

Mobile application to optimize the transfer of knowledge and technology for the economic reactivation of small companies affected by covid-19

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Abstract: Due to the great demand that exists today in interconnecting businesses with their customers, after the crisis generated by the pandemic, it is necessary to adopt new measures that allow economic reactivation. Knowledge transfer is an important issue; Peru must face the unproductive situation with tools that enable people to make their small and medium-sized companies and/or businesses profitable, and implement ICT provide innovation and boost development, for this reason the objective of this article is to develop a prototype that helps companies to be trained on how to act in this situation, helping them to become economically reactivated.

1 INTRODUCTION

Due to the crisis generated by COVID-19, the business sector has been affected; the measures taken by the different countries of the world have led to the reduction of social contact, and therefore, to the limitation of economic activities, also suspending productive activities, mainly affected tourism, entertainment, hotels and restaurants, transportation and personal services (United, 2020).

According to the latest assessments of the Economic Commission for Latin America and the Caribbean (ECLAC) (United Nations, 2020), on the magnitude of the effects generated by the pandemic, "34.2% of formal employment and 24.6% of the region's GDP comprise sectors strongly affected by the crisis produced by the pandemic" (p.4).

The stoppage of operations in Peru has caused micro, small and medium-sized enterprises (MSMEs) to face financial problems and reductions in household income; being previously considered as the "growth engine for the development of the national economy who represented 99.4% of the national entrepreneur and provided around 63.4% of employment" (Tello Cabello, 2015, p.203). The Instituto Peruano de Economía (2020) mentions that "online sales in the country are lagging behind other Latin American countries" (p.19).

Information and Communication Technologies (ICT) are powerful tools that are not being taken advantage of. There are family, small and medium-sized companies that are not prepared to face the challenges that the new information and knowledge era demands. Most small companies are unaware of how ICTs can add value and increase business revenues

because they have not developed management skills that allow them to adapt to new ways of producing by focusing on the use of ICTs, in addition to retaining the idea that the implementation of these could generate costly software or hardware expenses to develop the transfer of knowledge. For this reason, many of these companies do not have accurate information to help them design measures that, in the face of the current crisis, promote the reactivation of their businesses, thus allowing them to move towards productivity and technology. To achieve a correct adaptation of technologies, a transformation of the organizational culture is required, highlighting the importance of ICT, considering that they would not work properly without a balanced connection between man, technology and the organization (RonquilloBolaños, 2020, p.42).

Technological progress has led to a large number of people having a smart device within reach, one of its main features being to enable communication to the data stored in the cloud. In a research conducted by the authors Caicedo, P. Acuña, Rodríguez and W. Acuña (2016), it was found that cell phones have important attributes for the transmission of knowledge, obtaining data such as proximity, ubiquity or interaction, digitizing the information and facilitating the visualization by means of an intelligent device, if it is carried out properly. With the advance of technology and the internet of things it is very common to know or interact with this type of architecture, with its implementation in different areas makes it possible to carry information to distant distances does not become an impediment.

Humberto and Hinojoza (2018) indicate that the first step a business or company should put in place before starting to invest in potential opportunities, is to conduct an organizational analysis both externally and internally to ensure the viability of what is planned, in order to confirm the viability of a proposal, also indicating the closeness that businesses have with technology, leading to the design of an optimal mobile application for the exchange of information between micro, small and medium enterprises.

This study is related to the work because it provides us with a tool with which we can carry out an internal analysis of the company, giving way then to the implementation of a mobile application that has information on good practices and knowledge, so that in this way we can analyze the options and make the best decision for the company.

The objective of this article is to propose a mobile application to help companies affected by the crisis derived from COVID-19, optimizing the transfer of knowledge and technology among them, allowing economic reactivation.

The article is divided into sections, where Section II details the methodology to be implemented; Section III details the development of the application of the case study; Section IV the results and discussions obtained; and Section V the conclusions and future work.

2 METHODOLOGY

For the development of the application, an agile methodology such as SCRUM was used to manage the development of the project by means of work cycles. The SCRUM methodology is the most accepted and implemented within software and mobile application development companies due to its simple formalism but rigorous control and monitoring (Higuera, Durán& Torres, 2014).

