
ERGONOMÍA OCUPACIONAL

INVESTIGACIONES Y APLICACIONES

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Prefacio

Una cosa es hablar de ergonomía y otra muy distinta es entender de ergonomía, una palabra que enmarca bienestar, confort, productividad y en fin resultados. En otro artículo diseñado para una universidad colombiana había escrito que considero a la ergonomía como "*una necesidad absoluta de implementar dentro del contexto del desarrollo de los seres humanos, no solo en el ámbito laboral, sino en todas las actividades en las que tenga que ver una persona*". Al ser una necesidad absoluta entonces siempre va a ser necesario aprender de ella un poco más, conocerla y sobre todo investigarla.

En esta obra se consideran varios temas relacionados con la identificación, evaluación, intervención y puesta en marcha de programas ergonómicos empresariales e institucionales en los cuales siempre estará presente el ser humano, desde el punto de vista integral, es decir en cuerpo y alma; de tal manera que se convierta en un ente productivo, sano y seguro.

La SEMAC cada año edita un libro de este tipo y lo indexa, el objetivo fundamental de esta gran labor es resaltar la importancia de la investigación en ergonomía y que no quede solo en una exposición, sino que permanezca abierto al conocimiento de estudiantes, consultores y toda aquella persona que quiera aprender sobre la aplicación de la ergonomía, es decir esté al alcance de toda persona de manera gratuita.

Los temas de esta edición son novedosos, interesantes y sobre todo dignos de considerarlos para futuras investigaciones en otros campos sin dejar de lado que gran falta nos hace a nuestras sociedades la investigación, su aplicabilidad y en muchos de los casos la normatividad deficiente en muchos países de Latinoamérica con respecto a otras regiones del mundo.

SEMAC le dio, una vez más, la importancia a estas obras y a sus autores, (profesores, investigadores, consultores, prevencionistas y estudiantes) quienes fueron escogidos por la Comisión Académica del Congreso la cual estuvo conformada por un grupo selecto de investigadores de México, Nicaragua, Honduras, Guatemala, Costa Rica, República Dominicana, Colombia, Ecuador, Perú, Bolivia, Uruguay, Chile, Argentina y Brasil.

En cuanto a los autores de los artículos cabe señalar que no son invitados especiales ni exclusivos, por el contrario son investigadores apasionados de la ergonomía que han presentado trabajos libres los cuales han sido aplicados en sus lugares de trabajo o estudio, los organizadores del evento han decidido abrir las puertas a todos los estudiosos de la Ergonomía siempre y cuando tengan como mensaje fundamental el dar a conocer que en América latina se hace investigación de la ergonomía con altos estándares.

La idea fundamental de este trabajo es difundir los avances en el tema de Ergonomía en Latinoamérica y sobre todo formar y formalizar la academia en la ergonomía, generando espacios en los que el lector se ubique dentro del universo de la investigación.

Al considerar a la ergonomía como multidisciplinaria, estamos hablando que se deben integrar varios aspectos, es así como tenemos trabajos relacionados con sectores: Industriales, agrícolas, de salud, construcción, pesca

Dialogando con algunos autores de los artículos me han manifestado que el proceso investigativo les ha llevado desde dos años hasta seis meses de constante sacrificio para sacar a la luz trabajos fiables que aporten nuevos conocimientos y aplicaciones creativas.

Esta obra pretende mostrar mediante los procesos investigativos, la gestión de la ergonomía con enfoques no solo físicos sino mentales y sociales que influyen dentro del bienestar de los miembros de las empresas y organizaciones

Iván López E.
Responsable Comisión Académica ULAERGO

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SERIOUS GAME PROTOTYPE FOR BURNOUT AWARENESS AMONG MAQUILADORA EMPLOYEES IN CIUDAD JUAREZ

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Abstract: This work aimed to develop a serious game prototype to contribute to the awareness of employees of the maquiladora industry about the effects of Burnout syndrome, and to inform them about the symptoms, consequences, treatments, dimensions, and prevention. For the development of the prototype, the iPlus and APRehab methodologies were adapted in combination with the Kmos-RE methodology to identify all the elements that comprise the Burnout syndrome and create a correct conceptualization of the problem that helps define the objectives of the project. Subsequently, the player experience and the expected gameplaying were specified. Then, all the content of the game was defined, in addition to the mechanics and gamification elements that were used. Finally, the development of the prototype was carried out, accompanied by its validation and its respective refinement in each iteration to achieve the expected solution. All this is validated by health specialists and others in serious games, to be later evaluated by employees of the maquiladora industry. The game achieved a satisfactory level of quality for the three categories evaluated, which were functionality, usability, and reliability. As conclusions, the information and gamification elements used in this project successfully contribute to the process of raising awareness of the effects of Burnout syndrome in employees with middle and high positions in the maquiladora industry.

