

Methodology for the Digital Transformation Based on Digital Skills

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Abstract

This paper proposes a methodology for the implementation of digital transformation to strengthen the productivity of the personnel of a company, promoting certain digital skills to effectively carry out the assigned responsibilities. For this work, first of all, an analysis of existing methodologies is carried out in order to determine their limitations, to then explain the proposed methodology with its phases in detail. Once explained the proposed methodology, it is applied in a real company to show its positive effects such as collaboration increase, process optimization and development of digital skills in employees.

Keywords: Digital Transformation, Processes, Digital Skills, Collaboration, Productivity, Innovation.

INTRODUCTION

Nowadays, the digital revolution is deeply modifying society and with it, the business model at an accelerated pace and in an integral way [1]. Digital technology has exponentially multiplied the ability to connect to the world. In the beginning, the Internet connection used to be through traditional computers, but currently and in the very near future, the connection will be extended to everyday objects such as cars, appliances and medical devices. These changes are forcing companies to improve or reconsider their processes regardless of the functional area or sector. Given this fact, companies with a coherent plan to integrate digital and physical components of operations will have more possibility of being successful, since they can transform their business models according to demand [2].

The World Economic Forum indicates that currently great technological changes are taking place, where people and companies may feel overwhelmed by these changes underestimating their effects [3]. Given these changes, the concept of digital transformation has captured the attention of the world in recent years, which has led several specialists to define and set up processes, methodologies and reference frameworks so that digital transformation is an option for

improvement and aggregation of value of a product or service [4].

It is said that of 88% of the companies that are in a Digital Transformation project, only 25% know how to explain the objective of the project [5]; this shows that there are flaws in the implementation of Digital Transformation in many organizations. Another disadvantage is that many organizations only worry about hiring a project supervisor, but they do not control personnel and their skills to carry out this change [6].

A study conducted by the Forrester consultancy, by means of a survey of 396 people in charge of making decisions, reported that only 5% of the organizations claim that they dominate the digital aspect to such an extent that it allows them to differentiate themselves from the competition [7].

Starting a Digital Transformation project does not imply that it will affect all the cross-sectional processes of the company. Instead, it can be segmented into several projects [8]; for example, in the case of *Telefónica*, one of the projects allowed employees to connect with social communities and thus start little by little with Digital Transformation [9].

To start a Digital Transformation project in organizations, it is necessary to use implementation methodologies. In this sense, despite the existence of several of these methodologies [1,2, 10-16], they omit the study and development of the digital skills of the employees who will participate in the Digital Transformation process. This is very important, because before starting this process, the skills of employees to know whether or not they are able to take this change that benefits the entire organization must be known.

Starting a Digital Transformation project in a company without first evaluating the employee's digital skills [10] will increase the risk of project failure, which is why a lot of attention must be paid to evaluating the selected methodology so that it has a true approach on the development of digital skills that employees require. An appropriate methodology will contribute to a lower risk of failure and impact [11].

Additionally, many of the methodologies that are promoted nowadays to initiate the Digital Transformation are about

digital culture, but not about personnel and their skills [12]; it does not take into account the employees of companies who are going to be responsible for the success of the Digital Transformation. Most of the time people believe that Digital Transformation is a superficial change; however, it means a deep change of strategies and processes of the organization [13].

Based on the aforementioned, it can be indicated that existing jobs still suffer from many limitations. It is for this reason that the present work proposes a new digital transformation methodology emphasizing the analysis of the digital skills of the internal personnel of the organization.

The rest of the paper is organized as follows. Section 2 briefly explains the existing methodologies of digital transformation. Then, section 3 explains the details of the proposed methodology conceptually. Subsequently, section 4 shows the implementation of the proposed methodology for the transformation in a company with the obtained results. Finally, section 5 gives the conclusions and recommendations.

STATE OF THE ART

In recent years, Digital Transformation has been of great interest because digital revolution is deeply modifying society and the business model at an accelerated pace and in a comprehensive manner; for this reason, several researchers have proposed different methodologies for the Digital Transformation of a company. These methodologies are briefly explained below.

Schuchmann and Seufert [1] propose a reference framework for the digital transformation for banking organizations, defining a portfolio of services. From their point of view, they propose 4 areas of action: Personnel development as an executive management task, Development of work with people or teams, Transformation of the organization and learning and innovation oriented to the administration of the systems, supported in the ability of learning and development [1].

S. Berman [2] proposes to study the essence of digital transformation, (the fundamental aspects that force companies nowadays to change their strategy) in the way of offering and publicizing the products and services of the organization. The authors contextualize the process in three stages: Improve, Extend and Redefine, accompanied by 3 levels: Creation, Leverage and Integration [2].

iSkills [11] proposes a process of literacy for information and communication technologies. This proposal is based on five steps: Access, Administration, Integration, Evaluation and Creation. These steps are intended to generate a digital culture that must be accompanied by the support of governments with policies so that it can be sustainable [11].

