Detecting, Evaluating and Proposing a Set of Methods to Improve Quality in Information Technology Services

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***Abstract* - The economic growth of several countries has been positively impacted by the service sector. In particular, the number of companies providing Information Technology (IT) services has expanded. However, it is remarkable the lack of concern to improve customer satisfaction within these companies. Here we present a case study performed in a software development company, aiming to detect and evaluate the customer satisfaction level using Net Promote Score (NPS) and propose an improvement plan. The NPS results revealed: 1) a high percentage (82%) of Passive customers and 2) customer service for technical support and functionality level of the product offered as the most valued aspects. Within those, the excess stock of demands, misuse of resources and excessive processing were identified as major defects. Improvement suggestions were mainly based on ITIL, PMBOK and Agile Methodology, representing potential solutions to promote services provided by software development companies.**

***Index Terms* – IT Service Management, Customer Satisfaction, Agile Methodology, SWOT Analysis, Net Promoter Score, Project Management.**

I. Introduction

THE services sector has been contributing positively to the economic growth of Latin America. Countries such as Costa Rica and Panama moved from a traditional agricultural and textile context to an economy directed towards the service sector, with particular potential in the area of technology [1] - [2]. In 2017, the distribution of workers in Costa Rica was 11.99% in the agriculture sector, 18.55% in the industry and 69.46% in services [3]. In Brazil, the IT market has also stood out in terms of the expansion of its investments, representing 36.5% of the Latin American IT market share in 2016 [4]. Despite this fact, IT services processes are still considered high cost due to their complexity, resulting in a large amount of work in progress [5]. Studies found that the lack of success in IT projects occur regularly [6] - [7]. Problems such as lack of planning, lack of management, unrealistic expectations [6], absent strategic management, excessive prerequisites and constant scope changes [8] are pointed out as some of the main causes of IT project failures. However, the improvement of IT services is essential to guarantee the perception of value for clients, as well as the quality of life of active workers in the sector. In this context, the need for improvement is evident, although investments by companies that supply software solutions are still limited as they are seen as costs [9].

In addition, recent studies present the viability and/or application of ITIL methodology for IT service management and others put in practice the concepts of agile methodology focused on the software development process and project management for software implementation. However, it is noticeable that the concern of software development companies with the improvement of its processes in an integrated way and consequent reduction of costs and wastes is recent.

This article presents a case study in a software development microenterprise, in which an improvement proposal was developed, focusing mainly on customer satisfaction.

II. COMPANY BACKGROUND

ALPHA is a Brazilian software development microenterprise founded in 2001 based in Joinville (Santa Catarina State). The company started as a software factory and specialised as a services provider for other corporative software companies. In 2004, ALPHA made a big investment and created its own ERP (Enterprise Resource Planning) software, looking to simplify integration and allow integrity within the processes and management information from its clients business. Today, the company has a portfolio containing software solutions for distributors, wholesalers, service providers, manufacturing industries, and other business segments.

Until 2010, ALPHA's main activity was the provision of services to other companies, having a team with approximately 30 professionals. As a result of the growth of its own ERP software and, together with the acquisition of its client company and, consequently, a service policy change, ALPHA ended up putting all of its focus on the ERP software. Also, due to the exclusive focus on its own product and, especially, the economic crisis that devastated the country, the company counts on a reduced number of employees, having only 5 professionals working on its behalf.

The employees are distributed on the following departments: Sales, Financial and Administrative, Product, Development, Support and Implementation. In general, the employees are part of more than one department simultaneously, being structured as follows: the Sales

department is composed by the Executive Director only; the Product department counts on two System Analysts and the Executive Director; the Development department, therefore, has the same two System Analysts exclusively; the Support department is composed by the same two System Analysts (acting as a second stage support only) and a Support Analyst; the Implementation department is formed only by the Support Analyst itself; and finally, the Financial and Administrative department has a dedicated Administrative Analyst working with the Executive Director.

III. MATERIAL AND METHODS

The research method used was the qualitative research, so that the methodology used was the case study. The purpose of a case study is to critically and orderly describe an experience, or to evaluate it in depth to make decisions related to it or to suggest innovative actions [10]. It is possible to correlate the case study phases proposed by [11] with the phases of the present study. This correlation can be seen on Figure 1.