Keywords. Digital transformation, Burnout, Serious Game, Industry.

Relevance to Ergonomics: As a contribution to Ergonomics, this work contributes to promote a technological alternative developed and evaluated according to various quality characteristics that can contribute to disseminating, understanding, and making users aware of phenomena, problems and working conditions of interest to this science and that affect the individual and/or organizations. It is considered that these alternatives are being increasingly exploited to achieve the most important

objectives of Ergonomics in terms of the adaptation of work, products, systems, and environments to man for the prevention of health problems.

1. INTRODUCTION

Currently, the pillars in digital transformation are new technologies such as cloud computing and cognitive computing. While the former provides the necessary infrastructure for digital transformation processes, cognitive computing relies on the knowledge recovered from the analysis of digitized data to solve problems and make decisions (Vial, 2021). In addition, the process of digital transformation must be a tailor-made suit since it depends on the specific needs of each organization. Data acquisition is one of the most important activities for this process, because the efficiency of the analysis depends on the quality of the data, that they represent the closest information to reality. However, there are domains (areas of knowledge) that have very complex characteristics, and it is difficult to represent their knowledge. Because this knowledge is not homogeneous, it comes from various sources, it is multidisciplinary, mostly tacit, and derived from experience, these domains are called Informal Structure Domains (ISD) (Olmos-Sánchez & Rodas-Osollo, 2017). An example of this type of domain is work stress because the worker is often unaware that he or she suffers from it, in addition to the social stigma against mental illness and is not adequately cared for at the individual or organizational level. In addition, companies do not have enough health personnel or do not have them to care for their employees. Therefore, non-conventional applications that support data acquisition are required. One of these applications are serious games (Tomalá-González et al., 2020), which are computer video games designed for teaching or to solve health, political, social, cultural problems, among others, that are not only focused on entertainment, if not to help motivate and encourage a change in the user, which is essential to combat social, cultural and health problems (Dias et al., 2018; Fleming et al., 2014, 2017).

The objective of this work is to develop a serious game to contribute to the awareness of Burnout syndrome in employees of the maquiladora industry and provide tools for its detection, prevention, and treatment. The methodology used is a combination of the iPlus and APRehab methodologies in combination with the Kmox-RE methodology to identify all the elements that comprise the Burnout syndrome.

The document is structured as follows. Section 2 presents the knowledge necessary to understand the topic of the project. Section 3 presents the objective. Meanwhile, section 4 describes the methodology used for the solution. The results and discussion are presented in section 5. Finally, in section 6 the conclusions of the project.

2. BACKGROUND

Mental health is a state of emotional, psychological, and social balance that allows the individual to carry out their activities, work productively, manage stress, relate to others, make decisions, and, in general, is the basis for the effective functioning of a community to achieve their goals ("WHO | International Classification of Diseases, 11th Revision (ICD-11)," 2019). According to the World Health Organization (WHO), mental illnesses worldwide represent a morbidity burden of 13% and in Mexico, 17% of people have at least one mental disorder. These mental disorders directly damage the nervous system, and the consequences are reflected in behavior, emotions, and cognitive processes such as memory and perception of the person, affecting productivity in organizations (Tudela et al., 2010).

In countries like Mexico, only about 2% of the health budget is allocated to mental health, while the WHO recommends an investment between 5% and 10%. In countries like Mexico, only about 2% of the health budget is allocated to mental health, while the WHO recommends an investment between 5% and 10%. In addition, in Mexico, 80% of spending on mental health is allocated to the maintenance of psychiatric hospitals, so there are insufficient funds for the detection, prevention, and rehabilitation of these conditions (INCyTU, 2018). Mental disorders such as work stress are a consequence of psychosocial risk factors caused by workload, changes in schedules, shifts and even violence towards the worker (STPS | DOF, 2018). Among the vulnerable groups with the highest risk of presenting these disorders are employees with middle and high management, due to the demands and responsibilities in decision-making (Macias-Velasquez et al., 2019; STPS | DOF, 2018).