Day-Yang, Shou-Wei, and Tzu-Chuan [14] propose to analyze four dimensions: adjustment of the external resource, adjustment of the internal resource, capacity of the external adjustment and capacity of the internal adjustment forcing its

managers to consider new services and better performance. The authors apply this proposal in an e-banking project, supported by digital transformation [14].

Cover and Elkhuzen through the work [15], and Capgemini Consulting by means of the reference [16], determined a reference framework for the digital transformation of the business based on four large strategic areas: digitization of customer experience, digitization of products and services, digitization of operations and digitization of the organization [15].

Wade Michael [17] proposes a conceptual reference framework for the digital transformation of business, asking three key questions: Why to transform? What to transform? How to transform? Additionally, to this reference framework is added a concept that claims to affect the industries at the moment of transforming, that is, the Internet of things (IoT). Based on this concept, each question is answered to determine the true meaning of initiating a process of digital transformation in a company [17].

Raab Martin and Griffin-Cryan Belinda [18] propose a reference framework to apply the concept of digital transformation focused specifically for the supply chain, since it is a critical process within a company from which it can be obtained information for decision making, agile and effective collaboration. It also describes seven key limitations that may arise when initiating the digital transformation applied to the supply chain [18].

SAP [13] proposes an architecture based on the agility of services and focused on customer satisfaction in its reference framework. SAP has a tool based on this reference framework developed under best practices [13].

As observed, each work has its own way of focusing on digital transformation. All have their main focus in the business, either in a macro or holistic way, however, sometimes it is forgotten to analyze the digital skills that a person must have to understand and apply what is desired to achieve in a company with the Digital Transformation. This is very important because Digital Transformation not only depends on the technology, but also depends on the degree of understanding of the business core and the key processes to establish a productive ecosystem that generates value and competitiveness for the company.

PROPOSED METHODOLOGY OF DIGITAL TRANSFORMATION

The proposed methodology consists of five phases that will help a Digital Transformation project to be carried out successfully in any type of organization. The proposed phases are: (1) Determination of Needs-based Strategies, (2) Development of Digital Skills, (3) Selection of an Agile Methodology, (4) Selection of Critical Processes, and (5) Generation of an Enhanced Digital Ecosystem.

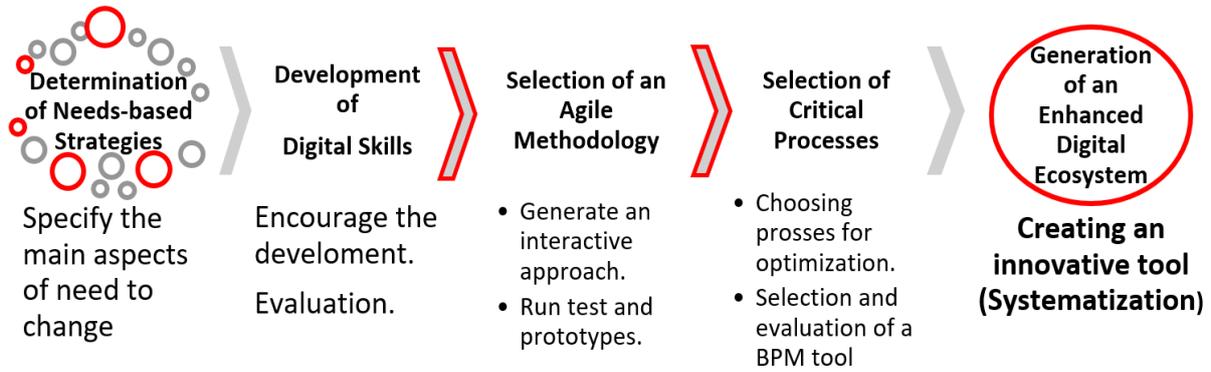


Figure 1 Proposed Methodology for Digital Transformation

DETERMINE NEEDS-BASED STRATEGIES

A strategy based on needs is to talk about a strategy based on analyzing its environment. For this phase to be successful, the concept of an effective digital strategy and the elements that contribute to the efficient execution [19] such as facilities, brand equity, human resources, among others must be understood [16, 20].

The strategies that can be chosen are several, everything will depend on the actual needs, circumstances and environments of the company. Figure 2 shows the strategies that are being adopted by companies when a digital transformation is required. Nowadays, these strategies are the most relevant for companies that want to start this process.

