.

The methodology was guided by the OECD (2005; 2015) and in an analysis of indicators of innovation and public policy development of National Innovation System (NIS). Also, guidelines from NSF — National Science Foundation (2018) and Pannano (2017), (1st Pan-American Congress of Nanotechnology Fundamentals and Applications to Shape the Future) was used as a milestone for standardization in applying a structure of roadmaps to exploring, communicating, building relationships, evolving multiples networks and development markets, products and technologies over time. Parallel, happed the 60th years of IEA-R1 60Y Workshop where were addressed the challenges and potential field of research reactors (IEA-R1 60Y, 2018).

The innovation pool perspective in Nuclear and Energy Research Institute is a natural consequence of investments in Research and Development (R&D), between and among Universities and Public Research Institutions and multiple benefits arising from results, towards Awards in Science and Policy disclosure.

Units

N: it was applied to present the total sum/quantity/frequency to address simple integer number in independent categories variable. In the categories Patents and Scientific Publication, the result integer over sixty (60) years.

E: In the categories of Projects and programs and categories of Education and teaching the result integer

current active, enable us to address past and future performance.

U\$: it was used to standardization monetary in American dollars.

3. Results and Discussion

From the research in institute database, with keywords that was rooted “nano”, was possible to compile the Table 1.

Table 1 Innovation Impact Nanotechnology Approach

Currents Projects and Programs	E	U\$ ~
Institutional and collaborative	160	39.544.735
Nano rooted title projects and programs	14	1.049.113
Patents	N	Collaboration Patents
Total Patents	127	18
Nano rooted patents title	21	11

Currents Education and Teaching	E	U\$ ~
Post-graduated students projects	440	1.295.585
Nano rooted title Post-graduated students projects	56	169.697
Scientific Publications	N	
Total Publication		23.734
Nano rooted field Publication on title		41

Where N is the total sum of specific quantity applied in categories of Patents and Scientific Publication. E is the number of Projects and programs and categories of Education and teaching under development in 2017, enabling us to address past and future performance. U\$: it was used to standardization monetary in American dollar in order to compare different periods of time to overcome national economic instability.

In Table 2 we preset the data compilation for both nuclear reactors:

Table 2 Innovation Impact Research Reactors Approach

A) HUMAN RESOURCES	2012	2013	2014	2015	2016
Total Nuclear and Energy Research Institute (CNEN-IPEN-SP) and Pars	399	407	614	651	497
Pars on Collaborations and Cooperation	85	87	152	171	121
B) TEACH & EDUCATION	2012	2013	2014	2015	2016
Guidance and completed projects (IC, Masters, Doctorate and Postdoc)	88	90	103	89	83
Fund to students by Government (U\$)x1,000	341	352	359	305	319
C) PRODUCTS & SERVICES	2012	2013	2014	2015	2016
Revenues (U\$) x1,000	33	13	138	143	139
Industry Customers	51	36	24	34	32
D) Scientific & Technological Research Reactors	2012	2013	2014	2015	2016
Scientific publications x 10	14.6	14.6	14.6	14.6	14.6
Projects and Programs in Collaboration	24	27	1	1	6
Technological products	0	17	10	6	0
Patents	2	0	0	0	2

For better understanding, we also preset the data for Table 1 in Figure 1.

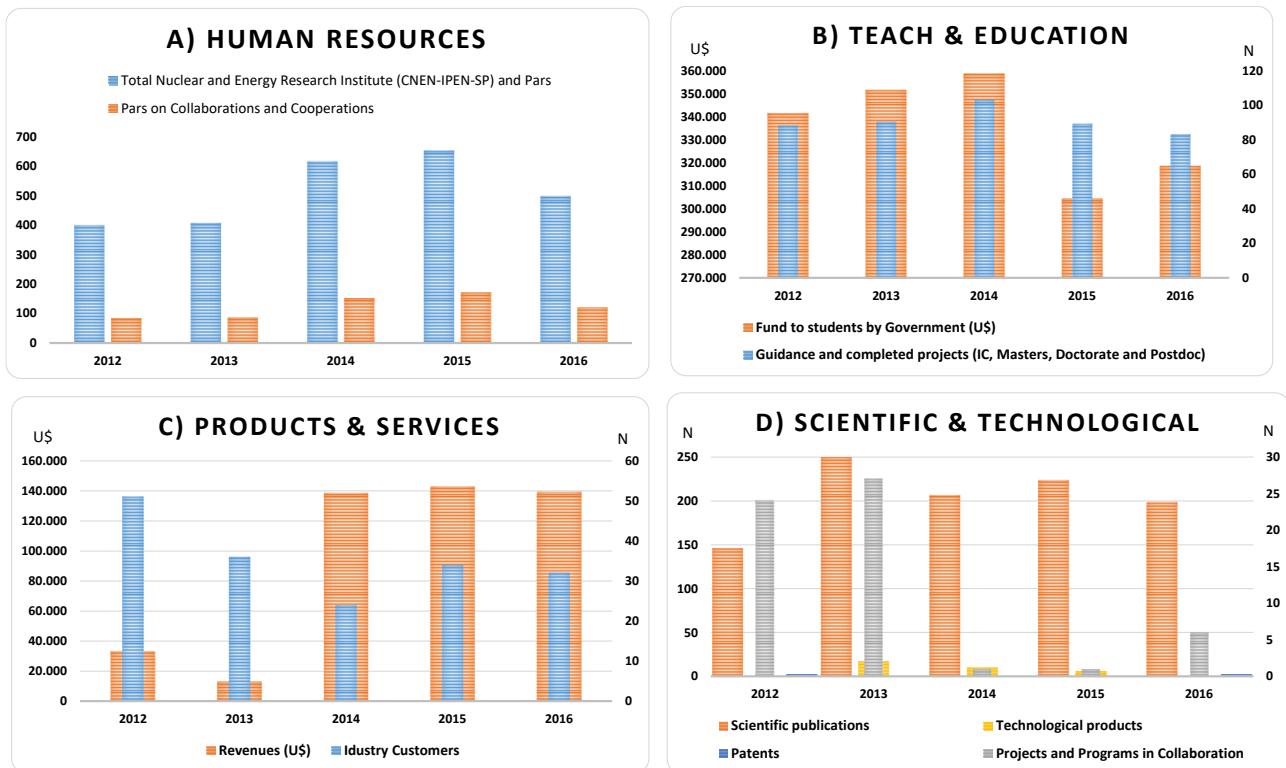


Figure 1 Innovation Impact Research Reactors Approach

We can see from Figure 1(a) that human resource is decreasing in last 2 years, but the collaborations are growing to overcome this very high lever human resource. In another hand we can highlight form Figure 1(b) that the completed projects from students has a little increase, even the total fund decrease. The Figure 1(c) shows how import is the service to society because the main products and services from our nuclear reactor are related to radio pharmacy production to nuclear medicine utility. The scientific and technological production Figure 1(d) are directly related to Figure 1(b) in number of scientific publications and scientific collaborations.

Universities and Public Research institutions occupied the center stage of The Science, Innovation and Technological in Research Reactors. The innovation and technology impact pool perspective in Research Reactors is a natural consequence of investments in Research and Development (R&D), between and among Universities and Public Research Institutions and multiple benefits arising from results, towards Awards in Science and Policy disclosure.

Research Reactor in numbers is an inspirational approach engine and large influence in cultural and Institutional policymaking in Science, Technology and Innovation (S,T&I). The unique strengthen link can be matched from the S,T&I Policy in term of “technology transfer” in capacity building from push or/and pull innovation models.

The roadmapping in Nanotechnology approach provided integration through Science, Technology and Innovation (S,T&I) and Institutional Stagey and Business Model in create synergy and integration fields in science and environments social and economic networks. Identifying disruptive technology and surviving in disruptive markets is not easy but roadmaps can help for policy makers, technology and innovation management, industry, leaders and researchers.

The geographical localization implies a mimetic mechanism to build-to-suit capabilities and empowerment

flow to share people, information and knowledge. As so as the social networks build a strengthen link between Science, Technology and Innovation (S&T&I) and Smart Cities Solution to shape the future needs.

The solutions by market-driven provide improvement at total quality managing front-to-end of technology transfer. Though roadmapping is one of the most widely used tools as predictive exercise, supporting systematic planning and standardized strategy development.

4. Conclusion

The central competence framework from roadmapping manual costuming aimed at advancing knowledge necessary that would eventually lead to innovation trajectories and with strong security cultural insertion gauge to country succeed in international competition through innovation and economic growth, high-quality products and services, and research and education. The approach provides a structured to strength the link to market mechanism design to survive in complex environment trends.

Technology transfer is an important axis, both in the domestic market and in export. Business combinations can meet different objectives between supply and demand. The unique combinations strengthen the link between different segments of niches and segments society. The technological potential of new specific projects in advance can be matched from the S&T police in state capabilities and institutional arrangements and formats to long-term duration.

The workgroup faces challenges to enlace integration Institutional vision of distinctive technologies core of eleven (11) centers to evidenced two potential fields. To shape a better future, the roadmapping is a power tool to start an establishment of an integrated innovation culture and could be useful in frontiers in contextual area to boost Science and Research and, align strategy, leadership and plan business. For other side, increases the Government's responsibility for directing and supporting R&D in the sense of developing not only technological competences, but also marketing competences. It is to the extent of strengthening the institutional role, broadening the mission and vision of business.

This work is under development, in your initial stage. The complete data compilation in the last 60 years will afford to forward an integrated vision among the Nuclear and Energy Research Institute and its Stakeholders. Provides a better comprehension of how the many variables are liked together and how we optimize this relation to have better innovation social impact in applying roadmaps to exploring, communicating, building relationships, evolving multiples networks and development markets, products and technologies over time.

Acknowledgements

This paper has been produced as part of an applied research project. The authors acknowledge the time of intelligent management system SIGEPI.

The fund was provided by FUNDEP, to enable reach research community to carry out the manual and customization this study.

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Competitive Strengthening of Socio Entrepreneurs in Facing Industrial Revolution 4.0 Through SWOT Analysis Identification

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Abstract: This study aims to analyze the factors that can increase the competitiveness of socio entrepreneurs/village owned enterprises (BUMDesa) in the era of the industrial revolution 4.0. Many regulations to improve community welfare and village income does not increase awareness of the village apparatus in the Bogor Regency to establish microfinance institutions. Moreover, Law No. 6/2014 on the Use of Village Funds has been running for three years, but its use by villages in Bogor Regency is more focused on the physical, but less on community empowerment. The purpose of the management assistance activities of village owned enterprises. Village owned enterprises get training and mentoring aspects of business and governance that ultimately BUMDesa has professional organizational capabilities and can have competitiveness in the face of the industrial revolution 4.0. The method used to determine the model and training needs and assistance is first performed an analysis, the analysis used is to use a SWOT analysis. The analysis shows that BUMDesa managers need assistance in the form of training and education, the right model of assistance is mentoring through BUMDesa Clinics and Schools. Pakuan University has assisted through BUMDesa Clinics and Schools that have been established and as a result several BUMDesa have had good governance.

Key words: BUMDesa; SWOT analysis; clinics and schools

JEL code: O

1. Introduction

The development of the economic base in rural areas has long been carried out by the government through various programs. But these efforts have not produced satisfying results as desired together. One of the most dominant factors is that government intervention is too large, the result is that it inhibits the creativity and innovation of rural communities in managing and running the economic engine in the countryside. The system and mechanism of economic institutions in rural areas are not running effectively and have implications for dependence on government assistance, thus killing the spirit of independence. Based on this assumption, the existence of the village should receive serious attention from the central government with the birth of policies related to economic empowerment carried out by collecting and institutionalizing economic activities of the community. Therefore, the government applies a new approach that is expected to be able to stimulate and move the wheels of the rural economy through the establishment of an economic institution that is fully managed by the

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village community, namely the Village Owned Enterprise (BUMDesa) as one of the mainstay programs in increasing the independence of the village economy. although there are many regulations related to efforts to improve community welfare and village income, it turns out that awareness of the village apparatus, especially in Bogor Regency, to establish microfinance institutions and BUMDesa villages is still lacking. In addition, village officials still do not understand how to implement the business organization management system mechanism. This is the obstacle. Even though BUM Desa is a pillar of the village economy. In the regulation, it is stated that one village must have a BUMDesa, whose business type is adjusted to the potential, resources and services of basic community needs.

The Bogor Regency Government stated that out of 416 new villages of 282 that have Village-Owned Enterprises (BUMDesa), there are still 134 villages that do not yet have BUMDesa. Of the 282 BUMDesa, these can be categorized as follows:

Table 1 BUMDesa Data in Bogor Regency

Year	Total of Village	BUM Desa	Active	Non Active	Category			
					Elementary	Develop	Up	Independent
2016	416	201	98	103	190	10	1	
2017	416	249	127	122	238	10	1	
2018	416	282	161	121	148	11	2	

Sources: DPMD Kabupaten Bogor (2018).

The existence of BUMDesa is very important so that the economy in the village can develop and be independent. Although there have been many regulations related to efforts to improve community welfare and village income, it turns out that awareness of the village apparatus in Bogor Regency to establish microfinance institutions and BUMDesa is still lacking. Various central and regional government efforts aimed at making the economy develop and be independent but have not yet been maximized. Moreover, in Law No. 6/2014 on Village Fund Users it has been running for three years, but its use by villages in Bogor Regency is more focused on physical, but less on community empowerment. BUM Desa in Bogor Regency is like two sides of a coin. On one hand saving potential and hope for people's lives through optimizing the potential of natural and human resources, on the other hand BUM Desa has complicated problems. BUMDesa in Bogor Regency is indeed not maximally managed professionally, so it is very vulnerable to horizontal conflicts. Some of the problems encountered in the Bogor Regency BUMDesa include: Business Aspects, consisting of: Production, Marketing, Business development. Governance aspects, consisting of: Administration, Organization, Finance. From some of these problems it can be concluded that the governance system of the BUMDesa management organization is still lacking, this is due to the lack of BUMDesa administrators getting education and training. Therefore there is a need for assistance to be done by academics.

2. Literature Reviews

2.1. Village-Owned Enterprises/Socio Entrepreneur (BUMDesa)

Village-Owned Enterprises/Socio Entrepreneur (BUMDesa) are village businesses formed/established by village governments whose capital ownership and management are carried out by village and community governments (Wiwoho & Kholil, 2012). The more comprehensive definition of village-owned enterprises

(BUMDesa) is contained in Law No. 6 of 2014 in which Village-Owned Enterprises (BUMDesa) are business entities which all or most of their capital are owned by villages through direct participation from village assets that are separated to manage assets, services, and other businesses for the maximum welfare of the community village. Village-Owned Enterprises (BUMDesa) can also be defined as village business institutions that are managed by the community and village government in an effort to strengthen the village economy and are formed based on the needs and potential of the village (Center for Dynamics of Development Systems Development, 2007). Village potential in this case is a benchmark for making village businesses. According to Minister of Domestic Affairs Regulation No. 39 of 2010, Village Business is a type of business in the form of village economic services such as, service businesses, distribution of nine staples, trade in agricultural products, as well as industry and folk crafts. As an institution for economic development of rural communities, BUMDesa has several goals. The purpose of establishing BUMDesa is to increase the village's original income in order to improve the ability of the Village Government in governance and development and community services, develop economic potential in rural areas to encourage the development and economic capacity of the rural community as a whole, and create employment.

2.2 Competitive Strengthening

The definition of competitiveness is the ability of companies, industries, regions, countries, or between regions to produce relatively higher and sustainable income and employment factors to face international competition. Therefore, in the context of a district/city as an organization, competitiveness is defined as the ability of a district/city to develop the social economic capacity of its region in order to improve the welfare of the people in its region. Competitiveness is the concept of comparing the capabilities and performance of companies, sub-sectors or countries to sell and supply goods and or services provided in the market. The competitiveness of a country can be achieved from the accumulated strategic competitiveness of each company. The process of creating value added (value added creation) is within the scope of the company. The Minister of National Education defines competitiveness as the ability to show better, faster or more meaningful results. The capabilities referred to are (1) the ability to strengthen its market share, (2) the ability to connect with the environment, (3) the ability to improve performance without stopping, (4) the ability to uphold a favorable position. Competitiveness is productivity defined as the output produced by labor work. According to the World Economic Forum, national competitiveness is the ability of the national economy to achieve high and sustainable economic growth. Competitiveness is determined by the competitive advantage of a company and very much depends on the level of relative resources it has, or we can call it competitive advantage. The importance of competitiveness is due to the following three reasons: (1) Encouraging productivity and increasing independent capacity, (2) Can increase economic capacity, both in the context of the regional economy and the quantity of economic actors so that economic growth increases, (3) The belief that market mechanisms create more efficiency.

2.3 SWOT Analysis

According to Philip Kotler, SWOT analysis is defined as an evaluation of the overall strengths, weaknesses, opportunities and threats. SWOT analysis is one of the most widely recognized internal and external environmental analysis instruments for companies. This analysis is based on the assumption that an effective strategy will minimize weaknesses and threats. When applied accurately, this simple assumption has a big impact on the design of a successful strategy. According to Ferrel and Harline (2005), the function of SWOT analysis is to obtain information from a situation analysis and separate it into internal issues (strengths and weaknesses) and external issues (opportunities and threats). The SWOT analysis will explain whether the information indicates

something, which will help the company achieve its goals or provide an indication that there are obstacles that must be faced or minimized to meet the desired income. SWOT analysis is the systematic identification of various factors to formulate a company strategy, this analysis is based on logic that maximizes strengths and opportunities. (Opportunities), but at the same time can cause weaknesses and threats. The strategic decision-making process is always related to the development of the mission, goals and strategies, and policies of the company. Thus, the strategic planner must analyze the company's strategic factors (strengths, weaknesses, opportunities and threats) in the current conditions. This is called a situation analysis.

3. Research Methods

The first method of assisting in developing village-owned enterprises is identified using a SWOT analysis. SWOT analysis is a useful technique for understanding organizational Strengths and Weaknesses, and for identifying both Opportunities that are open to organizations and Threats faced by organizations. The aim of this analysis is to find new opportunities, manage and reduce organizational threats. In a business context, SWOT Analysis helps businesses manage sustainable market niches of companies. In a personal context it is used to help someone develop a career by utilizing the best advantages of talents, abilities, and opportunities. In the context of BUMDesa development or management, SWOT analysis and SWOT matrix are used to formulate the BUMDesa strategic plan.

From the results of identification using the SWOT matrix then the appropriate assistance method is then determined in the form of initial diagnosis as follows:

Quadrant 1

This condition is experienced by villages that have not yet established BUMDesa

Quadrant 2

This condition is experienced by villages that have established BUMDesa but have not made Village Capital Participation

Quadrant 3

This condition is experienced by villages that have established BUMDesa and have made Village Capital Participation, but have not yet circulated businesses

Quadrant 4

This condition is experienced by villages that have established BUMDesa and have already participated in Village Capital Participation, and have carried out business circulation, but how do they continue.

At this time, obedience of village officials in complying with policies regarding the establishment of BUMDesa is still not optimal, the many potentials of villages that have not yet been developed into business feasibility, can be seen as educational facilities for administrators and managers of BUM Desa. Partnership cooperation, meeting forums and communication facilities do not yet exist. Does not have a wide network of marketing, production and bureaucratic networks. There is no container for solving business problems. BUMDesa management performance has not been evaluated. There is no assessment in risk management.

4. Conclusions

The aim of this research is for the BUMDesa management to have a good organizational governance system consisting of business aspects and financial administration aspects. It is expected that the existence of research on village-owned enterprises in Bogor Regency will be able to be useful in driving the dynamics of the village economy and as an agent for regional development as well as driving the creation of small and medium business units.

Based on the results of the analysis of the methodology carried out the following things are carried out:

(1) Accelerating the development of BUMDesa

The acceleration of BUMDesa development for quadrant 1 and quadrant 2 through through the identification of potential and problems for institutional development, business and development of BUMDesa Human Resources. This is done in the form of training and assistance in preparing business feasibility analysis, managing human resource needs analysis, marketing analysis and financial statement analysis. All activities are carried out by the lecturer and accompanied by students.

(2) Establishment of BUMDesa Business School

The establishment of the BUMDesa Business School Pakuan University is a program that seeks to provide a different and comprehensive model of training and mentoring. BUMDesa Business School Pakuan University offers BUMDesa training concepts based on problems that occur in the field. By combining several methods such as lectures, discussions, Focus Group Discussion (FGD), practice, field trips, and application usage. In the field of assistance, the BUMDesa Business School of Pakuan University divides the BUMDesa mentoring model into 4 different levels according to the quadrant, namely the level of building, growing, developing, and strengthening. As a way of looking at the different contexts and content in each village, these 4 levels are an effort of the BUMDesa Business School of Pakuan University to understand and formulate a mentoring model that is right on target and meets the needs of BUMDesa.

(3) Building Partnership Collaboration

Article 18 of Permendesa Number 4 of 2015 indicates that BUMDesa can collaborate with various businesses. Article 18 paragraph (1) reads:

1) Village capital investment as referred to in Article 17 paragraph (2) letter a consists of:

- a) grants from the private sector, social and economic institutions and/or donor agencies that are channeled through the Village APB mechanism;
- b) assistance from the Government, Provincial Governments, and Regency/City Governments distributed through the Village APB mechanism;
- c) business cooperation from the private sector, social and economic institutions and/or donor agencies that are ensured as village collective wealth and channeled through the Village APB mechanism;
- d) Village Assets submitted to the Village APB are in accordance with statutory provisions concerning Village Assets.

Part c of article 18 clearly shows that BUMDesa can work together with the private sector and other social economic institutions. BUMDesa collaboration with the private sector, such as that carried out by BUMDesa Bogor Regency with Pakuan University in terms of management and financial consultations.

Real action in the context of strengthening the competitiveness of village-owned enterprises in the face of the industrial revolution 4.0 through enhancing the capacity of 30 Bum village employees in Bogor district is carried

out through the following matters:

(1) Quadrant 1 (This condition is experienced by villages that have not yet established BUMDesa), Pakuan University provides assistance and consultation with the aim of:

- a) So that the village must establish BUMDesa
- b) In order for the Village to appoint BUMDesa administrators who are not part of the village government and make the BUMDesa organizational structure.
- c) BUMDesa Managers are trained by experts who are experts in accordance with their competencies.

(2) Quadrant 2 (This condition is experienced by villages that have established BUMDesa but have not yet participated in Village Capital Participation), Pakuan University provides assistance in the form of training with the aim of:

- a) So that the Village Government encourages BUMDesa Management to benchmark BUMDesa that has developed and advanced and visits business exhibitions.
- b) In order for the BUMDesa Management to submit a Business Plan Proposal to the Village Government so that the Village Government wants to make Village Capital Participation.
- c) So that BUMDesa Managers are trained and accompanied by experts who are experts in accordance with their competencies.

