

THE IMPACT OF THE AGILE SCRUM METHODOLOGY IMPLEMENTED ENTERPRISE SOFTWARE DEVELOPMENT

THE IMPACT OF THE AGILE SCRUM METHODOLOGY IMPLEMENTED ON THE DEVELOPMENT OF ENTERPRISE SOFTWARE

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Abstract - Since the emergence of the term Information Society, society has gradually integrated IT solutions in its activities [1], a clear example is the business organizations, which as a result of this transformation and technological irruption have implemented systems [2] such as ERP, CRM, MIS, among others.

However, in order to implement them, it is important to consider the process involved in their development.

There are a large number of methods that allow managing project development, however, Mersino in his Vitality Chicago publication [3] indicates that the success rate of projects under agile methodologies is twice as high as projects under traditional methodologies, this according to the latest report of The Chaos Report in 2018.

Therefore, this paper shows the development of a web information system as an improvement tool for the management of information related to the software licensing service provided by a company, under the agile Scrum methodology.

Once the system was implemented, the customer service time decreased by more than 80%, considering that before implementing the system the approximate service time was 11 working days. In addition, 100% of the members of the development team confirm that it is easy to work under the agile Scrum methodology.

Keywords: Information Management, Agile Methodologies, Scrum, Information System, Web.

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Due to all of the above, this work shows the development of a web information system as an improvement tool for the information management for the software licensing service, under the agile Scrum methodology, this according to the latest report from The Chaos Report in 2018.

Once the system was put into use, customer service time decreased by more than 80% considering that before implementing the system the approximate service time was 11 working days. In addition, 100% of the members of the development team confirm that it is easy to work under the agile Scrum methodology.

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INTRODUCTION

Over time the evolution of industries has been of adaptation and search for improvements to innovate their production processes, management, organization, or other aspects, however, considering that we live in the so-called "Information Society" one of the main changes involves the implementation of Information and Communication Technologies (ICTs) as a tool that when incorporated into the industries allows to develop the ability to transmit, produce and use information correctly and as updated as possible, all this through different digital applications of ICTs.

The information society model is oriented towards technological development and the accumulation of knowledge, resulting in the complexity of information processing and management [4]. It is said that the challenge of the eighties was to transform data into information and that the dilemma of the nineties was to convert information into knowledge and nowadays it is to manage knowledge.

Cano-Pita [5] mentions that ICTs are essential for improving company productivity, quality, control and facilitating communication, among other benefits, although their application must be carried out intelligently.

For confidentiality reasons we will refer to the organization that requested the developed software as "The Company"; "The Company" provides the software licensing service and only in the year 2019 one of its main clients to which it provides such service, reported an average of 161 licensing tickets per month, where each ticket is composed of at least 3 tasks or a maximum of 7, depending on the protocols established by the company itself to solve the ticket. All the information is managed locally, through spreadsheets and reports that are updated manually, so the time spent to update the information ranges from two to three hours.

The company's customers receive reports on the service provided to them, however, because of the time spent on updating the information,

These reports are not 100% up to date, as new tickets can be registered during the elaboration process, which is a problem for both customers and the company.

The time invested in updating information and therefore the waiting time for customers to receive their reports is excessive, so the automation of these activities is required in order to make the management of information and thus the service provided by the company more efficient.

Once the problem was examined and considering that the time for the solution already implemented was only 6 months, it was determined with the development team that the methodology that best suited the project would be an agile methodology and not a traditional one, so that different items were questioned to define which of the different agile methodologies was the most appropriate for the project, the research questions are:

1. Is it true that the Scrum methodology allows to manage projects under an adaptive environment?
2. Does Scrum offer the possibility of incorporating improvements to the project without drastically impacting development times?
3. Is the Scrum methodology enriched by stakeholder participation?

In addition to the above and according to a study conducted in 2016, 38% of Mexican SMEs use Scrum as a methodology to ensure software quality [6]. For all of the above reasons, it was finally decided to work with Scrum.

This methodology gave us the possibility that with each iteration (sprint) in weekly periods a functional and evolutionary version of the system was generated [7], thus allowing both the company and its customers to perceive the results of the project under development, in addition to the fact that at the same time that we were working on system advances, the details that came out per sprint were adjusted.

In this sense, the present project shows the implementation of the Scrum methodology for the development of a web system as a tool for the development of a web-based system.

administration and control software licensing.

As soon as the development and testing stage was completed, the system that was implemented met all the objectives set at the beginning of the project, as well as those that arose in the sprints, in addition to the fact that, by delivering operable versions to company, it allowed both them and their customers to become familiar with the software and the results it generates, so that once it was implemented in its final version, there was no doubt about the management of their information.