The main psychosocial risk factors are work stress and Burnout syndrome. Job stress is a set of psychological, emotional, cognitive, and behavioral reactions to certain overwhelming or demanding aspects of the workplace organization and environment (Houtman et al., 2008). On the other hand, Burnout syndrome is a psychological syndrome of exhaustion where emotional exhaustion, depersonalization or cynicism, and decreased performance or inefficiency occur (Michael P. Leiter, Christina Maslach, 2017). Burnout arises in response to stressors in the work environment and has a wide range of negative effects on the performance and personal well-being of employees.

Whenever the topic of burnout is raised, the key question is often "What can be done about it?" Although many different ideas on how to deal with burnout have been proposed, few of them have been systematically implemented or evaluated. Also, there is a cognitive bias in trying to cure people, instead of seeking to fix the employment situation in the company. In addition, there is a social stigma toward the mentally ill that can prevent them from going to the appropriate health services (Maslach, 2017). Due to the variable nature of burnout, there is no consensus to prevent, treat, or cure it.

There are instruments to identify and calculate the levels of fatigue, cynicism, and ineffectiveness of Burnout in the individual, such as the Maslach Burnout Inventory - General Survey (MBI-GS) questionnaire (Schaufeli et al., 2009). Once it is identified that the employee suffers from stress, anxiety or depression disorders,

strategies must be applied to reduce their levels. Nevertheless, most of the treatments found to reduce stress focus on the individual instead of addressing the problem at the organizational level to improve the work environment (Shanafelt et al., 2012).

For this, there are traditional treatments that range from exercising the body to having a controlled diet, healthy sleep cycles and support medication (Arbués et al., 2019). Even interventions such as physical-recreational activities (Calero et al., 2016), music therapy (Izarra, 2017), behavioral activation (Coto-Lesmes et al., 2020), mindfulness sessions (Martinez-Escribano et al., 2017), and traditional games (Holgado Grajeda, 2018).

There are also modern treatments based on technological advances to treat mental health. An example of this is computer video games since they can be used for serious purposes, such as health and education (Fleming et al., 2017). These types of computer games for serious purposes are known as serious games and can go hand in hand with gamification. The latter is made up of video game elements used to attract the attention of users towards applications that are not necessarily in the field of entertainment (Fleming et al., 2014). Gamification and serious games have become a strategy to motivate and involve users of educational, business, and health applications to generate new projects. In addition, they have been shown to support several positive aspects, such as learning or training, whether in the field of education or health (Dias et al., 2018).

A project that meets the aforementioned characteristics of serious games and gamification is *Focusing Gamificada* project that deals with an application for stress management aimed at helping doctors in public hospitals in Ecuador. These doctors can set their goals for the application of the Focusing technique and, in turn, can reduce their stress levels (Tobar Lara, 2019). In addition, *Luccentus* is another video game for teaching stress assessment with the psychosocial risk battery of the Colombian Ministry of Labor. This development of a serious game was used to train desirable behavior in the cognitive-behavioral therapy of Burnout syndrome (Zielhorst et al., 2015). Another video game, that showed positively influences on learning of the subject, since, at the time of the application of the master class in conjunction with this video game, there was an increase in academic performance for the application of the stress questionnaire (Arboleda & Díaz, 2020).

Additional examples are the one proposed by (Egas-Reyes et al., 2018) in this project called *Mini-Spin-VR*, an anxiety test is carried out in virtual reality (environment of scenes or real-looking objects simulated by a computer) that, through a three-question questionnaire, helps to identify the level of anxiety in each simulated staging. Another case is the *Ubiquitous Biofeedback Serious Games* project, which consists of feedback that reflects the state of a certain physiological process based on the characteristics of the user. This allows users to have more control over their cases to achieve a higher state of well-being (Al Osman et al., 2016). There is also a serious video game called *Emotion4Down* to support the emotional education of adolescents and young adults with Down syndrome (Hernández Lara, 2019). In 2020, the serious game *Co-Op World* was developed to support the field of child psychotherapy and encourage child cooperation and reciprocity (Alkalay et al., 2020). *Stigma-Stop* is another example of a serious game

created for the 2017 Video Games and Education Congress to raise awareness of mental health issues, developed in a non-immersive virtual reality environment (Cangas & Ojeda, 2017).

