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# **ECORFAN-Journal Paraguay**

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In the first article we present, *Analysis of the exercise of spending on personal services for the years 2019-2021 and results of the measurement of work environment and organizational culture 2020 of the executive state of Guanajuato*, by GALVÁN-ZAVALA, Karina, JIMÉNEZ-RICO, Artemio, REACHÁVEZ, Luis Gerardo, with adscription in the Universidad de Guanajuato, as the next article we present, *The increase in the discount rate in Mexico for investment projects over the last twenty years*, by GARCÍA-GONZÁLEZ, Miguel Ángel, GARCÍA-PERÚ, Kevin Bryan, CORRALES-FLORES, Regina Alejandra and ORTEGA-HORTELANO, Paola Daniela, with adscription in the Universidad Politécnica de Juventino Rosas, as the next article we present, *Development and deployment of a web application to control and query school assessments*, by URUETA-HINOJOSA, Daniel Edahi, LUNAFITZ, Brenda Areli, LAVÍN-DELGADO, Jorge Enrique and MOTA-CRUZ, Juan Esteban, with adscription in the Universidad Politécnica del Estado de Guerrero, as the last article we present *Diagnosis of Technostress, its causes and repercussions in the teaching staff of the Instituto Tecnológico Superior de la Sierra Norte de Puebla*, LEGUIZAMO-HERNÁNDEZ, Miriam, PÉREZ-ESTEBAN, Guillermo, VERA - UGARTE, Ricardo Iván and HERNÁNDEZ-HERRERA, Fátima, with adscription in the Instituto Tecnológico Superior de la Sierra Norte de Puebla.

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## Analysis of the exercise of spending on personal services for the years 2019-2021 and results of the measurement of work environment and organizational culture 2020 of the executive state of Guanajuato

### Análisis del ejercicio del gasto en servicios personales para los años 2019-2021 y resultados de la medición de clima laboral y cultura organizacional 2020 del poder ejecutivo del estado de Guanajuato

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#### Abstract

The objective of this research document is the analysis of the exercise of spending on personal services for the years 2019-2021 in contrast to the results of the survey of work climate and organizational culture 2020 of the agencies attached to the executive branch of the State of Guanajuato, with the purpose of identifying the main changes compared to the years 2019 to 2021, being that since 2019 and to date the health pandemic has brought with it an increase in work stress, with negative impacts on organizational climates, it will be reviewed as the variables rewards and recognition, training and development, gender equity, communication, availability of resources, balance work family, focus on results and productivity, among others influence work climates and their relationship with the expenses that are made to cover the costs of personal services. The methods used are the analysis of the results of the survey of work environment and organizational culture integrate 16 categories of analysis, with a total of 63 reagents.

#### Public finance, Public spending, Wages

#### Resumen

El objetivo del presente documento de investigación es el análisis del ejercicio del gasto en servicios personales para los años 2019-2021 en contraste con los resultados de la encuesta de clima laboral y cultura organizacional 2020 de los organismos adscritos al poder ejecutivo del Estado de Guanajuato, con el propósito de identificar los principales cambios en comparación con los años 2019 a 2021, siendo que desde 2019 y a la fecha la pandemia sanitaria ha traído consigo un incremento en el estrés laboral, con impactos negativos en los climas organizacionales, se revisará como las variables recompensas y reconocimiento, capacitación y desarrollo, equidad de género, comunicación, disponibilidad de recursos, balance trabajo familia, enfoque a resultados y productividad, entre otros influyen en los climas laborales y su relación con los gastos que se hacen para cubrir los costos de servicios personales. Los métodos empleados son el análisis de resultados de la encuesta de clima laboral y cultura organizacional integran 16 categorías de análisis, con un total de 63 reactivos.

#### Hacienda pública, Gasto público, Salarios

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## Introduction

The ILO has recognized a relationship between the increase in job stress and other work-related mental illnesses and technological, social and economic factors, for example "information overload, intensification of work and time pressures, greater demands for mobility and flexibility, being always 'available' due to mobile phone technology and, last but not least, the fear of losing one's job" (INSP, 2021).

The ILO and the WHO agree in identifying the main cause of job stress in various factors that make up poor organization at work, such as job characteristics, volume and pace of work, schedules, participation and control, professional perspectives, interpersonal relationships and culture institutional (INSP, 2021).