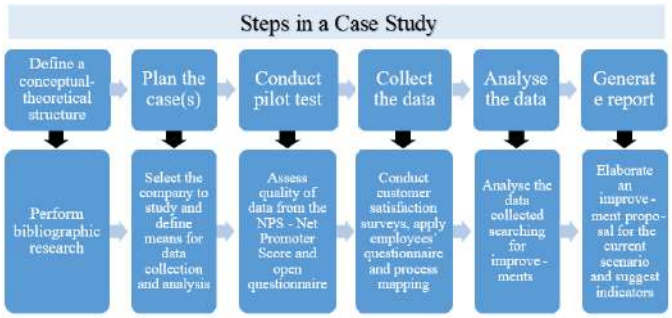

Fig. 1. Correlation of the steps of a case study with the steps of the present study

The data collection phase was divided to come up with two outputs: 1) customer satisfaction level emphasizing value aspects under the customers perspective, and 2) positive and negative features related to the valuable processes pointed out by the customers.

In order to obtain the **first output**, a customer survey was conducted using the Net Promoter Score (NPS) methodology, in which, through simple questions, the company can identify the satisfaction and loyalty level from its customers, classifying them in Detractors, Promoters and Passive clients. The NPS survey clarifies which are the key-aspects that are noticed by clients so they can be satisfied and loyal to the company [12]. The questionnaire was sent by email to all contacts from 40 client companies, totalizing 102 people of all hierarchical levels. The email was custom-written to each individual so they felt valuable and understood how important their opinion was to the company. As a result, the questionnaire was answered by 24 people, where non-answering individuals were considered as Passive, assuming that they did not answer the questionnaire by feeling indifferent regarding the service provided [12]. The Figure 2 presents the questionnaire sent to the clients' contacts.

Moreover, in order to obtain the **second output**, the process and subprocess mapping was performed, drawing its general flow putting in evidence the correlation between them. Yet, another questionnaire based on the first output was sent to the company's employees, so they could express their opinions and give improvement suggestions in the current situation of the processes in need. It was modeled as an online qualitative questionnaire with open questions, having the advantage of exploring every possible answer related to an item [13], and had 100% adherence, which means that all 5 employees answered the questionnaire. The questionnaire can be seen on Table 1.

1- How likely would you recommend us to a friend or collegue? ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10
2- What is the most important reason for your score? ☐ Customer Services for Technical Support ☐ Customer Services for Sales and Billing ☐ Quality Level of the Product ☐ Functionality Level of the Product ☐ Cost x Benefit Relation ☐ Flexibility for Customised Features ☐ Brand Name ☐ Other
3- How can we improve to get a score 10?

Fig. 2 Customer satisfaction questionnaire

1- What are the biggest difficulties faced by the employees in the customer service process (support)? How does this affect the customer?
2- List things that can be improved in the customer service process (support). Do you have any suggestions for improvement?
3- What are the biggest difficulties faced by the employees in the development process? How does this affect the customer?
4- List things that can be improved in the development process. Do you have any suggestions for improvement?

Table 1. Employees questionnaire

Based on **both outputs**, it was possible to identify failed processes and activities that negatively impact the company's general process workflow, observing constantly the value observed by the client. Subsequently, improvement suggestions were made for each problem raised, being followed by an action plan for each improvement. In addition, indicators were proposed to assist in monitoring the company. The indicators allow the company to track and follow the progress of your processes, collecting important information that aid in decision making, bringing effectiveness and efficiency to the processes and, consequently, positively reflecting the company's results [14].

IV. RESULTS

A. Output 1: Data Collection – Customer Satisfaction

Currently, several successful companies aim to improve their service delivery through customer satisfaction surveys [15]. By doing this, companies are able to identify important aspects to improve their processes and products,

managing the lack of accuracy with more assertiveness and narrowing the relationship with their customers [16]. Figure 3 presents the result of the first question of the questionnaire applied to APHA's clients:

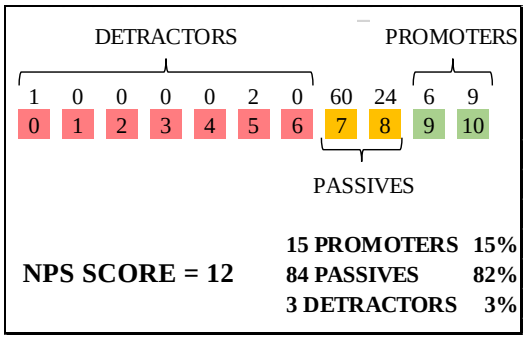

Fig. 3. Output 1 – Customer satisfaction level according to NPS

It is possible to verify that the percentage of Promoters clients is greater than the percentage related to Detractors, resulting in a positive score of 12 (according to equation (1) proposed by NPS model), suiting the case company in the Zone of Improvement, which serves as an alert for the company to enhance its processes until reaching the Zone of Quality [12]. In spite of the positive NPS score, it is necessary to emphasize the high percentage of Passive clients, whom are not unsatisfied enough to make a complaint but are not loyal enough to recommend the company's service, a fact that could compromise its loyalty level for services in the future.

The chart presented in Figure 4 shows the result for the second question of the questionnaire. This question is highly important by evidencing the company's aspects considered the most important for the clients. The two highest voted aspects are: Customer Services for Technical Support (27%) and Functionality Level of the Product (20%). This indicates that customers value the quality of their questions response and have high expectations for the resolution of problems and incidents that are reported through the technical support department. In regards to the functionality level of the product, the survey indicates that clients see value related to improvements and evolutions of the ERP product, in a way that the product remains functional and adds value to the customer's business. This aspect is directly related to the development process of the company, because the functionality level depends on the development team availability to repair software bugs and enhance the product constantly. In addition, it is also related to the customised routines that are offered to the client to pursue an even higher functionality level and deal with its specific business scenarios.

Lastly, the third question in the questionnaire was optional and open, giving the customers the freedom to express their opinions about what actions the company could take to be 100% recommended. 15 answers were obtained for this question, and it is possible to verify the key aspects of the responses in the Appendix. A great value is attached to the functionality and utility of the offered software, as well as the level of customer service, being consistent with the answers given in the previous question. Thus, the present study will focus on the following processes: Support and Development.

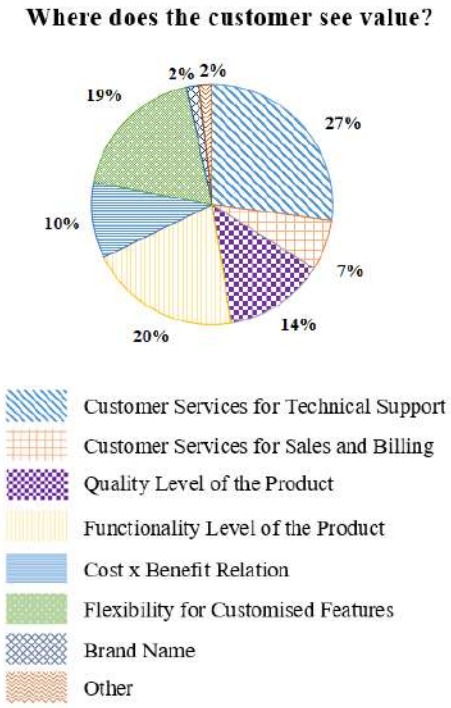

Fig. 4. Second question from the customer satisfaction questionnaire

B. Output 2: Data Collection – Positive and Negative Processes' Aspects

All company processes run simultaneously and are interrelated. The software development process carries out any changes in the product, both for corrective – such as bug fixes, law changes - and evolution purposes – such as new routines and new modules. In addition, Special Projects are considered in this process, that is, customised developments for a client. On the other hand, the customer technical support process is the process given to the technical assistance provided to the company's client.

A survey was executed with the company's employees in order to identify improvement points in these two specific processes. In addition to contributing to the company by exposing their opinions, employees need to be engaged so the improvement actions can be implemented unsuccessfully. Communication within the company is a highly important factor that reflects directly in the organisational climate, influencing motivation, human performance and job satisfaction [17].

Based on the full report of the survey conducted with the collaborators, it was notable the lack of detail from the first level Support Analyst regarding the understanding of the

customer's problem, making the work of the second level support (when involved) difficult. In addition, it was mentioned an obstacle to identifying the main problems of the system that constantly generate support to be addressed to the development team for correction. Regarding the software development process, it was noticed that the biggest problem faced by time is a constant redefinition of priorities and interruption of work due to the actuation of technical support.