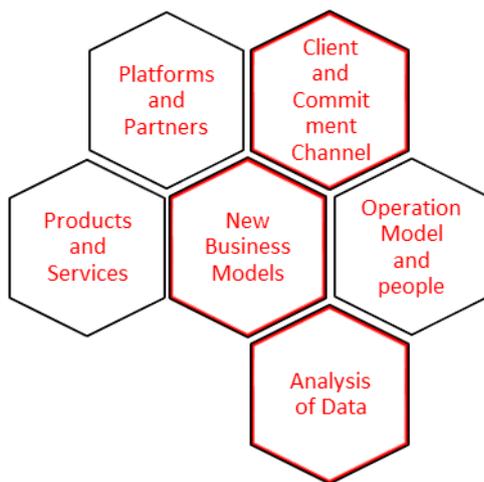


Figure 2. Digital Strategies [15, 21-23]

To choose one of the strategies, it is necessary to identify the critical problems of the current situation in order to be able to propose their solutions, that is, the “how are things?” must be known in depth, to outline the “how should they be?” This leads to analysis of problems, identification of results and elaboration of action plans for change.

An organization with a digital maturity follows a clear and coherent digital strategy, and communicates it effectively to

employees. Companies in general are using digital technology to improve efficiency and user experience as a strategy that is why the most mature companies are differentiated by using digital technology to transform their business and thus improve the proposals of their competitors [19].

DEVELOP DIGITAL SKILLS

In the proposed methodology, this phase could be considered as the most important. It can also be said that it is the differentiating point from the other existing methodologies.

Nowadays, developing digital skills in the employees of a company or organization is one of the keys to the success of the Digital Transformation process; and this is demonstrated by several studies conducted such as [21, 22]. That is why, developing the digital skills of employees must be a priority for board of directors, since having personnel with the right digital skills would be ideal to eliminate gaps [23]. In addition, knowing the digital skills of current workers can help to verify if they have insufficient skills for new roles and responsibilities and guide them towards the necessary training [24].

In this stage, the following digital skills are considered: information management, digital communication, networking, continuous learning, digital knowledge, customer orientation, network leadership and strategic vision.

Information management:

Skill with which previously filtered information can be searched, obtained, evaluated and shared. For example, Internet can be used to find better resources and services more efficiently, in less time, evaluating quality and reliability. The most important information will generate relevant value for the company and encourage innovation.

Digital Communication:

Competence to communicate, relate, and collaborate efficiently using technological tools. For example, participation in online discussions to deliver valuable ideas

helping the company to increase internal productivity and strengthening a digital culture.

Networking:

Skill that will help to work, collaborate, and cooperate in digital environments to improve processes, tasks and objectives. For example, online collaborative documents will help to improve the circulation of information and knowledge. This is one of the basic skills, since not everyone understands the importance of an environment with shared and collaborative information.

Continuous Learning:

Skill that many companies want to develop, since it is about managing autonomous learning about digital resources.

Digital Knowledge:

Skill that will help to use digital tools more efficiently. It includes the hypertextuality and the multimodality of new digital media.

Customer Orientation:

Users with this skill are able to understand, know how to interact and meet the needs of new clients in digital contexts. They are able to monitor the activities of their main clients and users on the network, and learn more about their clients to offer services in the best way.

Network Leadership:

This skill is essential to direct and coordinate work teams distributed in a network, encouraging and promoting digital tools to achieve works under the methodology by objectives. It facilitates and promotes organizational structures that make easier the rapid circulation of information in the team and with other teams that are collaborating. It generates confidence and commitment by offering a virtual way of participation in the decisions of the team.

Strategic Vision: Skill of strategic vision, that is very necessary to know how to evaluate compared with others. It helps to understand the current digital phenomenon and incorporate in the strategic orientation of the company's projects. With this vision, it can be understood how new digital trends can influence the organizational strategy by aligning it with strategic objectives, with which a general vision of the information can be obtained to generate concrete actions.

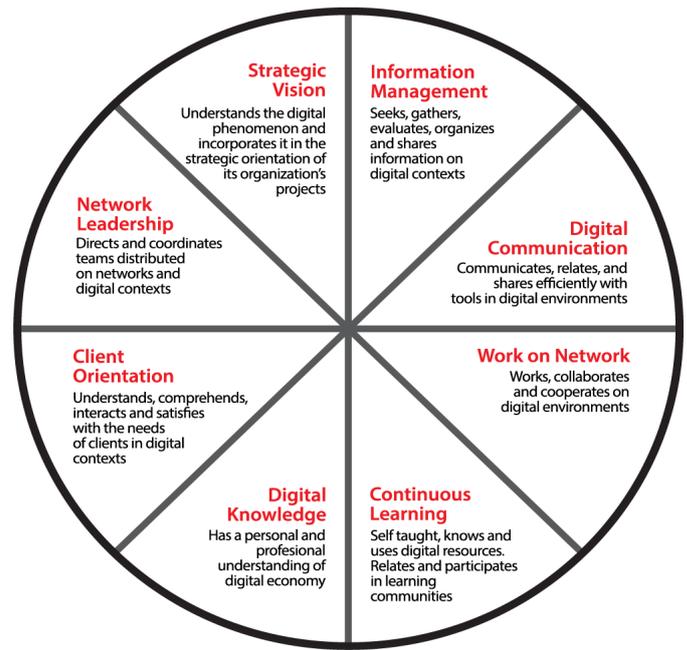


Figure 3. Digital Skills [24, 25]