(3) Quadrant 3 (This condition is experienced by villages that have established BUMDesa and have made Village Capital Participation, but have not yet circulated a business), Pakuan University provides assistance with the aim of:

- a) The Village Government encourages BUMDesa Management to benchmark BUMDesa that has been developed and advanced and visits business exhibitions.
- b) BUMDesa Managers continue to be trained and accompanied by experts who are experts in accordance with their competencies.
- c) BUMDesa Management is included in BUMDesa Business School
- d) BUMDesa Management actively builds Partnership Collaboration
- e) The BUMDesa management is active in the regular BUM One Business Management Meeting.
- f) BUMDesa Managers are active in the regular BUMDesa Forum.
- g) BUMDesa management is active in BUMDesa Clinic
- h) BUMDesa Management is active in the BUMDesa Coordination Meeting periodically

(4) Quadrant 4 (This condition is experienced by villages that have established BUMDesa and have made Village Capital Participation, and have carried out business circulation, but how is its sustainability), Pakuan University provides assistance and training with the aim of:

- a) So that the Village Government encourages BUMDesa Management to benchmark BUMDesa that has developed and advanced and visits business exhibitions.
- b) So that BUMDesa Managers continue to be trained and accompanied by experts who are experts in accordance with their competencies.
- c) In order for BUMDesa Management to be included in BUMDesa Business School
- d) So that BUMDesa Managers actively develop Partnership Collaboration
- e) So that BUMDesa Managers are active in periodic BUMDesa Business Meeting
- f) So that BUMDesa Managers are active in the BUMDesa Forum on a regular basis
- g) So that BUMDesa Managers are active in BUMDesa Clinics

h) So that BUMDesa Managers are active in the BUMDesa Coordination Meeting periodically

The research of BUM Desa in Bogor Regency first performed an analysis using SWOT analysis, SWOT analysis is a useful technique for understanding organizational Strengths and Weaknesses, and for identifying both Opportunities that are open to organizations and Threats. faced by the organization. Basically this analysis seeks to find new opportunities, manage and reduce organizational threats. Based on the results of the analysis, assistance and education must be provided in the form of assistance. Related to training and mentoring for Village Bum administrators in 30 Village Bum in Bogor Regency, this is what Pakuan University has done, namely establishing the BUMDesa Clinic and School which is a vehicle for BUMDesa administrators in Bogor Regency in order to increase capacity and competence in order to strengthen BUMDesa in the face of BUMDesa the industrial revolution era 4.0.

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Bankruptcy Policy — An Instrument for the Economic Recovery from the COVID Crises

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Abstract: The main objective of this study is to analyze the “pieces” that support the construction of a bankruptcy policy, aiming to identify those that allow building a bankruptcy policy which will help in the recovery from the economic COVID crisis, as well as to build a winning policy in the economic competition between countries.

To promote this purpose is observed the impact of bankruptcy policy on the entire economic cycle, allowing to understand that, more than intervening companies at the “end of life”, bankruptcy policy impacts on the everyday life of a company, even before its establishment.

Subsequently, identifying the characteristics of the ex ante, interim, and ex post efficiencies of a bankruptcy policy, it is analyzed how it can be built one aiming at its maximum efficiency.

Finally, the main variables of bankruptcy policy are analyzed, aiming to understand its real implications, sometimes even dual, in the efficiency of this policy.

Key words: bankruptcy; insolvency; bankruptcy policy; bankruptcy efficiency; legal efficiency

JEL codes: E61, G32, G33, L38, O29

1. Introduction

The pandemic crises Covid-19 have had a devastating impact on the world economy: The demand has shrunk rapidly, leaving, in a short time, companies and entrepreneurs in lack of free liquidity for the payment of due liabilities. So, while the population was facing the “new normal”, economic ministers/secretaries face a “headache”: how to prevent all economy from fall apart.

So, the first step adopt was to prevent businesses from a “crash down”, and all around the world, we have assisted to the introduction of an extraordinary moratorium (to provide some breathing space for debtors mainly from enforcing their claims), and temporary suspension on the insolvency petition, which became known as “Covid’s Lex” (e.g. United States of America: Coronavirus Aid, Relief, and Economic Security Act (CARES Act); United Kingdom: Corporate Insolvency and Governance Act 2020 (CIGA, 2020)).

Now is the moment to think in a “post-Covid era”, when the limitations of creditors, and the corresponding protection of debtors, will cease to apply, and it should be carefully thought how bankruptcy laws could help in the economic recovery.

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Bankruptcy laws, traditionally, are observed as “the end of the line” of a business, but there are several examples where bankruptcy policy had been used to help countries to face economic crises (e.g., East Asia crises 1998; Argentina’s crises 2001; Subprime crisis 2008; Sovereign Debts crisis 2010), but, and above of all, it allows to discipline the market aiming the recovery.

So, the redesign of a bankruptcy policy, in order to help the economic recovery, should allow debtors and creditors to negotiate the terms of an agreement in a shorter period, avoiding the long periods, and costly procedures, in the traditional reorganization, and, simultaneously, should allow “to be laid” the foundations for a better, and more efficient, insolvency procedure.

But, to draw a bankruptcy policy that helps in the economic recovery, and in winning the economic competition between countries, is very important to know which variables matter in the bankruptcy policy, and their impact on the economic cycle.

Nowadays there are three major guidelines for a bankruptcy policy design:

- World Bank (2016): Principles for Effective Insolvency and Creditor/Debtor Regimes;
- United Nations — UNCITRAL (2019): Model Law on Recognition and Enforcement of Insolvency-Related Judgments with Guide to Enactment;
- European Union (2019): Directive (EU) 2019/1023 of the European Parliament and of the Council of 20 June 2019.

This paper aims to revise the “state of the art” behind the options made by those organizations, allowing thinking the design of the policy, and helping to make decisions, in this critical time.

2. The Importance of Bankruptcy Policy

According to Dye (2013), a public policy impacts people’s lives, whether by action or by the omission of the government.

The omission of a bankruptcy policy¹ it was only possible until the emergence of mercantilism, contemporary with the rise of Absolutism, characterized by the opening of cities, tensions, and struggles around central dimensions, such as legitimate authority, economic growth, taxes, that is, adventist of modernity.

It is observed, then, that bankruptcy policy is closely linked to modernity and economic activity, as highlighted in the preamble to the 1935 Portuguese Bankruptcy Code:

The trader is part of an extensive organization and is part of a network of interests that constitute an important element of the public economy. The ruin of one, the profound blow to a commercial activity, can have repercussions and is often reflected, with greater or lesser intensity, in the activity of many others, in the activity of those who in their company are interested as creditors and in the economy itself public. (...) And because the repair of the damage caused or the reduction of that damage is also of public interest, the State intervenes so that the momentary association of the interested parties proceeds justly (Portugal, 1935, p. 1557).

And the recognition of this importance continues until today, as demonstrated by the Proposal of Directive No. 2016/0359: “A well-functioning insolvency framework (...) is an essential part of a good business environment as it supports trade and investment, helps create and preserve jobs and helps economies absorb more easily economic shocks that cause high levels of non-performing loans and unemployment.” (European

¹ The foundations of a bankruptcy procedure remotes to the “Rutilian Process” (BC 41), but de direct participation of the State in this procedure only occurs with the growth of the mercantilism (15th century), where it becomes to be seen as a social problem, and the State “pulls” to him the coordination of the procedure.

Commission, 2016, p. 2).

Aware that a good bankruptcy policy aims to optimize the resources of companies in financial difficulties, allowing a second opportunity and avoiding the destruction of value, and if this is not feasible, it quickly promotes the liquidation, distributing its product by creditors graduated in a universal contest, then is observed that bankruptcy policy infers in all life cycle of a company.

For this purpose, the Product Life Cycle model will be adopted, which is the “grandfather of concepts for predicting the probable course of industry evolution is the familiar product life cycle” (Porter, 1998, p. 157).

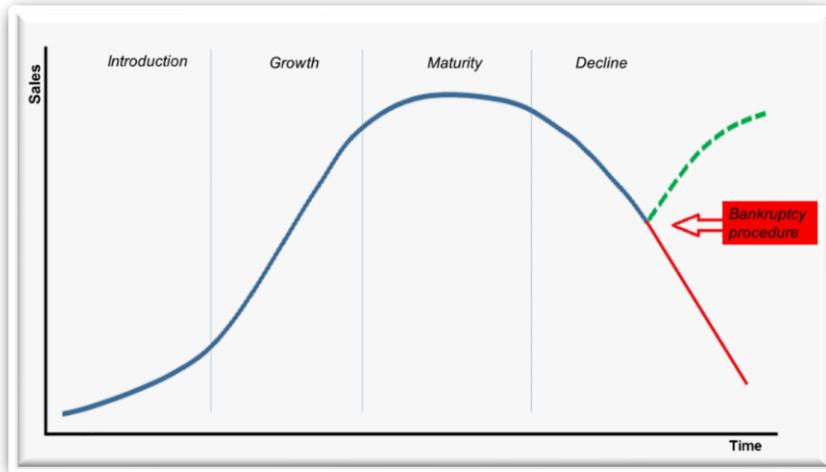


Figure 1 A Company's Life Cycle and the Bankruptcy Procedure

Source: Adapted from Porter (1998, p. 158)

Based on this model, we observe that the bankruptcy policy impacts each of the stages:

- Entry \Rightarrow Entrepreneurship;
- Investor \Rightarrow Growth;
- Maturity \Rightarrow Credit;
- Decline \Rightarrow Recovery of viable companies;
- \Rightarrow Liquidation of inefficient economic players.

2.1 The Influence on Entrepreneurship

According to the Theory of Economic Cycles (Schumpeter, 1911), entrepreneurs are the driving force of economic growth, as they introduce innovations to the market that make existing products and technologies obsolete through a process of creative destruction. Thus, the entrepreneurs' contribution to economic development occurs mainly through the innovation and competition they create in the market (Baumol, 1990), which is commonly referred to as disruptive entrepreneurship.

However, business failure is a very common result in entrepreneurship (Wennberg et al., 2010). In this way, conscious entrepreneurs, prior to deciding to start a business, are also concerned with the impacts of an eventual failure, accepting only what they consider to be an affordable loss (Dew et al., 2009). This causes 43% of Europeans not to start a business due to fear of bankruptcy (European Commission, 2012: 72).

And so, Di Martino (2005), comparing bankruptcy policies (English vs. Italian), noted that a debtor-friendly bankruptcy policy is more effective than creditor-friendly policies to attract more, and higher quality, new

entrepreneurs².

In face of the described, Lee, Peng, & Barney (2007) concluded that bankruptcy policy is central to entrepreneurship, since it is this that defines “the rules of the game” to deal with failure, whether it be a business failure or the effects of that business failure on the entrepreneur’s personal life. And so, more debtor-friendly bankruptcy policies, reducing the entrepreneurs’ risk, encourage their entry into the market (Estrin, Mickiewicz, & Rebmann, 2017)³.

2.2 Influence on Investment

Investors look for the investments that most make their money grow, and so, when they choose to invest their capital in a company, they expect to receive dividends and the increase in the value of the company itself, higher than that of a risk-free investment⁴, to maximize its value. For its part, the company, receiving the investment, seeks to multiply it, to meet the expectations of their shareholders (Watson & Head, 2010).

Thus, companies facing the possibility of new investment have two options: they either use foreign capital or use equity capital, generating conflict between shareholders and stakeholders⁵. From the perspective of the investor (shareholders) the use of foreign capital – credit – appears advantageous, as it does not require additional investment (Brealey, Myers, & Allen, 2011).

However, in the event of failure of the investment, this can jeopardize the continuity of the company. In this context, it is important to note that, in Portugal, 44% of the companies did not survive the two years of life (Statistics Portugal, 2017).

And so, “a good insolvency framework (...) provides entrepreneurs and lenders with tools to evaluate the consequences of a worst-case scenario” (World Bank, 2018, p. 56), with many investors indicating uncertainty about insolvency rules, or the risk of lengthy or complex insolvency proceedings in another country, as the main reason for not investing or establishing economic relations abroad (European Commission, 2016, p. 2).

Exemplifying this assertion, it should be noted in the case of Saudi Arabia that, in 2018, “was forced” to restructure its bankruptcy procedure, given the foreseeable lack of investors in the initial public offering of Saudi Aramco, a company charged with boosting a pipeline of billions of dollars, since the Saudi bankruptcy procedure only provided for liquidation. Thus, King Salman “was forced” to adopt a modern bankruptcy procedure – which also provided for the restructuring of debt with creditors — in order to captivate foreign investors (Reuters, 2018).

Already Schwartz (2005) warns that, in Delaware (USA), it is bankruptcy law that allows small investors⁶ — “nonadjusting creditors”⁷ — understand the legal framework that makes them responsible for the investment made, as well as allow them to identify the possibilities of being compensated for their investment, within the vote of a recovery/insolvency plan against the “big” creditors.

² However, without failing to guarantee creditors higher levels of recovery and a shorter bankruptcy time (Cirmizi et al., 2012).

³ It should be noted that the authors conclude, without being able to prove, that this effect is ambiguous, as it can simultaneously hinder access to credit by entrepreneurs, creating obstacles to their entrepreneurial activity.

⁴ As a rule, investment in government bonds is seen as a risk-free investment.

⁵ While shareholders prefer the use of foreign capital (leverage effect of credit), stakeholders prefer the use of equity (greater solidity of the investment made).

⁶ Small shareholders or bondholders, and small customers and commercial suppliers, which, per se, represent a small part of the total credit obtained by the bankrupt. It should be noted that, in a varied bibliography, this type of creditor is identified as being the “junior creditor”.

⁷ “In the literature, a ‘nonadjusting creditor’ is a natural person who lacks the sophistication to evaluate a contracting scheme or a business whose bankruptcy claim would be too small to justify evaluating a contracting scheme. This definition characterizes many participants in capital markets.” (Schwartz, 2005, p. 1253).

2.3 The Influence on the Granting of Credit

The leverage effect of credit on economic growth is widely recognized (Stuart Mill, 1882; Schumpeter, 1911), a fact that leads any economy/organization to use credit to increase its growth/profit. However, this recourse to credit, when not properly controlled, instead of driving growth, creates solvency problems, which can lead to the destruction of value.

In this way, economic-financial science has created indicators that would allow identifying when the use of foreign capital endangers the continuity of an entity. According to Carvalho das Neves (2015), one of these indicators is the Financial Autonomy ratio, the result of which is considered acceptable is in a range between 33% and 66%⁸.

From consulting the Central Balance Sheet, Bank of Portugal (2019), we note that the Financial Autonomy ratio, of the 428 497 Portuguese reporting companies in 2018, is 35.4%. In other words, only 35.4% of the assets are financed through equity. Saying in another way, 64.6% of the assets of Portuguese companies are financed through foreign capital – credits –, thus allowing the leverage of the results compared to the capital invested by its holders.

As a result of this granting of credit, and noting that it is not just the granting of loans, but also the normal exercise of an economic activity whose form of payment is not prompt payment⁹, the failure of an economic operator may affect the economic balance of the remaining operators in the market.

The extreme mobility and susceptibility of the credit, whose security the law of bankruptcy intends to protect, disorient is undermining the most complete and adequate measures and obliges the legislator to follow in its constant transformations the capricious movements of that wonderful protein (Portugal, 1899, p. 200).

It can be concluded that the granting of credit results from the market's confidence in the economic policy pursued, namely in the bankruptcy policy (Schwartz, 2005), which will ultimately allow the creditor to recover the credit granted to the bankrupt, or part of it, and that failures in the procedure of executing a debt discourage lending activity (Djankov, Hart, Mcleish, & Shleifer, 2008), that is, bankruptcy policy acts as a “credit insurance” for creditors (Posner, 1986).

Corroborating this premise, La Porta, Lopez-De-Silanes, Shleifer, and Vishny (1997) demonstrated that countries with low creditors' protection have smaller capital markets.

In short, a good bankruptcy policy boosts economic growth, by providing sufficient confidence to grant credit (Ayotte & Yun, 2007).

2.4 The Influence on Corporate Recovery

After the product's maturity, the economic agent is at a crossroads, or accepts the decline in its sales margin and/or finds substitute products, or leaves that market (Porter, 1998), and these decisions end up influencing companies' financial needs. This is not to overlook the possibility of financial imbalances arising from inefficient management/administration.

However, whatever the option, except for the closure of the company, may not go according to plan, and the company may not be able to meet its obligations to creditors on time.

Since the end of the 20th century, bankruptcy policy has developed a new trend: promoting the rescue of

⁸ Depending on the sector of activity in which the company operates.

⁹ According to the Central Balance Sheet Database, Bank of Portugal (2019), corresponds to 10.8% of assets.

companies (Cook & Pond, 2006), and in this way, priority has been given to restructuring and recovery plans, allowing companies to continue working.

At first glance, it may seem like a humanistic action: instead of selling the debtor's assets, he urges creditors to help him get back into the business. However, in a more detailed analysis, it appears that this "humanism" is based on the selfish interests of creditors, since the option of redemption may be the only realistic alternative for creditors to receive at least part of what is due to them (Paulus et al., 2015).

Thus, in its genesis, when preparing these plans, creditors observe whether the company has greater value by continuing with the development of economic activity or proceeding with its liquidation.

If the option is for the highest value of the company remaining on activity, the insolvency procedure will help the debtor by adopting a recovery plan, which may consist of an extension of the payment terms, allowing him to comply with the overdue/due obligations in the short term or partial debt forgiveness.

Another possible scenario will be the restructuring of the company, performing a downsizing/separation of branches of activity, or the replacement of the management body at the discretion of the creditors (when shareholders haven't done voluntarily), or, still, in the injection capital/granting of new credits that allow "expanding" the business, making it profitable.

In either scenario, the insolvency procedure allows the debtor to "catch his breath" and continue his activity, with considerable evidence that these plans have higher business and job preservation rates, in addition to a recovery debt rate, for all creditors' classes (Cook & Pond, 2006).

2.5 The Influence on the Liquidation of Inefficient Players

Although the life cycle of a company can end in any of the phases described above, it is traditionally in the phase of decline that its disappearance begins. "In the transition to long-run equilibrium, inefficient firms, firms using obsolete technologies and those producing products that are in excess supply are eliminated. Consumers benefit because, in the long run, goods and services are produced and sold at the lowest possible prices." (White, 1989, p. 129).

According to Lester, Parnell, & Carraher (2003), this phase is characterized by being the moment when the concern of managers/administrators with their personal goals overlaps the companies' goals, increasing their inefficiency. Thus, in this phase of the companies' life cycle, it is important to pay attention to the actions of the management body, to prevent it from being more concerned with the satisfaction of their interests than in the satisfaction of the interests of stakeholders.

Recalling the economic theory of Adam Smith (1776), as a result of interested actions by individuals, in the long run, the economy can produce more efficiently, however, as the company/organization is already in the decline phase, economic agents are no longer aiming for the long run¹⁰, but rather concerned with the short term, being able to adopt delaying strategies/maneuvers to ensure the withdrawal of income for a longer period, delaying the beginning of the bankruptcy procedure, worsening the economic situation, and reducing the chances of creditors being reimbursed.

In this way, when, as a result of the economic inefficiency of a company/organization, its liquidation is decided, this liquidation must be carried out quickly and efficiently, thus reaching the highest levels of return for creditors.

¹⁰ If they are aiming in the long term, waiting for "better luck", given that the company proves to be inefficient, they will only find themselves "agonizing" the weak economic status of the company, and jeopardizing the value for which creditors will be compensated.

In this situation, many companies choose¹¹ for initiating a bankruptcy proceeding, allowing settlement to be handled by an administrator appointed by the court under the applicable provisions of the respective bankruptcy code (Ratner, Stein, & Weitnauer, 2009).

For the debtor, the bankruptcy procedure has the advantage of trusting that its settlement will take place legitimately and efficiently. For creditors, the bankruptcy procedure has the potential for them to see their credits recognized, and paid, according to their priority in the bankruptcy law, as well as that liquidation occurs in a transparent and regulated manner.

Thus, “the legal mechanism through which inefficient firms most often are eliminated is that of bankruptcy” (White, 1989, p. 129).

3. The Magic Formula VS. a Sure Formula

Given the importance demonstrated so far from bankruptcy policy in society and his antiquity, it can be assumed that it is already properly consolidated, allowing the identification of the necessary characteristics to develop an ideal bankruptcy policy — the magic formula.

But not. That does not happen!

Until today it was not possible to define the ideal bankruptcy policy, i.e., the “one size fits all” policy has not yet been found (Hart, 1999), and according to La Porta, Lopez-De-Silanes, & Shleifer (2008), this is due to the institutionalism existing in each country, even though there is some convergence¹², even among countries with different “varieties of capitalism” (Paterson, 2016).

In addition, although bankruptcy law fills the gaps in incomplete contracts, itself is an incomplete contract, i.e., bankruptcy law does not provide a formula that determines, in detail, what should be done in a reorganization, in a conflict resolution, and in a settlement of the debtor’s assets, or even when a mechanism should be adopted in detriment of another (Stiglitz, 2001).

However, it is not easy to find the delicate balance between the rights of creditors and the protection of debtors, in a way that boosts the credit market and, at the same time, does not stop entrepreneurship, especially since this balance will be different from country to country.

But the observation of the impossibility of identifying Pareto’s efficiency in world bankruptcy policy should not lead to the opposite fallacy: that the design of the policy will be merely a political issue (Stiglitz, 2001) since poorly designed bankruptcy policies hinder the activity of all economic agents (Claessens, Djankov, & Mody, 2001).

On this path, it was only possible to identify the objectives of a good bankruptcy policy, as well as some of the characteristics of an efficient bankruptcy procedure (Hart, 1999) — the right formula.

Thus, in the absence of a magic formula, but fixing the right formula, it is important that the bankruptcy policy is detailed and carefully designed, and that this conception results from an articulated work among the various actors in the bankruptcy arena: politicians, judiciary, public administration, trustees, academia and civil society.

¹¹ Despite the authors adopting the expression “opt” — North American reality, in Portugal it is not an option. If the company meets the conditions provided for in article 3 of CIRE, it is obliged to request its insolvency within 30 days after becoming aware of this situation (article 18 of CIRE). If you are not in a situation of insolvency, you will not be able to request the initiation of insolvency proceedings, under penalty of your preliminary rejection under the terms of article 27 of CIRE.

¹² E.g., the recovery procedure was introduced in the USA in the 19th century, by the court, to recover a railway company (Bebchuk, 1988). In the United Kingdom, the recovery mechanism was introduced at the end of the 70s, by the Bank of England — London Approach (Kent, 1993).

So, we can observe that the impossibility of identifying an ideal bankruptcy policy, essentially, results from the different “varieties of capitalism” of which country, as well as the different stages of his institutional development.

Corroborating the idea of Hall & Soskice (2001), whereas the institutionalism present in national political economies is very strong, and thus the economic approaches necessary to operate through public policies, to obtain maximum efficiency, change from economy to economy, Claessens & Klapper (2005) showed that bankruptcy policy varies significantly given different legal traditions/families, macroeconomic factors and even the accounting standards adopted.

Confirming this assertion, we have the fact that the objective of each bankruptcy procedure varies according to his family of legal origin: the legal family of French inspiration aims at the preservation of employment and companies, whereas the Common legal approach tends to promote entrepreneurship. On the other hand, bankruptcy legislation of US origin aims to provide a fresh start, while the German legal family aims at the best possible satisfaction of creditors (La Porta et al., 2008; Paulus et al., 2015).

Additionally, and not failing to corroborate the assertion of institutionalism — sociological neo-institutionalism, it is also important to consider the evolution/maturity of the bankruptcy thinking of each economy. Charles Warren (1935) and Radin (1940: 3) distinguishes three periods in American bankruptcy policy: “Pro-creditor period” (1789-1827); “Pro-debtor period” (1827-1861); and “Period of National Interest” (1861-1935), stating that more than thinking about the creditor, or the debtor, bankruptcy policy should focus on achieving an efficient result for society.

Despite the antiquity of this thought, it remains current today, and allows to identify three states in bankruptcy thinking:

- State 1: Bankruptcy-liquidation system;
- State 2: Bankruptcy-sanitation system;
- State 3: “Bankruptcy-national interest system”.

In Portugal, the bankruptcy policy was guided by the bankruptcy- liquidation system until 1961 and in the period from 2004 to 2012, and the bankruptcy-sanitation system was in force from 1961 to 2004 and is in force from 2012 to the present day (Oliveira Fernandes, 2018).

Given the above, the present point, not aiming to identify an ideal bankruptcy policy, aims to identify the crucial elements in a bankruptcy policy, to better understand/identify a bankruptcy policy efficiently compatible with national institutions, as defined by Douglass North (1990), which allows the national bankruptcy policy to evolve to the third stage — Bankruptcy-national interest system.

