



A Model to Calculate the Return on Investment After a Software Implantation

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Abstract— Currently the organization has been concerned with the analysis of the impact of IT investments. Economic pressures, combined with years of significant IT spending without demonstrating clear returns, forced companies to improve their financial practices and justify better and more clearly every penny invested way. Thus, this article presents the model to calculate the return on investment after deploying software. This model was generated from two experiments conducted in the laboratory and in the field, applied in southern Brazil, which showed effective action to catch the post-deployment time metrics. Nevertheless, this article may be applicable to all companies wishing to calculate the temporal return from a deployment.

Intex Terms—Return on Investment; Investment; Investment in technology.

I. INTRODUCTION

Investment in Information Technology in Brazil will reach US\$165 billion in 2015. The perspective is that the country will consolidate itself as the fourth largest IT market in the world [1].

Given the rising prominence of IT in organizations, one of the evaluations methods whose growing use to justify economic rationality of IT acquisition is ROI (return on investment) [2], a method that allows to analyze the investment viability.

ROI calculation allows to decide on the values to be investment, either based on the savings or by the income growth achieved [3].

It is important to point out that ROI can be applied to all types of investments. This fact reflects the growing demand for evidence of positive returns on the investments in all kinds of projects. ROI can be used to measure quality, processes, procedures, change management, marketing and others [15].

In the specific software context, there is no difference. As in any other investment, we need to consider its return, that is: does the developed (or bought) software gives returns to the

company? What is the aggregated value the software will bring after its implantation?¹

ROI has become one of the indicators used to answer this question, because companies use its value with the goal to evaluate if the investment in a software presents enough returns to justify its implantation, when you consider all the real gains to the organization.

In the context presented in the previous paragraphs, this paper has the goal to propose a method to calculate the return on software investment. Developing a technique that allows us to measure and plan the profitability of a software may offer to an organization an important value. In order to achieve the proposed goal, the authors of this paper enumerate our two premises and a question to be answered:

Premise 1: Given that software has the goal to speed up several business processes;

Premise 2: Given that the processes are automated by the functionalities that make up software;

Question: Is it possible to propose a model to calculate the return on investment, focusing basically on the time economy after the implantation of a set of functionalities from a given software?

In order to answer the proposed question, this paper was structure into seven sections. Section 2 will present a bibliographic referential on the theory of return on investment. Section 3 presents some works related to this study. The proposal of the model on return on investments after the implantation of a software is presented in section 4. Section 4 presents the methods and procedures. Section 6 presents the execution of experiments to verify the model viability. Finally, Section 7 presents some conclusions and further works.

¹ The authors define implantation as the replacement or installation of a new software.

II. RETURN ON INVESTMENT

ROI has become a popular metric for investment analysis, because it was developed to measure the profit and to guide decisions with the final goal to demonstrate if there is economic viability before investment [4]. ROI is a way for the company to determine the relationship between the applied value into an investment and the financial gains that will be derived from it.

Several companies use methodologies to calculate return on investment. For Rico [5], "... ROI is the amount of money that returns from a given investment". Hence, it can justify your choices in decision making processed, with the goal to avoid financial losses that can be incurred from bad investments. It can also make companies consider their costs and the benefits from investments made in their work processes.

The simplest expression to measure an investment is established by the equation that adopts subtraction of the return achieve from the investment cost and divides it by the investment cost (equation 1).

In literature, there is no absolute conformity on the concepts that appear in the numerator and denominator of the ROI calculus. This paper adopts the one we consider to be the simplest².

It is important to point out that ROI can be used in two different ways, according to financial tactics [6]: (i) Operational Strategy: price policy, production scale, quality, purchase and stock decisions, etc.; (ii) Investment strategy: more productive use of the capital, technology, identification of new investments that are economically attractive. In this context [5] points out that the Operational Strategy intends to relate ROI with efficiency (making things right), while Investment Strategy relates ROI with efficacy (making the right thing). In this prism, [5] clearly shows that the former focuses on the systemic operational level of a specific organization, while the latter focuses on the managerial level.

$$\text{ROI} = \frac{(\text{Achieved Return} - \text{Investment Cost})}{\text{Investment Cost}} \times 100$$

Equation 1 – ROI formula, (Andru & Botchkarev (2011)).