DEVELOPMENT

As mentioned above, the development methodology applied to the project was Scrum, each sprint was executed in weekly blocks and at the end of each block a functional progress of the project was delivered to the client, being that after the weekly meetings the client defined changes to be made, eliminating or modifying the functionalities that were presented in each session. Figure 1 below shows a diagram representing the Scrum methodology applied to the project; however, the following paragraphs describe each stage of development.

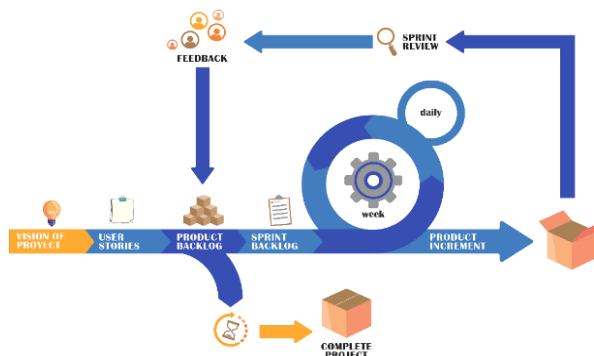


Figure 1. Scrum Methodology Diagram Source: Own elaboration

Information gathering

The first stage to be considered is a meeting with the Scrum team (Product owner, Scrum master, development team) as well as the client and the end users of the software, since in this session the objectives of the system are defined, as well as the user stories that allow the product owner to design what is known as the "user stories".

as "Product Backlog", usually this first meeting is known as "Sprint 0" [8].

It is important to clarify that the initial "Product Backlog" does not necessarily include all the customer's needs, so this list may change over the course of the sprints [9], but given the flexibility of the methodology, this is not a problem to achieve the objectives. Table 1 shows a list of the most important user stories to be considered in the system, these activities are prioritized by color, according to those established in the company, where a requirement can go from priority one or high (red color) to priority three or low (yellow color).

Table 1. User history by priority

USER STORIES		
Activities		
ID	Description	
US01	Manage the information licensing information	
US02	Information update	
US03	Count of days days for applications and tasks	
US04	Generate reports from automatically	
US05	Control of software renewal notifications	
US06	Follow-up by task and leave request	
US07	Assignment of on-site technicians to requests	
US08	Stock tracking by license	
Connotations		
Priority:	1	2 3

Source: Own elaboration

Project backlog

Subsequently, the product owner designed the "Product Backlog", which is nothing more than a list of tasks or functionalities for each user story. These activities are presented to the development team which, by sprint, selects those to be developed during the course of the iteration.

For example, as can be seen in Figure 2, the activities involved in managing licensing information are described,

However, it is necessary to consider the , but to elaborate the database it is necessary to analyze the system, the information to be stored, the technology to be used, the CRUD functions (create, delete, update and visualize records), among other things.

BACKLOG: PROYECTO DE LICENCIAMIENTO					
ID	Historia de usuario	No Sprint	#	Inicio	Duración: #días
US01	Subtarea				Precedencia: 1
T01	Recopilación de información sobre el proceso de licenciamiento	terminado			Pendiente el análisis de sistema para controlar el flujo de trabajo
T02	Identificación de fases y stakeholders	terminado			Archivo con status general en Power Point y un concentrado
T03	Recopilación de información sobre entregables	terminado			Consultar los datos que requiere el cliente en sus reportes
T04	Identificación de procesos de desarrollo de entregables	terminado			Cruce de información entre varios archivos excel
T05	Identificación de herramientas de desarrollo actuales	terminado			Flejas de cliente, matriz lógica manual, reportes y vistas por
T06	Análisis e identificación de áreas de oportunidad	terminado			
ID	Historia de usuario	No Sprint	#	Inicio	Duración: #días
US01	Subtarea				Precedencia: 1
T07	Propuesta de soluciones	terminado			Presentación al cliente el día 21 Enero a las 11:00hrs por job
T08	Diseño de solución a desarrollar	terminado			Incorporar el control de stock con la herramienta de la empresa
T09	Investigación y análisis de las herramientas de desarrollo	terminado			Considerar los recursos proporcionados
T10	Ejecución de software, hardware	terminado			Realizar pruebas antes de realizar la instalación
T11	Entrega de software de desarrollo	pendiente			Pendiente hasta terminar las pruebas con departamento de s
T12	Elaboración de diagrama de procesos	terminado			Consultar en recursos compartidos
ID	Historia de usuario	No Sprint	#	Inicio	Duración: #días
US01	Subtarea				Precedencia: 1
T13	Diseño de casos de uso	en proceso			
T14	Modelado del software	en proceso			
T15	Diseno del modelo ER	pendiente			
T16	Modelado lógico de la base de datos	pendiente			Obtener datos del sistema que controla el flujo de trabajo
T17	Diseño del modelo ER	pendiente			
T18	Entrega de software de desarrollo	pendiente			Ya se ha solicitado los permisos con C-D para instalar soft

Own elaboration

Sprint planning and execution

At the beginning of each sprint a meeting is held to plan the sprint [10], which is divided into two sections, in the first one the product and the development team land the features and details the high priority elements of the backlog, clarifying doubts, the objective of each task and the tools where the results will be embodied in such a way that the team understands what the product owner transmits once he understood the customer's requirements.