The process executed to develop digital skills changes in each organization according to their digital maturity and capacity for transformation. The key areas of focus will depend on the commercial requirements of each organization, as well as on their availability of resources.

Companies need to define a vision, identify future skill requirements, perform a comprehensive assessment of the skill gap, take action to close the gap and, finally, initiate actions to constantly assess progress on their way to the development of digital skills as suggested in [22] (see Fig. 4).

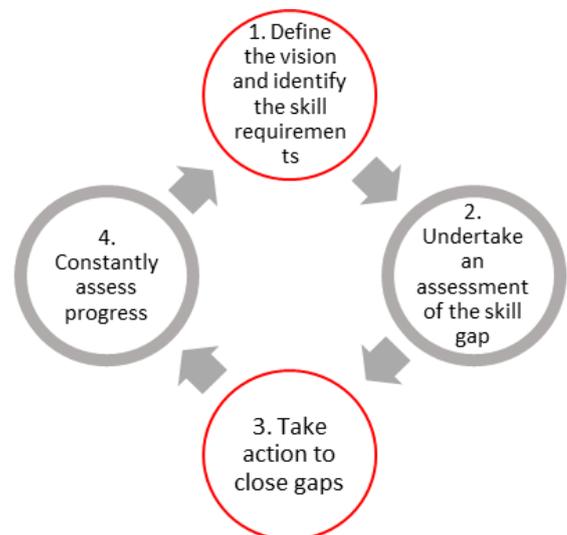


Figure 4. Guide to Develop Digital Skills [22]

SELECT AN AGILE FRAMEWORK FOR PROJECT MANAGEMENT

There are several agile frameworks for the management and execution of different types of projects. For a digital transformation, a framework that adapts to the project's need must be selected for successful planning and execution from start to finish. Most digital transformation projects fail on the way because of a wrong choice of the framework [26] that will be used to guide the execution of the project.

Among the possible frameworks, the proposed methodology suggests the use of one of the following, which are the most used in organizations.

Traditional Approach:

This type of framework is common in industrial and construction environments. Its way of working is to divide the project into different processes that are executed sequentially until achieving the stated objective. The executed phases are the following:

- **Initialization:** Definition of the scope of the project.
- **Planning:** Development of the different management plans.
- **Execution:** Completion of the different tasks planned in the previous phase.
- **Monitoring and Control:** Carrying out of all performed tasks, without losing the baseline.

Closing: Completion of the cycle or the entire project.

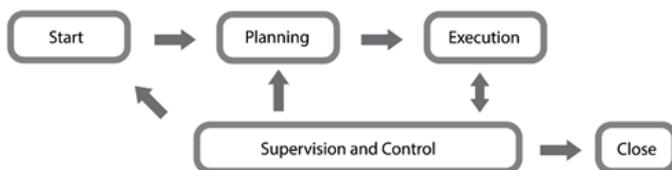


Figure 5. Traditional Approach for Project Management

Agile Framework:

This type of framework was especially created for the Information Technology (IT) sector and for those projects that require flexibility and capacity to change from requirements modifications during the project [27].

One of the most popular agile methodologies is Scrum, which divides the project into blocks called sprints; several iterations are carried out by the people involved to meet the objectives set out in each sprint and until finishing with all of them and fulfilling the total development of the functionalities defined for the product [26] (see Fig. 6).

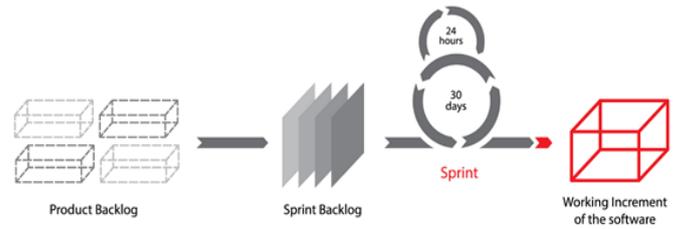


Figure 6. Scrum Methodology [28]

Critical Chain Framework:

This is one of the most recent frameworks for project management. This framework is the best option for complex projects due to its characteristics of simplifying the monitoring and control steps, relying on project protection based on the detection of critical activities.