2.1 SCRUM Methodology

This is an agile development framework that manages to facilitate control and management, which proposes an iterative incremental model divided into Sprints (Pastrana et al., 2019). Starting with a list of requirements prioritized according to their importance, in order to name the activities to be carried out.

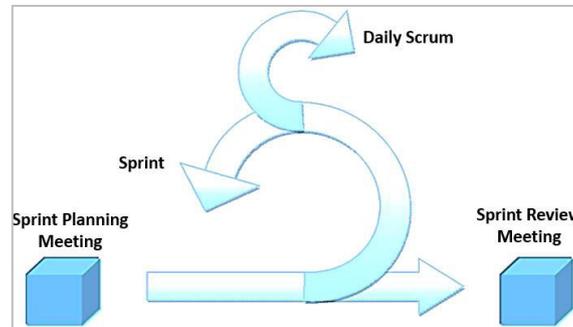


Figure 1: Overview of Scrum (Ventura et al., 2019)

2.2 Sprint

Sprint are periods of time from 1 to 4 weeks, where the execution of the global task is developed, broken down into small tasks. The planning of these allows identifying the work to be done and considering other quality factors (Pastrana et al., 2019, p.34).

2.3 Technology Employed

This section shows and details the technological tools used for the development of the application.

2.3.1 MySQL

This is an open source database that allows to manage a large volume of information, it uses the SQL structured query language, therefore, it allows to create a database, as well as to manipulate it.

2.3.2 AdobeXD

It is a tool for prototyping application screens from different platforms, allowing the animation connection between templates, but not before defining the templates to be used (Adobe, 2021).

2.3.3 Visual Paradigm

Web tool that allows the modeling of multiple UML diagrams for free, it also has a paid edition (Enterprise Edition) with which you can establish work teams (Visual Paradigm, 2020). It also allows to generate diagrams from code imported from another IDE, after that, it also adds the reverse engineering functionality.

2.3.4 REST Architecture

It is a decoupled model, in which the FRONT END block will never have the possibility to interact directly with the data repository. It is effected by means of standardized public HTTP interfaces accessed by links to establish communication and exchange resources in formats such as JSON and XML (Chisaguano, 2018).

2.3.5 Spring Framework

It is an open source framework used with java, which allows building robust applications with less effort in a more dynamic way.

2.3.6 Java

Programming language offers multiple features for which it is widely used in development environments such as: object-oriented, multi-threaded, distributed (supports multiple protocols such as TCP/IP, UDP, HTTP and FTP), secure and cross-platform (Ladrón, 2015).

3 CASE STUDY

There are poorly trained companies or sectors that do not know the way to cope with their business when faced with an imminent change such as the use of new technologies to get afloat, and due to the confinement that has affected micro, small and medium enterprises, the need arises to evaluate and implement new strategies that allow to achieve significant contributions in the reactivation of the economy of certain sectors, allowing larger companies to transfer knowledge to smaller ones and thus implement activities that help them to improve their processes, offer a quality service and ways to improve the dissemination, becoming visible to the public.

We propose the development of a mobile application that optimizes the transfer of knowledge between businesses, through M - learning, which involves different technological concepts, integrating them to create a new concept, which is flexible, immediate, portable and cooperative. This application will have Webinars that provide meaningful input, training materials, contact recommendations, messaging and a FAQ section that provides correct information and the use of ICTs, in this particular case of mobile applications, proposes to medium, small and family businesses to acquire knowledge to boost development, innovation and improve the competitiveness of their business, just as larger companies have achieved.

3.1 Knowledge and Technology Transfer

Based on the transmission and integration of techniques, experiences, skills and knowledge under environments with objectives that solve needs, this leads to the adoption of technologies for greater appropriation of knowledge (Vázquez, 2017).

There are two points that must coincide in order to confirm that it is a transfer of knowledge and technology. In the first place, the receiver must appropriate and consume what has been acquired. Secondly, it is wrong to assume that when mentioning technology it should be inferred that we are only talking about machines or technological devices; this concept is more in line with the transfer in terms of a technological package, in which what

is transmitted is an integrated package of services that, when accepted by the receiving equipment, will go on to create new products or services.