Other serious games have also worked as a tool for the treatment of Attention Deficit Hyperactivity Disorder (ADHD). Such is the case of the serious behavior change game Plan-it Commander (González-Calleros et al., 2019). In 2019, an interactive game prototype was presented at the IEEE international conference on Serious Games and Applications for Health (SeGAH) that helps with anxiety management (Dheda & Heymann, 2019). Another project linked to serious gaming and especially gamification is a virtual reality-based multimodal treatment for members of Canadian Armed Forces (CAF) pilots with combat-related post-traumatic stress disorder (Jetly et al., 2017).

In addition, the current world health situation due to the COVID-19 (SARS-CoV-2) pandemic have had a great influence on the increase in risk factors associated with mental disorders in humanity (Rodríguez et al., 2021) and there is also a leap in technological advances for their respective treatments (Galindo-Vazquez et al., 2020). Although research on serious games and gamification have become very important in recent years, an increase in the implementation of these tools in the field of health is required, especially for the employee and at the organizational level. This background shows projects that are the basis for research on the application of gamification and serious games in the area of education or health care. They function as a reference to identify the scope and areas of opportunity that currently exist.

3. OBJECTIVE

The general objective is to develop a serious game to help raise awareness of Burnout syndrome in workers in the manufacturing industry and provide tools for its detection, prevention, and treatment.

3. METHODOLOGY

To solve the problem defined in this project, a serious game prototype was developed, complemented with behavioral change design techniques, so that the employee identifies a possible incidence of the syndrome, and creates awareness of the repercussions that Burnout can cause in the social sphere, and health, as well as providing tools to assist in the prevention and correct treatment of this problem. To identify the dimensions of Burnout in the employee, an interactive dynamic implementation of the MBI-GS questionnaire was carried out to determine the degree of emotional exhaustion, depersonalization, and work efficiency (Rotenstein et al., 2018). To help with awareness, playful tools from serious games were used to capture the attention of the end user and make it easier to retain the message that is expected to be imparted. In addition, it is expected to instruct the employee with advice that will be collected in interviews with health specialists to attend to the syndrome, if necessary, to propose to the employee that he goes with professional help. To solve the problem defined in this degree project, it was developed a serious game prototype complemented with behavioral change design techniques, so that

the employee can identify a possible incidence of the syndrome, create awareness about the repercussions that Burnout can cause in the social and health spheres, as well as provide tools to help in the prevention and correct treatment of this problem. To identify the dimensions of Burnout in the employee, dynamic and interactive implementation of the MBI-GS questionnaire was carried out to determine the degree of emotional exhaustion, depersonalization, and work efficiency (Rotenstein et al., 2018). To help with awareness, playful tools from serious games were used to capture the attention of the end user and make it easier to retain the message that is expected to be imparted. In addition, it is expected to instruct the employee with advice that will be collected in interviews with health specialists to treat the syndrome, and if necessary, propose the employee seek professional help.

In this project, a combination of the Kmos-RE methodology, the iPlus methodology, and the APRehab methodology was used, which is the result of the most important characteristics of other methodologies for the design of serious games in the field of education and health care. It is worth mentioning that the methodology was designed to solve a specific problem, so some modifications were made to adapt it to the objective of this project.

The Knowledge Management as a Strategy for Requirements Engineering (KMOS-RE) methodology is a high-level strategy based on knowledge management to elicit requirements, designed essentially to work with DEIs in which knowledge is mostly partial, non-homogeneous, implicit, tacit, and unstructured. This methodology allows for capturing, structuring, evaluating, and developing a complete and adequate solution. It consists of three phases: 1) Domain Modeling, 2) System Modeling, and 3) Specification Development. In addition to three activities that support the three main phases, 1) Identification of tacit knowledge, 2) Registration of assumptions, 3) Knowledge matrix.