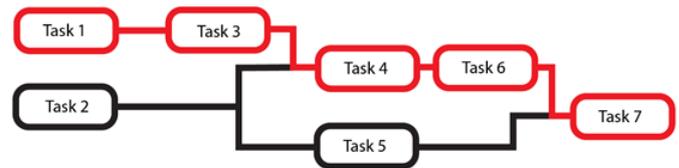


Figure 7. Critical Chain Project Management

SELECT CRITICAL PROCESSES

This phase focuses on the selection of processes independently of whether the processes are from the business core or if they are part of the value chain. The selection of processes goes more thoroughly evaluating if they are well defined, optimized and correctly managed. Digital innovation in companies requires reviewing all current processes to make the necessary changes to achieve the desired objectives [29]. It also involves analyzing the level of maturity of processes.

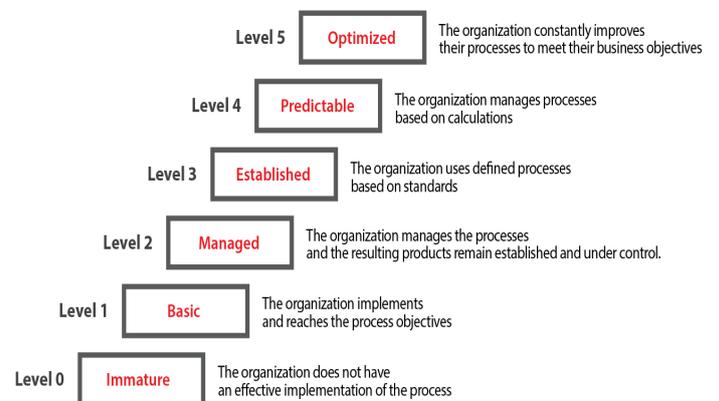


Figure 8. Maturity of Processes [30]

The main objective of the maturity levels presented in Fig. 8 is to achieve an appropriate level of standardization for each process of the company, in order to properly manage projects and thus achieve compliance with the planned objectives. For a set of processes to be taken into account in a digital

transformation project, they must be at level 3 (see Fig. 8), since it means that such processes are based on standards.

It is necessary to take into account that to reach a level 3, processes must be managed by means of a technological tool called Business Process Management (BPM), which will allow the whole company to speak the same language and be strategically operational [31]. The use of a BPM tool implies:

- **Modeling:** It describes the design, definition and limitation of roles and development of workflow.
- **Execution:** It executes task lists, business rules by means of notifications, alarms, and, tasks routing and assignments.
- **Monitoring:** They are the operational and business metrics backed up with the management of alerts and warnings.
- **Optimization:** It is the feedback, the situational analysis and the continuous improvement that can be applied to the processes.

As mentioned above, to reach level 3 implies relying on a BPM tool which is based on the following perspective (see Fig. 9):

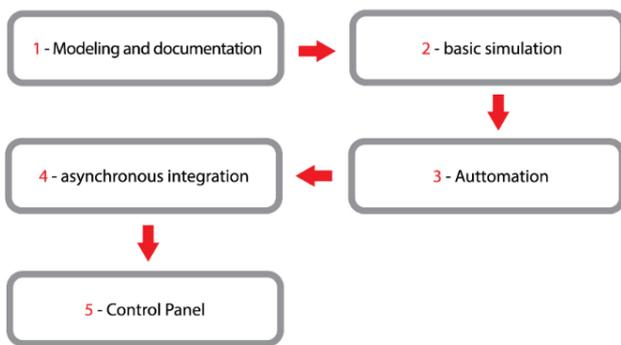


Figure 9. BPM Maturity Level [32]

Once the processes are managed by a BPM tool and placed at level 3, they can be taken into account for the project. Something very important that must be taken into account is that the selected processes are those that are currently generating problems or having a lack of control. It is also important to consider that the Digital Transformation project does not have to be strictly linked to the core business processes.

For the selection of the critical processes of the organization to which the digital transformation will be applied, it is necessary to obtain the matrix of selection of critical processes based on the impact on objectives and clients (see Fig. 10). It is recommended to read [33] to understand the details of the creation of the matrix.