3.2 Company analysis

In order to successfully implement ICT, it is necessary to conduct an analysis of: the company, direct competition, indirect competition and substitute products. It then establishes the levels of competition, for which it is essential to take into account the following:

3.2.1 FODA

Study the company's situation, the objective of this tool is to determine the company's advantages for decision making.

3.2.2 Porter's 5 forces

Model that allows to perform an analysis to determine the level of competition of the organization by analyzing the opportunities and threats to have clear competitive advantages depending on the sector to which the company belongs, therefore, facilitates the development of business strategies, taking into account the following:

- Threats of entry of new competitors.
- Rivalry among competitors.
- Bargaining power of suppliers.
- Bargaining power of customers.
- Threat of entry of substitute product.

3.3 Description of activities: Sprint

The detail of the Sprint is shown with its respective detail of activities.

3.3.1 Sprint 1: Information gathering

In this stage, projects with similar research problems were sought and selected, from which information will be obtained for the development of the objectives.

- Activity 1: Search for projects with research objectives similar to those presented in our project. The activity consisted of searching for similar projects in scientific databases such as IEEE Xplore, Scopus, Elsevier and the university's virtual library.
- Activity 2: Selection of projects related to our research problem. In order to obtain concrete and relevant information for the research, the projects that were similar to the research problem and could respond to the objectives set by the team were selected.

3.3.2 Sprint 2: Project planning

At this stage, the feasibility of the project was analyzed, determining the research problem and the objectives to be met. Based on these, the following activities were carried out:

- Activity 3: Establish the scope of the project. In this activity it was specified what is going to be done in the research, establishing the limitations and coverage that the mobile application will have.
- Activity 4: Determine project objectives. The objectives of the project were determined focusing on responding to the research problem.

- Activity 5: Identify project risks. In this activity, the possible risks to the project were identified in order to establish preventive actions to minimize or eliminate the probability of their occurrence.
- Activity 6: Identify acquisitions for the project. This activity identified the software and hardware used for the development of the mobile application.
- Activity 7: Meeting with the team to review the progress of the project. This activity allowed validating and reviewing the progress of the project, brainstorming ideas for the improvement of some project development activity.

3.3.3 Sprint 3: Project development

In this stage, the requirements of the mobile application were analyzed, user stories were described and diagrams of use cases, collaboration and architecture were elaborated.

- Activity 8: Determine and analyze requirements for the mobile application. In this activity the requirements for the mobile application were specified, which go hand in hand with the scope of the project and allow to fulfill the functionality of the mobile application.
- Activity 9: Describe the user stories. According to the requirements, the user stories are analyzed and prioritized, which allow to have a short and precise description of the functionality of the mobile application.
- Activity 10: Meeting with the team to review progress. This activity allowed us to validate and review the progress of the project, brainstorming for the improvement of some project development activity.
- Activity 11: Drawing up diagrams. In order to visualize the dependencies that the mobile application will have, the architecture diagram of the application was made, detailing what is going to be built, as shown in Figure 2.

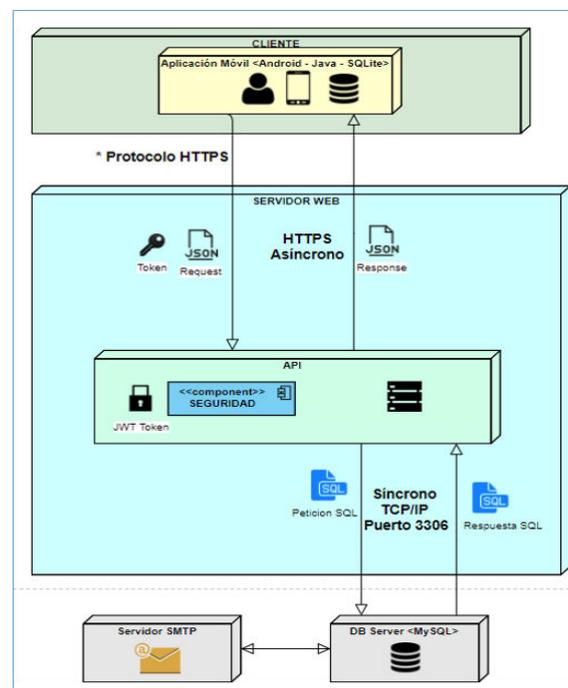


Figure 2: Application Architecture Diagram.