In the case of software, ROI has the goal to identify if the software, after its implantation, achieved the expected goal or if

² The judgement on formula simplicity was performed by the authors. The criterion used was the smallest number of variables in the formula.

it at least covered the invested value – through the automation of business processes from a specific organization.

After presenting formally the concepts that concern ROI theory, we present in the next section the related works.

III. RELATED WORKS

In 2003, IDC³ developed a study on the return on investment in IT. Participated in this study 60 managers of IT areas, a group of professionals that is part of the e-business panel of IDC [2].

The general view of IDC classifies ROI as an extremely important tool to: 1) assure IT investment decisions; 2) align IT projects and business strategies; 3) adequate investments to the organization goals and consequently to achieve or reinforce competitive advantages.

According to IDC, the steps that involve the process of ROI calculation are:

a) information gathering: gather as much information as possible on organizational structure and business process. This gathering process is widely based on theories inherent to an organization requisite gathering;

b) establishment of strategic priorities: in parallel to the information gathering process, it is necessary to establish the process and organizational challenges and the possible alternatives. These challenges are deeply linked to the process improvement and the return the organization might achieve with the investment being considered. Prioritizing this challenge is inherent to the actors belonging to the organization strategic areas;

c) definition of indicators: these are defined based on the information gathered, on the definition of strategic priorities and in the discussion among the several business units directly impacted by the project;

d) cost determination: calculation of all investments and costs (direct and indirect). IDC points out that there are several ways and techniques that may be used to determine these costs;

e) analysis of new opportunities: to put into perspectives the transformation of business processes, focusing on the creation of new products and services – focusing always on improving efficiency and efficacy indicators;

f) measurement of gains: quantify the direct and indirect benefits, both tangible and not tangible (higher productivity, cost

³ IDC is the leader company in the area of market intelligence, consulting services and event organization for the markets of Information Technology and Telecommunications. IDC helps IT professionals, businessmen and investors to make decisions on technology and business strategies based on facts. More than 1000 analysts from IDC provide deep knowledge on opportunities, technological trends and market evolution at a global, regional and local level in more than 110 countries for more than 45 years.

reduction, sales increase, client retention rate increase and others).

The steps described above by the IDC served as a foundation to build the steps of the proposed model, allowing us to direct it towards the capture of information on variables, the definition of the strategic axis and the determination of costs and investments.

In a second paper, McShea [8] defines a new metric of Financial Return on Infrastructure (ROIE). According to McShea, the most important benefit from using ROIE as a performance metric is that it allows for IT management as a contribution to the aggregated value to the global organization financial reality context.

The study from McShea made us visualize the importance of the metrics on IT expenses and the use of personalized formulas to calculate ROI. McShea also points out that the metrics provide to IT executives the ability to communicate in real economic terms on issues that are inherent to the technological infrastructure, a fact that greatly benefits the organization's performance. Customizing the formulas to personalize ROI goes hand in hand with the perspective defined by metrics which formally define the organizational wishes. Customizing these metrics require customizing variables and the formula proposed by McShea opens the possibility of extending this work, with the perspective of customizing the model and the formula for the ROI.

Rico [9] presents the return on investment with an approach that is widely used to measure the value of a process or a product. For the author, ROI can also be used to measure the economic value of the software process improvement approaches. In this sense, Rico [9] explains on ROI as an Improvement of the Software Process presenting metric, practices, models and examples.

The work by David Rico is one of the most cited papers in the area of return on investment and presented in a systematic way the techniques to calculate the metrics related to ROI – focusing mainly on profitability issues after the implantation of the process. Rico's proposal is a strong contribution to the idealization of our proposal.

The proposal defined by Rico [9] does not mention directly the definition of steps to calculate the ROI proposed by IDC, but it is clear the relationship between both proposals. For instance, Rico proposes the problem identification phase while IDC works with the information gathering step.

We also highlight the assumptions inherent to ROI developed by Viana and Vasconcelos [10]. They propose the framework FROISPI (*Framework Return on Investment of Software Process Improvement*), which is made by phases in which the organization uses the set of metrics defined by Rico [9], to

compose the ROI in Software Process Improvement. The phases that make the framework are: a) problem identification; b) detailed diagnostics; c) ROI estimative; d) pilot project implementation; e) termination. This paper presents some results from an experimental research conducted in three organizations on the relevant aspects of Software Process Improvement.

Viana e Vasconcelos [10] had a strong impact on our proposal, given their cycle and the steps for FROISPI, in which each step presets indicators that contribute to the Improvement of the Software Process.