3.1 The Efficiency of a Bankruptcy Policy

A policy is said to be efficient if achieves the expected results with the least possible consumption of resources. Thus, from an economic point of view, an efficient bankruptcy procedure will allow for the rapid restructuring of viable companies — companies that make efficient use of their resources, generating economic value — and the quick liquidation of non-viable companies — companies that provoke the destruction of value, thus allowing the rapid reallocation of resources employed there (White, 2005; Cirmizi, Klapper, & Uttamchandani, 2012; Paterson, 2016; among many others).

From the point of view of the Law of Obligations, an efficient bankruptcy policy will be one that allows maximum reimbursement from creditors (White, 1980).

Starting from these two definitions, Gamboa-Cavazos & Schneider (2007)¹³ argue that the first question to keep in mind when considering the efficiency of a bankruptcy policy is whether *ex ante* or *ex post* efficiency is desired. Other authors also defend the consideration of *interim* efficiency (Couwenberg & de Jong, 2008; Succurro, 2012). However, the most defended solution is the need to find the right balance between these levels of efficiency, one that is appropriate for each economic reality.

The *ex ante* efficiency must prevent the management and/or the shareholders from taking reckless loans, as well as prevent creditors from granting too risky loans (Claessens & Klapper, 2005), i.e., to borrow/lend with an inefficient level of leverage (White, 1996), inducing the borrower to adopt an optimal capital structure (Haugen & Senbet, 1978). At the same time, *ex ante* efficiency, with its deterrent effect (like any other law, e.g. criminal law) should not prevent entrepreneurs from starting their businesses (Estrin et al., 2017).

In other words, *ex ante* efficiency impacts on the normal functioning of the credit market, long before there are any signs of bankruptcy (Franks, Nyborg, & Torous, 1996). If creditors believe they are less protected in the bankruptcy procedure, they will tend to increase the cost of credit, or may even refuse to take out any loan. Thus, to facilitate the flow of credit, the bankruptcy procedure must protect creditors' rights and allow creditors to monitor debtors' activities. On the other hand, *ex ante* efficiency does not allow creditors' rights to hinder entrepreneurial initiative, impelling entrepreneurs to start economically efficient activities, and discouraging them from starting too risky projects (Boughanmi & Nigam, 2017).

The *interim* efficiency occurs when the course of the bankruptcy procedure is not "contaminated" by the conflict of interest of the participants, that is, it does not allow entropies to be created with the rapid completion of the bankruptcy procedure, namely by filing appeals (with suspensive effects), or "sloppiness" by the intervening parties (Succurro, 2012), so that this does not happen, it is necessary that both parties have the full amount over the debtor, and thus Franks et al. (1996) alert to problems of information asymmetry.

On the other hand, *ex post* efficiency ensures that the highest value is returned to creditors, in accordance with their respective contractual rights. Thus, *ex post* efficiency maximizes the debtors' value, has low process costs, and transfers control from the debtor to creditors (Claessens et al., 2001).

For Boughanmi & Nigam (2017), *ex post* efficiency is determined by two important characteristics: 1) credible information about the debtor is made available in a transparent manner, allowing stakeholders to carry out correct assessments; 2) assists in the decision-making process by coordinating creditors' actions. To this end, the bankruptcy policy should adopt the mechanism that makes the best possible use of the debtor's assets, keeping in mind the rights of all interested parties when deciding the order of priority for distribution.

Finally, in an exercise of relating *ex ante* efficiency to *ex post* efficiency, Franks et al. (1996) conclude that if efficient *ex post* investment decisions are reached, then *ex ante* efficiency will also be achieved. The basis of this assertion is that any financial rehiring that is done aiming at *ex post* efficiency will be anticipated at the beginning of the contract. Thus, the authors exemplify, creditors who expect to be adversely affected by such rehiring (called negative deviations from absolute priority) will demand a higher interest rate. The implication is that any rehiring in the event of bankruptcy should not affect the ideal *ex ante* investment. Given this proposition, the role of bankruptcy policy will be to promote the production of comprehensive, credible information at a low cost.

As has been shown, bankruptcy policy is complex in its conception, as it tries to balance several objectives,

¹³ It is not only these authors who defend the dichotomy of *ex ante* vs. *ex post* efficiency, but these authors argue that they defend their prior consideration, and not as a result of the policy adopted.

including the protection of creditors' rights — essential for the mobilization of capital for investments — and the incentive of entrepreneurship — vital for the growth of the economy.

3.2 Some Variables in Bankruptcy Policy

The bankruptcy procedure is characterized by being a negotiation between creditors and the debtor¹⁴. Thus, the bankruptcy law, by establishing the environment in which these negotiations will take place, restrains the outcome of these same negotiations (Berkovitch, Israel, & Zender, 1998). To this end, bankruptcy policy requires an integrated approach to legal and institutional mechanisms, which must align incentives and disincentives, in a broad spectrum — commercial, corporate, financial, and social.

And so, as argue Hart (1999), the objectives of bankruptcy policy must be in line with the institutionalism of each country, as creating very elaborate laws, whose national institutions are not prepared to put into practice, becomes an obstacle, greater than "weaker" laws but whose implementation is effective¹⁵.

On this path, Djankov et al. (2008) demonstrate that as countries become richer, and their companies have more complex financial structures, more elaborate bankruptcy procedures may prove appropriate. However, the same authors warn of the need to carry out the training of the entire public sector, and not only of what is directly related, before the implementation of the policy, under penalty of the policy failing to achieve the objectives that have been outlined.

Centralizing their analysis in the judicial institution — training of the legal system, quality of execution and available resources — Ayotte & Yun (2007) conclude that the adoption of a bankruptcy — liquidation system — oriented to the creditor — is more appropriate when the quality of enforcement and the judicial experience are low. And as these factors improve, the law can adopt a more debtor-friendly approach — bankruptcy-sanitation system — and allow "honest, but unlucky" managers to remain in control of their companies, avoiding inefficient liquidations.

On the other hand, Gamboa-Cavazos & Schneider (2007), observe that deliberate obstruction, sometimes seen in the bankruptcy procedure, is a product of poorly structured legislation. And so, if bankruptcy law allows opportunistic behavior by stakeholders, the results of the bankruptcy procedure will reflect these deficiencies in policy design.

Thus, at this point, it is intended to highlight the main variables, pointed out in the literature, for an efficient bankruptcy procedure, without having any claim to the exhaustiveness of the theme, given its vastness.

3.2.1 Stakeholders in the Process

At this point, the observation that the economic results of the bankruptcy procedure crucially depend on the legal process in place should no longer be surprising. However, we find that it is not only the letter of the law that is relevant; the procedural structure, the administrative efficiency, and the training of the stakeholders are factors that influence the results of the bankruptcy policy too. So, bankruptcy policy shaping the incentives of the parties, determining the rules of action, and the ways of carrying out the legal process, creating expectations in a long time before the bankruptcy procedure, will influence the normal development of the economic market.

¹⁴ "Liquidation is the basic bankruptcy procedure. Even for firms that decide to reorganize rather than liquidate, the liquidation procedure sets the framework for bargaining over a reorganization." (White, 1989, p. 130).

¹⁵ "A country that wants efficient bankruptcy should regulate only what it can enforce. Sophisticated reorganization procedures work only in rich countries, with experienced judges and lawyers, and a liquid market for the assets of reorganizing firms. In middle-income countries, a simpler procedure — liquidation — brings the most benefits to all parties, including employees and suppliers. In poor countries, the highest return comes in debt enforcement procedures — not in reorganization." (World Bank, 2007: 55).

Thus, the first aspect to be noted will be a political intervention in the bankruptcy procedure of any specific company.

The insolvency of large companies, as a result of their social, and sometimes even economic, the impact can create the tendency for political intervention to occur. Yet, Lam & Kan (1999) warn that this intervention is inefficient, generating market uncertainties and may even generate corruption. Thus, these authors argue that to protect the bankruptcy procedure from this trend and to transmit confidence to the market, the management of the bankruptcy procedure should be committed to strong and independent institutions, which are kept away from these political pressures, namely to the judiciary institutions, transmitting credibility and confidence in the bankruptcy procedure.

And so, Cirmizi et al. (2012) claim that courts and judges sometimes act as an obstacle to efficient insolvency resolution, and thus are often the focus of bankruptcy policy reforms.

According to Claessens & Klapper (2005), an efficient judicial system will be one that enforces creditors' rights, which serves as a threat of reliable execution, and that, in a fast way, leads the procedure of liquidation or restructuring.

Also, is observed that institutional independence, in itself, is not sufficient for an efficient judicial system in bankruptcy policy. It is also necessary to train the stakeholders.

Concerning the training of stakeholders, Paulus et al. (2015) argue that the creation of an environment that guarantees bankruptcy efficiency depends on qualified university education and, subsequently, improvement of skills. To this end, universities must offer bankruptcy courses, with an interdisciplinary approach – economics and law –; courts should encourage judges to receive ongoing training; and the body responsible for insolvency practitioners must demand adequate basic/admission skills and qualifications, as well as the existence of a system of continuing training. In addition, there should be an exchange of experiences, not only between insolvency practitioners but also with judges and other interested parties.

On another side, Westbrook (2001, p. 53), arguing that «educational programs frequently make more difference in the actual function of a legal system than the incentives and disincentives so carefully included in the law itself», also defends the specialization of those involved in the procedure — judges, trustees and other consultants (lawyers, accountants, etc.) — invoking the effect of economies of scale.

And so, Succurro (2012) demonstrates the complementarity between the quality of the law and the quality of its application, i.e., that legal production does not determine the expected results if it is not properly applied by the intervening institutions, concluding that, in “rich countries”, by virtue of having more complex legal regimes, this quality of application requires greater efforts on the part of its stakeholders.

In addition to institutional independence and the training of agents, Warner (1977) draws attention to the need for agents, in the bankruptcy procedure, to be duly encouraged to “extract” the greatest value from the debtor.

Then, focusing on the figure of the trustee, the author considers that, as an agent of the court, the trustee has the authority to manage the debtor. However, the author does not consider that it is clear that this relationship *per se* provides sufficient incentives for the trustee to manage the debtor efficiently, and to make decisions that maximize the debtor's value. Thus, if the trustee does not have the necessary incentives, he will tend not to exercise optimal management, one that adopts the most efficient decisions, leading the debtor to incur the loss of opportunities or loss of value. This loss of opportunity, or loss of value, Warner (1977) included in the list of bankruptcy indirect costs.

3.2.2 Start of the Process

As has been shown, bankruptcy policy is not limited to the bankruptcy code, despite the fact that this is at the “heart” of its action. This fact makes simple changes in the bankruptcy code harmless if they are not accompanied by legislative changes in other areas or changes in mentalities on the part of those who are going to apply it. And so, Westbrook (2001) states that the most important areas complementary to the bankruptcy procedure are individual debt collection, banking regulation¹⁶ and taxation¹⁷, emphasizing the role of debt enforcement.

For this author, if the execution of debts proves to be an efficient and economical method of recovering credits, through the seizure of assets, debtors on solvency will tend to pay their debts instead of seeking refuge from the bankruptcy procedure. However, if a legal system, due to inefficiency or corruption, allows long periods of delay in the execution of debts, no bankruptcy system will likely work effectively as a result of the problems associated with the initiation of the procedure.

Thus, it is important to note that, even if the causes of bankruptcy may be exogenous, the moment for its formal initiation is highly endogenous, and that the bankruptcy does not “hit the company like a ray”, which can be concealed by the debtor for some/a long time (Povel, 1999).

Confirming this assertion, Fiirst, Pamplona, Bambino, & Klann (2020) observed that companies in financial difficulties tend to use, with greater intensity, the manipulation of the results presented, within the limitations established by accounting principles, from the three years before the beginning of the bankruptcy procedure.

Most observed that, from three to four years before the formalization of the bankruptcy request, the management bodies try to mask the financial difficulties of the companies, through positive discretionary accumulations, and in the last year, they mostly observed negative discretionary accumulations, possibly intending to expose the financial suffering of companies, to formalize the request for recovery or bankruptcy.

Thus, the first factor to take into account is the information asymmetry between the debtor and the creditor.

Nobody better than the debtor knows his financial situation, however, the stakeholders need the financial statements to know the true financial situation and the financial performance of the debtor, resulting in the importance of high standards of accounting quality, independence of accounting professionals, and the mandatory disclosure of accounting information (La Porta & Lopez-de-Silanes, 2001).

This information asymmetry makes the creditor lend when the debtor is no longer on solvency, encouraging the debtor to postpone the disclosure of his insolvency situation, to receive these loans, waiting for the “miracle that will take him away” of this distressing situation.

Currently, the Portuguese Insolvency and Corporate Recovery Code (CIRE), in its article 3, foresees two causes for the situation of business insolvency: the inability to comply with past-due obligations; and when the liability is higher than the asset. While the first condition reveals little about the debtor’s solvency, as we may only be facing a situation of mere one-off default (current liabilities higher than current assets – financial problems), the second condition is symptomatic of economic problems (the debtor owes more than what the assets it owns).

However, and considering the subject of the present investigation, none of these conditions leads us to the efficient allocation of resources employed, as we may be faced with an inefficient allocation internally (cases in

¹⁶ For Westbrook (2001) a regulatory scheme that requires total forgiveness of the insolvent’s debt will leave the bank with little incentive to participate in a business reorganization process. On the other hand, if only a partial pardon is required, less than what would be obtained in the liquidation, then the bank creditor will be motivated to participate in the reorganization.

¹⁷ According to Westbrook (2001) if bad debts are only tax-deductible when they are effectively uncollectible, the creditor will be motivated to opt for the debtor’s liquidation. However, if the creditor can deduct the debt forgiveness realized in the corporate reorganization, then the reasons that will lead him to vote for this reorganization, or not, will not be merely fiscal.

which reorganization will be the best option, allocating resources to other projects, within the debtor itself) how can we find ourselves faced with organizational inefficiency (cases in which the best option will be quick liquidation so that these resources can be quickly allocated to more efficient companies — efficient external allocation) (White, 1982).

Besides, it is important to note that the bankruptcy procedure is a collective procedure, which means that it is rarely in the interest of a single creditor to bear the costs, and the risk, of initiating the bankruptcy procedure when it will only be one of the many beneficiaries. Solving this problem, by establishing an easy standard for initiating an involuntary bankruptcy procedure, could create an even bigger problem: the extortion power of creditors and the risk of loss of value for all involved, due to the irresponsible actions of a single creditor (Westbrook, 2001).

In turn, introducing an automatic mechanism that “triggers” the bankruptcy procedure, to avoid delaying maneuvers, may increase the time to complete the process, due to the lack of capacity to respond to the number of requests, as was verified in 1992 in Hungary, causing it to be withdrawn in 1997 (Claessens et al., 2001).

It should also be noted that, in opinion articles, some argue that the initiation of insolvency proceedings, at the initiative of the debtor, should be freely adopted — even if they are not in a situation of insolvency, thus allowing an impartial and transparent settlement, carried out by duly controlled professionals, benefiting both shareholder and stakeholders, that is, in practice, the entire market in which it would benefit.

Lastly, Claessens & Klapper (2005) alert to the motivations of the holders of the social capital and the management bodies, in postponing the beginning of the insolvency process.

Shareholders will tend to postpone the start of the bankruptcy proceedings if the bankruptcy law provides that they are not entitled to receive any credit. In this situation, they will tend to invest in high-risk businesses, in an attempt to save the company, but generally leaving the company in a worse financial condition.

Furthermore, the management is also motivated to postpone the start of the bankruptcy procedure, at which point it will lose access to its source of income (and complementary income), which may lead to the management of the company, in this period, directed to extract the greatest benefit of their own.

3.2.3 Mechanisms of the Bankruptcy Procedure

Schwartz (2005) argues that the efficiency of the bankruptcy procedure could be achieved if creditors and debtors were free to determine the characteristics of their bankruptcy proceedings. This argument is compatible with the model presented by Berkovitch et al. (1998), which demonstrates that the optimal bankruptcy procedure varies depending on the exogenous characteristics of the parties and/or the legal environment. However, and even if each debtor could choose the bankruptcy system that best suited him, it is unlikely that each debtor would find his own ideal procedure (Ayotte & Yun, 2007).

In this way, when defining a bankruptcy code, the legislator must take into account compliant companies, but also those that choose to avoid/circumvent the law, and thus, a good bankruptcy procedure guarantees not only the orderly disposition of debtor's assets but protects creditors' rights; it recovers viable companies and does not “castrate” the debtor's entrepreneurship.

To achieve this goal, La Porta & Lopez-de-Silanes (2001) consider necessary that the bankruptcy procedure meets four conditions:

- 1) You must obtain a result that maximizes the total value of the debtor's resources, to reimburse the creditors;
- 2) It should not be “moderate” with companies that make a poor allocation of resources, nor “severe” with companies that make a good allocation of resources;

- 3) You must respect the credit privileges of the claims claimed;
- 4) It must limit the discretion of the institutions involved in the process.

Thus, although there are a multiplicity of bankruptcy mechanisms around the world, they can be grouped into two distinct categories: liquidation and reorganization (Hart, 1999).

In the literature, these mechanisms take several names:

- Credit recovery is made through the sale of the debtor's assets, as a production unit or piecemeal: Settlement; Bankruptcy; Bankruptcy-liquidation system; or Creditor-oriented system.
- Credit recovery carried out through a business plan, enabling the debtor to: Reorganize; Insolvency; Bankruptcy-sanitation system; or Debtor-oriented system.

In the settlement mechanism, the companies' activity is terminated, the management body is removed, and a trustee is appointed, who is responsible for promoting the sale of assets, either as a production unit or by the individualized sale of assets (piecemeal). In adopting this mechanism, La Porta & Lopez-de-Silanes (2001) warn of capital market imperfections, which could have serious consequences if companies are inefficiently disbanded, and their assets sold for less than their fair value — at settlement prices¹⁸.

The reorganization is a supervised procedure that aims to rehabilitate companies in financial difficulties, encouraging creditors and debtors to negotiate about the future of the company itself. For this purpose, a business plan is prepared, which will promote a better internal allocation of resources, which will be voted on by creditors.

Here the problems of reorganization begin to emerge: voted on by creditors.

The secured creditor will tend to press for a quick settlement of the debtor, since, with great probability, he will always be reimbursed of its credit, but, in the procedure of liquidation, more quickly. On the other hand, a common creditor will tend to vote for the reorganization, since the probability of being repaid of his credit is small, and so he has little to lose, only having to win if the debtor effectively recovers. Thus, credit priority rules can be useful in rigid mechanisms (settlement), but they can be an obstacle, for economic efficiency, on flexible mechanisms (reorganization).

On another side, La Porta & Lopez-de-Silanes (2001) warn that reorganization mechanisms require a sophisticated legal system and that these mechanisms are commonly criticized for taking too long, and for involving high legal and administrative costs¹⁹, which can cause considerable losses in the company's value. They are also common criticisms: the fact that they appear benevolent towards the management, as well as granting discretionary powers to the judge.

Dissenting in the cost/loss of value argument for creditors, Bris, Welch, & Zhu (2006) demonstrate that, in the U.S. Bankruptcy Code, liquidations (Chapter 7) have no lower costs than those of reorganizations (Chapter 11). Most verified that, in the liquidations, are the bankruptcy professionals — lawyers, accountants, and judicial administrators — who, as a rule, end up receiving most of the value of the post-bankruptcy company.

Also proving this assertion, Povel (1999) adds that it will be more beneficial for creditors to realize debt forgiveness in the reorganization, a fact that will induce the debtor to reveal his financial difficulties as soon as

¹⁸ In the definition of "settlement prices", Shleifer & Vishny (1992) demonstrate the "general equilibrium problem", that is, that buyers are more able to extract a better return on the asset will not be able to bid on the asset due to lack of liquidity, causing the asset to be acquired by inefficient buyers, and at prices below fair value. They, therefore, argue that the prospect of *ex post* losses of this type creates an *ex ante* incentive to adjust the level of credit granted — financial leverage — to mitigate the possibility of compulsory asset sales at prices below fair value.

¹⁹ Claessens et al. (2001) argue that political intervention in this mechanism should be limited to guaranteeing an adequate economic environment, in which resources can be redistributed at a minimal cost.

possible, increasing the chances of a successful recovery.

This fact leads to the moment when the reorganization mechanism must take place, within bankruptcy policy. As already seen, in many jurisdictions the reorganization mechanism takes place already within the bankruptcy procedure, but in others, this is possible beforehand, and there are also jurisdictions where it is possible to use this mechanism at both times.

By focusing the analysis on the reorganization mechanism before the bankruptcy procedure, we find that this mechanism avoids the inherent costs of the bankruptcy procedure, such as the appointment of a judicial administrator, the supervision of the judicial power, ensuring the best internal reallocation of resources, or that is, this would be the most efficient mechanism from the point of view of ex post efficiency (White, 2005). On the debtor side, this mechanism keeps holders of share capital, as well as the management body, and avoids social censorship of bankruptcy (Gertner & Scharfstein, 1991).

However, several factors must be considered for this mechanism to be successful: a) abuse by the debtor: to improve its profitability, it simulates financial difficulties; b) the efficiency of the debtor's proposal: too optimistic for the debtor, leaving creditors in a worse position than they would be if insolvency were to occur; c) the strategic positioning of creditors: knowing that the proposal welcomes the favorable position of the majority of creditors, the latter may vote unfavorably to not be included in the plan and thus receive his credit in full; d) rejection by privileged creditors: a creditor who has secured his credit will tend to vote negatively, since his credit, even in bankruptcy, will be fully refunded; in short: the normal functioning of game theory with asymmetric information (Schwartz, 1993).

Another relevant aspect to be considered is the stand-still effect.

To achieve ex post efficiency, bankruptcy mechanisms must preserve the company as a productive unit (internal inefficiency), or its assets (external inefficiency).

Thus, the stand-still effect provides a suspension/moratorium, so that businesses can be kept together and sold as a production unit, whenever possible, to maximize the amount of capital that is reallocated. Thus, in addition to imposing a moratorium on creditors, it imposes duties on the management and shareholders, ensuring that capital is not invested in risky projects, designed only to increase the interests of shareholders, as well as adjusting payments made in insolvency to reduce the incentives to favor some interested parties in detriment of others (Paterson, 2016).

Claessens & Klapper (2005) note that the absence of the stand-still effect can prove advantageous for creditors when the judicial system is weak, as it tends to force debtors to negotiate outside the court, thus concluding that there is a substitution effect between the creditor's rights and judicial efficiency, concerning greater use of the bankruptcy procedure.

In short, Povel (1999), in an attempt to identify "the magic formula", in a market with information asymmetry, concluded that both "hard" bankruptcy laws — liquidation — and "soft" bankruptcy laws — reorganization — can be ideal, depending on the respective parameters. This conclusion reveals that bankruptcy procedures that only adopt one of the two options, will not be ideal. He also concluded that the "hybrid" procedures, i.e., procedures that try to combine elements of these two procedures into one, are redundant and predictably harmful.

Finally, it is also important to note that Hart (1999) warns of resistance to changing the pro-creditor to the pro-debtor system, proposing the coexistence of the two systems for some time, as an option, and in the long run, the efficient choice will be made by those involved in the process.

Additionally, it is important to note that international economic organizations, such as the World Bank (World Bank, 2016), UNCITRAL (United Nations Commission on International Trade Law, 2019), and even European Union (2019), since the beginning of the century, they have been “encouraging” the adoption of the bankruptcy-sanitation system — insolvency — to the detriment of the bankruptcy-liquidation system — bankruptcy, even changing the terminology they had been adopting from “bankruptcy” to “insolvency”.

With regard to this “strong commitment” of international organizations to insolvency, consideration should be given to Paulus et al. (2015), who note that the reorganization processes do not arise from the creditors’ altruistic concern for the debtor’s fate, but as a result of the evolution of society, i.e., the change in the predominance, in the economy, of the secondary sector — production of goods — for the tertiary sector — services, which forced the bankruptcy policy to rethink the form of reimbursing creditors since there are no tangible assets that justify the intrinsic value of the debtor’s production unit²⁰; this value is now found in intangible assets such as know-how and contracts, assets with value, but, as a rule, insusceptible to transmission.