Regarding the APRehab methodology, it is identified by its iterative process as a primary property, this facilitates each period to have constant progress of the interactive product and offers the opportunity to create the ideal documentation, such as the game design documents and the documents of technical design (Peñeyor et al., 2018). It also proposes an evaluation process with the support of health professionals during the development of the project, to receive constant feedback from the early stages of serious game design and thus correctly adjust the next phase of the methodology, to achieve the expected results with the final product.

On the other hand, the iPlus methodology focuses on the user's educational, interactive, and participatory experience. Considering the elementary term of history, art, and technology of a serious game, adding the pedagogical component, gameplay, and gamification resources (Carrión et al., 2019). In addition, it is identified by its verification phase of requirements validated by experts in pedagogy, experts in the main topic or problem, and experts in the development of serious games. iPlus is easy to implement in the requirements phase of any software development methodology, integrating with ease. Figure 1 shows an own edition based on (Peñeyor et al., 2018) on the integration and composition of the design process.

3.1 Identification of the problem

The *problem identification phase* was the basis of the entire methodology to identify the team of specialists with whom they collaborated and break down every detail of the project problem, this to have a broader conceptualization of the problem that would later serve to define the problem. essential elements of the solution.

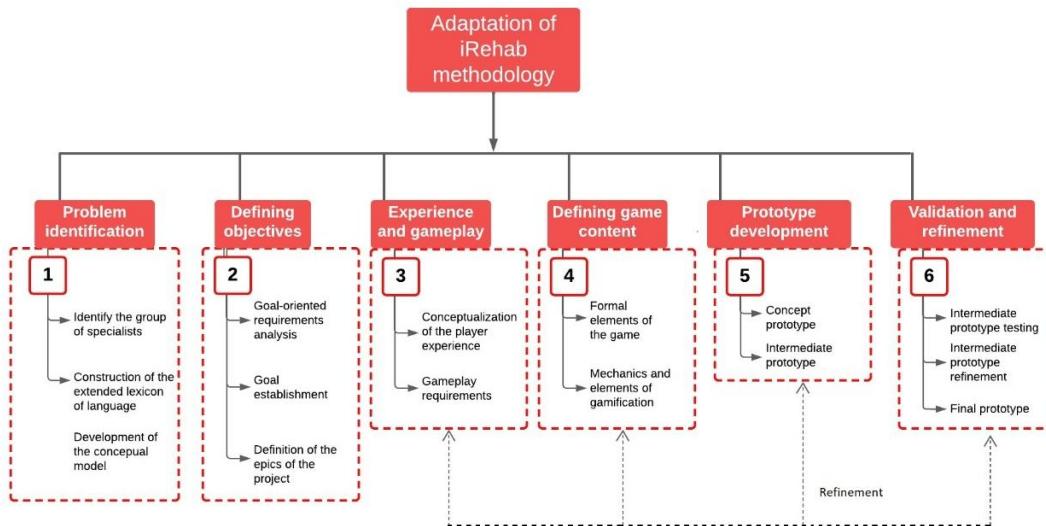


Figure 1. Modified methodology to develop the serious game proposed in this document

The *identification of the essential team of specialists* to identify and delimit the conceptualization of the problem, as well as plan its effective resolution. The iPlus methodology suggests team member profiles for the best effectiveness and efficiency throughout the project. Among those who stand out are an expert in the theme of the game, an expert in pedagogy, an expert in educational psychology, a video game designer, and a developer. The same ones that were a key point throughout the project, both in the creation of the solution, until its development, validation, and evaluation.

Construction of the extended lexicon on language model (LEL), which has its origins in requirements engineering (Hadad et al., 1997), was designed to help the bidding and representation of the language used, as well as to improve the understanding of the domain. It is a fundamental initial phase to have a better conceptualization of the problem and thus, identify, categorize, and delimit the elements that encompass it to have a better knowledge management in the development of this project. The LEL construction process consists of the following activities: identify sources of information, identify symbols, classify symbols, describe symbols, verify the LEL and validate the LEL. These activities are carried out iteratively so that they evolve in each round. Figure 2 (is shown in Spanish as it is the source language of the domain of this project) shows an example of an object type symbol with the following elements:

Symbol type – Object type symbols.

Notion – You must define the object and identify other symbols of the same type with that are related.

Impact – Describes the actions that can be applied to this object.