Based on the process mapping and the result of the collaborators survey, a SWOT analysis was elaborated for each process, showing weaknesses that should be eliminated, the tasks that should be analysed, the opportunities that should be highlighted and strengths that should be recognised . When an organization's forces are aligned with critical success factors to correspond to the market opportunities, a company tends to gain long-term competitiveness [18].

Figures 5 and 6 present the SWOT analysis.

	Positive Factors	Negative Factors
Internal Environment	**STRENGTHS** 1) High performance team 2) Independent team	**WEAKNESSES** 1) Lack of planning 2) Lack of control when scheduling updates in the software 3) Excessive demands
External Environment	**OPPORTUNITIES** 1) Noticeable value given to unbureaucratic service	**THREATS** 1) Inexistent priority management 2) Resistence to change features in the software that may lead the customer to the competitor

Fig. 5. Output 2 – SWOT analysis of the Development process

	Positive Factors	Negative Factors
Internal Environment	**STRENGTHS** 1) Fast response to simple questions 2) High availability from the support analyst 3) Cordiality, agility, patience, education, sympathy and dexterity in the service	**WEAKNESSES** 1) Calls being directed to the second level support constantly 2) Missing information when redirecting incidents to the second level support 3) Lack of procedure for releases 4) Lack of incident recording raised by the customers
External Environment	**OPPORTUNITIES** 1) Noticeable value given to unbureaucratic service 2) Customer fidelity	**THREATS** 1) Customer dissatisfaction due to the lack of incidents prioritisation 2) Recurrent errors and bugs in the software that are not fixed and may lead the customer to the competitor

Fig. 6. Output 2 – SWOT analysis of the Customer Support process

V. DISCUSSION

The improvement proposal was elaborated based on the weaknesses and threats exhibited in the SWOT analysis for both client support and development process. The goal to be achieved with the current proposal is to utilise the strengths to develop the weaknesses, be aware of the threats and identify new opportunities for the company.

Firstly, it is suggested to structure the workflow in a simple and standard approach, seeking the waste reduction – as well as excess demand stock, process defects, inefficient utilization of workforce and over processing caused by process redundancies – and the defects that may be perceived by the customers.

The lack of screening and registration for prioritization of incidents, and the lack of existing procedures to update the system when it has a fix constantly reflects in the displeasure of customers, as customers value how important the company judge their problems. The main suggestion for the customer support process is to adopt good incident management practices and problems proposed by ITIL v3 [19] As the company replies to its customers enquiries by phone, chat or email, that is, the customer does not register an issue in the internal system by himself, all incidents and calls must be registered internally by the Support Analyst in the existing system. In fact, the registration of the calls and issues will not be led by the customers, since it has been identified that the debureaucratisation of the customer service process is pleasing them. In this way, as soon as a customer reports a relevant incident or doubt, the Support Analyst should register a call on the internal system and classify it by its type (incident, question or service request). Through this registration, the company can analyse the data and conduct training proactively and prioritise with assertiveness the recurrent errors to be corrected in the ERP product.

In parallel to registering the issues, the Support Analyst should carry out the prioritisation of the calls when the service demands analysis and is not terminated in the first contact with the customer.

Prioritisation is important to improve the quality and time of having a response to the incident [20]. The prioritisation of calls will be made according to the urgency and impact of the incident reported by the client, being categorised in low, medium, high or critical priority [20]. Table 2 presents the composition of the priority.

		IMPACT		
		High	**Medium**	**Low**
URGENCY	**High**	Critical	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Low

Table 2. Classification of incident priority

The determination of the level of urgency and impact of demand is established by the first level Support Analyst himself after the contextualization and primary analysis of the incident. The impact escalation is determined according to the consequence caused in the client's operation, which may, for example, prevent the client from performing a fundamental activity in its process or only make him circumvent a redundant routine within the software. The urgency varies according to the palliative solutions that are available for the reestablishment of the services, where high urgency should be assigned for incidents that do not have contouring solutions, medium urgency in the incidents that do have contouring solution but present some risk and low urgency in incidents

that can be easily circumvented by a workaround. The priority should be registered within the incident tracking system.