For the second stage, the development team selects the tasks to which it is committed to deliver at the end of the sprint, making a prioritized list of tasks. In case there are pending tasks from the previous sprint, the team organizes itself in such a way that these tasks do not affect the progress of the project development.

During the course of the sprint the development team manages its progress graphically, either by means of post-it notes, spreadsheet records or some Scrum management tools.

This graphic shows the activities that make up the sprint and their progress, as well as some other characteristics, such as the participants in the development of the activity, the roles that are affected by the activity, etc.

As shown in Figure 3, a task can be in the to do list, in the to do list, in the to do list, in the to do list, in the to do list, or in the to do list.

process (doing), in testing (testing) or done (done). This classification can vary, however, the important thing is to know at what point each task is.

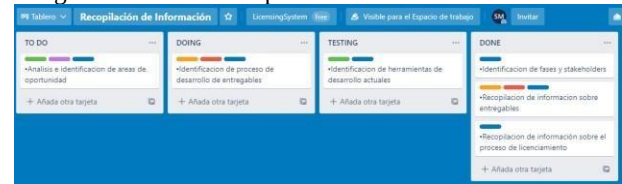


Figure 3. Recording statuses by task in Trello

Source: Own elaboration

At the end of the day there is a daily review (also known as "Daily Scrum"), of no more than 15 minutes where some difficulties or needs are exposed to the Product Owner who is in charge of providing a solution [11].

For the sprint review, sessions of no more than 60 minutes were scheduled for the Scrum team to review the progress of the project. In these meetings, an overview of the tasks pending, those completed and those to be performed in the next sprint were presented (Figure 4).

Sprint: 05		US01
Puntos pendientes - Modelado lógico de la BD - Casos de uso - Creación de la BD		Siguientes avances - Creación de la página principal - Desarrollo de las interfaces - Aplicación de diseño y colores - Desarrollar las funciones para subir los archivos en csv y registrar o actualizar (dependiendo el caso) las tareas y solicitudes de licenciamiento
Puntos a tratar - Selección de diseño y colores para el sistema - Desarrollo de login - Desarrollo del menú - Creación de la página principal - Desarrollo de las interfaces		
Actualizaciones - Actividades completadas - Inicio de actividades		

Figure 4. Example of items to be addressed per review session

Source: Own elaboration

This stage is an inspection and adaptation activity of the deliverable product, since the product owner can operate the system version and evaluate if there are functionalities to add, change or eliminate, thus providing feedback to the development process and avoiding that in future iterations such details in the system generate conflicts that affect other modules or functions.

Finally, this feedback process was captured in minutes (Figure 5) and then incorporated into the backlog and Trello to manage these new changes.

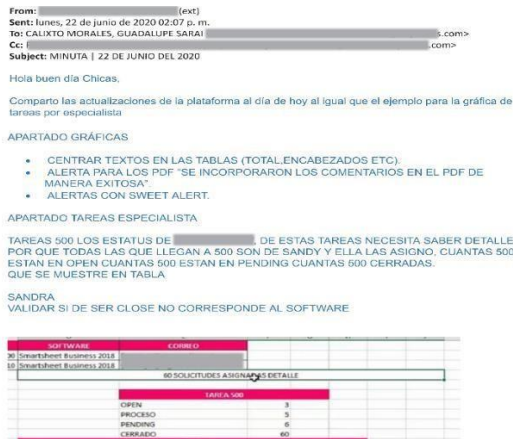


Figure 5. Example of a minute, as a result of the sprint feedback process Source: Own elaboration

DISCUSSION AND ANALYSIS OF RESULTS

Once the testing stage was completed and after several reviews, analysis and verification of results, especially with respect to the reports generated, the system met the client's objectives and was finally implemented on the company's servers.

In terms of the system, the following results are available:

- The search for information was more efficient for the user.
- The system is considered intuitive
- Time spent generating reports reduced from 3hrs to only 10mins including the logical match.
- More accurate stock control data available
- Customer service time reduced by more than 80%.
- Notification control allows the user to distribute time spent on other activities that increase productivity

In addition to applying a customer satisfaction survey, an evaluation of the development methodology used was also applied, and an analysis of the results obtained is presented below.

