











# Methodology for the Management of High Performance Teams in the Development of Computer Applications, Using Emerging Technologies

Christian Ovalle<sup>1</sup><sup>a</sup>, Sandra Meza<sup>2</sup><sup>b</sup>, Wilver Auccahuasi<sup>3</sup><sup>c</sup>, Oscar Linares<sup>4</sup><sup>d</sup>, Kitty Urbano<sup>5</sup><sup>e</sup>,  
Emilio Rosario-Pacahuala<sup>6</sup><sup>f</sup>, Yoni Nicolas-Rojas<sup>7</sup><sup>g</sup>, Aly Auccahuasi<sup>8</sup><sup>h</sup>,  
Tamara Pando-Ezcurra<sup>9</sup><sup>i</sup> and Margot Corilla-Condor<sup>10</sup><sup>j</sup>

<sup>1</sup> Universidad Tecnológica del Perú, Lima, Peru

<sup>2</sup> Universidad ESAN, Lima, Peru

<sup>3</sup> Universidad Privada del Norte, Lima, Peru

<sup>4</sup> Universidad Continental, Huancayo, Peru

<sup>5</sup> Universidad Científica del Sur, Lima, Peru

<sup>6</sup> Universidad de San Martín de Porres, Lima, Peru

<sup>7</sup> Escuela superior la Pontificia, Ayacucho, Peru


<sup>8</sup> Universidad de Ingeniería y Tecnología, Lima, Peru


<sup>9</sup> Universidad Privada Peruano Alemana, Lima, Peru


<sup>10</sup> Universidad Nacional del Callao, Lima, Peru


**Keywords:** Equipment, Development, Applications, Emerging, Technology, Team, Development, Discord.


**Abstract:** In the development of computer systems, there are many paradigms that are presented, from collaborative work to the implementation of high performance groups, all of them in order to maximize the capabilities of the programmers for the benefit of the development team, in this paper we develop a method for the design of a development environment based on emerging technologies, in order to optimize the development based on the interaction between team members, the proposed method is the use of the virtual environment defined by the tool DISCORD, where team members are connected for a given project, each with a specific role, the results of the methodology, is defined from the use of line work, visualizing the progress of each and every one of the team members, as well as allowing the project coordinator to evaluate the progress and organize functional tests as the system develops, the method can be scaled and replicated to the development of complex systems, can also be used in teaching programming courses such as project management where each of the team members have a specific task.


<sup>a</sup>  <https://orcid.org/0000-0002-5559-5684>


<sup>b</sup>  <https://orcid.org/0000-0002-4650-1340>


<sup>c</sup>  <https://orcid.org/0000-0001-8820-4013>


<sup>d</sup>  <https://orcid.org/0000-0002-7952-9518>


<sup>e</sup>  <https://orcid.org/0000-0003-2009-000X>

<sup>f</sup>  <https://orcid.org/0000-0003-2421-548X>

<sup>g</sup>  <https://orcid.org/0000-0001-6493-6084>

<sup>h</sup>  <https://orcid.org/0000-0001-5069-0415>

<sup>i</sup>  <https://orcid.org/0000-0003-0301-3440>

<sup>j</sup>  <https://orcid.org/0000-0002-1578-6558>

## 1 INTRODUCTION

The online work is based on being able to perform daily tasks from any physical location, these theories applied to the development of systems covers a wider spectrum, by the optimization of time for the benefit of the progress of projects, in order to meet these expectations that help to organize and develop computer projects, it is necessary to have a stable and high speed network in order to be always connected as well as to share resources among team members, if you work with a wireless network it is advisable to have a connection based on a WIFI 6 network, where you can fully exploit the online work (Auccahuasi et al., 2021a; Auccahuasi et al., 2021b).

Making a review of the literature we found works where the last technologies are applied for the benefit of the development of computational systems, such as the use of VR technology applied to different areas, in this case it was applied to physical education where the objective is teaching, processes and methods, where it has combined the connotation and characteristics of VR technology, in order to perform the analysis on the application of physical education in order to expand the form of teaching reaching students directly (Han, 2020). We also found works referred about the consistency about a 3D mobile application used for learning the use of the Bubble Sort sorting algorithm, increasing the interactivity and interest of students for the use and learning for which a Virtual Reality technology and VR headsets are proposed, where the design is based on the concepts of gamification applied to the easy learning process, applied to students where effective results have been seen about the application of this learning methodology where it has been designed in Unity editor with C# scripts to implement the functionality (Nicola et al., 2018).