Also, in addition to the prioritisation of calls, a service rule based on an internal SLA should be implemented, i.e. the response to the incident should respect a defined maximum time [20]. This will make the customer's expectations align with the company's ability to service and resolve the problem, enhancing the business relationship between the service provider and the customer [21]. Reference [22] states that SLAs are becoming primarily a tool for managing customer expectation as they create a common perception of services, priorities and responsibilities, and determine the IT specifications required to meet business purposes.

In order to balance the workload between the collaborators, it is suggested that work scales are determined for System Analysts so that the two analysts work in a planned way between the demands of support (second level) and development. The goal is for System Analysts to take turns over a period of the week so that for a specific period an analyst is available to answer calls that are routed to the second level (which does not prevent him from executing development tasks in the absence of calls). In the other period, the analyst will know that the focus will be solely on the development demands and will not be interrupted by support calls, being more productive overall.

The establishment of work scales will eliminate the feeling of overload the System Analysts have and the unexpected disruption of development activities by the support service calls. Also, when working with scales, the company will be able to observe if the deadlines and expectations of the clients are in agreement with the internal structure and capacity of the company, clarifying the need to hire more people or not.

As a complement, it is also suggested standardisation of the form of recording incidents and tasks reported by the customers, in which the Support Analyst should record in full and in detail the incident information, following the pattern presented in the Appendix. According to [23], if a second level analyst received a call containing adequate information about the affected service and the components related to the incident, the incident can be solved more quickly. In addition, in order to avoid the constant actuation of the second level of support, a training program for the first level of support is suggested, increasing the analysts' problem-solving capacities and knowledge around the ERP software.

Another problem identified is the lack of procedures to update the system for the clients that have pending updates to fix some issues with the software. As verified, the update is performed according to the analysts' experience in knowing the customer and assuming what is urgent and what is not. For this scenario, it is suggested the establishment of update windows, which means the definition of specific period during the months that will be solely dedicated to this activity. On the specified date/time, all customers who have pending updates should have their systems upgraded by the Support Analyst. Thus, at the moment the customer reports an incident that will require some sort of development in the product, the analyst can pass the estimated date that the solution will be implemented in their environment. Choosing the date for the updates should match with the period of the month with least customer support.

Regarding the negative aspects related to the development process, it is noted that the lack of priority management and the lack of task planning means that the analysts and the company itself do not have visibility of what is being done and what is in the backlog, i.e. pending development. The first suggestion is the implementation of Kanban as a support tool for managing the demands and their priorities. Similar to the suggestion made for the customer support process, development demands will need to be categorised according to their type and priority. The cards should follow a colour code for priorities (low priority (blue), medium priority (green), high priority (yellow) and critical priority (red)) and also contain any relevant observations.

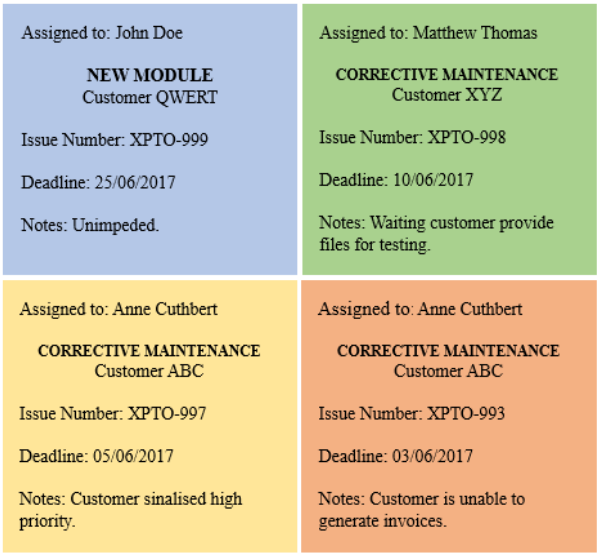

Fig. 7. Example of Kanban cards

In addition, within the classification of development tasks, it is necessary to register in each demand the deadline agreed with the customer, being easy to identify which tasks will be delayed and which tasks are already behind the deadline, managing the WIP [24]. It is important to mention that in the current scenario of the company it is not possible to control the lead time of each development task, since there are no records of the hours dedicated for each task. Therefore, it is also suggested that the company requires the logging of hours from the System Analysts when the process gets more mature, as this will facilitate the identification of the company's real capacity to accept new projects. Figure 7 shows four examples of Kanban cards with their respective detailing.