Question 1

The first question asks the member if he/she is familiar with the Scrum methodology.

As we can see in Figure 6, 50% of the team did not know Scrum because they had previously only used traditional methodologies, and they had not implemented any methodology in a software project.

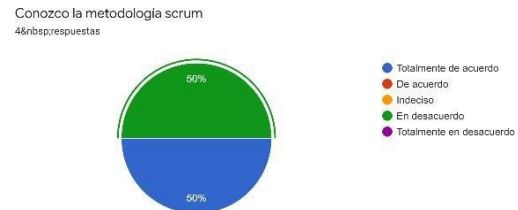


Figure 6. Graph corresponding to the first question regarding the Scrum methodology Source: Own elaboration

Question 2

In order to implement Scrum in the work team, the characteristics of the methodology were presented so that everyone knew the way of working. Afterwards, it was asked if it was easy to work with Scrum, taking into account that for the first sprints 50% of the team learned and implemented the methodology at the same time.

As shown in Figure 7, the results were satisfactory as it was not complicated for the team to work with Scrum.



Figure 7. Graph corresponding to the second question regarding the Scrum methodology Source: Own elaboration

Question 3

Once the team understood how Scrum works, it is important to know if the team found that with the Scrum methodology the process to develop the system turned out to be faster and more efficient.

Seventy-five percent of the members consider that they "Totally agree" with the statement, however, the other 25% consider that they "Agree", so it is considered that it is true, the development was fast and efficient.

El trabajo con un equipo scrum resulta rápido y eficaz.
48 respuestas

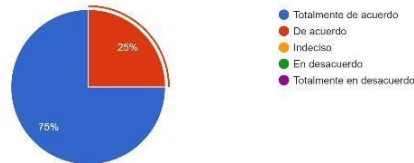


Figure 8. Graph corresponding to the third question regarding the Scrum methodology Source: Own elaboration

Question 4

One of the main characteristics of Scrum is the flexibility and adaptability to change during the development of the project [12] and a clear example is given when with each iteration feedback is received and with it changes to the functionalities that are being presented, considering the frequency of these changes it could be perceived that the development enters a loop that would finally reflect time adjustments, however, everything depends on the management and commitment of each of the team members.

When questioned on this issue, 75% of the team felt that this was not the case, that their delivery times were not affected by the feedback from each sprint.

Como integrante del equipo scrum, mis tiempos de entrega se vieron afectados por los cambios considerados por cada sprint.
48 respuestas

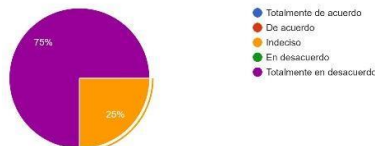


Figure 9. Graph corresponding to the fourth question regarding the Scrum methodology Source: Own elaboration

The 25% who indicated that they were "Undecided" on the question is because despite making adjustments to their delivery times, it all depended on the type of functionality involved in the sprint.

CONCLUSIONS

Each development methodology has its advantages and disadvantages, and each one can be considered as long as it adapts to the project and its needs, however, taking into account that companies require fast and concrete results for their projects in any field, whether it is production, administration or, as in this case, software development, an excellent option is Scrum.

Flexibility to change is one of the benefits of Scrum [13], in addition to the response of the development team to change, because for the operation of the methodology these are important factors, if the team does not self-manage correctly, the changes could represent a weakness and would harm the development time. That is why it is said that the team members should have qualities such as self-organization, adaptability, collaboration and commitment, thus answering the research questions initially posed.

Since the backlog tasks are prioritized, it is considered that with the passage of time the main or essential functionalities to achieve the system's objectives already completed and implemented, leaving aside those tasks that, although necessary, do not take too long to develop and to be approved and integrated into the system, which benefits the development team by allowing them to distribute more time on those functions that require it due to their construction complexity.

The customer is present throughout the development of the project and constantly [14] and one of the principles of the Scrum Manifesto states that business managers and developers work together on a daily basis throughout the project [15]. This ensures that the final version of the software fully complies with all the requirements and functionalities according to what the customer reviews in each sprint.

Each Scrum team may consider different ways of organizing their deliverables and products per iteration, as well as tracking backlog activities.

Today there are already platforms that allow Scrum management with all the objects involved, from user history to sprint reviews or deliverables, one of the most popular is Atlassian Jira.

The factors present when implementing Scrum is that there are stages during the development that are concurrent within the process ("Work in progress") and this can cause instability in a Scrum team that has been recently created and is just starting to manage the sprints, the backlog, among other things, as was the case of this project, so it could be investigated what are the main causes of an accumulation of tasks in process and thus also find ways to avoid it.

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