In order to finalize this section it is also important to point out that all cited authors contributed to the conception of the model described here (Figure 1), but none of them defines directly which is the return a software product provides after the implantation (an information summarized by Figure 1). The union of the model with all the contributions coming from the literature may foster the creation of a tool that is interesting to define ROI in the IT field.

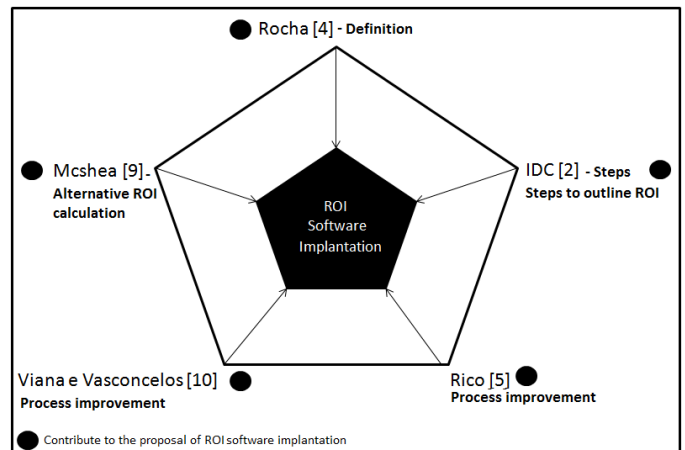


Figure 1 – The relationship between the theoretical framework with the ROI for software implantation.

IV. A MODEL FOR THE RETURN ON INVESTMENT AFTER THE IMPLANTATION OF SOFTWARE

The model to compose the ROI after a software implantation is directly influence by the studies [2], [9] e [10] presented in sections 2 and 3.

The model design was based in the *Business Model Canvas* presented by Osterwalder and Pigneur in their book *Business Model Generation* [11].

The Canvas model has the goal of outlining in a simple and didactical way, how the organization business model works.

Osterwalder and Pigneur [11] classify the Canvas as a visual tool and an easy to understand practice. The tool has been used by organizations of all sizes, given its ease of implementation and of maintenance.

It is important to point out that the simple, visual, practical and didactical way of the Canvas model contributed significantly to the composition of the calculation model that defines the ROI that an organization gets after the implantation of the functionalities of a software.

The Canvas is made of nine blocks (clients, value propositions, channels, client relationship, income sources, key resources, key activities, key partnerships and cost structure) drawn in a piece of paper. Each point corresponds to a key point that a team or an organization must seek for its business to be successful.

Osterwalder and Pigneur [11] proposes that within each block questions be posed so that a global vision of the business can be established. The model allows to discuss and integrate several views about how each company may/should act, the main elements of each block and how they interact.

With the prerogatives established by Canvas, the calculation model that defines the ROI over time that an organization achieves after implanting the functionalities of a software is structures in a sheet. Nevertheless, the number of blocks (divisions) is smaller (four in total).

The blocks present in the model are (see Figure 2):

1. strategic axis;
2. investment;
3. returns achieved;
4. benefits and opportunity.

It is important to point out that the blocks defined by the canvases are used to foster new ideas. The canvas, in the context of this work, served only as an inspiration to visually establish the information that will be achieved with the application of the ROI for a software implantation. It should e noticed that no block defined in Canvas has any relation to the blocks used in the artifact used to calculate the ROI.

A detailed description of the specificities that make the model is presented in the next subsections.

A. Strategic Axis – Choose Return Concentration Axis

The strategic axis or direction has the goal of making the strategic choices responsible for the organization desired results. Therefore, this axis, must define all the roads that must be travelled for the business to succeed, preferentially combining them. When defining the axis, the priorities within the organizational environment are established. The predefined axis presented in the model are: management and intellectual:

- Management axis: its goal is to identify the contribution level that the software implantation offers to the organization results, such as higher productivity for the performance of he business process, reducing time and consequently the costs within the organizational environment.
- Intellectual Axis: points to all the knowledge, information, intellectual property and experience offered during the software implantation process.

It is important to point out that the Intellectual Axis will no be studied in this paper, because the authors of this paper do not have enough subsidies, given the number of subjective variables that influence the issues concerning knowledge management.

B. Investment: Quantifying the Invested Capital.

The goal for this block is to quantify all the capital that was invested in the software implantation, that is, all resource application made with the goal of receiving any future return.