Verify, in this activity, the help of the specialists was required for the objective confirmation that the symbols were identified, classified, and described correctly, to capture the conceptualization of the problem in a clear and detailed way.

After building the LEL, the *conceptual model* of the application domain was developed using a class diagram of the Unified Modeling Language (UML) from a specification perspective to graphically represent the relationship between the

Factor de riesgo psicosocial	
Noción:	<ul style="list-style-type: none"> Son aquellas condiciones presentes en un <u>ambiente laboral dañino</u> directamente relacionadas con la <u>empresa</u> y su entorno social.
Impacto:	<ul style="list-style-type: none"> Se presentan con capacidad para afectar el desarrollo del <u>trabajo</u> y la <u>salud mental</u>. Los principales factores son el <u>estrés laboral</u> y el <u>síndrome de burnout</u>. Carece de un buen <u>diagnóstico de seguridad y salud en el trabajo</u>. Deben de ser solucionados por la <u>autoridad laboral</u> de la empresa.

Figure 2. LEL psychosocial risk factor symbol in Spanish language

symbols resulting from the LEL on the problem of real world, show in Figure 3. This image is shown in Spanish as it is the source language of the domain of this project.

3.2 Definition of objectives of the serious game

In this phase, an analysis was carried out to identify the goals that had to be covered to solve the problems addressed in this project. We worked with the specialists to define where we wanted to go with this project and the activities that would make it possible to achieve these objectives. Resources such as the SMART methodology were used to establish the necessary requirements and define the epics necessary for the development of the game. This phase is made up of the following activities: goal-oriented requirements' analysis, goal setting, and defining project epics.

Goal-oriented requirements analysis, in this activity, the resources collected from the LEL model, and the conceptual model were used to correctly conceptualize the problem and, with the support of the specialists, identify the necessary functional requirements in the serious game to solve the problem and the goals to achieve said requirements.

Goal setting, this activity takes place after analyzing the requirements and identifying the solutions to achieve them, the formal definition of the goals that the serious game will address was carried out. For this, the SMART methodology was used, where (Tondello et al., 2018) proposes that goals are more motivating for high performance when they are specific, measurable, achievable, realistic and of a determined duration.

Defining project epics. The last step in defining the goals of the serious game was to develop the project epics, using the conclusion of the goal-oriented requirements analysis as input, to define the elements that were implemented in the game to satisfy those goals.

3.3 Experience and gameplay

Once the objectives that would solve the problems of this project were defined, an analysis was carried out to identify the experiences expected by the employee when playing the game (conceptualization of the player experience), as well as the definition of the *gameplay requirements* that complement that experience.