This view contrast with the view presented by Gant (2014), which argues that the evolution towards bankruptcy procedures of the bankruptcy-liquidation system is due to the awareness of the welfare state and the precarious position of workers in insolvent companies.

3.2.4 Creditors’ and Investors’ Rights

The protection that creditors receive in each economy determines their willingness to invest in that economy. Thus, the law and the quality of its application are important determinants in the dimension of the capital market (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998), and the bankruptcy procedure assumes to be a determining factor for the size of the capital market (Claessens & Klapper, 2005).

Corroborating this idea, Modigliani & Perotti (2000) observed that when the rights of minority and foreign creditors are not adequately protected, companies have greater difficulties in proceeding with capital increases, thus accessing smaller amounts of credit, a fact that hinders the realization of new investments.

Regarding the rights of creditors, it is observed that the way to proceed with the graduation of credits, as well as the exceptions to insolvency and the stand-still effect, are determining factors in the execution of the bankruptcy procedure.

The graduation of credits consists of hierarchically ordering the credits claimed from the debtor, thus creating an order in which those credits will be paid.

The credit priority rule (APR²¹ or PPR²²) determines that creditors must be compensated for the order of credit privileges they hold (either individually or included in homogeneous classes), without this order being derogated by situations considered as special, namely the attribution of priority to workers, to tax authorities, suppliers, or shareholders.

The introduction of the “special” qualification of these credits is likely to distort incentives for choosing the most efficient bankruptcy mechanism, namely leading to the option for the reorganization of economically

²⁰ According to Franks & Sussman (1998), the emergence of the reorganization mechanism occurred in the USA in 1884, with the bankruptcy of the Wabash Railway. In this bankruptcy proceeding, the court accepted the argument that being a railway transport company, its assets would be "just iron" in a liquidation process, and thus there would be a need to preserve the company in operation so that it was able to repay your debts.

²¹ In its Anglo-Saxon acronym for the absolute priority rule: Absolute Priority Rule (APR). This rule determines that each creditor must be reimbursed in the order of his credit privilege over the debtor.

²² In its Anglo-Saxon acronym for the proportional priority rule: Proportionate Priority Rule (PPR). This is identical to APR, except that creditors are grouped into homogeneous classes.

inefficient companies, since creditors could not recover any credit if opted for the debtor's liquidation.

Djankov et al. (2008), in their analysis of debt collection procedures around the world, observed that only 45% of world economies respected the credit priority rule. Analysing the frequency of this derogation, they observed that it occurred in 33% of high-income countries and 74% of low-income countries. They further observed that this derogation did not occur in any Nordic country, it occurred in 25% of the countries of Common legal origin, in 52% of the countries of legal origin in Germany, and 74% of the countries of legal origin in France. Finally, they concluded that the execution of debts, in poor countries and of French legal origin, was hampered by this derogation.

On another side, White (1980) analysing the efficiency of the absolute priority rule (APR) and the proportional priority rule (PPR), in bankruptcy policy, had concluded that the conventional priority rules, when applied to the liquidation mechanism, do not lead to efficient investment incentives, they do not have *ex ante* efficiency (they do not prevent the granting of risky credits), nor *ex post* efficiency (they do not maximize the value of the debtor to creditors), which can only be achieved through institutional combinations, particularized in each economy.

Thus, Franks & Torous (1989) analysing the US reorganization mechanism (Chapter 11), observed substantial deviations from the absolute priority rule, having attributed these deviations to the characteristics of this mechanism — the maintenance of control by the debtor and the fact that the costs of the reorganization are borne by the debtor, and that these deviations resulted from creditors recognizing the management's ability to preserve the debtor's value.

Another aspect to be considered in creditors' rights is the exceptions granted in the assets of the debtor which will answer for debts. In a bankruptcy procedure, the debtor's entire assets must be held accountable for the debts incurred. However, due to personal bankruptcy proceedings²³, it is common for exceptions to be granted to the assets of the debtor who will answer for his debts²⁴.

Thus, and for the sake of the debtor's social dignity, it is common not to allow the execution of the value that is considered as the minimum subsistence, as well as the assets considered necessary for his dignity²⁵.

However, and to increase entrepreneurship, greater limitations can be created on the execution of entrepreneurs' assets, as well as on their future income (White, 2007). And, doing so, bankruptcy policy is giving a clear incentive to entrepreneurship. However, and as has already been demonstrated, this action has an "other side of the coin" which is to find it hampering that same entrepreneurship, by increasing the difficulty of access to credit by the entrepreneur. Once again, the difficulty in finding the delicate balance in bankruptcy policy is evident.

But the use of these exceptions is not limited to the incentive of entrepreneurship, being many times adopted by incentives considered as socially desirable, e.g., in the period of the independence of the state of Texas, in the US, from 1839 to 1845, in fear of a new Mexican invasion, the first property exemption was adopted for the debtors' homes — homestead exemptions²⁶. This exception was aimed at capturing emigrants who could help the

²³ Personal bankruptcy is not the object of analysis in the study — business bankruptcy — however, given its interference in entrepreneurial activity, it is preponderant to highlight the importance of bankruptcy exceptions.

²⁴ Elias (2011) presents an extensive list of exceptions granted in the US, divided by state, and some states still allow accumulating with the exceptions granted state-wide, with the federal exceptions. In the list of federal exceptions alone, it is possible to identify 9 classes of exceptions.

²⁵ In Portugal, these exceptions are enshrined in articles 736 to 739 of the Code of Civil Procedure.

²⁶ Today, too, a federal exception.

state of Texas in its defence against the eventual invasion. Given the success of this political measure, the nearby states responded by adopting their exemptions, to compete with the Texan state to win emigrants (White, 2005).

Finally, another exception to the rights of creditors, which constitutes a clear incentive to entrepreneurship, is related to the fresh-start mechanism, or in the Portuguese terminology “exoneration of the remaining liabilities”. This mechanism, by relieving debtors, from debts before the bankruptcy, restricts the rights of creditors to be repaid from their credit.

However, this mechanism, by allowing the debtor to free himself from the debts incurred, provides to entrepreneur a new start, allowing him to resume his entrepreneurial activity²⁷ without “carrying the burden” of previous negative experiences.

Armor & Cumming (2008) analysing the application of this mechanism in 15 countries (Europe and North America), over 16 years, they concluded that it varies from country to country, according to the degree to which they allow a new start and do not impose other forms of discrimination, that is, no restrictions are placed on the debtor's civil or economic rights (e.g., being prevented from obtaining credit, running a business, or running for political office).

Thus, these authors concluded that the main variants in this mechanism are: the form of access by the debtor, and the period required to release the debtor.

Concerning access conditions, they noted the existence of countries in which it is automatic, and other countries that access depends on request (in these cases, it may not even be granted if the debtor does not comply with the required requirements). About the time required, they observed that it varies between 0 and 7 years, in the countries that have this mechanism.

However, the entrepreneurship that leads to the growth of an economy is disruptive entrepreneurship, and not the simple activity of creating a business, and so, Primo & Green (2011) investigating the effect that bankruptcy policy has on entrepreneurship, corroborated that generous exemptions in the bankruptcy procedure encourage entrepreneurship, yet point to a negative relationship between a more generous bankruptcy policy and disruptive entrepreneurship.

3.2.5 Bankruptcy Costs

In bankruptcy policy, the costs of the bankruptcy proceedings have the potential to influence both *ex ante* efficiency and *ex post* efficiency.

In the analysis of *ex ante* efficiency, and supported in Modigliani & Miller's Theorem (1958, 1963), Warner (1977) study how the costs expected in the bankruptcy procedure affect the capital structure of companies. Under the scenario of a railway company, which chooses a level of indebtedness whose probability of bankruptcy would be once, every twenty years (i.e., the probability of bankruptcy is 5% each year), and the direct costs of bankruptcy would be 3% of their market value, these would represent 0.015% of their market value. And even if the amounts were doubled, i.e., the probability of bankruptcy would be 10%, and the direct costs of bankruptcy would be 6%, these costs would represent only 0.6% of the company's current value.

Thus, the authors concluded that these numbers are too small²⁸, not that they can be overlooked in discussions about the capital structure to be adopted by the company, but they are not large enough to induce less

²⁷ As has already been amply demonstrated, and supported by Schumpeter (1911), entrepreneurship is one of the engines of economic growth.

²⁸ This reference “are too small” refers to the scenario created by Warner (1977), in his study the author concludes that the direct costs estimated at the time were 4% of the debtor's market value.

bankruptcy friendly behavior.

As for *ex post* efficiency, it appears that the costs of the bankruptcy procedure, ultimately, will burden creditors, influencing the amount they will receive for their credits, and consequently the assessment of the efficiency of the bankruptcy policy in practice.

For Warner (1977) is important to distinguish the costs of the bankruptcy procedure between direct costs and indirect costs, classifying as direct costs the costs of operation associated with negotiations between rights holders, and as indirect costs the costs that depend on the market.

Altman & Hotchkiss (2019) detailing these definitions, classify as direct costs the expenses incurred with lawyers, accountants, restructuring consultants, recovery specialists, and other professionals, and they classify as indirect costs the opportunity costs resulting from the market reaction to the debtor's bankruptcy.

The same authors, given the somewhat laconic classification, carried out on indirect costs, end up exemplifying:

For example, many firms suffer from lost sales and profits caused by customers choosing not to deal with a firm in bankruptcy. The bankrupt firm may also suffer from the increased costs of doing business, such as higher debt costs and poorer terms with suppliers while in a financially vulnerable position. Indirect costs also include the loss of key employees or opportunities due to management's diversion from running the business. Another potential source of indirect costs is the fire sale discount of assets sold by firms in financial distress and bankruptcy. (Altman & Hotchkiss, 2019, p. 72).

Regarding the measurement of these costs, this proves to be very difficult to achieve. If direct costs apparently would be easy to measure, this is only possible concerning the costs incurred by the debtor himself, who is under supervision. But these are not the only direct costs, as the costs incurred by creditors to proceed with the claim of credits, to develop reorganization plans, to define their vote in the creditors' meeting, and to participate in the creditors' meeting and commission, these are costs that do not have records associated with the bankruptcy procedure, and are often not even individualized by creditors. And if these would be easy to measure, imagine the difficulty of measuring indirect costs.

However, this measurement difficulty does not prevent the existence of a vast list of academic works developed, over the years, on this matter, which can be consulted in Chapter 4 of the work "Corporate Financial Distress, Restructuring, and Bankruptcy: Analyze Leveraged Finance, Distressed Debt, and Bankruptcy" (Altman & Hotchkiss, 2019). However, despite the difficulty in collecting data (overcome in the most diverse ways) and the different methodologies adopted, the conclusions reached do not differ from those reached by Warner (1977), in his work "Bankruptcy Costs: Some Evidence", where he concluded that there is a "scale" effect on direct costs, represented by a concave function on the debtor's market value.

In this way, direct costs may become unaffordable for small companies, and in large companies, despite their high monetary value, they may turn out to be small, in the percentage of the debtor's market value.

"Time is money"²⁹

An indirect cost that must be met in bankruptcy policy is the time it takes for the bankruptcy procedure to effectively reimburse creditors for the amount they are entitled to receive on the bankrupt's estate. Indeed, it is not

²⁹ The well-known phrase "time is money" is often attributed to Ben Franklin, who wrote the following in a short essay "Advice to a Young Tradesman" (though the origin of the concept traces back to ancient Greek philosophers): "Remember that time is money. He that can earn ten shillings a day by his labor, and goes abroad, or sits idle one half of that day, though he spends but sixpence during his diversion or idleness, ought not to reckon that the only expense; he has really spent or rather thrown away five shillings besides." Available at <https://medium.com/financial-strategy/time-is-money-doesnt-mean-what-you-think-it-means-ba993723819c>.

the same for the creditor to receive 50% of his credit today, or to receive the same 50% two years from now when the bankruptcy procedure ends.

To identify this indirect cost, Djankov et al. (2008) propose the application of the discount rate, indexed to the interest rate in practice in that economy. However, to be able to carry out an effective calculation, it is necessary to know, *a priori*, how long the bankruptcy procedure will take (*interim* efficiency). However, this solution only mitigates the problem, as there may be an opportunity cost borne by the lender.

Additionally, it is important to note that it is not only indirect costs that increase with a longer duration of the bankruptcy procedure, Thorburn (2000), also, identified a positive and significant correlation between the time of the bankruptcy procedure and the direct costs of the procedure, namely the remuneration of professionals — lawyers, accountants, trustees.

Thus, given the costs, it induces in the bankruptcy procedure, the expected duration of the bankruptcy procedure may influence the creditors' decision to make an economically efficient decision, causing the choice of the mechanism that is expected to be faster, in detriment of one that makes the best allocation of resources.

4. Conclusion

This paper aims to revise the “state of the art” behind the options made by the three major guidelines for a bankruptcy policy design — World Bank, United Nations, and European Union — allowing to draw a bankruptcy policy that helps in the economic recovery, and in winning the economic competition between countries.

After observing the impact of this policy on the life cycle of a company, and subsequently, in the economic market, there was observed that, until today, was not possible to define one ideal bankruptcy policy as a result of the institutionalism, and different stages of development, of each country.

So, in absence of this “magic formula”, was observed a “sure formula” for the design of a bankruptcy policy. This “sure formula” only provides instruments to understand the arguments that stand behind the guidelines above indicate, hoping that helps to design a winners policy — one that allows quick recovery from the COVID crisis and allows the economy to get stronger than it was before the crisis.

From an economic point of view, an efficient bankruptcy procedure will allow for the rapid restructuring of viable companies — companies that make efficient use of their resources, generating economic value — and the quick liquidation of non-viable companies — companies that provoke the destruction of value, thus allowing the rapid reallocation of resources employed.

To achieve this result must observe the *ex ante*, *interim*, and *ex post* efficiency of bankruptcy policy, and should get an equilibrium of these efficiencies according to the institutionalism of each country.

Along this paper are detailed some variables of the bankruptcy policy, explain their relevance, and their impact, in order to offer tools to (re)think the design of this policy.

In so, it was observed, that changes in the bankruptcy code will be harmless if they are not accompanied by legislative changes in other areas or changes in the mentalities of those who are going to apply it.

Given the asymmetry of information between the debtor and the creditor, it was seen the importance of high standards of accounting quality, independence of accounting professionals, and the mandatory disclosure of accounting information, which will prevent creditors from granting too risky loans, and at the same allows to start de bankruptcy procedure in the right time. And so, must attend the interest of shareholders and management in postponing the starting of the bankruptcy procedure, by manipulating of information, but at the same time, that the

introduction of an “automatic trigger” has already proved to be a mistake in the past, despite the costs for a single creditor to initiate the procedure.

That political intervention in any bankruptcy procedure in particular, despite the most social relevance it appears to have, is prejudicial in the confidence of the bankruptcy actors, and so the procedure should be delivered to independent institutions, those that do not suffer political pressures, like the judicial institution.

That all actors of the bankruptcy procedure should have a multidisciplinary education — law and economic — and, to achieve an optimal level, it should start on qualified university education and continue in ongoing training and exchange of experiences between all the actors, and that they should be correctly motivated to extract the maximum value from the bankrupt.

That there are several costs in the bankruptcy procedure and the indirect costs are very difficult to identify given their nature. That direct costs may become unaffordable for small companies and creditors, while large companies, despite their high monetary value, may turn out to be small, in the percentage of the debtor's market value. At the same time, was observed that in the liquidation procedure are the bankruptcy professionals — lawyers, accountants, and judicial administrators — who, as a rule, end up receiving most of the value of the post-bankruptcy company.

That the presence of a credit priority rule, while function as “credit insurance” to the market, given confidence to capital's market, creates strong incentives in senior creditors to go liquidation, and in junior creditors to prefer reorganizations proceedings, distorting incentives for choosing the most efficient bankruptcy mechanism. And, that bankruptcy's exemptions difficult entrepreneurship by raising their credit score, but, at the same time, they are indispensable to motivate the entrepreneur to carry on.

The indispensability of the stand-still effect, to preserve the value of the bankrupt as a productive unit (internal inefficiency) or its assets (external inefficiency), but his absence is advantageous in fragile judicial systems.

For last, but not least: time. The time of all bankrupt procedure, since the default of the debtor to the repay of the creditor, is crucial in the bankruptcy policy, because it reveals how long those resources are not having adequate employment, allowing the waste of opportunities, hindering economic growth.

In conclusion, there are so many variables in the bankruptcy policy, and some of them have the ambivalent power to help by one side and destroy by the other, that is very difficult to find the delicate balance in bankruptcy policy, and only knowing how could function all variables and combining them with the institutionalism and the stage of development, of each country, allows to realize an evaluation of the present bankruptcy policy, and redraw one of success: one that will help in the economic recovery of COVID crisis, and that stands for the future, allowing the country to have greater economic growth, by winning the international economic competition between countries.

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Impairment Test and Quality of Accounting Information in Brazilian Publicly Traded Companies

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Abstract: We aim to investigate whether the evidence regarding the impairment test indicates an increase or reduction in the quality of accounting information of Brazilian listed companies and whether there was a persistence of earnings from 2010 to 2015. Initially, our sample comprised 464 companies from the ten Brazilian Stock Exchange sectors comprising six periods/years, from 2010 to 2015. Of these, 53 companies recorded impairment losses. The results confirmed hypotheses 1, 3, and 4 of the research that showed evidence of using the impairment test opportunistically and not using the test when possibly they should have done so. Finally, the results showed that the persistence of the profit of the 53 companies is lower with the recognition of impairment losses.

Key words: impairment test; quality of information; IFRS standard; Brazilian companies

JEL codes: M41, C12, M49

1. Introduction

The adoption of the International Accounting Standard Board (IASB) was intended, among other things, to improve communication between accounting users at the international level through financial reporting. Otherwise, the purpose is to improve the quality of information published through the companies' financial reports so that users, especially creditors and investors, can make better decisions. Thus, high-quality information, such as profit, would be a better predictor of future dividend flows and would be more useful to various financial statements.

Recent research has sought to demonstrate whether the adoption of the IASB standard has improved the quality of accounting information or increased the level of earnings management under openness to professional judgment (Barth, Landsman & Lang, 2007; Chen et al., 2010; Iatridis, 2010; Jeanjean & Stolowy, 2008; Yoon, 2007). However, there is still no consensus in the literature regarding this fact: some studies point out that the

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adoption of a set of principles-based accounting standards increases results from management (Ashbaugh & Pincus, 2001; Bartov, Goldberg & Kim, 2005; Elbannan, 2010; Jeanjean & Stolowy, 2008); while others point out that the adoption of principles-based standards increases the quality of accounting information, decreasing earnings management (Barth, Landsman & Lang, 2007; Chen et al., 2010; Christensen et al., 2015; Iatridis, 2010; Paananen & Lin, 2009; Yoon, 2007).

The possible justifications consist of several factors that influence countries' accounting policies and practices, such as the legal system, culture, type of capital market, and social environment (Askary, 2006). In general, in countries with a common-law accounting system, the quality of accounting information is preferred, unlike countries with a code-law accounting system (Jeanjean & Stolowy, 2008).

Other research seeks to demonstrate the effect of specific standards, such as inventories, depreciation, fair value, and above all, impairment tests (Chen, Wang & Zhao, 2009), which can have a significant impact on companies' fixed and intangible assets. Chen et al.'s research (2009) with Chinese companies presented evidence that used the impairment test to manage results, recognizing losses in specific periods, and subsequent reversals of losses previously recognized in profit or loss, due to professional judgment criteria.

As far as the Brazilian reality is concerned, the impairment test may be used opportunistically, thus reducing the quality of the financial reports' information. Since it has characteristics of the continental model (Niyama, 2010; Nobes & Parker, 2010), Brazil, as well as France, Germany, Italy, Japan, Belgium, Spain, South American countries, among others, stands out as predominant characteristics: a) a weak and inactive accounting profession; b) substantial government interference in establishing accounting standards, especially those of a fiscal nature; c) financial statements primarily seek to serve creditors and the government, rather than investors; and d) the importance of banks and other financial institutions, including government, as a source of funding for companies, to the detriment of funds from the stock market. In this way, the impairment test may be used in a sub-optimal way to improve accounting information quality (Chen, Wang & Zhao, 2009).

Because of the above, the research question is the following: does the evidence regarding the impairment test indicate an increase or decrease in the quality of accounting information of Brazilian companies listed on B3 (Brazilian Stock Exchange)? This investigation aims to analyze whether the asset impairment test has increased or reduced the quality of Brazilian listed companies' quality of information.

This study contributes to the accounting literature on the adoption of the IFRS standard, especially regarding the impairment test, in different ways: first, although numerous previous studies have examined the asset recoverability test (Chang & Yen, 2015; Devalle & Rizzato, 2012; Glaum et al., 2013; Husmann & Schmidt, 2008, Kvaal, 2010; Mazzi, Liberatore & Tsavaloutas, 2016; Petersen & Plenborg, 2010), few studies have investigated its application in Brazil, as well as possible impacts on the quality of the information provided in financial reports.

Most research on impairment tests focused on countries like the United States and the European Union members. Few studies have focused on emerging markets, where control and monitoring structures are weaker, opening the opportunity for further expropriation by the manager, especially in the face of minority shareholders.

We performed this research also seeks to show whether the impairment test in Brazilian publicly traded companies. It was evidencing the economic essence of the underlying assets recognized in the Balance Sheet and whether it could increase or reduce the accounting information quality.

Second, it adds to the accounting literature that compares the quality of accounting information through the adoption of IFRS across countries (Ashbaugh & Pincus, 2001; Barth, Landsman & Lang, 2007; Bartov, Goldberg & Kim, 2005; Chen et al., 2010; Christensen et al., 2015; Elbannan, 2010; Iatridis, 2010; Jeanjean & Stolowy,

2008; Paananen & Lin, 2008; Psaros & Trotman, 2004; Yoon, 2007). Also, it highlights the persistence of profits with the recognition of impairment. This research seeks to highlight whether profit persistence increased or decreased with the recognition of impairment losses.

2. Literature Review

The Technical Pronouncement CPC 01 (Reduction to the Recoverable Value of Assets) establishes the impairment test procedures of Brazilian companies' assets. If an asset has been recognized for an amount greater than its recoverable value, a loss must be recognized. The standard (or technical pronouncement) requires preparers of financial statements to review at least once a year goodwill for expected future profitability and intangible assets with indefinite useful lives (CPC, 2010; IASB, 2001).

The recoverable value of an asset is defined by CPC (2010) and IASB (2001) as the higher its fair value and value in use. If the book value of the asset or Cash-Generating Unit (CGU) is greater than the recoverable amount, an impairment loss should be recognized. Thus, assets should not be reported in the balance sheet at a value higher than the recoverable amount, thus evidencing previously recognized assets' economic reality.

There is a long debate in the literature, mainly related to the impairment test's implementation and reliability (Mazzi, Liberatore & Tsalavoutas, 2016). IAS 36 requires managers to make substantial, subjective, and difficult to verify judgments and assumptions. These are mainly related to the estimation of recoverable value (e.g., cash flow projection periods, growth rates, discount rates) and circumstances leading to the recognition of an impairment loss (Glaum et al., 2013; Husmann & Schmidt, 2008; Kvaal, 2010; Mazzi, Liberatore & Tsalavoutas, 2016; Petersen & Plenborg, 2010).

Previous literature argues that when accounting standards allow managers to apply such discretion, they will use it to their advantage and pursue personal objectives (Chen, Wang & Zhao, 2009; Trottier, 2013). Since estimating asset impairment involves subjective judgment, it provides an opportunity for managers to manage results (Chang & Yen, 2015).