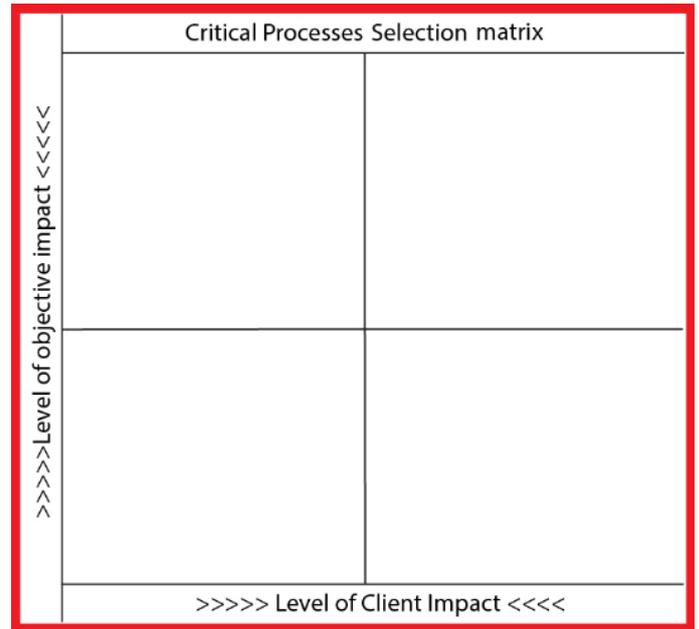


Figure 10. Critical Process Selection Matrix [33]

The matrix of selection of critical processes will help to prioritize and identify with what processes the Digital Transformation will begin. Companies that have ISO 9001:2015 certification will be able to use the list of processes of each department, since it has a map of business processes and support processes.

GENERATE AN ENHANCED DIGITAL ECOSYSTEM

Once the previous phases have been analyzed and executed, a productive and quality digital ecosystem can be consolidated [34]. The following are the pillars of this digital ecosystem that are the foundation of the application of the transformation: Infrastructure, Services, Applications and Users [35 – 37, 40].

- **Infrastructure:** They are the physical elements that promote digital connectivity, such as data center, network connection, among others.
- **Services:** The services would be those that were determined in the first phase, according to the needs.
- **Applications:** If a productive digital ecosystem want to be generated, this must be accompanied by applications or tools that allow carrying out a Digital Transformation in the company.
- **Users:** Finally, the users, who are directly responsible for the Digital Transformation project. They will lead the digital transformation process to generate new values to the organization.

This would be the last phase in which all the results of the previous 4 phases converge to form the productive digital ecosystem.

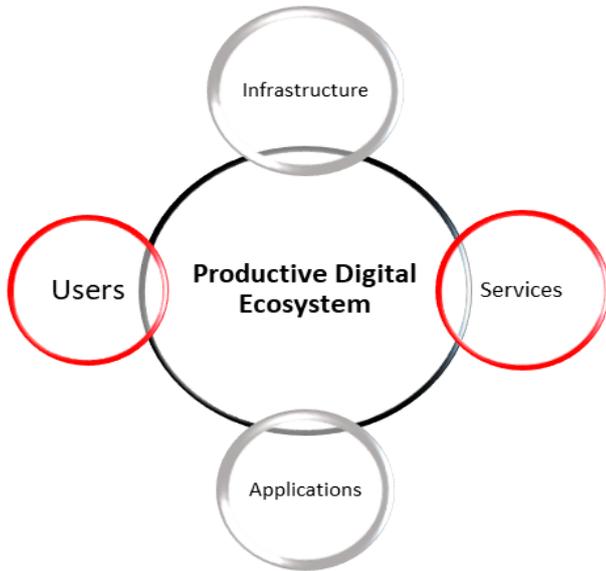


Figure 11. Productive Digital Ecosystems [35 – 37, 40]

IMPLEMENTATION CASE

To verify the benefits of the proposed methodology, an implementation case was made. This case study was carried out in the Human Talent Management department of the Sedemi S.C.C Company, a leading national company in the development of highly complex infrastructure projects. The company has offices in Ecuador and Peru and has more than 1,000 employees. It is also important to mention that the company has seven steel production plants and has five special business units in project management such as: Oil & Gas, Telecommunications, Electrical, Civil Works and Sub Stations.

The Human Talent Management department where the case study will be carried out has 14 people with a well-defined structure and processes.

Determine Needs-Based Strategies :

In this first phase, two meetings were held with the Board of Directors, General Management and Departmental Directors, to define which department or departments had the most critical processes of the company and needed a change urgently from the point of view of Digital Transformation.

Based on the indicator of satisfaction at the departmental level, it was possible to identify that the department with the urgent need for change was the Human Resources Management Department.

Table 1. Satisfaction Indicator by Departments

Department	Indicator %
Human Resources Management	65
Production	71
Financial	73
Information Systems and Technologies	77

It is important to mention that the indicator of satisfaction at departmental level is the result of the average of the indicators of the internal management processes of each department.