We found works referred about IoT applied to the different fields such as education, where augmented and virtual reality (AR/VR) was applied, where it is applied to a new dimension with IoT capability in order to connect and use a digital information to various physical devices by using a specialized software and hardware in AR / VR applied to the real world without any problem, generating a unique experience enabling a range of functions such as R&D, manufacturing, production and field services, with aspects of smart education helping educations in a positive way, a prototype has been developed with the implementation of AR in IoT used in a general way for both students and teachers (Paul et al., 2019). We found works referred about the emerging development of virtual reality (VR), through a head-

mounted device (HMD) VR that is applied to various fields, in the area of education has been applied a multimedia design of VR, for which has been developed a virtual reality game in real English that is played with VR HMD, called VR Life English (VRLE), which has 2 play modes one is played with voice and subtitles, and the other has only voice, for the study conducted the VRLE was analyzed about the performance of learning, immersion and excitement of students, where high school students from 2 classes have been included in the experiment individually and mixed about the design of virtual reality serious game (Yang et al., 2018).

We found works referred about simulations applied to undergraduate nursing education applying low-risk experiences in order to expose pre-licensure students to clinical environments where the development of knowledge and skills necessary for patient care are located, the simulation was performed through virtual reality (VR) applied to clinical education, so the application on epistemic network analysis (ENA), a technique of quantitative ethnography (QE) with which the nursing educator is modeled facilitated clinical judgment with which has promoted quality education and safety of nurses, applied via the use of Simulation Learning System with Virtual Reality (SLS with VR), the simulation was applied from October to November 2020 to 2nd year nursing students where they practice basic assessment and care management (Shah et al., 2021). We found works referred about the design, implementation and an initial evaluation of an edutainment application called Virtual Environment Interactions (VEnvI), considered as an application for students to learn computer science concepts through the process of choreographing the movement of a virtual character using a fun and intuitive interface, for which an exploratory study was applied with 54 participants, applied to a summer camp in order to promote the participation of women in science (Parmar et al., 2016).

We found works referred about the IT tool used in cognitive info communication which support about educational skills starting from the mathematical point of view with the use of edu-coaching, 3D/VR considered as a valuable method where engineering knowledge is applied to solve problems, where edu-coaching is considered as an alternative with which can improve the efficiencies about education with the application of disruptive technology through a cooperative learning environment 3D VR, where ICT have improved the effectiveness of learning, motivation and creativity (Kovari, 2018). We found works referred about low-cost VR applications

through applications which are going to run on inexpensive hardware, applied to mobile-based solutions through the combination of smartphone together with virtual reality viewers for which we will analyze an approach of creating applications applied to people who can use the applications in different places and situations which meet the target challenges (Wallgrün et al., 2019).

In this work we use the DISCORD tool as a collaborative work environment to generate a virtual environment for the development and implementation of computer systems, where team members play an important role, but the maximum benefit is the synergy and the use of the resources available to each team member, with which you can get to develop high performance teams by the fact that all team members share their progress and this information is counted in real time, so development times are optimized and progress is verified for the achievement of the goals, in the development of the work, we describe the steps necessary to replicate the method as well as the tools and components needed for implementation.

## 2 MATERIALS AND METHODS

The method we present, consists of a description of the problem where we describe the main problems when working in teams and online, then we continue with the description of the method we propose where we describe how we can exploit the benefits provided by the DISCORD application, and end with a description of uses and applications of the proposed method (Figure 1).

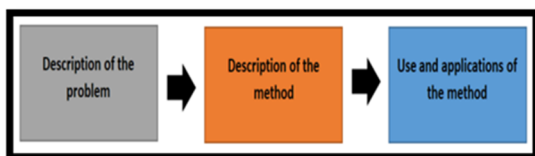


Figure 1: Block diagram of the proposal.