Once all development tasks are mapped and categorised, they should be placed on a panel (Figure 8) separated by their status, which may be Pending, In Development, Completed or Impeded, where:

- Pending: the task is assigned to an analyst but has not been started yet.
- In Development: the task is being dealt with by an analyst.
- Completed: the task has been completed.
- Impeded: there is some restriction preventing the progress of the task.

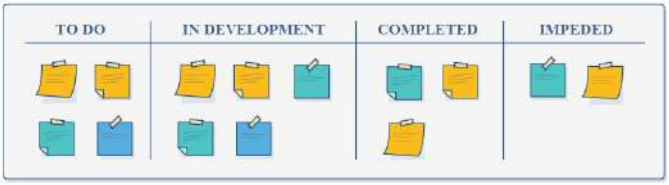

Fig. 8. Kanban panel applied to the software development process

Utilising the Kanban model in this context provides a gradual evolution from the traditional software development process to the agile development model [24]. Also, it is suggested to hold daily meetings to plan the tasks that will be executed throughout the day and exchange experiences with the other team members. The meeting should take place in the morning and should be quick, being essential to maintain a balanced rhythm of work [25].

According to what was observed, there is no conduction of project management for new projects accepted by the company, impacting directly the customer satisfaction due to the misalignment of expectations. For this problem, it is suggested that a dedicated professional is hired to perform the management of all development projects that are conducted in parallel. This way, System Analysts could dedicate themselves exclusively to the development task itself, and the focal point to the customer would be the Project Manager (PM). The requirements gathering process and designing of the project scope would be more assertive and would facilitate the process of managing changes requested by the customer. Also, the PM would be responsible for reporting constantly to the client with the status of the project and would manage the capacity and availability of the development resources [26].

It is seen that the customer support and development processes need to be close to each other and interact continuously in order to contribute to the overall optimum of the company. The summarised improvement proposal elaborated for the company of this case study with the respective actions can be seen in Table 4.

Controlling indicators are essential to measure and follow process performance. For [27], "in the own concept of measuring performance is inserted the enhancement idea", because measuring performance by itself is not justifiable when there's no intention to improve it. Based on the enhancement proposal shown and, considering the execution of the plan, some indicators were suggested in order to control the performance level of the company. Indicators should eliminate subjectivity and facilitate assertive decision making by the strategical and tactical level of a company [28]. Table 3 shows the indicators suggested, as well as the measurement type and its classification.

Process	Indicator	Measurement	Classification
Customer Support	Number of incidents	Incident tracker system	Quality
Customer Support	Number of incidents resolved on time	Incident tracker system	Productivity
Customer Support	Number of incidents resolved at the first level of support	Incident tracker system	Productivity
Customer Support	Number of incidents requiring fixes in the product (demanding development)	Incident tracker system	Quality
Customer Support	Distribution of solution between support levels	Incident tracker system	Productivity
Development	Number of development projects that have undergone changes in scope	Project Management	Quality
Development	Number of development projects that did not respect the delivery deadline	Project Management	Quality

Table 3. Indicators suggestion

Having quality and productivity indicators, the company will be able to measure and review its processes constantly, looking for constant improvement. Indicators have a fundamental role to the critical performance analysis and retro-analysis when compared to the achievements established in the first place [29]. Also, indicators provide directions to re-plan activities and make decisions. It is suggested that the indicators are monitored by the director of the company for decision-making and exposed to the employees in a physical panel, making them aware of the actual situation of the company and encouraging them to work towards improving the numbers.

Among the challenges encountered during the development of this study, we highlight the resistance of the employees during the mapping of processes and questionnaire application, as it was applied for the first time in the company. Also, it was identified that the employees had difficulties on identifying the value in documenting and standardising their practices, since almost all processes were conducted informally.

Finally, it is advised that efforts related to the implementation of the improvements proposed in this study are continued, executing the listed actions, measuring and controlling the results obtained through the proposed indicators, pursuing the process of continuous improvement within the company. At the end of the improvement cycle, another customer satisfaction survey should be performed to quantitatively measure gains from applied improvements. This way, the company will be increasingly prepared to be a company without borders, as described in its vision.