Once the department was selected, a special meeting was held with the General Manager, Director of Human Resource Management Department and Director of the Information Systems and Technologies Department to identify the internal management processes with the most deficiencies, which caused problems at the organizational level. The identified internal management processes of the Human Talent Management department were:

Table 2. Processes and Indicators of the Human Resources Management Department

Process ID	Process	Satisfaction %
3	Registration of Overtime	58
5	Registration of Days in the Field	60
6	Payment of payroll	63
4	Social Visit	66
8	Personnel Selection	70
7	Training Planning	77
1	Personnel Recruitment	83
2	Induction of New Personnel	85

The processes listed in Table 2 are those declared in the ISO 9001: 2015 Quality Management System. Each process has its indicator that is evaluated by means of a specialized software that was custom-made developed by the IT & Systems department of Sedemi.

Once the processes were listed, the best strategy to solve the needs was evaluated; under this premise, the option of working on the strategy on the operation model and people was selected, with what is intended to establish an efficient work model for the Human Resources Management department and with the collaborators.

Develop Digital Skills:

In order to develop the digital skills of the collaborators of the Human Talent Management department, their current level in digital skills was first evaluated, to verify the way to support them. For example: training to improve the less developed digital skills.

In order to evaluate the level of the digital skills of the collaborators, the test called Self-Perceived Digital Skills Evaluation [38] was applied. The test consists of 22 question where each question is focused on a digital skill. The aforementioned test was applied to the 14 collaborators of the Human Talent Management department and the result is shown in figure 12 (on a score of 10).

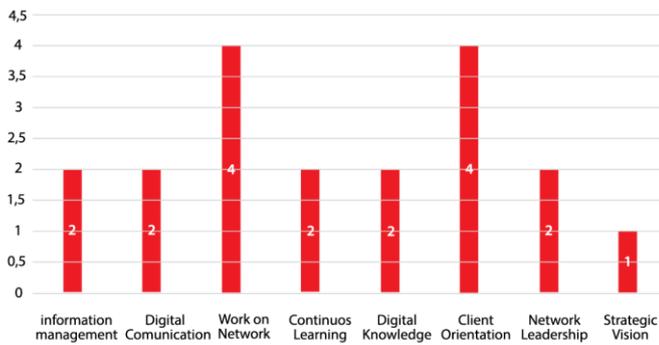


Figure 12. Current Digital Skill Level

It should be noted that the collaborators who obtained the highest score are those who already have work experience with more than 6 years using digital tools or who have knowledge in the process.

In order to develop the digital skills of the Department's collaborators, an internal training plan was carried out with the help of the Systems & IT department. The trainings were oriented according to each skill with practical workshops and digital tools that are used in the company. Each training took a digital approach, with the aim of making employees aware of what is wanted to do and where is wanted to go; additionally, an explicit training was carried out for the subject of processes.

After the training sessions that lasted 2 months, the Self-Perceived Digital Skills Evaluation test [38] was carried out again, and the results indicated in Fig. 13 were obtained. The results indicate that the change in the employee performance is notorious.

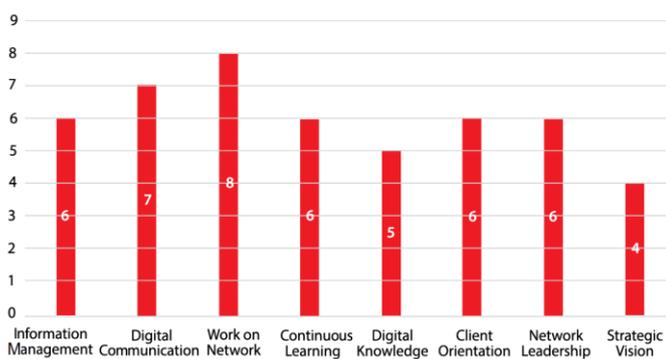


Figure 13. Digital Skill Level Results after Training

Agile Framework:

After having analyzed the different agile frameworks, Scrum was chosen, since it complies with the necessary characteristics for a Digital Transformation project, i.e. it must be agile and dynamic and easy to understand for the team [26]. This type of framework (i.e. agile) and traditional one (or heavy) have significant differences, such as:

1. Traditional frameworks tend to plan in great detail the entire development process throughout the project, but this

only works as long as things do not change. Facing this resistance to change, agile methods, being more adaptable than predictive, assume that this will occur and they prepare to receive it.

2. Second, agile methods focus more on people than on the process, explaining the need to take into account the nature of people instead of going against it.

Based on Scrum, the different roles were assigned to the actors (see Table 3).

Table 3: Roles of the Actors

Role	Responsible
Scrum Master	System Manager
Product Owner	Director of Human Resource Management Department
Team	Human Resources Management Department Members and Software Developers

Once the roles were defined and the working framework was established, the different iterations that follow the number of requirements contained in the Backlog were initiated.

Select Processes:

For the selection of the critical processes of the Human Talent Management department, the list of the processes of the Department (see Table 4) was used as input to elaborate the following matrix of selection of critical processes [33] (see Figure 14).