C. Achieved Return: Quantifying Achieved Return

This block is characterized by quantifying all the return achieve by the implantation of the software, that is, all the amount of money, time or effort gained or lost during the implantation.

It is important to point out again that the foal of this work is to create a calculation mode for the ROI within a time frame that an organization achieves after the implantation of the functionalities of a software. For our proposal, it is necessary first to calcute the achieved return. In order to calculate this return we created an algorithm that can be seen in Table 1.

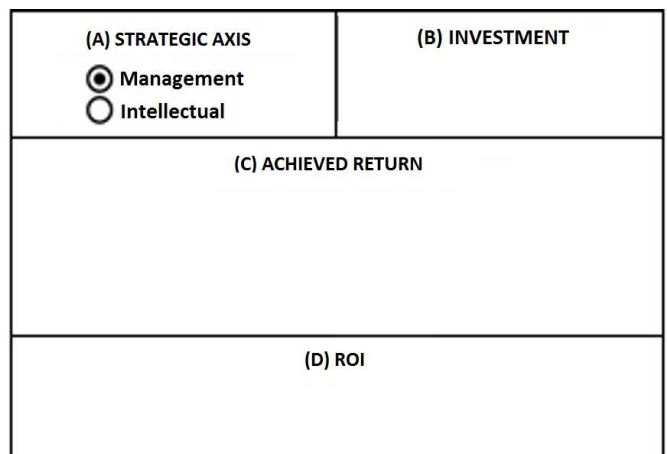


Figure 2. Model to estimate the Return on Investment after the software implantation.

Analyzing Table 1 it is possible to see that the vector RF stores the financial return achieved within a time frame for each functionality of the specific implanted software. To calculate the total return we just need to use equation 2.

$$RF_t = \sum_N^{I=1} RF_i$$

Equation 2 – Formula for the Total Financial Return – i represents the index for the vector of implanted functionalities.

D. Calculate ROI.

The last block pointed in the model defines how to calculate the ROI.

In order to calculate this value, we need to use the formula presented in Equation 1. The variable Return is defined by RF_i , calculated with Equation 2 and the variable cost is characterized by the investment, as defined in section 4.2.

The numerator of Equation 1 uses the subtraction of the achieved return (RF_i generated with Equation 2) with the investment cost, determined in block B of Figure 2 (INVESTMENT). The denominator is determined by quadrant B of Figure 2.

Finally, it is important to point out that the formula for the ROI presents the values in Reais of every invested cent. In case the ROI has negative value, the investment in the implanted functionalities is not supposed to return value.

V. METHODS AND PROCEDURES

This work adopts the controlled experiment as research method. It is important to point out that this method performs the hypothesis test through a controlled experiments designed in order to create the necessary data. This method can be performed both in the lab or in the field [13].

- a) Hypothesis definition.
- b) Experimental protocol conception. Set of environmental rules used to execute the experiment.
- c) Execution of the experiment (described in a specific section because of its importance).
- d) Result analysis (described in a specific section because of its importance).

a) Hypothesis definition: The hypothesis formulation is the formal definition which we intend to qualify as true or false in the experiment. The hypotheses are possible answers to a

Start:

Variables: $f, T_{ssw}, T_{csw}, \Delta T, P, RF[n], i, F, CH$

Variable description

f : represents a selected functionality

T_{ssw} : time the organization takes to perform the functionality without the software.

T_{csw} : time the organization takes to perform the functionality with the software.

ΔT : Stores the time interval $T_{ssw} - T_{csw}$.

Note: It is important to standardize the time unit.

P : How many times the functionality will be performed within a month, semester, year, biennial, etc.

RF : vector that stores the financial returns achieved with the functionality.

n : number of functionalities the software has.

i : index of the vector RF

F : total number of functionalities the software has,

CH : Cost to execute a specific business process. This cost may be measured in hours, minutes or seconds.

1. **Read** (F).

2. $i = 0$.