### 2.1 Description of the Problem

The description of the problem, is focused on the multiple problems that we have when working in teams, from the realization of a joint work, to the execution of a project of great dimension, where there are many collaborators and it is required the verification of the deliverables as well as an analysis of the deliverables; in a project of development of a computer system or information system, we have

collaborators that develop different roles, like the one in charge of the design of the database, the one in charge of the analysis, the one in charge of the user interfaces, the one that implements the programming of the interface with the database, the ones that develop the reports and the ones in charge of documenting the implementation, depending on the dimension of the project, the number of collaborators can increase.

One of the classic problems that we have is the administration of the advances, as well as of the deliverables, where the tasks are configured in series, with this logic we cannot start a task without the previous task is not finished, this type of organization generates delays in the development, because we must wait that the analysis finishes to begin with the design, to improve this process it is necessary to have a mechanism that allows the integration of the team and to be able to share resources, as well as the verification of the advances to optimize the time of development.

### 2.2 Description of the Method

The method we present is related to the optimization of resources as well as the use of the time dedicated to the development and implementation of computer and information systems, these features are achieved thanks to the DISCORD tools, which provides us with a development environment where you can integrate several participants, where you can share screen, files, videos, among all participants, where you can label the participants to know what their role in the project is, where we can configure an administrator or team coordinator who can interact with each and every one of the participants, in real time. All these features are achieved thanks to the customized configuration of the DISCORD tools, which can be seen in the following figure.

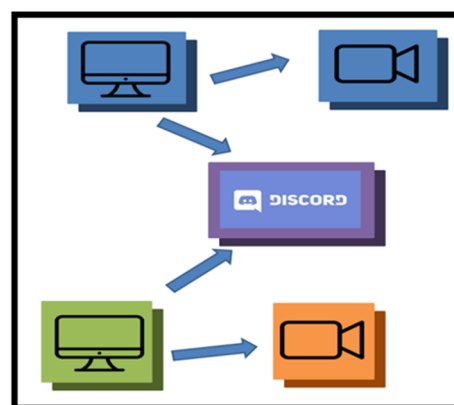


Figure 2: Architecture of the proposal.

In Figure 2, you can see the diagram of the architecture of the method, where the heart is the DISCORD application, which allows connectivity with various devices, whether computers, workstations, mobile devices, among others, as additional configuration can exploit the different resources that have the devices, such as the ability to share screen, to make recordings, share files, all in real time, also when one of the devices makes a video transmission, all collaborators can observe them, In order to achieve these configurations, it is necessary that all devices are connected to the same network and connected to the main device where the DISCORD application is installed and configured as a server, in the other devices the DISCORD application is configured as a client.

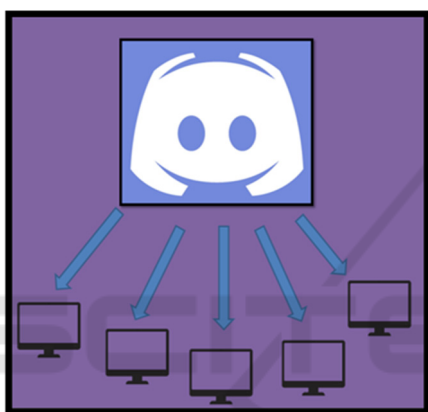


Figure 3: DISCORD allows connection to multiple devices.

One of the advantages provided by the DISCORD application is the multiple connectivity, with which we can configure a device as a server and several devices as a client, the advantage of this configuration is the integration and availability of resources, this configuration can be exploited in environments where a team is required to work on the development and implementation of software applications, can also be applied in the implementation of tasks between students in order to perform a single job and all contribute to its development.

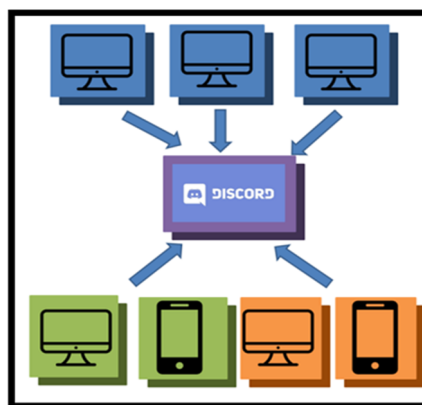


Figure 4: DISCORD allows connection with multiple operative systems.