Improvements	Actions	Responsible
Recording incidents and tasks in a standardised way	Use the internal incident track system accordingly	Support Analyst and System Analysts
Implementation of incidents and tasks prioritisation	Categorise incidents and tasks in the incident track system based on impact and urgency	Support Analyst
SLA definition for customer services	Categorise customers according to their relevance to the company	Director
	Define a limit of response time based on the internal structure of the company, considering the proposed work scales	Support Analyst, System Analysts and Director
	Disclose the new process to customers	Support Analyst
	Incorporate the SLA agreements into new contracts	Director
Work scales creation between support and development processes	Implement the work scale for System Analysts	Support Analyst and System Analysts
	Ensure that it is adherent and adjust if necessary	Support Analyst and System Analysts
Definition of the software release process	Identify the period of the month with least activation of the customer support	Support Analyst
	Define and structure the release process	Support Analyst and System Analysts
	Disclose the new process to customers	Support Analyst
Implementation of Kanban to manage development demands	Raise all development activities	System Analysts
	Prioritise development activities according to their deadline	System Analysts
	Categorise development activities in corrective maintenance, evolutionary, etc.	System Analysts
	Check the status of each activity	System Analysts
	Fill in the Kanban panel and keep it updated	System Analysts
Daily meetings for planning and follow-up	Define an adequate time for holding meetings daily	System Analysts and Director
	Attend meetings	System Analysts and Director
Implementation of project management in the software development process	Recruit Project Manager	Director
	Structure the project management process	Director and Project Manager
	Manage and control software development projects	Project Manager
Training program for the support analyst	Identify skills limitations	Support Analyst
	Structure training and knowledge recycling program	Support Analyst, System Analysts and Director

Table 4 Improvement proposal and action plan

VI. APPENDIX

1) The software is a little unstable about availability for work. It has to be restarted with some frequency.
2) System depends on own server, I suggest working with the cloud.
3) Overall it is a great customer service with a lot of agility.
4) The program does not attend the administrative part.
5) Some features could be improved.
6) I think the response [for customer services] should be quicker, although the response is always positive.
7) There is little resistance to modify something that has already been created, but hasn't been well accepted by the customer.
8) Program without errors, and better system functionality.
9) The response to requests must be faster.
10) It is necessary to solve more effectively the incidents reported (in the support), because sometimes we have call the support again due to recurring errors that haven't been solved yet.
11) I really like your service [for customer services], always helping quickly to solve a problem in the system and with patience as well.
12) Quality in the product.
13) Nothing to declare.
14) The software "crashes" constantly.
15) There is no integration with some specific systems.

Fig. 9. Key aspects from the third question from the customer satisfaction questionnaire.

REQUESTER INFORMATION
Company:
Contact information:
Email:
Phone number:
INCIDENT INFORMATION
Module:
Program:
Priority: ◉ Blocking ○ High ○ Medium ○ Low
Incident/Task description:
Procedures to reproduce the incident:

Fig. 10. Standard information to be filled when recording incidents/tasks

VII. ACKNOWLEDGMENTS

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VIII. REFERENCES

[1] J-P. Pourcelot. (2018, May.). A brief analysis of the Central America and the Caribbean economy. [Online]. Available: https://www.focus-economics.com/blog/central-america-caribbean-economy-update

[2] O. Houlcroft. (2017, Dec.). What are the possibilities for business growth in Costa Rica and Central America? [Online]. Available: https://www.bizlatinhub.com/business-growth-central-america/

[3] Statista. (2018). Costa Rica: distribution of employment by economic sector from 2007 to 2017. [Online]. Available: https://www.statista.com/statistics/454908/employment-by-economic-sector-in-costa-rica/

[4] ABES – Associação Brasileira de Empresas de Software. (2017). Mercado Brasileiro de Software: panorama e tendências, 2017. [Online]. Available: http://central.abessoftware.com.br/Content/UploadedFiles/Arquivos/Dados%202011/ABES-Publicacao-Mercado-2017.pdf

[5] M. L. George, *Lean Seis Sigma para serviço*. Rio de Janeiro: Qualitymark, 2009.

[6] V. Vandoren. (2009, Jan.). How to avoid project failure. [Online]. Available: http://www.controleng.com/single-article/how-to-avoid-project-failure/81fb90a6efcf798732230c57f0a7 e978.html

[7] V. Padma, N. N. Anand, S. S. Gurukul, S. S. M. Javid, A. Prasad, and S. Arun, "Health problems and stress in information technology and business process outsourcing employees", *Journal of Pharmacy & Bioallied Sciences*, vol. 7, pp. 9-12. 2015.