3.3.4 Sprint 4: Project design - prototypes

In this stage the visual part of the mobile application is developed, according to the requirements specified in the user stories, as shown in Figures 3, 4, 5 and 6 (set of figures). For the development of the prototypes AdobeXD was used, which allowed the interaction with the interfaces.

- Activity 12: Develop the login interface to the mobile application. This was done according to the functional and non-functional requirements, to provide access to the user, as shown in Figure 3.
- Activity 13: Elaborate the interfaces where the video courses are shown, recommended books and achievements of the user as he/she advances in the acquisition of knowledge, as well as the questions and answers section, shown in Fig. 4 and Fig. 5.
- Activity 14: Networking. In this section the interfaces for the contact network are developed, shown in Fig. 6, which allows the user to have a company profile, contact list and messaging section.

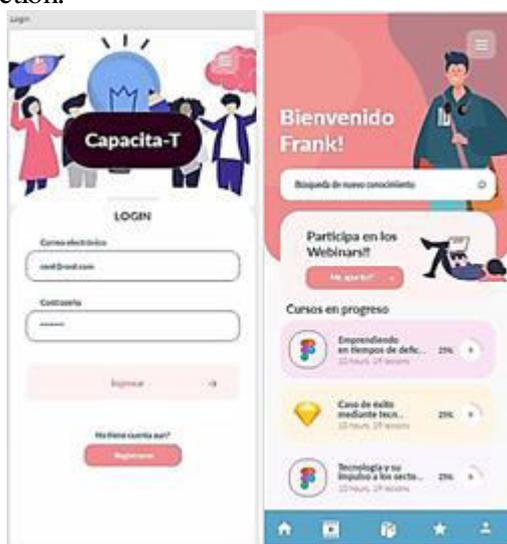


Figure 3: Start of the application.



Figure 4: Knowledge transfer module in the application.

- Activity 17: Meeting with the team to review the progress. This activity allowed us to validate and review the progress of the project, reviewing the Sprint performed, explaining the functionality of the module performed.

4 RESULTS AND DISCUSSION

The analysis of these problems resulted in the development of a mobile application to optimize the transfer of knowledge and technology, the purpose of which is to provide support for the respective economic activation of companies that are in an unproductive situation after the crisis generated by COVID-19.

On the other hand, the transfer of knowledge offers agility in the processes of the company, in addition, at the moment that the service is provided, it generates cost reduction, since the experience obtained turns in the direction of correct levels of competitiveness, achieving benefits in the company. When a company manages knowledge in terms of productivity, the results will go in the direction of quality. That is why there is a need to expand the economic development of companies, especially those affected by the crisis resulting from the pandemic (United Nations, 2020). By means of a mobile application that has information on good practices and knowledge, so that the options can be analyzed and the best decision can be made.

5 CONCLUSIONS AND FUTURE WORK

The benefit of continuous training in organizations is a reality, but it is often dismissed because of the difficulty of adaptation or even because the new knowledge is not distributed in all relevant areas due to lack of knowledge on how to adopt the techniques received or simply because in this new reality in which we find ourselves due to the pandemic, many of these problems have come to light, highlighting the absence of ICTs, mostly focused on MSMEs. use there is no mentality to adapt to new trends.

In order for these companies to recover, they will need not only economic support but also good practices. This is where the transfer of knowledge and technology comes in, to help them innovate and improve their competitiveness. For this reason, obtaining information on the capabilities and skills of companies positioned in the sector is vital for their reactivation. Technology does not stop advancing, so having the information and being able to make use of it through a mobile application is important to achieve success in the innovation process.

It is recommended for future research to implement the mobile application as a business social network selected and grouped by production sectors, as it would be of great benefit to companies, supporting the expansion of their knowledge and network of contacts.

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