In Figure 4, it can be seen that the DISCORD application is multiplatform, where multiple devices can be connected, such as computers, mobile equipment, of all brands, as well as there is no limit to the number of devices that can be in a development environment, this multiplatform feature is important because the development team is always connected, by any means or device.

### 3 RESULTS

After having made the explanation of the method, which has as main actor the DISCORD application, we can indicate multiple applications, where it is required that the team members are always connected, that consultations can be made and with assistance in real time by all team members as well as having a project coordinator who can at all times verify the progress of each of the team members, we can apply the method in the design of information systems where it is required to meet specific times, and the verification of progress is one of the primary tasks, which ensures the development, maintaining an idea of revised process, tested and finalized process; This task of approval and verification of progress is performed by the project coordinator or leader, who is verifying the activities of each one, thus ensuring compliance with the work plan.

We can use the method in other activities where teamwork is required, such as school activities, university student projects, or any type of task that requires a group of people.

The results presented are related to the use and exploitation of the method. The previous chapters describe the configuration of the DISCORD tool, which is the fundamental part, where the use of its

connectivity and resource sharing features is used, optimizing the development environment generated with the tool. Next, we present the characteristics of the method and what tasks we can perform.

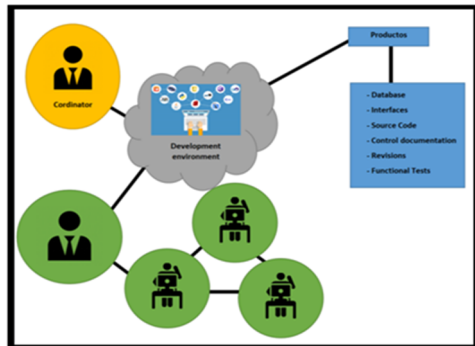


Figure 5: Distribution of the development team.

Figure 5 shows the work mode in a high-performance team configuration for the development of computer systems or information systems, where a DISCORD environment is configured and different users are associated to the environment to perform different functions.

A high performance development team is characterized by the high specialization of each of the team members, with the characteristic that the work of the team is superior to the sum of individual work, in this sense to demonstrate and improve performance, the use of the DISCORD platform is used to create a development environment, one of the characteristics of the method is to have a coordinator, who has the function to analyze the progress of each of the team members, so that the tasks can be performed in parallel.

The distribution of the roles of the team where you can see the components of a programming team, where we have the first place the team coordinator, who can enter each session of the members, then we have the responsible for the database, which is responsible for the administration and organization of data, handles data modeling tools and applications such as MYSQL and others, we also have the team members who programming interfaces, are those who program the visual part of the systems, They handle programs such as PHP among others, among the team members who are responsible for the part of the complex algorithms for calculation, who work with programming languages such as C, C++, Python among others, complementing the development team, we have those responsible for performing the documentation, as the team progresses the project, the documentation must be accompanied to finish in the

estimated time, so we can configure the tasks that can be executed in parallel.

In figure 6, a description of the architecture of the development team is presented, where the coordinator is evidenced and how he influences the development of the team where he can visualize and control the progress of each of the collaborators, in this way the virtual development environment helps in the administration and collaboration of the members of the team in improvement of its results that is evaluated with the fulfillment of the objectives and delivery times.

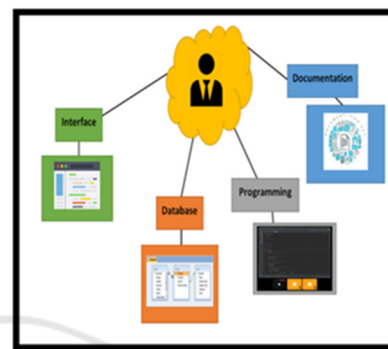


Figure 6: Development team task.

## 4 CONCLUSIONS

The conclusions we reached at the end of this research, is related to indicate the best conditions and development environments for teams that implement software-based applications, one of the daily tasks is the use of physical spaces for the team to perform their tasks. In these times where telework arises, where people can develop their work from places other than offices, new ways to manage these development teams arise, in order to continue and improve the development as well as the performance of the development team, here are some of the benefits of the proposed methodology.