Compared to the impairment of current assets, the impact of long-term asset impairment is more significant as companies can take advantage of asset impairment and reversal as tools to manage profits during that asset's lifetime. For executives who want to take advantage of the cookie jar reserves of impairment and reversals, long-term assets are a better option than current assets. This fact is one reason why regulators in China Accounting Standards have eliminated the reversal of long-term asset impairment losses (Chang & Yen, 2015).

Given this, several issues related to the implementation of IAS 36 have been investigated so far, with most studies examining companies' actual financial reporting practices, and eventually, their economic consequences (Mazzi, Liberatore & Tsalavoutas, 2016).

More specifically, since the assumptions needed to measure recoverable amounts are difficult to verify, their disclosure is considered highly relevant. Thus, previous studies document a high level of non-compliance with the standard and a tendency to standardize the explanatory notes on accounting policies, leading to a lack of adequate justification in the assumptions adopted in estimating the recoverable amounts of assets (Mazzi, Liberatore & Tsalavoutas, 2016).

Some studies reaffirm such findings (Devalle & Rizzato, 2012; Glaum et al., 2013; Mazzi, Liberatore & Tsalavoutas, 2016). Previous research examined the determinants of these levels of disclosure. It highlighted that non-compliant behavior could be determined jointly by country variables, indicating that accounting traditions and

other specific factors play a role, despite common standards such as IFRS (e.g., Glaum et al., 2013).

Research that relates the use of asset impairment to earnings management has revealed that companies use asset recoverability testing for techniques such as big-bath reporting and earnings smoothing (Chang & Yen, 2015). These authors noted that managers tend to record more asset impairment losses when annual profits are high, indicating that conducting impairment testing is related to smooth results.

Some studies, such as Chen, Wang, and Zhao (2009), explore reversals of impairment losses. The evidence suggests that companies use recognition, and later reversal, to avoid evidence of losses in specific periods. Petersen and Plenborg (2010) focus on how preparers in the Danish environment implement impairment testing of goodwill. The results indicate that practice varies considerably between companies. Some of them do not even define a CGU and therefore do not comply with IAS 36. They also document inconsistencies in how companies estimate recoverable values, such as calculating the discount rate, adjusting risk, and estimating cash flows in the terminal period.

Trottier (2013) assesses the managers' decision to record an impairment loss. The results of its experience with Canadian companies' managers show that participants believe that managers will be more likely to recognize a loss if they reversed it later. At the same time, they will be less interested in situations where reversals are not allowed or have a bonus plan. The above findings are in line with the flow of research showing that long-term asset impairment is associated with large compensation gains (Mazzi, Liberatore & Tsalavoutas, 2016) while hiring and market incentives are capable of triggering, especially concerning the opportunity of deteriorating goodwill (Knauer & Wöhrmann, 2015).

High-quality profits can be defined as those that can increase investment efficiency and have lower future cash flow sensitivity (e.g., Biddle, Hilary & Verdi, 2009; Bushman & Smith, 2001; Dechow, Ge & Schrand, 2010; Healy & Palepu, 2001; Lambert, Leuz & Verrecchia, 2007). Besides, high-quality profits provide more information on a firm's financial performance characteristics relevant to specific decision making (Dechow, Ge & Schrand, 2010).

Users of accounting information are generally interested in assessing current performance as well as estimated future performance. Management judgments for the accounting practices adopted are often associated with discretionary accruals. Managers may opportunistically use these discretionary choices - possibly to increase their compensation or hide underperformance. They may use this criterion to improve the informational value of profit, possibly communicating the firm's long-term performance to investors (Chaney, Faccio & Parsley, 2011). In this way, the use of asset retrieval testing, whether opportunistic or not (producing better or worse quality information), can be related to environmental factors, mostly educational, legal, cultural, among others, that surround each country.

According to Nurunnabi (2015), the adoption and implementation of IFRS depend on the high level of education and knowledge needed to understand and interpret accounting information. Accounting education is the cornerstone for modern and complex accounting systems (Zeghal & Mhedhbi, 2006). An increase in a country's education level can increase political awareness and corporate responsibility demand (Cooke; Wallace, 1990). Zeghal and Mhedhbi (2006) found that countries with the highest education levels are adopting IFRS. Abdelsalam and Weetman (2007) suggest that achieving success in education and training is likely to be more problematic in developing countries with limited financial and technical resources. Research by Chand, Cummings, and Patel (2012) suggests that global accounting education systems can influence IFRS's implementation. The authors also argued that education and the professional status of accountants are essential to explain accounting systems.

Also, Jeanjean and Stolowy (2008) point out that the legal system influences this process. For these authors, countries characterized by a code law system (based on bank financing, low level of professional involvement in setting accounting standards, low economic development level, and poor accounting education) should have relatively low-quality financial reporting. On another side, countries characterized by a common law system have an adequate accounting education (Ali & Hwang, 2000; Ball, Kothari & Robin, 2000). Additionally, countries with a code law system are associated with less timely loss recognition (Ball, Kothari & Robin, 2000) and more significant profit smoothing practices than in countries with a common-law system, which usually have conceptual structures similar to IAS/IFRS (Leuz, Nanda & Wysocki, 2002).

In light of these findings, Klann and Beuren (2018) state that studies are showing that the adoption of a set of principles-based standards increases results management and others such as Barth, Landsman, and Lang (2007) and Chen et al. (2010) that the adoption of principles increases the quality of accounting information and decreases results management. Considering that Brazil is a country whose legal system is based on the code law - whose research indicates a greater tendency for results management - finds an accounting system with peculiar characteristics and converges with opportunistic practices.

Based on this evidence, concerning the performance of the asset recoverability test and the possibility of its use in an opportunistic manner, or, further, it is not appropriately used, we state the following research hypotheses:

H₁: there is evidence of using the income smoothing test to prepare of the information provided in the financial statements of Brazilian public companies.

H₂: there is evidence of the use of the test of recoverability of assets in an opportunistic manner (big bath accounting) to prepare of the information provided in the financial statements of Brazilian public companies.

H₃: there is evidence of not using the asset recoverability test when it should be used in to prepare of the information provided in the financial statements of Brazilian public companies.

H₄: the quality of earnings, based on persistence, has decreased with the performance of the asset recoverability test of Brazilian public companies.

3. Case Study

In this research, the data from the financial statements published and made available to the public on the stock exchange website (B3) were used and extracted through the EmpresasNet external dissemination software. Initially, the sample comprised 464 companies from the 10 B3 sectors (industrial goods, construction and transport, cyclical consumption, non-cyclical consumption, necessary materials, oil, information technology, telecommunications, public utility and, financial) comprising six periods/years, i.e., 2010 to 2015.

The years 2008 and 2009 were not analyzed due to the proximity with the start of international accounting convergence in Brazil. Thus, it is only from 2010 that the obligation to adopt has reached all companies through the application of technical pronouncements. The final sample resulted in 53 companies that recognized impairment losses in at least one period. Thus, except for hypothesis 3, explained later, these companies comprise the sample of most of the analysis in this research.

To achieve the first specific objective, we have analyzed the Income Statement of each of the 53 companies that recognized impairment losses per period to verify the existence of the evidence 1 and 2 highlighted in Table 1. As for evidence number 3, we have analyzed the Income Statements of all the companies.

Table 1 Evidence of Low Quality of Impairment Test Application

Research hypotheses	Evidence
H1: using impairment to produce income smoothing	The company reports losses for two consecutive years but is profitable in those same years (Chen, Wang & Zhao, 2009)
H2: using impairment to produce big bath accounting	The company reports profit in t-1 but remains profitable in t only after reversals (Chen, Wang & Zhao, 2009)
H3: no use of impairment test	The company does not recognize loss for any of the periods of validity of the technical statement CPC 01
H4: profit quality (persistence) reduced with the use of impairment β of the regression (1) with the company's net profit and net profit adjusted by the impairment test	Companies with more persistent profits present more useful information in the valuation of the share price (Dechow, Ge & Schrand, 2010; Perotti & Wagenhofer, 2014)

We adopted Persistence metrics to achieve the fourth research hypothesis. To this end, the persistence metric, presented by the angular coefficient β of the regression Eq. (1), was used as a proxy for earnings quality to observe publicly traded firms' behavior. The basis for measuring profit is net profit, earnings (E). Besides, the coefficients were also estimated using the pretax earnings (PTE) variable.

$$E_{i,t} = \alpha + \beta E_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

In which:

$E_{i,t}$ = earnings for the period t.

$E_{i,t-1}$ = earnings for the period t-1.

Companies with more persistent earnings have more sustainable earnings/cash flows that will help them assess stock prices (Dechow, Ge & Schrand, 2010; Perotti & Wagenhofer, 2014).

In addition to the earnings taken from the Income Statement, the effects of recognizing losses and reversals have been expunged from earnings, so that net earnings has been obtained without the effect of the impairment test. Thus, the angular coefficients β were estimated using the model in Eq. (1), with net earnings and adjusted net earnings, to verify which shows more remarkable persistence and more excellent earnings quality. Likewise, these adjustments were made in PTE. The PTE persistence extracted from the Statement of Income for the Financial Year, and the adjusted PTE was obtained by removing the effect of impairment losses recognized.

4. Results

To verify whether the adoption of Technical Pronouncement CPC 01 presented evidence of results management, reduction in the quality of information (or elevation), and less or greater persistence of earnings, we analyzed the Income Statements of Brazilian publicly traded companies. Of the 464 companies distributed across the ten sectors, according to Table 2, only 53 recognized losses or reversion, at least once in the post-convergence period. Except for the Telecommunications sector, companies were identified that recognized losses in at least one of the periods analyzed in all the others.

In terms of quantity, the Financial and Other sectors showed the largest number of companies that recognized impairment losses, i.e., 16 companies, representing 30% of the total. The Public Utility sector comes next with nine companies, representing 17% of the total. As for individual analysis, in the Oil sector, 4 of the 11 companies recognized losses, equivalent to 36% of the companies that comprise it, followed by the Information Technology sector, where it reached 25%.

Table 3 shows the values of net income, losses, reversals, and the companies' assets analyzed. In absolute figures, 2015 was the first year of to recognize of losses and reversal of impairment losses. In percentage terms,

these losses represented 0.78% of the total assets of the companies under analysis. Overall, the sum of the five analysis periods' losses was more significant than these companies' net results.

Table 2 Distribution of Companies by Sector of Operation/Loss Recognition

#	Sector of Activity	Number of Companies	Companies that Recognized Losses
1	Industrial goods	76	4
2	Cyclic Consumption	87	7
3	Non-cyclical consumption	26	5
4	Financial	122	16
5	Basic Materials	33	3
6	Oil, Gas and Biofuels	11	4
7	Health	15	3
8	Information Technology	8	2
9	Telecommunications	7	0
10	Public Utility	68	9
	No Classification	11	0
	Total	464	53

Table 3 Distribution of Variables by Analysis Period

Variable	2010	2011	2012	2013	2014	2015	Total
E	97.058.767	99.297.000	(1.752.518)	21.766.699	36.323.914	(46.357.617)	206.336.245
% of Asset	3.58%	1.57%	-0,02%	0.28%	0.42%	-0.42%	0.47%
Losses	14.883.739	21.370.738	53.245.974	42.287.226	39.472.740	85.360.535	256.620.952
% of Assets	0.55%	0.34%	0.73%	0.54%	0.45%	0.78%	0.58%
Reversions	751.413	121.885	4.899	581	0	1.292.954	2.171.732
% of Assets	0.03%	0.002%	0.0001%	0.00001%	0.00%	0.01%	0.005%
Assets	2.714.262.590	6334.378.123	7.299.935.301	7.845.357.042	8.687.014.375	11.005.561.722	43.886.509.153

The analysis also highlights that in the two periods of higher loss recognition, i.e., 2015 and 2013, net results were negative (losses).

4.1 Evidence of Results Management

Among the companies that recognized impairment losses, in total 53, most did not present evidence 1 and 2 (income smoothing and big bath accounting, respectively), as shown in Figure 1. As for evidence 1, we found it in 15 companies, and evidence 2 in none. Thus, these 15 companies that recognized losses may have done so to smooth their results. On the other hand, there is no evidence that firms have practiced big bath accounting, since at no point did the reversal of the loss make it possible for firms to become profitable in the current period.

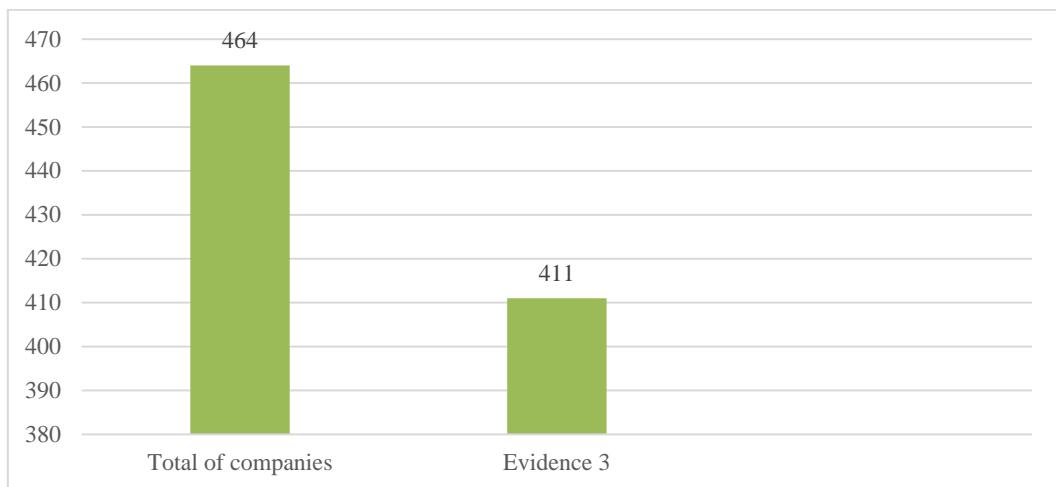


Figure 1 Comparison of Evidences 1 and 2

4.2 Evidence of Non-Use of the Impairment Test

When we analyzed evidence number 3 (not using the impairment test), we expected companies to recognize in at least one reporting period impairment losses. This loss could be due to estimates concerning the value, useful life, residual value, depreciation, and amortization of several assets, mainly fixed and intangible assets, and, due to the change in standard, due to the adoption of IASB standards and the need of the assets to evidence their economic essence.

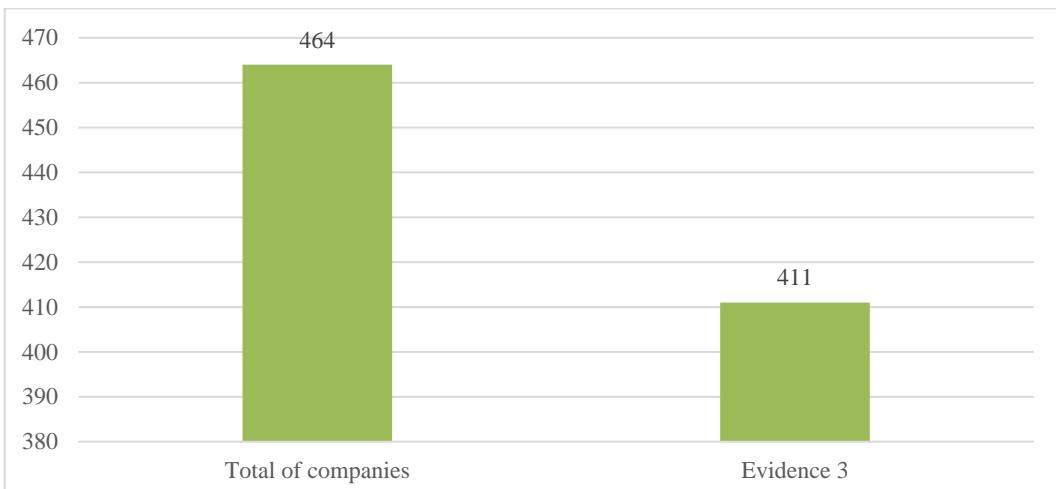


Figure 2 Evidence 4

However, as shown in Figure 2, most publicly traded companies did not recognize impairment losses for any period between 2010 and 2015. Thus, possibly these 411 companies did not meet the IFRS standard assumptions for asset impairment testing, CPC 01 (IAS 36).

4.3 Quality of Information

The net profit and pretax earnings, shown in the Income Statement for the Financial Year and adjusted for losses and reversions previously recognized, were used to verify the profit's persistence. The analysis of the descriptive statistics (Table 4) reveals a significant difference between E (earnings) and EWL (earnings without

effects of losses), and PTE and PTEWL (pretax earnings without effects of losses). For example, average earnings represents less than 50% of the earnings adjusted for recognized losses, i.e., without the effect of previously recognized losses.

Table 4 Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Standard Deviation
E	648.856,1	4.024,00	37.407857	(67.218.430)	7.924.792
EWL	1.449.011	12.316,00	39.081.144	(53.083.176)	8.328.775
PTE	1.020.637	10.974,50	45.921.673	(96.159.722)	10.076.949
PTEWL	1.820.791	14.681,50	45.921.673	(82.024.468)	10.108.739

Additionally, we analyzed the linear regression's basic assumptions, i.e., normality of waste, homoscedasticity, and autocorrelation. Regarding the normality of the waste, we performed the Jarque-Bera test, which indicated that the waste does not follow a normal distribution. However, based on Gujarati and Porter (2011), the Central Limit Theorem could be used as a support. For samples more massive than 100 observations, the normal distribution is assumed, i.e., the assumption of normality is restricted for samples containing less than 100 observations.

For autocorrelation of waste, we used the Durbin-Watson test. If we obtained values close to 2 for all regressions, demonstrating no autocorrelation of waste. For the assumption of the residues' homoscedasticity, we used the Breusch-Pagan-Godfrey test, demonstrating the non-existence of heteroscedasticity.

We performed Breusch-Pagan, Hausman, and F (Chow) tests to detect the best model, and the results showed no group and time effect. Thus, we performed regression on panel data from the pooled approach to estimate the coefficients and other statistics and subsequently compare them.

Table 5 reveals the results of the estimated OLS regression of equation (1) in which the coefficients, t-value, and significance of the coefficients for the E, EWL, PTE, and PTEWL variables were highlighted. The angular coefficients of the E variable are in columns 2 and 3. In contrast, column 2 shows the variable results as extracted from the Income Statement and column 3 shows the regression coefficients' results after purging the effect of the impairment on earnings. The persistence of earnings was lower with the recognition of impairment losses, i.e., for the E, the coefficient was 0.72, and EWL (earnings without the effect of impairment) the coefficient was 0.88. Thus, the realization and recognition of impairment losses reduced the persistence of profits, resulting in less predictability of investors' future results.

Furthermore, we estimated the coefficients using the PTE variable, in the same way as the E variable. We present the angular coefficients in columns 4 and 5 and show the same behavior as the E variable, i.e., for PTE, the coefficient was 0.64, while for PTEWL (earnings before tax without the effect of impairment), the coefficient 0.77. These findings corroborate those already highlighted since the realization and recognition of impairment losses have reduced PTE's persistence and may result in less predictability of investors' future results.

Finally, it is noteworthy that all the variables presented significant coefficients in all regressions carried out, and the model was robust for the estimation of the results presented.

Table 5 Regression Analysis of Variables - Persistence

Variables	E_t	EWL_t	PTE_t	$PTEWL_t$
	Coefficient	Coefficient	Coefficient	coefficient
	t-value	t-value	t-value	t-value
	(sig)	(sig)	(sig)	(sig)
Intercept	-88.134,57	52.431,65	86.749,19	273.312,6
	-0,2562	0,1813	0,1893	0,7037
	0,7980	0,8563	0,8500	0,4821
E_{t-1}	0,7242	-	-	-
	14,9703	-	-	-
	0,0000	-	-	-
EWL_{t-1}	-	0,8820	-	-
	-	23,3926	-	-
	-	0,0000	-	-
PTE_{t-1}	-	-	0,6469	-
	-	-	13,4208	-
	-	-	0,0000	-
$PTEWL_{t-1}$	-	-	-	0,7703
	-	-	-	19,7803
	-	-	-	0,0000
R ²	0,4149	0,6339	0,3637	0,5539
R ² adjusted	0,4130	0,6327	0,3617	0,5525
F	224,10	547,21	180,11	391,26
(sig)	0,0000	0,0000	0,0000	0,0000

5. Conclusion

The proposal previously highlighted for this research was to investigate whether the asset recoverability test has increased or reduced the quality of Brazilian listed companies' quality of information. Specifically, it seeks to analyze whether the impairment test's evidence indicates an increase or reduction in these companies' quality of information and whether the persistence of earnings has increased or decreased.

Based on the results, we confirmed hypotheses 1, 3, and 4. As for hypothesis 1, of the 53 companies that recognized impairment losses, 15 of them presented evidence of using the asset recoverability test opportunistically, possibly income smoothing, in the preparation of the information provided in the financial statements.

As for hypothesis 3, of the 464 companies listed, only 53 recognized losses between 2010 and 2015. Thus, 411 companies did not show any impairment loss in the six years of effectiveness of CPC 01 (post-convergence), characterizing as an indication of poor applicability of this pronouncement. Since the change of standard (to IFRS), the estimates of asset value, useful life and residual value, possibly would result in some assets or cash-generating units, recognized above the recoverable value.

In turn, we confirmed hypothesis 4, since the persistence of profits, both earnings, and PTE, decreased with the recognition of impairment losses. On the other hand, there is no evidence that Brazilian companies recorded

these losses and practiced big bath accounting.

Overall, the research results converge with those found in research at the international level, as previously highlighted in the hypotheses' construction. Therefore, new research related to asset recoverability testing is recommended, seeking to explain why most companies did not recognize the relative losses.

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Identification and Ranking of Factors Effects on Evaluation of Internal Controls of Vietnam Independent Auditors in Auditing the Financial Statements of Construction Enterprises

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Abstract: On the basis of the system of research projects related to evaluate internal controls in the audited financial statements report and interviews with experts in the field of audit. The article has summarized the factors that can affect the Internal Audit assessment in the financial statements audit of construction enterprises conducted by independent audit of Vietnam. At the same time, to check the validity and reliability of the questionnaire for the identified factors, the article uses SPSS software to analyze the factor and Cronbach's alpha coefficients and perform regression analysis to find out the impact of each factor on the internal control assessment.

Key words: evaluation; construction enterprises; internal control; auditing financial statements

JEL codes: M

1. Introduction

With the strong growth in both production capacity and operation scale of construction enterprises, the risks that these enterprises face are also constantly increasing. To provide a comprehensive view of the financial situation of construction enterprises to related parties through the audit report, the auditors need to fully implement the entire audit process. Evaluation of internal control of construction enterprises is the work that auditors focus on first. Direct inspection of each object to detect violations is extremely difficult and risky due to the large amount of work, while the level of violations and the concealment of errors are very sophisticated. Therefore, it is very necessary to predict the possibility of errors to localize the audit and determine the audit focus. The appropriate assessment of the effectiveness of internal control will be the basis for determining the audit volume to avoid spread or misalignment affecting the quality and effectiveness of the audit of financial statements. To further improve the effectiveness of internal control assessment by independent auditors in auditing financial statements of construction enterprises. The article focuses on understanding the factors affecting the assessment of internal control. Rank the influence of each factor on the effectiveness of internal control assessment.

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2. Literature Review

2.1 Internal Control

Auditors have long been aware of the impact of internal controls on a company's financial statements and have developed the skills to understand and evaluate them for audit purposes. From those perceptions, the concept of internal control has formed and gradually developed into a theoretical system of control issues in the organization, not only serving the work of auditors but also the most important factor in corporate governance. Currently, there are many different views on internal control, typically:

According to Committee of the United States National Council on Combating Fraud in Financial Statements: "Internal control is a process, effected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives relating to operations, reporting, and compliance"

Internal control is designed, implemented and maintained to address business risks that could cause the entity to fail to achieve one of its objectives related to:

- (1) Reliability of the financial reporting process;
- (2) Operational efficiency and performance;
- (3) Compliance with applicable laws and regulations.