[8] K. El Emam and A. G. Koru, "A replicated survey of IT software project failures," *IEEE software*, no. 5, pp. 84-90, 2008.

[9] R. Asato, M. M. Spinola, I. Costa, and W. H. D. F. Silva, "Alignment between the business strategy and the software processes improvement: A roadmap for the implementation", *Production*, vol. 21, pp.314-328. 2011.

[10] F. A. Martins, "O proceso de raciocinio da teoría das restrições da industria moveleira de pequeño porte: um estudo de caso," Mestrado, Engenharia de Produção, Universidade Federal de Santa Catarina, 2002.

[11] P. A. C. Miguel, "Estudo de caso na engenharia de produção: estruturação e recomendações para sua condução," *Revista Produção*, vol. 17, no. 1, pp. 216-229, 2007.

[12] F. Reichheld and R. Markey, *A pergunta definitiva 2.0*. São Paulo: Campos, 2011.

[13] R. Nogueira. (2002, Apr.). Elaboração e análise de questionários: uma revisão da literatura básica e aplicação dos conceitos a um caso real. Relatórios COPPEAD/UFRJ, Rio de Janeiro. [Online]. Available: http://www.coppead.ufrj.br/upload/publicacoes/350.pdf

[14] R. Tocha. (2014). A importancia da gestão por indicadores para o sucesso económico da sua empresa. [Online]. Available: http://www.blogdaqualidade.com.br/importancia-da-gestao-por-indicadores-para-o-sucesso-economico-da-sua-empresa/

[15] P. Kotler and K. L. Keller, *Administração de marketing*, 14 ed. São Paulo: Pearson, 2012.

[16] E. A. de Oliveira, A. L. Sanguineto, and J. M. L. Santos, "O Net Promoter Score (NPS) como forma de mensurar a satisfação dos clientes: O Caso Viana & Moura Construções," *Interfaces de Saberes*, vol. 14, no. 1, 2015.

[17] I. Chiavenato, *Recursos humanos*, 9 ed. Rio de Janeiro: Campus, 2009.

[18] J. N. Rodrigues, J. Cardoso, C. Nunes, and R. Eiras, *50 gurus da gestão para o século XXI*, 1 ed. Lisboa: Centro Atlântico, 2005.

[19] L. A. Steinberg, *ITIL Service Operation (Best Management Practices)*. Norwich: The Stationery Office, 2011.

[20] L. Hunnebeck, C. Rudd, S. Lacy, and A. Hanna, *ITIL Service Design*. Norwich: The Stationary Office, 2011.

[21] G. Cordall. (2012, Nov.). Service Level Agreements. [Online]. Available: http://www.keystonelaw.co.uk/keynotes/service-level-agreements

[22] J. J. Trienekens, J. J. Bouman, and M. Van Der Zwan, "Specification of service level agreements: problems, principles and practices," *Software Quality Journal*, vol. 12, no. 1, pp. 43-57, 2004.

[23] C. S. Mendes, M. A. Souza and H. R. Costa, "Service Desk: Os benefícios de um único ponto de contato," *Revista Pensar Tecnologia*, vol. 2, no. 2, 2013.

[24] F. S. Mariotti, "Kanban: o ágil adaptativo," *Engenharia de Software Magazine*, vol. 45, no. 4, pp. 6-10, 2012.

[25] Comunidade de Desenvolvimento Ágil do Brasil. Scrum. (2014). [Online]. Available: http://www.desenvolvimentoagil.com.br/scrum/

[26] PMI, *Um guia do conjunto de conhecimentos em gerenciamento de projetos (guia PMBOK)*. 5 ed. EUA: Saraiva, 2013.

[27] F. M. Kiyan, "Proposta para desenvolvimento de indicadores de desempenho como suporte estratégico," Mestrado, Engenharia, Universidade de São Paulo, 2001.

[28] C. W. Ambrósio and M. S. A. Leite, "Contratação por desempenho em serviços de manutenção: o caso da CST Arcelor Brasil," *Revista Produção Online*, vol. 8, no. 3, 2008.

[29] J. E. S. C. Branco, *Indicadores da qualidade e desempenho de ferrovias (carga e passageiro)*. Rio de Janeiro: ANTF, 1998.

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