From the aspect of being able to manage the team, the DISCORD platform provides the mechanisms for the creation of virtual environments, where you can integrate several users in order to share information and resources, in order to manage the team, manage progress, measure and evaluate the results as well as functional tests and to submit for discussion of the entire team the likely changes in order to approve them, thus improving the performance of the team.

From the aspect of usability, the DISCORD platform can be easily installed and configured work groups without much difficulty, we can also indicate

that it has no license, so we can use it without access problems, this feature is important in addition to the fact that it is multiplatform, where it can be installed on different operating systems and devices, so we can use them on cell phones, tablets, computers, as well as Windows, Linux, Android, IOS operating systems among others. With which it is demonstrated that the system that the method can be applied and scaled.

As a mechanism for discussion, we can indicate that the review of the literature presented shows that simulation techniques, virtual reality, as well as the application of different methodologies, show that as technology improves, experimentation shows an increase of these, in the market there are many applications related to provide interaction between different development teams, The method presented here is related to exploit the benefits of the DISCORD application, taking it from a highly demanding environment such as video games, to an environment of systems and applications development, through the interaction of the development team, in order to meet the objectives as well as compliance with the established standards and times.

After having carried out the experimentation, through the implementation of the methodology, having carried out tests with development teams, we recommend it as a working method, added to the fact that the tool has a free use license and is easy to use, which allows integrating the team in the shortest time possible while maintaining its development standards.

## REFERENCES

- Auccahuasi, W., Ovalle, C., Bernardo, G., Felipe, M., Pacheco, O., Lovera, D., ... & Ruiz, M. (2021). Connectivity pattern analysis for virtual simulation design, based on high-performance game analysis.
- Auccahuasia, W., Ovalle, C., Ayvar, Z., Aybar, J., Quispe, R., Lovera, D., ... & Ruiz, M. (2021). Methodology for the optimization of resources, applied to virtual reality, through the use of WIFI network 6.
- B. Han, "Application of Computer VR Technology in Physical Education Class," 2020 2nd International Conference on Applied Machine Learning (ICAML), 2020, pp. 434-437, doi: 10.1109/ICAML51583.2020.00094.
- S. Nicola, L. Stoicu-Tivadar and A. Patrascoiu, "VR for Education in Information and Tehnology: application for Bubble Sort," 2018 International Symposium on Electronics and Telecommunications (ISETC), 2018, pp. 1-4, doi: 10.1109/ISETC.2018.8583999.
- S. Paul, S. Hamad and S. Khalid, "The Role of AR/ VR in an IoT connected digital enterprise for smart education," 2019 Sixth HCT Information Technology

- Trends (ITT), 2019, pp. 305-308, doi: 10.1109/ITT48889.2019.9075102.
- F. O. Yang, H. Chen and C. Liao, "Exploring the Effects of Multimedia Design in a Life English VR Serious Game," 2018 7th International Congress on Advanced Applied Informatics (IIAI-AAI), 2018, pp. 946-947, doi: 10.1109/IIAI-AAI.2018.00194.
- M. Shah, A. Siebert-Evenstone, B. Eagan and R. Holthaus, "Modeling Educator Use of Virtual Reality Simulations in Nursing Education Using Epistemic Network Analysis," 2021 7th International Conference of the Immersive Learning Research Network (iLRN), 2021, pp. 1-8, doi: 10.23919/iLRN52045.2021.9459408.
- D. Parmar et al., "Programming moves: Design and evaluation of applying embodied interaction in virtual environments to enhance computational thinking in middle school students," 2016 IEEE Virtual Reality (VR), 2016, pp. 131-140, doi: 10.1109/VR.2016.7504696.
- Kovari, "CogInfoCom Supported Education : A review of CogInfoCom based conference papers," 2018 9th IEEE International Conference on Cognitive Infocommunications (CogInfoCom), 2018, pp. 000233-000236, doi: 10.1109/CogInfoCom.2018.8639879.
- J. O. Wallgrün et al., "Low-Cost VR Applications to Experience Real Word Places Anytime, Anywhere, and with Anyone," 2019 IEEE 5th Workshop on Everyday Virtual Reality (WEVR), 2019, pp. 1-6, doi: 10.1109/WEVR.2019.8809593.