The design, implementation, and maintenance of internal control may vary with the size and complexity of the entity.

According to the International Federation of Accountants (IFAC): An internal control system is a system of policies and procedures designed to achieve four goals: protecting the assets of an enterprise; ensure the reliability of information; ensure compliance with the law; ensure operational efficiency and management performance.

According to the British Association of Accountants (EAA): "The internal control system is a comprehensive control system with financial and diverse experience established by the Management Board to:

- (1) Conduct the entity's business in an orderly and efficient manner.
- (2) Ensure absolute compliance with the business line of the Board of Directors.
- (3) Keep property safe.
- (4) Ensure the completeness and accuracy of the data.

Individual components of Internal Control are considered tests or internal audits.

According to the American Institute of Certified Public Accountants (AICPA): Internal control includes the organization's plan and all recognized methods of coordination and measurement within the enterprise to ensure assurance secure their assets, check the suitability and reliability of accounting data, enhance operational efficiency, and encourage the implementation of long-term management policies.

According to Vietnamese Auditing Standard 315 (VSA 315) — Identify and assess the risks of material misstatement through knowledge of the entity and its environment: "Internal control is the process designed, implemented and maintained by those charged with management and other individuals to provide reasonable assurance about the entity's ability to achieve its objectives, ensuring the reliability of financial statements, ensuring operational efficiency and effectiveness, and in compliance with relevant laws and regulations". The term "control" means any aspect of one or more components of internal control.

2.2 Factors Affecting the Assessment of Internal Control

In research on audit quality in terms of the partners audited, makers and users of financial statements Carcello et al. (1992) showed that the factors affect the evaluation Internal Control and Risk consists of experience, professional qualifications, independence, and compliance with auditors' ethical standards. Rezaei et al. (1996) argue that the issues affecting the assessment of internal control during the investigation of control systems include: Inadequate university training in auditing; Confusion about the identification and assessment of internal controls; Lack of professional skepticism and lack of appropriate professional standards, fraud in management, insufficient internal control procedures for control purposes, time consuming to test the control system against with direct checks and ultimately lack of an adequate internal control system in most companies

Ghadimi (2004) when performing research auditing standards internationally and publications Internal Iran's assessment of internal control has concluded that there are no audit standards guidelines on assessing the effectiveness of internal control makes it difficult for the auditor to evaluate the effectiveness of internal control. Ge and McVay (2005) argue that companies with weak internal control systems often have complex business models, large scale and low profitability, low income, and lack of separation when performing the assignment of tasks or making mistakes in the account reconciliation when making the year-end report. In the same research direction, Doyle et al. (2007) in their study on the characteristics of companies with weak internal control systems also confirmed similar results as Ge and McVay. Sajjadi et al. (2005) studied the factors of auditor independence, using questionnaires, from the point of view of independent auditors, they believe that auditor independence factors that can affect the auditor's independence include: audit firm's audit committee, size and experience of audit firms, process size of the client company. Geiger et al. (2005) argue that drawing conclusions about the continuity of control activities will be influenced by many factors such as firm size, profitability, audit time, industry type, diversity. type of auditor and type of audit report in the previous year. Liu Xinmin (2005) in the study of the relationship between the company control mechanism and the way to choose the innovation option showed that the effectiveness of internal control has a positive relationship with the innovation of the entire operation of the company but has a negative relationship with the innovation of each part and each part of the enterprise. The results of the study by Ashbaugh-Skaife et al. (2006) show that auditors often have difficulty in understanding and evaluating the internal control system in units with complex activities and many changes in the organizational structure or the shortage of personnel for internal control. Abdul (2006), studied 297 companies over an 11-year period in Malaysia and found that in order to obtain a suitable audit report, the possibility of changing incompetent or weak auditors must be considered. Le Quang Binh (2006) said that in the period before the audit, the auditor must perform a preliminary assessment of the client's internal control system to estimate the level of control risk, audit risk, then decide to accept or reject the client's invitation to audit. To consider audit acceptability for clients, auditors often focus on assessing important information such as integrity of management, business complexity, size & organizational structure, the client's problems with legal authorities or the current business situation and the reason for the change of auditors.

Kym Boon et al. (2008) conducted a study on the factors affecting the evaluation of the quality of the audit program, the research team based on the factors in the study of Carcello et al. (1992) and Behn et al. (1997) and conducted a survey of auditors and financial professionals in New South Wales. The authors concluded that factors including level of business knowledge, experience of auditors, professional qualifications, independence and compliance with professional ethics are factors that can affect the effectiveness and quality of the process of

learning about controls and making judgments about required audit procedures. Vadie and Kouchaki (2008) in the study on assessing the effectiveness of internal control, said that the evaluation of internal control is ineffective and inappropriate by independent auditors resulting from the implementation of audit procedures. Using inadequate audit procedures will lead to a lack of evidence to be able to evaluate or draw conclusions about the effectiveness of the internal control system, thereby affecting the choice of audit method in the next stage.

Rajabi et al. (2008) looked at costs in the valuation of audit services, using correlational studies that showed a significant relationship between the cost and remuneration of audit services. Auditing firms that accept contracts with low fees will tend to reduce some audit procedures. Competition among audit firms has a negative effect on auditor independence, but the size of audit firms has the opposite direction. With the influence of competition among auditing firms, the acceptance of audits with lower fees is often applied, the auditors in this case will often focus on the more substantive test rather than tests of controls to provide a preliminary assessment of the internal control system as a basis for further audit procedures. In contrast, with large-scale auditing firms that already have stable clients, there will be a basis for auditors to fully comply with audit procedures from evaluating internal audit to substantive test.

Angella Amudo and Eno L. Inanga (2009) conducted a study evaluating internal control systems in public sector projects in Uganda. The evaluation model developed by Amudo and Inanga based on the internal control framework of COSO and COBIT includes: Independent variables are components of internal control with additional information technology variables according to COBIT and dependent variable is usefulness of the internal control system.

Ongeri et al. (2011), argue that a full assessment of internal control is essential, the authors' research results show that companies with weak internal control are often companies with complex operations, small size and less profit than those with good internal control.

Jameei (2012), in a study on the influence of management performance on independent audit opinion in Tehran listed companies. Considering the findings of the study, it can be seen that the level of confidence of client unit managers in the need and effectiveness of internal control will reduce the issuance of exception reports. Inadequate guidelines for evaluating internal control will also affect the independent auditor's opinion in selecting appropriate audit procedures.

Bani Mahd (2012) studied the effect of the effectiveness of internal control factors on the auditor's opinion. The study examined the impact of factors such as management performance, ownership change, privacy, company size, audit, choice of auditors, etc., and assumed that firm size, Frequent changes of management personnel will directly affect the effectiveness of internal control in the units.

Maham et al. (2012) in the investigation of barriers to internal control assessment in audit has presented a questionnaire consisting of 6 hypotheses and 27 designed questions. After collecting opinions, statistical tests were conducted and the results of the study showed that cost audit contract low, poorly trained, audit guidelines are not appropriate, the system unit traditional trade, inadequate cost of internal control assessment and poor professional training correspond to the most important barriers to internal control assessment in Iran's independent audit.

Rodgers (2015) in the study on "Corporate social responsibility with building a control system to ensure fraud reduction" said that it is necessary for units to build and perfect the internal control system to ensure operational efficiency as well as ensuring the request for providing truthful and reasonable information. The unit does not have independent control department will usually be difficult to ensure operational objectives than the other units.

Renu et al. (2017) suggest that auditors with skepticism are more likely to respond more strongly to negative evidence than to positive evidence to the same extent when evaluating internal control. set of customer units. For each different auditor when evaluating the elements of internal control with different complexity in each component can reduce the quality of decisions and each auditor can make completely different judgments for similar cases

2.3 Research Model Proposed

The proposed research model is based on the combined results from research and interviews with experts, the indicators for measuring concepts are based on the scales of previous researchers related to the context. research context and additions from qualitative studies. The research model for ranking factors affecting the assessment of internal control in the audit of financial statements of construction enterprises by independent auditors is shown as follows:

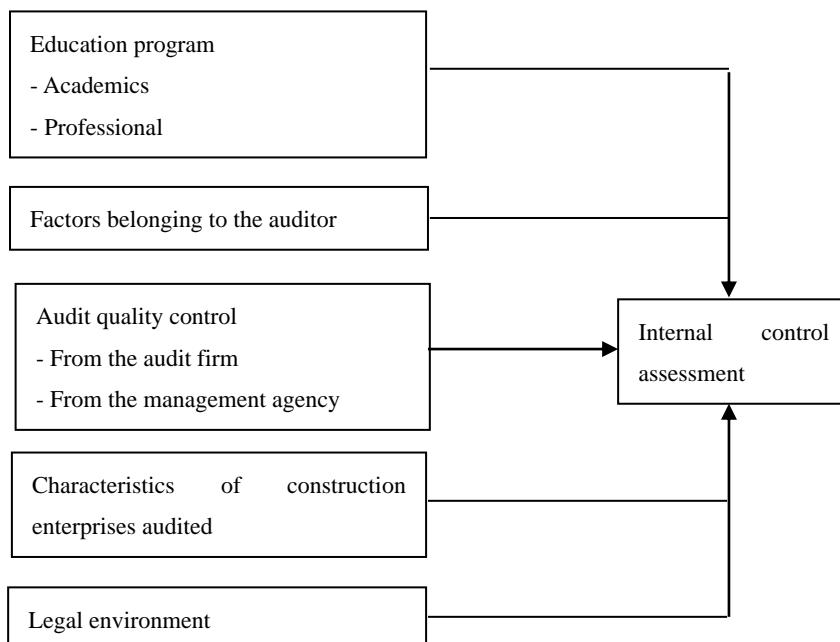


Figure 1 Research Model of Factors Affecting the Assessment of Internal Control in Auditing Financial Statements of Construction Enterprises

3. Research Methodology

3.1 Research Hypotheses

H1: The academic training program in Vietnam has an influence on the evaluation of the internal control system in the audit of financial statements of construction enterprises by independent auditors.

H2: The professional training program in Vietnam has an influence on the evaluation of the internal control system in the audit of financial statements of construction enterprises by independent auditors.

H3: Auditor factors affect the assessment of internal control system in the audit of financial statements of construction enterprises by Vietnam independent auditors.

H4: The quality control of the independent auditing company in Vietnam has an influence on the evaluation of internal control in the audit of financial statements of construction enterprises.

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H5: The factors belonging to the quality control of the management agency have an influence on the assessment of the internal control in the audit of financial statements of construction enterprises by Vietnam independent auditors.

H6: The factors belonging to the characteristics of the construction unit have an influence on the assessment of the internal control system in the audit of financial statements of construction enterprises by Vietnam independent auditor.

H7: The legal environment has an influence on the evaluation of the internal control system in the audit of financial statements of construction enterprises by independent auditors.

3.2 Identify the Observed Variables and Scale

The article proposes a research model to rank the factors affecting the assessment of internal control through the modified use of the evaluation model of Maham (2012), Javad and Mohammad (2015). To match with the characteristics of the study in Vietnam, after the synthesis of factors affect the evaluation Internal Control through works published, the author has conducted up the scale rough and interviewed experts in the field about the relevance of the content of the identified factors and in-depth interviews with experts including auditors, directors of auditing firms, experts from the association of practicing auditors Vietnam and lecturers from Vietnamese universities teach auditing about factors that can affect the internal control assessment of construction enterprises of Vietnamese independent auditing firms to fully identify the factors that can affect the assessment of internal control

In this research, data gathering tool is the questionnaire made by researcher. Indicators and components of the questionnaire is shown in Table 1 Method of scoring in the questionnaire, is the 5 points LIKERT scale method. Completely agree score is option 5 and completely disagree score is zero.

Table 1 Method of Scoring in the Questionnaire

No	Encode	Measurement indicator
Academic training program		
1.	ATP1	The connection between the university teaching with the actual audit issues
2.	ATP2	System of university training programs in accounting majors
3.	ATP3	Mastery of university faculty actual audit issues related to internal control system assessment
4.	ATP4	Appropriate educational resources for professional auditing such as actual audit programs or audit software, etc.
Professional training programs		
5.	PTP1	The quality of the experts team in intensive training on understanding and evaluating the internal control system for auditors
6.	PTP2	Content of training program on professional issues for auditors
7.	PTP3	Quality of professional training programs for auditors
8.	PTP4	Duration of training program
Factors belonging to the auditor		
9.	FBA1	The auditor's expertise in the subject matter to be audited
10.	FBA2	Auditor independence
11.	FBA3	Compliance with professional ethics when conducting the audit of the auditors
12.	FBA4	Aware annual update knowledge of auditors
13.	FBA5	Certificate of Auditor
Factors belonging to the quality control of the audit firm		
14.	COAF1	Quality control process of auditing firms
15.	COAF2	Commitment to quality assurance before each audit

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16.	COAF3	Sanctions for employees who do not fully perform the audit process
17.	COAF4	Employing incompetent staff and interns and not controlling their handling of issues that arise
18.	COAF5	Audit fee price
19.	COAF6	Size of audit firm
Factors under the control of the management agency		
20.	COMA1	Control content
21.	COMA2	Control process
22.	COMA3	Control frequency
23.	COMA4	Standards of inspection team members
Characteristics of audited construction companies		
24.	CACC1	Lack of effective internal audit or improper use
25.	CACC2	The extent to which client managers believe in the need and effectiveness of internal control
26.	CACC3	Continuous change in management or lack of stable management at the construction unit
27.	CACC4	Size and organizational structure of the management at construction uni
28.	CACC5	The complexity of the construction business
Legal environment		
29.	LE1	Completeness of legal documents and guidelines on internal control system assessment
30.	LE2	Regulations on grading scale of audit dossiers
31.	LE3	Regulations on the number of hours to update knowledge
32.	LE4	Sanctions and responsibilities of related parties

3.3 Research Sampling and Data Collection Methods

According to Hair et al. (1998), the survey sample size in quantitative research must be at least from 100 to 150. In the previous study, Gorsuch (1983) said that factor analysis needs at least 200 observe. According to Bollen (1989), to ensure information for quantitative analysis, the minimum sample size selected must ensure the principle that each observed variable must have 5 selected samples or each question needs 5 survey samples. Thus, the minimum sample size of the research model of the topic will be $32 \text{ variables} * 5 = 160$ because there are the same number of observed variables.

To improve the reliability of survey information, the study selected the largest sample for the models according to one of the above principles. Thus, the minimum sample size of both research models taken according to Gorsuch's point of view (1983) is 200 samples. In order to achieve the minimum sample size for each model as above, the author distributed 350 questionnaires to auditors at audit firms and lecturers majoring in auditing at Vietnamese universities. The results obtained the answers of 163 auditors at 48 auditing firms and 40 auditing lecturers at 13 Vietnamese universities.

3.4 Research Results

3.4.1 Descriptive Statistics Sample

The total number of valid votes collected for the research is 203 votes. Surveys obtained from Vietnamese auditing firms accounted for 46.8%, Vietnamese auditing firms that were members of international auditing firms accounted for 33.5% and 19.7% from lecturers at universities that teach auditing. The majority of the surveyed auditors are experienced people in Vietnamese auditing firms as well as member companies of international firms. Working time of the objects investigated in the audit firm also relatively long, only 11.7% were working under 1 year this ensures the answers has been collected is worth

3.4.2 Assess the Quality of the Scale

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The results of the quality of the model's scales based on Cronbach's Alpha coefficient with 7 scales and 32 observed variables are shown in Table 2.

Table 2 Results of the Quality Assessment of the Scale

Factor	Cronbachs Alpha
Academic training program (ATP)	0.873
Professional training programs (PTP)	0.812
Factors belonging to the auditor (FBA)	0.83
Factors belonging to the quality control of the audit firm (COAF)	0.784
Factors under the control of the management agency (COMA)	0.827
Characteristics of audited construction companies (CACC)	0.860
Legal environment (LE)	0.750
Effectiveness of internal control assessment (EOICA)	0.875

Table 2 show that the indicators of the scales include: "Academic training program"; "Professional training programs"; "Factors under the control of the management agency"; "Characteristics of audited construction companies" and "Legal environment" are the total variable correlation coefficient > 0.3 should ensure satisfactory.

For the scale "Factors belonging to the auditor (FBA)", the indicator FBA5 has the correlation coefficient of the total variable = 0.205 less than 0.3, so this indicator is rejected and after being eliminated, the coefficient Cronbach's Alpha reached $0.847 > 0.5$, so the scale after the type of variable is guaranteed to meet the requirements. Thus, it can be seen that when assessing the effectiveness of internal control assessment, the factor of degree or certificate is not the decisive factor.

For the scale of "Factors belonging to the quality control of the audit firm (COAF)", the COAF6 indicator has the total variable correlation coefficient = 0.292 less than 0.3, so this indicator is rejected and after being eliminated, the scale is accepted with Cronbach's Alpha coefficient reaching $0.805 > 0.5$. Thus, the size of audit firms is not a measurement factor for the quality control of audits in general and the evaluation of the internal control system in particular. Auditing firms are all established under the provisions of law; controlled by the Ministry of Finance through the Department of Management and Supervision of Accounting and Auditing; Sample audit programs for operational sections have been developed and issued by the Ministry of Finance in conjunction with the Professional Association of Accountants and Auditors with detailed instructions for both large and small client businesses so that small-scale audit firms that have not yet been able to build their own audit program can apply the template of the issued sample audit program and then adjust it accordingly customers in general and construction companies in particular, so removing the observed variable COAF6 in Vietnam can be considered appropriate.

After verifying the quality of the scale, the research model includes 7 independent variables with 30 observed variables, reducing 2 observed variables compared to the original model.

3.4.3 Exploratory Factor Analysis Results

Table 3 Exploratory Factor Analysis Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.897	
Bartlett's Test of Sphericity	Approx. Chi-Square	3147.912
	df	435
	Sig.	.000

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Table 4 Test the Explanatory Level of Observed Variables

Compon ent	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.943	33.144	33.144	9.943	33.144	33.144	3.373	11.244	11.244
2	2.206	7.354	40.498	2.206	7.354	40.498	3.068	10.228	21.471
3	2.082	6.941	47.440	2.082	6.941	47.440	3.043	10.145	31.616
4	1.833	6.111	53.551	1.833	6.111	53.551	2.933	9.775	41.392
5	1.494	4.981	58.532	1.494	4.981	58.532	2.818	9.394	50.786
6	1.339	4.462	62.994	1.339	4.462	62.994	2.456	8.188	58.974
7	1.148	3.825	66.819	1.148	3.825	66.819	2.354	7.846	66.819
8	.857	2.857	69.676						
9	.786	2.621	72.297						

Extraction Method: Principal Component Analysis.

Table 5 Rotated Component Matrix

	Rotated Component Matrix ^a						
	Component						
	1	2	3	4	5	6	7
CACC5	.737						
CACC4	.736						
CACC2	.732						
CACC3	.709						
CACC1	.690						
ATP2		.809					
ATP4		.776					
ATP3		.775					
ATP1		.708					
FBA3			.876				
FBA2			.800				
FBA4			.756				
FBA1			.654				
COAF2				.769			
COAF3				.746			
COAF4				.669			
COAF1				.663			
COAF5				.569			
COMA4					.786		
COMA2					.776		
COMA1					.766		
COMA3					.749		
LE2						.743	
LE4						.697	
LE1						.694	
LE3						.648	
PTP2							.764
PTP1							.685
PTP3							.646
PTP4							.559

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The results of the EFA analysis for the independent variables were divided into 7 groups (Table 5). The stats are as follows:

KMO = 0.897 so EFA analysis is consistent with research data (Table 3).

Sig. (Bartlett's Test) = 0.000 ($\text{sig} < 0.05$) shows that the observed variables are correlated with each other in the population and it is completely appropriate to use this data for EFA analysis (Table 3).

Eigenvalues = 1.148 > 1 represents the variation explained by each factor, only those factors with Eigenvalue greater than 1 are retained in the analytical model (Table 4).

Total variance extracted = 66.819% $> 50\%$ satisfactory, then it can be said that these 7 factors explain 66.819% of the variation of the data (Table 4).

Thus, through the evaluation of the quality of the scale and the EFA analysis, the topic identified 7 scales representing the factors affecting the objective of evaluating the internal control system with 30 observed variables.

3.4.4 Regression Analysis Results

Table 6 Summary of Regression Model Results

Model Summary ^b								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
1	.841 ^a	.707	.696	.53751	1.801			
a. Predictors: (Constant), LE, COAF, COMA, FBA, ATP, CACC, PTP								
b. Dependent Variable: MTDG								
ANOVA ^a								
Model		Sum of Squares	df	Mean Square	F	Sig.		
1	Regression	135.918	7	19.417	67.205	.000 ^b		
	Residual	56.340	195	.289				
	Total	192.257	202					
a. Dependent Variable: MTDG								
b. Predictors: (Constant), LE, COAF, COMA, FBA, ATP, CACC, PTP								
Coefficients ^a								
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF	
1	(Constant)	-1.588	.254		-6.258	.000		
	ATP	.123	.050	.124	2.468	.014	.599	1.669
	PTP	.289	.067	.229	4.337	.000	.538	1.859
	FBA	.192	.051	.194	3.788	.000	.576	1.737
	COAF	.260	.067	.193	3.905	.000	.613	1.630
	COMA	.184	.057	.143	3.244	.001	.776	1.289
	CACC	.200	.068	.154	2.935	.004	.545	1.834
	LE	.171	.058	.136	2.963	.003	.718	1.393
	a. Dependent Variable: EOICA							

According to Table 6, the Durbin Watson coefficient of the model is 1.801 (range from 1 to 3), showing no autocorrelation. Besides, the magnification of variance VIF of the variables in the model is less than 2, so it can be concluded that the variables included in the model do not have multicollinearity. Anova test with significance

level sig = 0.000 shows that the built multiple linear regression model is suitable for the data set and can be used.

The results of the regression analysis show that the coefficient R² (Adjusted R Square) = 0.696 means that 69.6% of the variation of the dependent variable that is the target of the evaluation of the internal control system is explained by the factors that are the independent variables included in the model, the rest is explained by other factors that have not been studied.

The Coefficients section shows that all independent variables have Sig significance less than 5%, so 7 independent variables including ATP, DT, FBA, COAF, COMA, CACC and LE all have a statistically significant impact on the dependent variable, EOICA.

Standardized regression equation as follows:

$$\text{EOICA} = 0.124 \text{ ATP} + 0.229 \text{ PTP} + 0.194 \text{ FBA} + 0.193 \text{ COAF} + 0.143 \text{ COMA} + 0.154 \text{ CACC} + 0.136 \text{ LE}$$

The impact of the variables in order from high to low will be:

PTP (0.229) → FBA (0.194) → COAF (0.193) → CACC (0.154) → COMA (0.143) → LE (0.136) → ATP (0.124)

4. Conclusion

The research focuses on determining factors affecting effects on Evaluation of Internal controls of Viet Nam Independent Auditors in Auditing the Financial Statements of Construction Enterprises. The results shows that there are 7 factors, which are that Academic training program; Professional training programs; Factors belonging to the auditor; Factors belonging to the quality control of the audit firm; Factors under the control of the management agency; Characteristics of audited construction companies and Legal environment. In which, the factor that has the strongest impact on the effectiveness of internal control assessment in auditing financial statements of construction enterprises at independent Vietnamese auditing firms is the Professional training programs element, the second is the factors belonging to the independent auditor, the third is Factors belonging to the quality control of the audit firm, the fourth is Characteristics of audited construction companies, the fifth is Factors under the control of the management agency, the sixth is Legal environment and the factor with the lowest influence on the effectiveness of internal control assessment belongs to the Academic training program.

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Crisis Management: How Local and Foreign Restaurant in China Response to COVID-19?