3. **While** $i < F$ **do**

4. **Begin**

a. **Select** a functionality i .

b. **Store** it in f .

c. **Standardize** the time unit

d. **Monitor** the business process execution time without using the software or **Monitor** the execution time of a business process that uses the functionality f that will be replaced by the software in the organization. Do not forget to use the standard time unit.

e. **Store** the calculated time into T_{ssw}_f .

f. **Monitor** the business process execution time without using the implanted software functionality f

g. **Store** the calculated time into T_{csw}_f .

h. **Calculate** the time difference using the equation

$$\Delta T_f = T_{ssw}_f - T_{csw}_f$$

i. **Measure** the number of times the functionality f will be used in a specific time frame.

j. **Store** the amount of time into P .

k. **Multiply** ΔT_f by P_f , using the equation below. Notice that executing the functionality f several times might increase the time economy.

$$\Delta T_{pf} = \Delta T_f * P_f$$

l. **Store** the cost to execute a specific business process into CH . Respect the standard time unit.

$$m. RF[i] = \Delta T_{pf} * CH_f$$

n. $i = i + 1$

5. **end.**

end.

Table 1. Algorithm to compose the achieved return with the implantation of a specific software.

b) specific research question. In Section 1 we presented the premisses and the research question defined in this work

- Premise 1: Given that software has the goal to speed up several business processes;

- Premise 2: Given that the processes are automated by the functionalities that make up software;
- Question: Is it possible to propose a model to calculate the return on investment, focusing basically on the time economy after the implantation of a set of functionalities from a given software?

There are two possible answers to this question – in this case, we have two propositions: Yes, it is possible to propose a model to calculate the return on investment focusing mainly on the time economy and No, it is not possible to propose such a model. .

b) Experimental Protocol: In order to conceive the experimental protocol it is necessary to:

- Define the experimental environment. In this step the researchers must answer the following question: Will the experiment be performed in the lab or in the field?
- Configure the environment: Performing this steps requires:
 1. Definition of the entities involved in the experiment (environment, people, tools, software or co components and artifacts) – See tables 2 and 4;
 2. Characterization of the entities (age, degrees, work place, sex, etc);
 3. Organization of the environment in which the experiment will be performed.
 4. Definition of the sample: amount of persons, for instance.
 5. Definition of how to gather the information (questionnaire, direct observation of the entities).
 6. Validation of the information: the protocol and the gathered information are consistent and prone to generalization?

As pointed out before, the authors of this paper developed two experiments in the lab and one in the field to verify the efficacy of the proposed model. The experimental protocols can be seen at tables 2 and 4.

In order to perform the lab experiments, the authors sought to create a business process environment where a calculator, chronometer and tokens were necessary.

When performing the experiment in the field, the authors presented the Multilevel Marketing organization, software consumer that used spreadsheet software for many years. In spite of being reasonably easy to create, spreadsheets define a series of limitations that make it practically mandatory to migrate to software systems as the organization grows. Hence, Organization X implanted a specific management software to the area of multilevel marketing.

After the protocol definition, the authors present in the next section information on the execution of the experiment.

VI. EXECUTION OF THE EXPERIMENTS ON THE MODEL

In order to perform the **lab experiment** in a class at the Graduate Program on Informatics (PPGI) at the Federal Technological University of Paraná - campus Cornélio Procópio – CP, the class was divided into 4 teams, each one with at least two members and at most four members.

After dividing the class into teams, we distributed the materials. During the materials, a calculator and the pertinent tokens were delivered to each team, from 1 to 3. The list with all clients and a calculator were given to team 4. All groups received a chronometer, which they were asked to reset.

Teams 1, 2 and 3 selected a member to manipulate the tokens and a member to control the time. Team 4 selected a member to handle the client list and a member to control the time.

The teams performed the following tasks in parallel:

1. Team 1 – the member manipulated the tokens selected indebted customers. After selecting, He summed the debt value for each selected customer. In the end, the group presented the total value of the customers' debt and the time need to perform the calculation.
2. Team 2 – the member manipulated the tokens and ordered them alphabetically. The execution of the process was timed. In the end, the group presented the customers' files ordered and the time need to perform this task.
3. Team 3 – the member inserted 30 customers into the files and the execution of this step was timed. In the end the group presented the new customers' files and the time need to perform this task.
4. Team 4 – the member responsible for the customers' list summed the debt value and this step was timed. In the end, the group presented the total value of the customers' debt and the time need to perform the calculation.

The execution time for each functionality was written on the board.

After performing the tasks, the functionalities implemented in the software were presented to the teams.

The theory of the calculation on the return on investment and the model proposed in this work were presented to the members of the experiment.