Table 4: List of Human Resources Management Department Processes

Process Number	Process
P1	Personnel Recruitment
P2	Induction of New Personnel
P3	Registration of Overtime
P4	Social Visit
P5	Registration of Days in the Field
P6	Payment of payroll
P7	Training Planning
P8	Personnel Selection

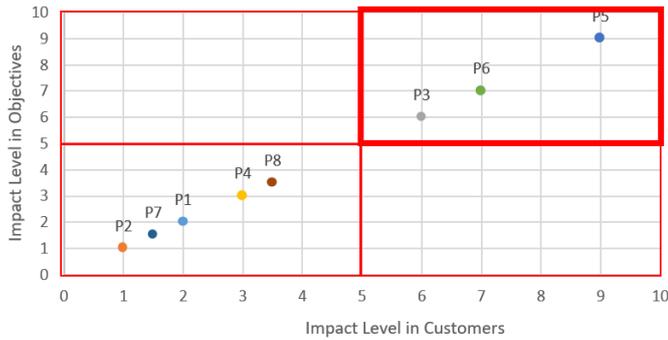


Figure 14. Result of Critical Process Selection Matrix [33]

Once the selection matrix of critical processes was applied, the critical processes of the department were obtained (see Table 5).

Table 5: Critical Processes of the Human Resources Management Department

Process ID	Process Name	Description	Approximate Monthly Cost
P3	Registration of Overtime	Currently signed sheets are sent for the payment of overtime.	\$18,000
P6	Payment of payroll	Currently the entire payroll is processed and executed in Excel sheets	\$500,000
P5	Registration of Days in the Field	Currently, records are sent from the field for the payment of the days	\$6,000

The processes identified in the selection matrix of critical processes did not reach level 1 of maturity. These processes were started by analyzing with the help of a BPM (Business Process Management) [32]; they were modeled to be clear about their inputs, outputs, and responsible people.

Generate an Enhanced Digital Ecosystem:

This phase is where the work and effort of the previous phases are converged and visualized. The results achieved of a Digital Transformation project are clearly denoted. Here it is very easy to realize if the Digital Transformation project fulfilled its objective and if it was possible to generate a new digital ecosystem increasing the productivity of the collaborators, and therefore benefit the company.

The new generated digital ecosystem, after applying the present methodology for digital transformation, is made up of pillars that house a set of new digital services that come from the applications developed for the systematization of the selected processes. Through the process, users managed to

achieve their digital skills that will help them continue their professional and digital growth autonomously, capable of initiating new innovations for the continuous improvement of processes.

Table 6: Pillars of the Current Digital Ecosystem

Pillars	Current Status
Infrastructure	Existing servers were virtualized to host new applications
Services	Services such as being able to consult their overtime, field days and role from any place were introduced.
Applications	3 web portals were developed to systematize the selected processes
Users	Nowadays, they have digital skills that generate value to the company and that helped to reach a successful project of Digital Transformation

After identifying the improvements made in each of the pillars of the new digital ecosystem, the evaluation of the processes was carried out. After carrying out the systematization in the selected processes, the results obtained were the following:

Table 7: Costs after Digital Transformation

Process	Monthly Previous Approximate Cost	Monthly Current Approximate Cost
Registration of Overtime	\$ 18,000.00	\$ 12,000.00
Registration of Days in the Field	\$ 6,000.00	\$ 2,600.00
Payment of payroll	\$ 500,000.00	\$ 430,000.00

As shown in Table 7, once the digital transformation project was completed, savings of around \$57,400 per month have been achieved, which demonstrates the benefits of implementing the proposed methodology.

CONCLUSIONS

By developing the following work, we have reached the following conclusions.

- The major drawbacks when carrying out the process of digital transformation, have to do with: the inability to experiment, the way in which change is managed, the attachment to the legacy systems, the culture and organizational silos.
- The power of a digital transformation strategy lies in its scope and objectives. Less mature companies digitally tend to focus on individual technologies and more operational aspects. On the other hand, the more mature

companies are betting on a complete transformation of all their processes.

- All companies, regardless of industry or size, place digital skills at the end of the list of skills required for digital transformation. Indeed, the skills that are most demanded or considered to be the most necessary are the so-called soft skills.
- The more mature digitally speaking companies are more effective at educating their employees and training them in the digital skills necessary to adopt the digital transformation than companies with a lower level of maturity.
- Based on the present research, new options, ways or methods could be proposed to develop the digital skills of the collaborators of a company.
- Establish a more formal evaluation scheme or method to evaluate the Digital Skills of the collaborators, which is quantitative.
- Organizations in their desire to be competitive must not forget about the digital skills of employees.
- In the selection and recruitment process, an evaluation of digital skills should be included for the applicants.

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