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Abstract: The purpose of this study is to examine the crisis response of restaurants in China, illustrates how local and foreign restaurants deal with this unprecedented situation, and develop strategies for crisis management. Foot traffic to casual dining and fast-food restaurants has decreased since the start of lockdown policies. And many restaurant operators don't expect to turn a profit or even break-even in the foreseeable future. This paper used descriptive research using qualitative and quantitative data collected from the public and private sectors. The data was analyzed to conclude food restaurants' specific measures for food safety and food security during COVID-19. With social distancing in place, big brands, fast food chains re-ed services in line with the government agencies' requirements and line with protective measures when people visit restaurants in-person. The paper provides recommendations and specific measures restaurants, policymakers, researchers, and practitioners with a suggestion about yet unexplored research avenues.

Key words: COVID-19; food safety; food security; fast food restaurants; China

JEL code: M3

1. Introduction

Compared with the SARS epidemic in 2003, the COVID-19 outbreak in 2020 has a wider geographical distribution and a faster spread in China. The relevant protective measures adopted by the Chinese government are also stricter (Xinhua, 2020). The impact of the epidemic on the catering industry has exceeded that of SARS in 2003 in terms of ponderance and scope (He, n.d.). Since the outbreak of the epidemic, Chinese restaurants have faced the biggest difficulty in the 21st century.

The COVID-19 epidemic has a disastrous impact on the chain restaurant industry. For example, the chain catering industry faces a large number of closures due to the sharp decline in consumer demand (He, n.d.). However, four different chain restaurants take corresponding measures to deal with the spread of the COVID-19 epidemic. McDonald's USA company-owned restaurants closed seating areas, including self-service beverage bars and kiosks, and using the takeaway platform such as drive-thru, walk-in take-out McDelivery to serve customer (McDonald's, 2020a). In China, McDonald's restaurants implement "no contact to pick up food at the store" to reduce interpersonal contact during ordering and picking (McDonald's, 2020b). Also, McDonald's and Burger King joined the Chinese food delivery service Ele.me, to deliver food to the frontline medical staff at more

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than ten hospitals in Wuhan (Wpowell, 2020). For local chain restaurants such as Wufangzhai and Jinxiaoyue, they use dine-in and take-out coexistence to combat the epidemic (Wufangzhai, 2020). The difference is that Jinxiaoyue is worried about the takeaway platform's food safety and uses self-delivery to deliver to groups and hospitals for meals.

In the face of COVID-19's huge blow to restaurants, what actions should restaurants take to reduce the risks involved and adapt to survival and transformation under the epidemic has become a problem for local and foreign chain restaurants. Food safety is an essential concern for consumers. For delivery services, chain restaurants adopt five major COVID-19 epidemic prevention measures such as temperature checking, wearing masks, restaurant disinfection, continuous hand washing, and lunch box disinfection management (McDonald's, 2020b). It is safer for the Chinese to place an order with McDonald's "Mc Safe Delivery Card" in the take-out, indicating production, the name of the delivery personnel, and their body temperature in the receipt. Most restaurants using platform application launched "contactless delivery", customers can choose to have the delivery personnel deliver the food to the designated location instead of taking the food face to face.

Kim et al. (2020) state that restaurants can understand the disease's characteristics, predict the magnitude of the economic impact, and simulate potential prevention strategies based on each company's available resources to minimize the financial impact of unexpected epidemic outbreaks on the catering industry. Also, restaurants can adopt cooperation with governments and organizations, launch marketing campaigns, and adjust the restaurant's positioning from limited service to full service (Kim et al., 2020). So, the purpose of this study is to examine the crisis response of restaurants in China, illustrates how local and foreign restaurants deal with this unprecedented situation, and develop strategies for crisis management.

2. Literature Review

2.1 The Impact of COVID-19 on Food Safety and Food Security

According to Food and Coronavirus Disease 2019 published by the Center for Disease Control and Prevention, there is no evidence that COVID-19 is related to handling or eating food (CDC, 2020). COVID-19 is spread from person to person through respiratory droplets when people cough, sneeze, or talk (WHO, 2020a). People may contract COVID-19 by touching their mouth, nose, or eyes after touching surfaces or objects that carry the virus (including food or food packaging). However, this is not the only way the virus spreads. Besides, the risk of contracting COVID-19 through food and packaging or treated drinking water is low (WHO, 2020b). Although workers in select food production and processing sites have been infected with COVID-19, there is no evidence that the virus is transmittable to consumers through food or packaging processed by workers in such sites.

Regarding the Beijing salmon infection COVID-19, Zhong Kai, a food safety expert, said that the probability of infecting COVID-19 through raw salmon is extremely low, which is an unnecessary risk (Ma, 2020). The possibility of salmon carrying COVID-19 is almost zero. Since the COVID-19 cannot replicate outside the body of warm-blooded animals, it most likely infected more people the moment the salmon got in contact with humans first, and then human-to-human transmission occurred. So far, there is no evidence that the COVID-19 is spread directly through eating and drinking.

2.2 Government Regulations on Food Safety and Food Security

Given the challenges posed by COVID-19, the Chinese government needs to assess whether there is a need

for interim amendments or adjustments to food regulations to ensure that the food supply is not affected. Simultaneously, the authority needs to assess whether there is flexibility and food safety in implementing food laws and regulations' technical regulations.

According to the interim guidance of the Food and Agriculture Organization of the United Nations (FAO) and World Health Organization (WHO) (2020), the risk level of the food company is determined in terms of the different nature and scope of the food company. For example, the risk-based food safety inspection method can identify high-risk food sites that need to be inspected. During this epidemic, it may be necessary for the country to keep checking even the low-risk and medium-risk food establishments. Strict control is also required for places where restaurants directly or indirectly supply meat. For example, slaughterhouses need to supervise control measures before and after slaughter. Food inspectors in such areas will need personal protective equipment (PPE) and need to be aware of the importance of keeping their distance, washing hands, cleaning, and disinfecting (FAO & WHO, 2020).

Some restaurants that rely on imported food and ingredients may not need to go through the full supplier's approval due to the sharp decrease in international transportation. In this case, the government can provide a temporary authorization to sell such products, stipulating that the label can be temporarily covered (FAO & WHO, 2020). Still, everything needs to comply with food safety regulations. Regarding the salmon import incident in Beijing, the National Health Commission of the People's Republic of China (2020) introduced a press conference to prevent the import risk of COVID-19 and strengthen the supervision of imported cold chain food.

Restaurant staffs need to understand the symptoms of COVID-19 and participate in training courses on the basic principles of food hygiene and restaurant food safety, especially on the use of personal protective equipment and ensure that they do not cause pollution to the work environment (FAO & WHO, 2020). If the surrounding environment is contaminated by the COVID-19, or the food industry personnel themselves are infected with the COVID-19, they may contaminate the food due to the various stages of food production, processing and sales. Thus, during the COVID-19 epidemic period, it is particularly important to emphasize that food workers must strictly follow relevant regulations and requirements to operate such as sanitation and disinfection of food production, processing and sales environments and facilities (National Health Commission of the People's Republic of China, 2020). Food workers should also strengthen their health monitoring. Once symptoms occur, such as fever, cough, fatigue, etc. appear, they should leave their medical treatment jobs and report immediately.

Also, because restaurants are less concerned about the food supply chain's integrity when looking for new food suppliers, this opens up new food fraud opportunities. Besides the food safety management system, restaurants should also consider introducing a risk-based vulnerability assessment system to stop food fraud. The Chinese government needs to emphasize the increased risk of food fraud and warn food companies and restaurants (FAO & WHO, 2020).

2.3 Crisis Face by Restaurant During the Outbreak

During the COVID-19 outbreak, Chinese restaurants are not only facing an external crisis, but they are also suffering from an internal management crisis. According to Tse et al. (2006), SARS belongs to the physical environment as an external factor and indirectly caused human or social environment crisis and management failure. Up to now, the source of COVID-19 has not been identified. Restaurant managers are still trying to deal with the aftermath of the outbreak. According to the National Bureau of Statistics (2020), the overall industry revenue was 44.3% during the first quarter of 2020, lower than in 2019.

The aftermath of COVID-19 has led to industry layoffs and restaurant closures. For example, Burger King closed half of the Chinese franchisee on February 10th due to enormous economic pressure from the epidemic (Patton, 2020). After the outbreak of the COVID-19, many restaurants face serious cash flow problems, and the temptation for operators to engage in unethical behavior to ensure the company's survival is great. Burger King has acted unethically to endanger consumers' health to maintain the survival of its stores. For instance, a Chinese Burger King operator fined over \$500 to use expired ingredients found on March 15th (Leggate, 2020).

Also, according to PWC's survey (2020) survey, restaurants are also facing the situation of the blocked supply of raw materials and the mismatch of goods' supply and demand. Foot traffic control and lockdown policies have impeded the supply channels of commonly used raw materials and feed for food processing companies and farms. Some imported foods, such as salmon, caviar, and Arctic shellfish, are also facing supply problems caused by the prolonged customs clearance and logistics time. Therefore, facing these problems, some Chinese restaurants need to look for supply channels and raw materials to replace them to maintain restaurant operations. In some restaurants, the lack of foot traffic has led to a backlog of food. It has to adopt direct price reduction and direct sale of processed food to maintain the restaurant's operation.

The COVID-19 epidemic has a massive influence on the catering industry. As the COVID-19 outbreak started, restaurants have reduced in numbers, including the gathering during the Spring Festival in 2020. Crowded places and restaurants were closed. As a result, raw ingredients such as vegetable stocks dropped prices. (Chen et al., 2020). According to the National Bureau of Statistics (2019), the national catering revenue in 2019 was 4,672.1 billion RMB, of which 15.5% came from the traditional peak consumption season during the Spring Festival. In March 2019, national catering revenue was 339.3 billion RMB. However, large-scale restaurants across the country were closed, and the catering industry suffered tremendous losses due to the outbreak of the COVID-19 epidemic in the Spring Festival of 2020. According to the National Bureau of Statistics (2020), in the first quarter of 2020 (from January to March), the national catering revenue was 602.6 billion RMB, a sharp drop of 44.3% year-on-year. In March, the national catering revenue was 183.2 billion RMB (National Bureau of Statistics, 2020). Compared with the same period in 2019, the catering industry's income has shown a dramatic decrease.

If the restaurants cannot realize capital turnover through banks, they are likely to risk breaking the capital chain. At the same time, the reduction of consumers' disposable income and the irreversible pressure of mortgage and car loans will reduce consumer desire, dramatically reduce residents' opportunities to eat out, and lower their living standards. As a result, Chinese restaurants faced bankruptcy and unemployment.

2.4 Foreign Restaurants in China

Typical examples of foreign fast-food restaurants for rapid prevention and control of the epidemic are McDonald's, KFC, Burger King, and Pizza Hut. In China, McDonald's has established a special epidemic prevention and control team to ensure employees' health and safety, delivery personnel, and customers. Based on the original management system, the restaurant has further developed preventive measures for upgrading from employees, restaurants, and delivery services to operational arrangements.

McDonald's has implemented "no-contact-to-store pickup" in restaurants across the country to reduce interpersonal contact in the process of ordering and taking meals. After ordering food at the mobile phone, self-service ordering machine, or counter, regardless of dine-in or take-out, customers can pick up their food at the pickup point according to the order number.

McDonald's provided customers with disposable hand sanitizers in restaurants. Besides, it implemented disinfection measures and strengthened disinfection frequency in all restaurants' ventilation systems and customer contact facilities.

Regarding the delivery service, all delivery orders will be accompanied by a "McDonald's Delivery Relief Card" with a mark that the food delivery personnel's name and body temperature. At the same time, "contactless delivery" is implemented. Customers can choose to have the delivery staff deliver the food to the designated location instead of a face-to-face pickup.

McDonald's prevention and control measures during the epidemic. The following observation during the experimental restaurant visit (1). Shows the green health code, then register your identity information and use an ear thermometer to measure your body temperature and record it on the table before entering the door. After that, use hand sanitizer to disinfect your hands; (2). The self-service ordering machine was closed. The clerk's recommendation is to place an order via a mobile phone is not to queue up; (3). Place an order in the McDonald's Mini Program. It will provide you with two options: for standard delivery, and the other is for delivery to a designated location, with no contact during the whole process; (4). Employees wear masks, hats, and disposable gloves throughout the entire process to ensure food safety; (5). Getting the take-out bag, the bag was sealed all the way, and the bag had the sign of the trust card.

2.5 Domestic Restaurant

Unlike the immediate establishment of epidemic prevention teams for foreign restaurants, Chinese-style fast food takes relatively simple measures against the epidemic. For example, Wufangzhai actively does an excellent job in staff training but has not developed takeaway services. If an employee is from a high-risk district, he needs to perform nucleic acid testing and conduct autonomous isolation. The disinfection of all Wufangzhai stores has commenced, and all public contact surfaces in the store are regularly disinfected. Employees must take their body temperature before starting to work. If there is any abnormality or fever or cold symptoms, immediately suspend the service and seek medical treatment. Each store is equipped with a disinfectant hand sanitizer, and all employees of Wu Fang zhai wash and disinfect their hands every 30 minutes.

Wu Fang zhai's prevention and control measures during the epidemic. The following observation during the experimental restaurant visit (1) When entering the door, one asked to undergo strict inspection as per McDonald's protocol. (2) The separation between each table is wider. (3) At the same time, the staff recommends that customers take away instead of dine-in. (4) During the preparation of food, the staff should wear protective equipment.

3. Conclusion

As the pandemic progresses, domestic or international fast-food restaurants decided to follow health protocols. They abide by the rules to use a thermometer to check their body temperature before entering the store, register their identity information, increase the safety distance between the dining seats, and encourage customers to do takeaway or delivery to reduce physical contact. At the same time, during the meal, the government is also trying to promote the use of disposable chopsticks and spoons to avoid cross-infection.

The COVID-19 epidemic in 2020 has a wide geographical distribution and a fast spread in China. The restaurant industry has a massive loss during Covid-19. Customers have been concerned about the food safety and food security of restaurants. Facing the pressure of the epidemic and consumers' health and safety, the restaurant

should strictly check the food supply chain and its staff's safety in operation. They must be obeying and adopting government policies and regulations. As researchers exploring this topic, restaurants should be strictly inspected by the assigned government sector and make strict precautions independently to ensure customers' safety.

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Life Cycle and Retirement Choices

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Abstract: The life cycle is used to explain the long-term motivation for retirement and understand people's financial behaviour as they grow old. This study aims to analyze how the life cycle affects the retirement choices in Brazil. Data collection consisted of a survey targeting Brazilian adults. The statistical methods included descriptive measures, correlational analysis, as well as tests of means and proportions. Responses revealed that the concern about social security depends on age, which is a relevant explanatory variable, with older individuals tending to show a more forward-looking behaviour. By suggesting an interface between behavioural sciences and public policies, this study points out that governments should both keep track of the citizen's behavioural aspects and promote educational activities oriented to raise awareness of the need to both avoid low savings toward the end of the life cycle and save up for retirement as early as possible.

Key words: life cycle; intertemporal choices; retirement

JEL codes: J1, J17

1. Introduction

Social security can be seen as planning of well-being for the upcoming years, which can vary depending on the time elapsing from the present decision making to the future retirement (Noone, Stephens & Alpass, 2009). Considering the rise in number of the elderly citizens worldwide and in Brazil as well, the promotion of well-being has to be a priority for a healthy aging (Gragnolati M., O. Jorgensen, R. Rocha, & A. Fruttero, 2011; Halaweh, Dahlin-Ivanoff, & Svantesson et al., 2018). This study seeks to analyse the influence of age (as a proxy of life cycle) on the choices for social security-related retirement.

Modigliani and Brumberg developed the Life Cycle Hypothesis (LCH) to explain the individual's consumption patterns. It states that the individual reduces consumption throughout time, saving up during their productive working stage, to cover their expenses at an old age. In this process, choices concerning retirement change over an individual's life and a share of wages or income is withheld for future retirement (Ando, Modigliani, 1963; Modigliani, 1986).

The LCH is a relevant instrument to understand social security decisions in different age groups as it assumes that people's financial choices vary with time (Deaton, 2005). The LCH assumes that the individual consumer's behaviour in the long run is inherent to the aggregate consumption during current and future periods, and also

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assume that the individuals increase their consumption habits once they have more resources available (Ando & Modigliani, 1963). In a general way, the life cycle model does a rather satisfactory job at reproducing the empirical retirement distribution (Jiménez-Martín & Sánchez Martín, 2007). Considering that savings are the result of the individuals' desire to support their own consumption when their income reduces significantly, age has shown it a relevant factor influencing financial decisions (Green et al., 1996).

Deaton (2005) pointed out that the most fundamental challenge to the life-cycle model has been directed at its basic underlying assumption, that people make rational, consistent, intertemporal plan, and several scholars state that economic decisions are not rational (J. H. Kagel, R. C. Battalio, L. Green, 1995). Blau (2008) argues that alternative behavioral models of saving show that consumers have limited ability or willingness to plan for the future or to carry out their plans. According to Loewenstein (2000), an understanding of people's behaviours should consider that they are influenced by their long-term rational concerns and the short-term emotional motivations.

An alternative explanation to the LCH when it comes to the savings-time relationship is the concept of hyperbolic discount, i.e., several individuals would rather receive earlier rewards than wait for long-term rewards (Laibson, 1997). The hyperbolic discount has been used to explain people's behaviours related to drugs use (Bickel & Marsch, 2001) gambling (Petry, 2001) and retirement (Diamond & Köszegi, 2003). In the hypothesis of hyperbolic discount the importance of immediate consumption drops as the time horizon expands, therefore, there is the phenomenon described as reversal of preference. In addition, in the phenomenon of reversal of preferences, the proximity to receiving a reward induces impulsivity (Tversky, Slovic & Kahneman, 1990).

Impulsivity was well documented in a typical Mischel and Underwood (1974) experiment, where children should choose between immediate and inferior or late and superior rewards. Impulsivity is measured from the capacity of the waiting time. The empirical result of the test proved to be strongly linked to age, with the proportion of children who are willing to wait until the end of the experiment comes close to 60% for the oldest, while the youngest invariably do not wait for the end of the test.

Saving and investing for retirement can be especially difficult as it involves making large long-term commitments in an area in which many individuals will never develop significant expertise. This financial decisions can be overwhelming for many individuals, especially those with little financial expertise and experience (Beshears, Choi, Laibson, & Madrian, 2011). It is important to highlight that the future retirement also depends on the amount of pension accumulated, which is affected by the design of the pension system and by individual decisions. If the pension system does not ensure the maintenance of people's living patterns, as in the case of Brazil, they should protect themselves through retirement savings (Piotrowska, 2019).

The Social Security itself is an issue of concern, as it is the best retirement alternative in some places worldwide. Any crisis in this system, or even the possibility of changes in its rules, can change the citizens decision. To sustain the Social Security system, the economically active people must produce enough capital to support the retirement of the elderly population. However, the further the population grows old and the elderly percentage increases faster than the workforce, higher are the concerns about the sustainability of the Social Security system (Lee & Mason, 2011).

Fast population aging is a worldwide tendency: the ratio of people at the age of 60 or older will double worldwide from 11% in to 22% in 2050, with absolute numbers increasing from 605 million to 2 billion in the same period (World Health Organization, 2014). While in Brazil, currently, there is a large portion of young citizens, the aging of the population has been significant: almost 20 million people are over 65 years old and it is

estimated that this number will increase to 58 million by 2020 (Total Population, 2019).

As a result, the Brazilian Social Security system is deficient and has affected the public budget. It is estimated that under the current rules, pension spending could reach almost 17% of GDP by 2060 (20% of GDP including the public sector regime). The combined annual deficit of the pension schemes is close to 4.5% of GDP, contributing substantially to the general government budget deficit (OECD, 2015a; OCDE, 2015b).

In this environment, each person's stage in the life cycle is relevant. The young workers should be worried about security and retirement, because some benefits may be restricted in some scenarios. The old workers should be concerned about rule changes that may impact their retirement expectations. The LCH provides an insightful theoretical framework to analyse the social impact of insufficient income and lack of social security in Brazil.

Given the association between people economic behavior and their life cycle, changes in the population age structure have a major impact on economic development of Brazil. The needs of an elderly population require rethinking the economic and social institutions needed to realize income security and provide adequate health care and other services for an aging society (Gragnolati, Jorgensen, Rocha & Fruttero, 2011).

2. Materials and Methods

A survey was carried out to analyze how the age (life cycle proxy) influences the retirement choices in Brazil. Before the survey's application, a pre-test was performed to ensure intelligibility and correction. The participants were invited to give their opinion on the wording and the comprehensibility of the items, thus, it was sought to identify possible inconsistencies and make adjustments.

A questionnaire was applied to a representative sample contained individuals of the most different age groups, educational levels, gender, positions, and functions. The survey was released through social media for two months, from July to August 2018. The initial number of responses was 656, but the final sample comprised 608 respondents, because some participants withdrew consent or were retired yet.

The survey's most relevant point was age. The participants were divided into three age groups related to the three stages of the life cycle as traditionally used in the literature: youth, maturity, and old age (Giannetti, 2003). This division into three age groups also occurred because of the similar numbers of participants between the three groups. Of the 608 participants, the youngest is 17 years old and the oldest 73 years old.

The first group ("youth") consisted of the youngest individuals, aged up to 29 years old, and represented 34% of the sample. These participants may witness a Social Security reform whereby the contribution time may be longer, while the time of pension income may be much shorter than the current practice. The deeper the reform is, the larger its future burden is expected to be.

As these workers are starting their careers, the impact of postponing a reform is expected to be greater, with a transfer of revenue from this generation to the other groups, particularly the pensioners or those close to retirement. However, due to a long path before their retirement and the potential hyperbolic discount, perhaps this may not be reflected in the concerns and behavior of this age group.

The second group ("maturity") included participants aged 30 to 39 and represented 35% of the sample. As they are already contributing to the Social Security system, their burden may be smaller compared to the first group. However, the potential delay in a Social Security reform may also entail a larger burden in terms of contribution or active work years. The third group ("old age") consisted of individuals at the age of 40 or older. As they have been in the labour market for a longer period, the impact of a reform may not be substantial due to

acquired rights.

Five sets of questions were asked to the three groups. The first set was about their attitude toward the Social Security system, i.e., if they had a more or less proactive attitude. The responses were divided into attitude levels: “It’s not a current concern” (level 0); “I’m starting to worry, but I haven’t done anything yet” (level 1); “I’m worried and looking for alternatives of savings” (level 2), and “I’m really worried, and I already have my savings” (level 3). The expected pressure over the Social Security systems has caused an increase on the individuals’ active planning for retirement (Noone, Stephens & Alpass, 2009). Therefore, it is relevant to identify the more or less proactive attitudes in the different stages of the life cycle.

The second set of questions was related to contribution, i.e., whether the participants contributed to any kind of pension plan, and which was it. Participants were allowed to select more than one of the following options: “I don’t contribute to any plan”; “I contribute to the official Social Security provided by the Brazilian Government”; “I contribute to the civil servant’s pension plan”, and “I contribute to a supplementary pension plan”. Economic factors, such as the retirement plans, or structural changes in the Social Security system influence the decision and preparation for this life stage. The aim was to analyze the contribution or its lack in the different life cycle stages and identify whether there is a great number of participants contributing to the supplementary pension plan, which is an option in Brazil. When the respondents selected the alternative “I contribute to Social Security”, their answers were used as a proxy of forward-looking behaviour.

The third set of questions was about whether the respondents make their own investments to support their life at a later age. The aim was to relate the provident (or improvident) behaviour to the different stages in the life cycle. Among the different aspects of the security planning, ensuring an income before retirement is closely related to the future well-being. As such, financial planning is a significant predictor of well-being, as the individuals who planned their retirement are more likely to be satisfied in this area than those who did not (Noone, Stephens & Alpass, 2009). The variable “saving money for an older age”, too, was used in this study as a proxy of forward-looking behaviour.