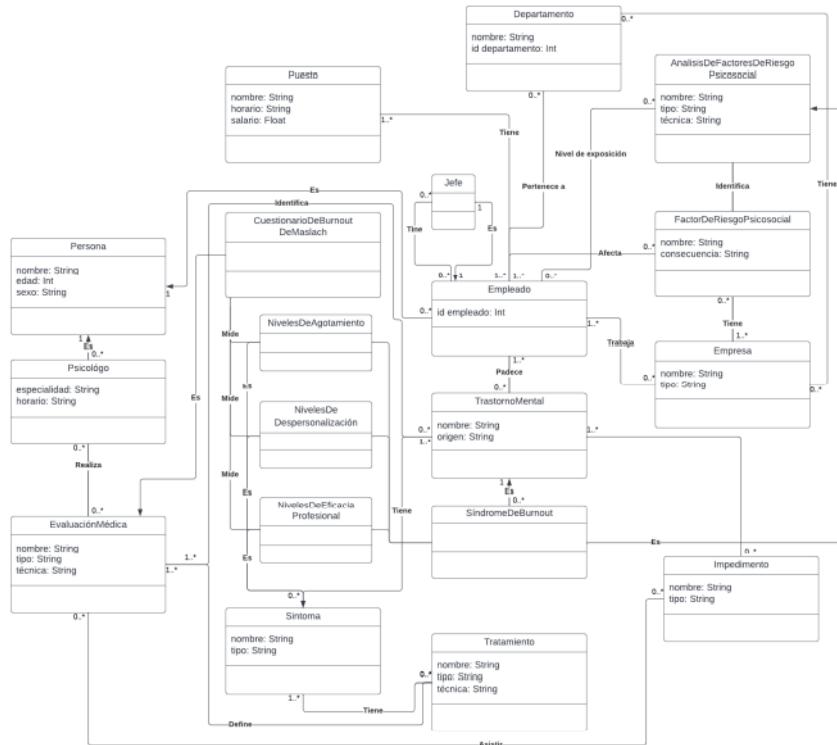


Figure 3. The conceptual model of the LEL is shown in Spanish language

Conceptualization of the player experience. The peculiarity that makes video games special is the enjoyment and fun of the user or group of users who use them, which is the purpose for which they are designed. And that goal is harder to measure than functional goals. Therefore, it is necessary to locate a series of qualities that allow us to determine the experiences of the player (Gonzalez Sánchez et al., 2008). For this, four dimensions were considered to identify: physical, cognitive, emotional, and social dimensions.

Gameplay requirements. The set of experiences in the serious game is called gameplay. According to (Gonzalez Sánchez et al., 2008), gameplay is the set of properties that describe the player's experience with a given game system, whose main objective is to amuse and entertain in a satisfactory and believable way, either alone or in the company. To finish the analysis of the serious game, it is necessary to decompose it based on different points of view, so the decomposition based on gameplay facets was used to identify the different attributes that make it up: Intrinsic gameplay, mechanical gameplay, interactive gameplay, artistic gameplay, and intrapersonal gameplay.

3.4 Definition of game content

In this phase, all the formal elements that make up the solution of this project are presented, based on the objectives and goals defined in the previous phases. Resources were used to organize the video game design structure and the main gamification elements for the serious games were defined. This phase is made up of the following activities: formal elements of the game and mechanics and gamification elements.

Formal elements of the game. To organize all the content information, a game design document was prepared, this document describes the characteristics that a video game will have, such as the name of the game (the name of the game is BAMI, an acronym for Burnout Awareness Maquiladora Industry), summary, and unique characteristics that are not found in another game.

Mechanics and gamification elements. The serious game was divided into four main elements: the topics to be reported, the questions, the tips, and the rewards.

3.5 Prototype development

Once the content and elements of the game were identified, the prototype development phase was carried out where a concept prototype was made, it was validated with the health specialists and the specialist in projects related to serious games, to make refinement and create an intermediate prototype with a level closer to the final solution proposed in this project. Once the player finishes answering the questions, the Burnout degrees are calculated, the total score of each dimension and the classification is based on the weights proposed by Maslach in (Schaufeli et al., 2009).

3.6 Validation and refinement

This phase of the methodology served for the specialists to test and validate the game. As well as making the necessary changes after each revision of the prototype to reach the final product defined in this project. The activities carried out in this phase were the tests of the intermediate prototype, refinement of the intermediate prototype and final prototype.

Intermediate prototype testing. In this activity, meetings were held with the specialists to test the game and validate its structure and content, making the changes requested by the specialists.

Intermediate prototype refinement. Meetings were held with specialists in syndromes to validate the information presented in the game and the content of the topics and tips. These tests focused on finding out if the objectives defined in the previous phases were met satisfactorily. The tests were divided into three sections: the game demo, the response to a survey to evaluate the game, and the corresponding analysis of the responses to identify changes or continue testing for end users.

Final prototype. This activity consisted of testing with the specialists and adding some changes for the final part of the game.

4. RESULTS

Regarding the results obtained from this project to validate the level of quality of the serious game, the systemic model of quality (MOSCA) proposed in (Mendoza, Luis E, Pérez, 2005) was used, with the categories of functionality, usability, and reliability, recommended by the model. Table 1 shows the results of these categories.

Table 1: Satisfaction of the level of quality of the serious game with respect to the satisfied categories.