Afterwards, the information generated by the experiment, that is, the time need to perform the processes described in items 1, 2, 3 and 4 of this section, the algorithm in Table 1 was executed and the information generated by the algorithm were inserted into the spreadsheet used to calculate the ROI. The established criteria were:

- a) Time unit: seconds
- b) Investment value: R\$ 100,00
- c) Execution times established during the experiment were inserted in the column *T_{sswf}*.
- d) For the variable *T_{cswf}* we inserted the execution times of the software functionalities. When there were no tools to calculate the processing time, a time of 1s was arbitrarily inserted at the *T_{cswf}*.

Entities Students at the graduate program enrolled in the Software Engineering subject.
Characterization of the entities The entities will be characterized with the capture of the following information: name, sex, age, education, profession, time of experience in the Field. These fields are stored in a specific form available at the Internet address http://goo.gl/forms/rixCddN2yu which was filled before performing the experiment.
Configuration of the environment for the lab experiment Computer lab with four computers 2 Calculators. 4 Chronometers – it is possible to use the chronometer software available at the students cell phones. 130 tokens. Each token contains the following fields: name, date of birth, debt value and situation (OK when there is no debt) The tokens were divided into three groups: 50 tokens ordered alphabetically for group1, 50 tokens with no specific ordering for group 2 and 30 tokens with no filled values for group 3. A list with all the customers stored in the tokens with all the same fields. A computer with MS - ACCESS installed. A DBMS developed MS – ACCESS whose structure is: <ul style="list-style-type: none"> o Table with all the fields described above, duly filled; o Table with all the fields described above and with no records; o SQL query to list all indebted customers (see Table 3); o Customer enrollment form; o Report that presents the total debt for all customers;⁴. o Spreadsheet to calculate the return on investment in software projects.⁵.
Sample definition The experiment was performed in a class of the Graduate Program in Informatics – PPGI at the Federal Technical University of Paraná - campus Cornélio Procópio – CP (12 students).
Protocol Validation The information defined in the protocol were analyzed by the authors, 3 professors of Software Engineering, one professor from the area of experimentation in software engineering and one professor in the area of management, all of the them from the faculty of the Federal Technical University of Paraná – campus Cornélio Próprio. Protocol validation was positive to the following question: does the experiment protocol offer the replication conditions for other researchers?

Table 2. Experimental protocol used in the lab

⁴ It is possible to find a copy of the DBMS presented in this item at the link: <https://www.dropbox.com/s/dbeg3x1tmhu2dm2/clientes.accdb?dl=0>

⁵ This spreadsheet can be found at the link <https://www.dropbox.com/s/yvaeaawsbn427o8/C%C3%A1lculo%20RoiSw.xlsx?dl=0>

```
SELECT clientes.nome, clientes.[valor devido], clientes.situacao FROM clientes WHERE (((clientes.situacao)=Yes)) ORDER BY clientes.nome;
```

Table 3. SQL used in the lab experiment.

Entities Na organization from the Multilevel Marketing sector that wishes to install a software.
Characterization of the entities The entity was characterized with the capture of the following information: name, address, number of employees, years in the market. This information was gathered in person by the authors before conducting the experiment. Since there is a single entity, there is no need for a Google Docs form to gather its information..
Configuration of the environment for the experiment performed in the field 1 Computer with MS – Excel and a Management Software Clients report Sales Report.
Sample definition The experiment was performed in a Multilevel Marketing organization within the presence of three of its employees.
Protocol Validation The information defined in the protocol were analyzed by the authors, 3 professors of Software Engineering, one professor from the area of experimentation in software engineering and one professor in the area of management, all of the them from the faculty of the Federal Technical University of Paraná – campus Cornélio Próprio. Protocol validation was positive to the following question: does the experiment protocol offer the replication conditions for other researchers?

Table 4. Experimental protocol used in the organization

The Alpha School hired the functionality “Online Grades” for R\$1500,00. Previously, the grades were printed and given to each student by the responsible secretary. Time estimated for the process was 480 minutes. Hiring the functionality made the process last about 1 minute. The grades are made available 12 times a year and the value for the hour of the secretary is R\$10,00. What is the return in R\$ of this investment?

Table 5. Problem situation to see if the students understood the algorithm used to calculate the ROI

Informations presented in the items a through d, as well as the algorithm, were inserted in front of the students, in Figure 3.

In order to verify whether the students understood how to calculate the ROI, a model problem was presented (Table 5). Afterwards, the students were asked to calculate the ROI for the problem situation.