The fourth set of questions was about participants perception of future retirement. This variable explores notions of financial stability, increase in the expenses, and the concern about obtaining and supplementing income during retirement period. Perceptions and attitudes have been shown to influence the planning behaviours and have a significant impact on the individuals’ lifestyle and financial planning (Noone, Stephens & Alpass, 2009).

The “perception of future retirement” was based on the following statements, with answers following a five-point Likert scale: Q1. I believe it’s going to be hard to live on my pension; Q2. I believe I’ll have financial stability in my retirement even if I have a smaller income than my current wage; Q3. I believe I’ll probably have to search for new ways to earn money to keep myself financially stable during my retirement; Q4. I believe I’ll have a pleasant financial life even though the pension may be small; Q5. I believe I’ll have a comfortable life considering my future income. This statement was adapted from the Retirement Future Perception Scale — EPFA (in portuguese), developed in the study by Rafalski & Andrade (2017).

High scores in Q2, Q4 and Q5 would point out that the participants identified themselves as successful and financially stable during retirement, but high scores in Q1 and Q3 would point to the opposite direction. As such, a rate was produced for “negative perception of future retirement” ($Q1 + Q3$), and a second one was produced for an “positive perception” ($Q2 + Q4 + Q5$). The general preception rate was calculated as ($Q2 + Q4 + Q5 - Q1 - Q3 + 8$). The score of the general rate ranges from 0 to 20 points, because each item follows a scale from 0 to 4 (0 – I totally disagree; 1 – I disagree; 2 – I neither disagree nor agree; 3 – I agree; 4 – I totally agree). The final result

was added 8 to find a positive value for the general perception of future retirement rate.

Finally, the fifth set of questions incorporated into the study was related to a behavioral variable. The Barratt Impulsivity Scale (BIS) was used to capture the respondents' impulsivity/impatience. According to Malloy *et al.* (2010), BIS is one of the most influential models in explaining the impulsive behavior already validated in Brazil. Impulsivity is characterized by cognitive and behavioral patterns that leads to immediate and medium and long-term dysfunctional consequences. In addition, impulsivity, from the point of view of intertemporal choice, reveals a strong behavior preferred by the present in relation to the future, that is, a high rate of time discount.

BIS allows the calculation of partial scores related to three subdomains of impulsivity, namely: motor impulsivity, attentional impulsivity and impulsiveness for not planning. For the purposes of this research, it seems more coherent to analyze impulsiveness through non-planning, considering that this impulsiveness encompasses behaviors that are more oriented to the present to the detriment of the future.

An impulsive behavior index was created, with the highest scores showing the presence of that behavior. For the calculation of the index, the participants answered the questions: 1) I plan tasks carefully. 2) I plan to travel well in advance. 3) I have self-control. 4) I save regularly. 5) I think about things carefully. 6) I make plans to stay in the job. 7) I say things without thinking. 8) I like to think about complex problems. 9) I get bored easily when I am solving problems mentally. 10) I am more interested in the present than in the future. 11) And I like games and mental challenges. Which one of the 11 items has a gradation of up to 3 points (0- Rarely or Never; 1- Every time from time to time; 2- Frequently; 3- Almost always/always).

Each variable, "Attitude Toward Social Security", "Provident Behaviour", "Perception of Future Retirement" and "Impulsivity" was analyzed to each life cycle. The relationship between the variables was measured through cross-tabulation and tests of means and proportions. As usual in the field, the significance level was set at 1%, 5%, and 10%, as appropriate. In the Levene's Test for Relative Variation, necessary for the test of means, the level was set at 5% to define equality of variances. The results had Cronbach's Alpha Based on standardized items equal to 0.692, adequate for this kind of research. The main limitation of the results stems from the instrument used, where the self-assessment process may not express the respondent's real feelings or his actions.

3. Results and Discussion

3.1 Age and Attitude Toward Social Security

It was found that for "attitude towards social security", 39.9% of participants are starting to worry, but have done nothing about it (level 1). Those who are concerned and looking for savings alternatives (level 2) represent 36.3% of the sample. The extremes, that is, those that are not concerned (level 1) and that are very concerned (level 3), represent 13% and 10.7%, respectively.

A cross-tabulation was performed to analyze how the life cycle influences the attitude toward social security (see Table 1). The test was carried out for each age group: 0 ("youth"), 1 ("maturity"), 2 ("old age"). The result show that the attitude toward Social Security is level 2 for most of the participants in the "old age". This means that the oldest respondents have a more proactive attitude toward this subject, i.e., they are concerned and searching for alternatives. Meanwhile, the youngest participants either had not taken any actions (44%) or were not worried about it (15%).

Life Cycle and Retirement Choices

Table 1 Level of Concern per Life Cycle

Life Cycle	0	1	2	3	Total
Youth	31	90	74	10	205
Maturity	23	90	69	30	212
Old Age	25	63	78	25	191
Total	79	243	221	65	608

Note: 0 = minor concern; 3 = high concern.

Another way to test the relationship between the variables was by determining the average age of the respondents according to their attitude level. A test of means was performed for age to assess if the results were identical in each age group. If the age did influence the attitude, the test was expected to point to different means.

Table 2 Average Age of Participants by Concern About Social Security

Concern	Age Mean	N	Deviation	1	2	3
0	35.49	79	11.43	0.088	0.41	0.073
1	33.76	243	9.27		0.012	0.005
2	35.81	221	10.03			0.049
3	38.15	65	10.04			

Note: the three last columns show the p-values in the mean test.

The result indicated that the participants who chose level 0 (Not a current concern) have an average age of 35.49 years. Those who marked “I’m starting to worry, but I haven’t done anything yet” had an average age of 33.761 years. From this answer, as the respondents’ concern grows, the average age also increased, to 35.805 and 38.154. The mean test values indicate that the participants who were more concerned with social security (levels 2 and 3 of attitude towards social security) had a higher average age than those who were more carefree.

The results also show that the age gap between the extremes is significant. For example, the average age of those who answered that the pension plan is not of their concern was 35.49 years. Meanwhile, the average age of those who said they are really worried about the subject was 38.15. The two-sample test for the difference of means showed a p-value of 0.073, according to Table 2.

3.2 Age and Perception of Future Retirement

It was found that for “future perception in relation to retirement”, 32% of participants believe that it will be difficult to live with retirement; it is also important to note that 39% of respondents say that they will probably have to look for new ways to earn income to remain financially stable during this period. In general, the participants do not perceive success, financial stability and a financially pleasant life in the future retirement period.

To analyze how the life cycle affects the “perception of future retirement”, a test of means was conducted, and every rate of perception (general, negative, and positive) was related to the respective age. As a result (see Table 3), the mean rates for “general perception” was sensible to age group, i.e., the higher is the age group, the higher is the perception of the individuals.

Life Cycle and Retirement Choices

Table 3 Perception of Future Retirement

Life Cycle	Mean	N	Standard Deviation	Youth	Maturity
General Perception					
Youth	7.62	205	3.89		
Maturity	7.98	212	4.38	0.187	
Old Age	8.57	191	4.22	0.010	0.086
Total	8.04	608	4.18		
Negative Perception					
Youth	5.56	205	1.85		
Maturity	5.23	212	2.04	0.043	
Old Age	4.52	191	2.31	≤0.001	0.001
Total	5.12	608	2.11		
Positive Perception					
Youth	5.18	205	2.82		
Maturity	5.21	212	2.93	0.455	
Old Age	5.09	191	3.00	0.384	0.345
Total	5.16	608	2.91		

Note: the three last columns show the p-value in the test of means.

The general perception of future retirement was dramatically different between groups “youth” and “old age” ($p\text{-value} = 0.010$) but close to the limit of significance between groups “maturity” and “old age” ($p\text{-value} = 0.086$), considering a significance level of 10%. This result means that the oldest respondents think they are more successful and financially stable for retirement. Besides, the negative perceptions were relevant to explain the results of the general perception rate.

However, the positive perception rate was not enough to distinguish the age groups, with differences between the means having no statistical significance. This finding is confirmed by the correlation between age and rates (general perception, negative and positive). Whereas the correlation of age with general perception was 0.075, the correlation with negative perception was negative (i.e., -0.17) and showed a higher significance (These numbers are not shown in the Table 3). The correlation with positive perception was close to zero.

3.3 Age and Forward-looking Behaviour

Forward-looking behaviour was based on two variables: “save money for an old age” and “contribution to Social Security”. Most of the survey participants reported that they make contributions to the general social security — INSS (49.9%), a significant part of the sample declared no scheme (19.2%) and 18.7% of the participants said they made contributions to complementary pension plans, which are optional in Brazil.

Most participants (54.2%) stated that they keep money saved in the form of investments to ensure old age. Tests of proportion were carried out to assess if the proportion of those who stated they save money and contribute to Social Security varied with age group. The test was carried out for each pair of age group: 0 (“youth”) and 1 (“maturity”); 0 and 2 (“old age”), 1 and 2.

The results for variable “save money for an old age” showed that the proportion of positive answers increased with the age group (51.71%, 52.83%, and 58.12%, for groups 0, 1, and 2, respectively), but the $p\text{-value}$ for the difference across those proportions was slightly above 5% (see Table 4).

Life Cycle and Retirement Choices

Table 4 Forward-Looking Behaviour

Life Cycle	Proportion	N		
Save money for an old age				
			Youth	Maturity
Youth	51.71%	205		
Maturity	52.83%	212	0.4095	
Old Age	58.12%	191	0.1002	0.1431
Do not contribute to Social Security				
Youth	33.66%	205		
Maturity	12.74%	212	≤ 0.001	
Old Age	8.38%	191	≤ 0.001	0.0785
Contribute to Social Security				
Youth	52.20%	205		
Maturity	54.25%	212	0.3374	
Old Age	41.48%	191	0.0164	0.0052
Contribute to Private Social Security				
Youth	12.20%	205		
Maturity	32.55%	212	≤ 0.001	
Old Age	51.31%	191	≤ 0.001	≤ 0.001
Supplementary Security Plan				
Youth	9.27%	205		
Maturity	25.47%	212	≤ 0.001	
Old Age	21.47%	191	≤ 0.001	0.1724

Note: the three last columns show the p-value for the test of means.

The number of those who do not contribute to Social Security was 33.66% for group 0, and above 8.38% for group 2. This difference between the results is significant. Besides, the number of those who contribute to the private pension system and to the supplementary security plan was significantly higher among those at a higher age. These findings might be indicative that part of the sample included young people who were not in the job market yet, while it also seems to show that ageing calls for saving up. This result responds to study reports that the discount rates decrease with ageing (Green, Fry & Myerson, 1994). In other words, older participants seem to ascribe a higher value to pension money in the present study.

The same test was performed for those who informed that they contributed to the mandatory Social Security, which represented a subsample. Those were 52.2% of the youngest respondents, while this percentage dropped to 41.48% among the oldest participants, with the difference between the proportions being significant ($p = 0.0052$). This might be indicative that the oldest respondents do not contribute as much as the youngest ones to the National Social Security system for workers in the public sector. This result was not expected. Part of the explanation may be that the oldest participants have the option of a supplementary pension plan or even because they are saving up by themselves. In general, the oldest respondents showed a more forward-looking behaviour in this study.

3.4 Age and Impulsive Behavior

The results of the impulsive behavior scale showed that most participants plan tasks carefully (44%), plan

trips well in advance (33%), claim to have self-control (45%), save regularly (31%), believe in thinking about things carefully (53%) and make plans to stay in employment (44.74%). In general, there is a tendency towards less impulsive or more controlled behavior revealed by the research participants.

To analyze how the life cycle affects “impulsive behavior”, the average impulsivity response for each age group was first calculated and, subsequently, an average test was performed to check if there is a difference between the averages. Thus, for each age group, the level of impulsivity was calculated and the mean values were tested to see if they differ from each other, using the mean test for independent samples.

Table 5 Impulsive Behavior

Life Cycle	Mean	N	Standard Deviation	0	1	2
0	12.76	205	4.70	-	0.7550	0.329
1	12.61	212	4.94	-	-	0.230
2	12.97	191	4.81			
Total	12.77	608	4.81			

Note: the three last columns show the p-value for the test of means.

The test results indicate that the impulsive behavior does not change according to the age group, which was not previously expected by the research. Giannetti (2005) attributes to youth the dominant vector of impulsivity and, to maturity, in turn, the relaxation of impulsivity in the formation of individuals' temporal preferences. On the other hand, however, it also emphasizes that old age harbors vectors that work by intensifying the willingness to discount the future, with a view to shortening the horizon ahead. Thus, the impact of maturation on impulsive behavior seems to be undetermined.

In a non-tabulated test, using impulsive behavior as a dependent variable and age groups as independent variables and others variables as control, there is a 6.7% significance, close to the 5% limit. The sign of the variable is positive, showing that the older the age, the greater the impulsive behavior. This result was also not expected, since impulsivity is more related to younger age. However, a possible reason is the fact that, for this research, respondents with older age were generally also employed in the public sector. In this sense, the stability of the public service could allow more impulsive behavior. Future research may help in understanding.

4. Conclusion

Retirement is a growing topic in Brazil due to demographic, socioeconomic and social security factors. To understand the phenomenon of savings decisions in relation to retirement, it is necessary to pay special attention to the behavioral dimension and how retirement is affected by this dimension.

In this context, Social Security is seen as a forward-looking tool for a long-term resource allocation in order to avoid the lack of income in the future retirement. As for the theoretical basis of the present study — Life Cycle Theory, it can help explain the trajectory of intertemporal allocation of financial resources, being relevant for illuminating the effect of age on resource allocation over time.

This study aimed to analyze how the life cycle affects the retirement choices in Brazil. It was possible tested variables about the participants' attitudes toward future retirement and the understand of the Social Security system as a means to gain a better understanding of the more or less forward-looking actions in three stages in the life cycle.

The results showed that the oldest respondents are in general the ones with a more active attitude toward the

Social Security system, being worried about and looking for alternatives to save up. Nonetheless, the youngest participants tended to have a less active or concerned behaviour. This result is contradictory in the current Brazilian context, since changes in the Social Security system are likely to affect the youngest workers in a larger scale than the oldest workers.

The future perception of retirement also showed sensitivity to the age group, so that older participants had a higher index of future perception. This result means that older participants perceive greater success and financial stability in the retirement period, compared to younger participants. The forward-looking behaviour was also more frequent among the oldest participants, and the number of participants who said they did not contribute to Social Security was much higher in the youngest group. It might be expected that aging shall come with more sobriety about the need to save up for retirement.

Interestingly, the share of workers who contribute to their own private pension system and a supplementary pension plan was higher among the oldest participants, and the number of participants who contribute to the State Social Security system decreased with age. This result was not expected but might be indicative that the oldest workers will not contribute to such a system as much as the youngest workers because most of them are civil servants and, therefore, have their own security system.

For this research, in general, older people are also linked to the public sector. This fact can help explain the issue of indeterminate impulsivity, because if on the one hand youth is a vector that influences impulsivity, on the other hand the security that public service provides to the elderly can also be a vector that influences impulsive behavior.

In non-tabulated tests, it was found that an interactive variable linking public sector and age group presented an interesting result. The model with the interactive variable does not substantially improve the R² of the regression, but in compensation the significance of the coefficients are all adequate, including the interactive variable. In this way, the age group together with the fact that the participant works in the public sector becomes relevant to explain attitude towards social security. The solution of the interactive variable was calculated for the variable impulsive behavior, but the model did not improve and for this reason it was not presented. Future research may help in understanding.

Bearing in mind that the connection between the theme of retirement and the life cycle is not limited to the national context, further research should both target a broader demographic and assess the relationship between social security and life cycle in further geographic contexts.

Acknowledgements

This research was carried out with the financial support of Brazilian funding agency Capes (Coordination for Improvement of Higher Education). The authors are thankful both to Capes and to all participants for their valuable contribution.

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Overview of the Agile Rational Unified Process (Rup) in the Context of Software Development Projects

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Abstract: One of the processes of software engineering is the AGILE methodology, which is famous for its iterative method of development. Its well-known types include Rational Unified Process (RUP), Scrum, Extreme programming (XP), and Adaptive software development. RUP is an incremental software development process which delivers releases over time with improvements per release while following the best practices along the way. The four phases of RUP, Inception, Elaboration, Constructions, Transition, provide a sequential and iterative approach to the development of a product. The workflow is divided into logical activities that are nine disciplines, and are maintained and performed throughout the four phases of RUP. RUP is not only a system development process but is also a mindset, which can be implemented with any process or project, by following certain recommended practices which will be discussed in the present paper.

Key words: agile; rational unified process; software development

JEL code: Y20

1. Background

The Agile methodology is one of the processes of software engineering, which is famous for its iterative method of development. Agile is especially useful in the context of a continuous evolution of the requirements and solutions, creating a solid foundation and helping the team to respond to the changes in a natural and faster way. Its famous types include Rational Unified Process (RUP), Scrum, Extreme programming (XP), and Adaptive software development. From the mentioned types, the Rational Unified Process (RUP) will be discussed in the present paper.

RUP stands for a Rational Unified Process; it focuses on creating and maintaining models, rather than on producing large amounts of documents. It is developed and maintained through Rational Software. The people responsible for RUP work in close quarters with clients, partners and product groups to ensure that the RUP is continuously updated and improved to keep up with the new times.

RUP guides in the usage of Unified Modelling Language (UML). UML is a standard language that allows users to display their requirements, designs and architecture. UML was originally developed by the Rational Software (Christensson, 2006) as well, but is now handled by the Object Management Group (OMG).

RUP is also supported by tools which help in the automating of large parts of the process. These tools are

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used to maintain and create various artefacts, like models, for the software engineering process, such as visual modelling and designing, programming and testing. These all are the reasons that RUP provides the best practices in software development which are suitable for a wide variety of projects and organizations.

2. The Dimensions of RUP

There are two crucial dimensions of RUP, along with 4 phases and nine disciplines and their correspondence is indicated by Figure 1 (Anwar, 2014).

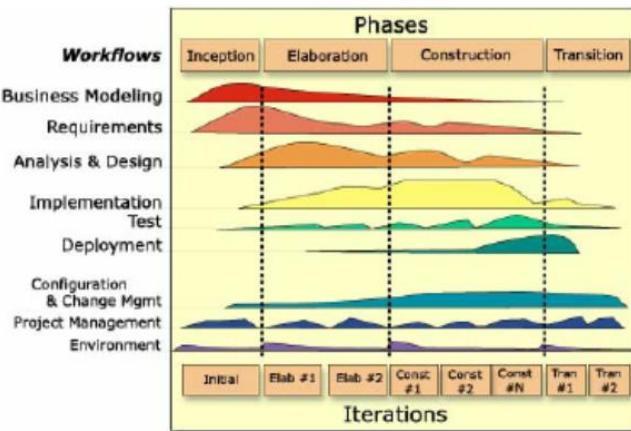


Figure 1 Overview of RUP

Source: Anwar, 2014

2.1 The Disciplines of RUP

There are nine disciplines defined by RUP (Hirsch, 2002):

- a) Business Modelling: both the business processes and its internal structures are defined to get a better understanding and to be able to come up with requirements for the desired software. Business Modelling involves exploring and evaluating potential strategies used for the reengineering of the business processes.
- b) Requirements Management: obtaining, organizing and processing and finally documenting the requirements. Working along with the project stakeholders closely to understand their requirements and needs is part of requirement discipline.
- c) Implementation: understanding the design model and transforming it into a source code by implementing components and finally integrating it together with sub-systems and into the complete build.
- d) Test: the three types of tests: integration, system and acceptance test are part of test discipline activities. That means both defining, planning and developing use cases to run tests on the project and, also, reporting the bugs/error found.
- e) Deployment: finalizing the project, packages, scripts and end-user documentation for it, along with any other tasks required to supply the user with the complete end product software. That also means to develop support and operational material along with all the necessary packages for deployment and training the end-users as well.
- f) Project management: planning and monitoring tasks for better management of the project through initiating a new project, management of staff, management of risk factors, planning and scheduling sub-tasks, doing iterations and completing the phase/project.

g) Configuration and Change Management: it includes everything about the version and after release and change request management and also consists of the configuration controls and its status by keeping track through monitoring. Baselines and releases management is also part of it.

h) Environment: processing materials for individual project teams, adapting to the project's or organisation's needs and introducing tools according to them and making sure all the tools etc. are appropriately installed to support the development of the project.

2.2 The Phases of RUP

Each software lifecycle is broken into smaller cycles, and each cycle represents a new generation of the software. RUP divides each development cycle into four phases. And each phase ends with a milestone. A milestone is a point or place in the process where certain decisions must be made, and certain goals are achieved.

RUP is a software development process that combines linear and iterative structures. It's four phases are Inception, Elaboration, Construction, and Transition (McManus, 2004). Every stage is done in many iterations except Inception. All other development process stages like requirements, design, testing, etc. are done corresponding with these four stages of RUP. Although the intensity is different, it helps build stable and flexible solutions. However, this software process is not the same as other Agile models like SCRUM and XP. It is not as efficient as other models of Agile. It is not as quick and adaptable as others. Customer involvement, iterations and their intensity vary depending on the project requirements.

The details of each phase are given below (McManus, 2004):

1) Inception Phase: the process of RUP starts from the first stage of Inception. In this phase, the idea of the project is proposed. Some of the milestones for this phase are a requirement document, general use case models and risk factors assessment.

2) Elaboration Phase: in this stage, the team developers evaluate the architecture and requirements of the project. Some of the milestones for this phase are use cases which have their actors identified, more in-detailed risk assessment and a general manual for users.

3) Constructions Phase: during this process, all the remaining features and functional components are developed and integrated into the build model to combine into a complete product. In this phase, all the processes, costs, quality, operations and resources are optimised. Some of the milestones of the phase are manuals, a complete product and description of the current software.

4) Transition Phase: in this phase, the product is released to the users. At the time of deploying to the users, issues might arise, which needs debugging and correcting the problems. Because of this, sometimes the new release is produced, and new features are added to the existing product. Some of the milestones are completed testing, properly operational databases, training of end-user and management and finally deploying the product to the market.

3. Best Practices Deployed by RUP

RUP effectively applies proven approaches on the software development process and the team responsible for it successfully obtains its objective. These practices are observed in successful organisations in the industry and they are given below (IMQS et al., 2015):

1) Develop the software iteratively: due to the changing times, no software can be designed, built and implemented through the sequential process methodology without there being a need to retouch some part of the

software due to some new update in the technologies or in the operating system etc. for this reason RUP allows the developers to iteratively go over the software in the process of development which helps in getting a deeper understanding of the particular problem through successive refinements and incrementally provide an effective solution over each iterative.

2) Requirements Management: RUP provides a way to obtain, organise and document the specified requirements and constraints, and make trade-offs and decisions. This is achieved through scenarios and use cases, which have been proven to provide the best way to capture functional requirements. These also help in tracing the requirements throughout the whole development process.

3) Component-Based Architecture: RUP provides support for component-based software development. Components are sub-systems that help in fulfilling a requirement. Through the use of new and existing components, RUP provides a systematic approach to defining an architecture.

4) Verification of Quality: one of the most important parts of software development is ensuring that the client receives a quality product. That means reviewing the functional requirements as well as the non-functional requirements to make sure that everything is in working state.

5) Model Visual Software: different models are used to communicate different aspects with different stakeholder. Through the usual visual models, we can capture the behaviour and structuring of the components of the required software.

6) Control Changes: because of iterative changes, it is necessary to be able to trace each change in the software. It is also needed to make sure that each change is accepted. Controlling, tracking and monitoring the changes to be able to integrate each iterative change successfully, are all part of this process.

4. Conclusion

Rational Unified Process (RUP) is an incremental software development process which delivers releases over time with improvements per release while following the best practises along the way. The four phases of RUP provide a sequential and iterative approach to the development of a product. The workflow is divided into logical activities that are nine disciplines, and are maintained and performed throughout the four phases of RUP. RUP is not only a system development process but is also a mindset, which can be implemented with any process or project.

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