Percentaje of BAMI	Funcionality	Usability	Reliability	Leve lof quality obtained
PBAMI < 25%	Not satisfied	-	-	null
PBAMI >= 25%	Satisfied	Not satisifice	Not satisifice	basic
PBAMI >= 50%	Satisfied	Satisfied	Not satisfied	Intermediate
PBAMI >= 50%	Satisfied	Not satisfied	Satisfied	Intermediate
PBAMI >= 75%	Satisfied	Satisfied	Satisfied	Advanced

5. DISCUSSION

At the end of the evaluations, satisfactory results were obtained for the three categories evaluated and a total of 85.3% for the entire serious game. According to Table 1, the game meets an advanced total quality level. The results show that the evaluated users showed interest in continuing to use the game and that more levels will be implemented to learn more about the syndrome. However, in the difficulty metrics there were separate answers, since having employees who had no previous knowledge about the syndrome, they had complications at the beginning of answering the questionnaires to advance in the game, but thanks to the topics and the help, the advance was more constant.

What could be improved in future refinements is the way of presenting the texts, adding animations or even other mini-games, as well as changing the size, color and font of the paragraphs. It is also proposed to improve the game installation method. Being just a prototype, the game was shared with the specific people who reviewed it via email, sharing the download link and installation guide, but to improve the experience and installation process, the game could be uploaded to a store of online applications to be downloaded and installed with a single click.

Although the game has obtained a satisfactory level of quality, it has been shown that it can be used as a support tool to publicize the effects of Burnout syndrome. The results obtained open the way to implement improvements to the game and cover other elements related to the problem addressed, to reach more people, even from other countries, and create other degree projects for careers related to computer systems.

6. CONCLUSION

The general objective of this project was to develop a serious game that helps raise awareness about Burnout syndrome in workers in the maquiladora industry and provide tools for its detection, prevention, and treatment. To achieve this goal, we

work hand in hand with specialists in mental health issues and psychosocial risk factors in the manufacturing industry. As well as the implementation of methods to achieve specific objectives.

With the tests carried out, it is concluded that the game fulfills the purpose of helping to create awareness among employees, informing about the concept of the syndrome, its dimensions, symptoms, and consequences. As well as helping to recognize the worker's own condition, that is, their degrees of exhaustion, depersonalization, and professional efficiency, so that they can recognize that Burnout could be affecting their health and work and go to a specialist for a qualified analysis and treatments if necessary. The game reached a satisfactory level of quality in functionality, usability, and reliability. In conclusion, the techniques used in this project successfully contribute to the process of awareness of the effects of Burnout syndrome in employees with middle and high management in the maquiladora industry.

In addition, the potential of the use of serious games in the educational and mental health field was demonstrated in this case and in the literature thanks to the several tests suggested and answered by the specialists, showing the metrics that were used and their respective results to increase reliability.

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PILOT TEST OF AN INSTRUMENT FOR THE ASSESSMENT OF MOBBING, BURNOUT, JOB PERFORMANCE AND OCCUPATIONAL PERFORMANCE IN ADMINISTRATIVE PERSONNEL OF THE MAQUILADORA INDUSTRY

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Resumen: Los cambios globales económicos y competitividad en México han modificado el modelo organizacional de las empresas incrementando el nivel de estrés y fatiga debido a la alta carga mental de trabajo, teniendo efectos importantes en el desempeño de los trabajadores. Adicionalmente, los factores estrés y mobbing han sido relevantes en investigaciones recientes donde se ha reportado su influencia en la carga mental y de igual manera en el desempeño. Los objetivos de este estudio son integrar una encuesta para valorar los factores mobbing, estrés y desempeño en trabajadores administrativos de la industria maquiladora, así como realizar una prueba piloto para conocer la consistencia interna de los instrumentos seleccionados en la encuesta. Se integraron los instrumentos Maslach burnout inventory, El IVAPT-PANDO (Inventario de Violencia y Acoso Psicológico en el Trabajo), Para la valoración del desempeño laboral y ocupacional se diseñó un constructo. La aplicación de la prueba piloto del instrumento se llevó a cabo en una empresa maquiladora de Ciudad Juárez encuestando se encuestaron cuarenta y cuatro empleados administrativos de la empresa. El valor del Alfa de Cronbach para todos los datos fue de 0.7671. Para el mobbing y el burnout el Alfa de Cronbach fue de 0.922 y 0.818, respectivamente. Mientras que para los dos instrumentos de desempeño ocupacional el Alpha de Cronbach fue de 0.844 y 0.946, respectivamente. Los valores obtenidos de Alfa de Cronbach se consideran buenos, por lo tanto, el instrumento cuenta con consistencia interna.

Palabras clave: Mobbing, burnout, estrés,