The experiment presents results on the return on investment as saved time after a software implantation. It is important to point out that the data generated in the lab experiment were consolidated in Figure 2. Notice that they follow the prerogatives defined by the model in section 4.

<p>(A) STRATEGIC AXIS Management</p>	<p>(B) INVESTMENT R\$ 100,00</p>																																								
<p>(C) ACHIEVED RETURN</p>																																									
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Figure 3. ROI of the benefits generated by the software implantation.

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Figure 4. ROI of the benefits generated by the software implantation.

Figure 3 presents the return on investment for the experiment performed in the lab for the students of our graduate program. Notice that in the experiment the return on investment for the functionalities that were performed twelve times after the software implantation was R1,63 for each real investment (for a total investment of R\$100).

Finally, it is important to point out that in the lab the values are fictitious, that is, we defined them *ad hoc*. This fact is not true in the field experiment. The Field experiment was performed in an organization on the Field of Multilevel Marketing, that for confidentiality reasons will be called organization X⁶. This is a small size organization that is located in the south of Brazil.

Multilevel Marketing is a distribution method that takes products and services directly to the consumer using independent distributors [14].

The ROI model was applied on the Multilevel Marketing management software installed at organization X. The software used has the goal of allowing the user to have full control on its sales to its distributor networks. Previously, organization X used MS-Excel spreadsheets to perform its controls.

In order to perform this experiment, three employees from the organization were interviewed and the following software functionalities were analyzed: client management, sales management and bonus management.

Notice that in Figure 4, Just as the previous experiment, follows all the prerogatives defined for the model in Section 4.

Figure 4 presents the ROI of the experiment performed in organization X. In this case, Figure 4 presents the return in time with the implantation of the new software and its functionalities, which were executed 48 times after the software implantation. In this case the ROI was R\$ 0,59 for each invested real (for an investment of R\$2.500).

The negative ROI represents that for those functionalities alone the investment of R\$2.500,00 did not bring any return for the organization, a fact that is consolidated if the ROI organization, a fact that is consolidated if the ROI is calculated for all functionalities by the algorithm presented in Table 1.

VII. RESULTS AND CONCLUSIONS

The results found applying this model and taking into consideration the initial goal set (propose a model to calculate the return on software investment) may be seen by the following qualitative results:

1) The model contributes significantly to a quick understanding of the ROI in a software implantation, given

⁶ The authors do not have formal authorization to divulge the organization name in this paper.

that just like the Canvas, the model is a visual artifact, easy to understand, implement and upkeep.

- 2) The model tends to make it easier to bring about the returns on software implantation, besides making it easier to see new opportunities for organizations through the study of its four fundamental elements;
- 3) The model makes it easier to discuss opinions, fostering a common understanding among the stakeholders and generating strong indicators for the improvement of operational efficiency given the software implantation. It should be remembered that the model was applied only within the management axis.
- 4) The model is a useful strategic artifact, easy and practical to use, given that it presents its usage logic.

It is interesting to point out that none of the four elements are considered as new by businessmen, but the model representation of the return on investment in a holistic way and in a single sheet of paper is something new for most entrepreneurs (a fact that was realized when we performed the field experiment).

Besides these results, we found the following limitations in the model:

1. The proposed model focus basically on the ROI on the automation of a business process using a software;
2. The data used in the model to calculate the ROI focus only in the time aspect;
3. This paper did not deal with the intellectual axis of the model

This paper presented a model to calculate the return on a software investment. As illustrated in section 4, the ROI calculation is characterized as an efficient way for an organization to determine the relationship between an invested value and the financial gains achieved with this investment. Given that the ROI calculation provides a foundation on which to base decisions, it helps to plan commercial goals based on more reachable results, to evaluate development opportunities and to measure market responses.

Therefore, the construction of the ROI is a way for the organization to structure and understand the investment on the purchased software. Using the model for this goal makes the process easier and allows a simpler evaluation of different areas and their interactions.

The construction process for the ROI is the important point for an organization. Hence, each organization can personalize the method, adapting it to its reality.

Two experiments were presented to demonstrate the benefits of the proposal. Nevertheless, it is still necessary to validate it with more experiments. This means that no generalizations on the model can be made at the model.

When performing the experiments, the participants showed

motivation and curiosity, for the benefits of the model were rapidly understood.

As future work we intend to validate the model with more experiments and deal with the intellectual axis, creating metrics to measure knowledge, intellectual property and experience offered by a software implantation.

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