The objective of this research document is the analysis of the exercise of spending on personal services for the years 2019-2021 in contrast to the results of the 2020 work environment and organizational culture survey of the agencies attached to the executive power of the State of Guanajuato, with the purpose of identifying the main changes compared to the years 2019 to 2021, being that since 2019 and to date the health pandemic has brought with it an increase in work stress, with negative impacts on organizational climates, it will be reviewed as the variables rewards and recognition, training and development, gender equity, communication, availability of resources, work-family balance, focus on results and productivity, among others, influence the work environment and its relationship with the expenses made to cover the costs of services personal. The methods used are the analysis of the results of the work environment and organizational culture survey, integrating 16 categories of analysis, such as rewards and recognition, training and development, improvement and change, quality and user orientation, labor equity, communication, availability of resources, quality of work life, work-family balance, collaboration and teamwork, leadership and participation, identity with the institution, focus on results and productivity, regulations and processes, professionalization, impact of the survey in my institution, with a total of 63 reagents, which were applied to the executive power of the state of Guanajuato.

As a first part, the position of the world labor organization is reviewed regarding the effects caused by post-pandemic work stress and its effects on organizational climates, secondly, the main findings of the work climate and organizational culture survey for the year 2020, later in section 3 the amount of expenses paid for personal services corresponding to the payroll of permanent and temporary personnel is reviewed, as well as the corresponding social security, in section 4 the analysis of the results that the survey with the state of expenditure to conclude with the conclusions and proposals.

## Position of the world labor organization

Work stress is a real problem for workers and the entities that demand them, as entities and work environments are changing. So do the stress issues employees may face. It is important to identify the existence of stress problems and try to solve them, promote healthy work and reduce the harmful aspects of work (OMS, 2021).

The pandemic has caused a major disruption in labor markets around the world. Compared to previous recessions, the COVID-19 crisis has been of an unprecedented pace and depth, and there have been no countries whose labor markets have not suffered a sharp deterioration (OMT, 2021).

According to the World Labor Organization, the effects of the crisis are likely to be felt in the organization and distribution of work in the coming years. (Dewan y Ernst, 2020; Lee, Schmidt-Klau y Verick, 2020).

In the context of the COVID-19 crisis, the disruption experienced by young people has been severe (ILO 2020d). The ramifications of a negative first experience of this type in the labor market can extend throughout your working life (OMT, 2021).

The World Labor Organization exposes that a study conducted in 19 high- and middle-income countries concluded that entering the labor market during a recession is associated with the decline in cognitive abilities later, especially among people of lower socioeconomic status. This is because young people join companies where skills development is not as important (Arellano-Bover, de próxima publicación).

## Methods used

Analysis of the results of the work environment and organizational culture survey integrate 16 categories of analysis, such as, rewards and recognition, training and development, improvement and change, quality and user orientation, labor equity, communication, availability of resources, quality of work life, work-family balance, collaboration and teamwork, leadership and participation, identity with the institution, focus on results and productivity, regulations and processes, professionalization, impact of the survey in my institution, with a total of 63 items, which were applied to the executive power of the state of Guanajuato (see tables 1 and 2).

Analysis categories	
1	Rewards and recognition
2	Training and development
3	Improvement and change
4	Quality and user orientation
5	Labor equity
6	Communication Categories of analysis
7	Resource availability
8	Quality of work life
9	Work-family balance
10	Collaboration and teamwork
11	Leadership and participation
12	Identity with the institution
13	Focus on results and productivity
14	Regulations and processes
15	Professionalization
16	Impact of the survey in my institution

**Table 1** Analysis variables, instruments and reagents

Font: STRC (2021)

0-59	60-80	81-89	90-100	Opacity
Critical situation in the aspect evaluated with large gaps and deficiencies that require primary care	Notable weakness in the evaluated aspect, incipient developments that require strengthening	In the process of strengthening the evaluated aspect, although with gaps and weaknesses	Parameter of excellence with successful practices	Don't know answers

**Table 2** Classification or chromatic scale in traffic lights of results

Table 2 shows a summary of the analytical statement of the expenditure exercise for the years 2019-2021 in the category of personal services.

Expenditure	2019	2020	2021
Personal services	27,698,659,291.97	27,619,813,116.00	28,331,503,706.00
Remuneration for Permanent Personnel	11,098,384,574.39	11,043,621,108.00	11,352,794,928.00
Remuneration for Temporary Personnel	603,417,018.99	667,651,674.00	575,270,640.00
Additional and Special Remuneration	5,087,401,877.20	4,944,400,974.00	4,964,654,707.00
Social Security	2,631,305,588.30	2,581,624,630.00	2,680,121,623.00
Other Social and Economic Benefits	7,613,830,954.00	7,692,996,584.00	8,032,164,881.00
Payment of Incentives to Public Servants	664,319,279.09	689,518,145.00	726,496,926.00

**Table 3** Total expenditure paid for personal services for the executive branch of the state of Guanajuato, 2019-2021

Font: SFIA, (2021)

## Discussion

In general, the item with the lowest rating was that corresponding to: rewards and recognition, as shown in figure 1.

The conclusions of the aforementioned report reveal in the general results the category of rewards and recognition, as the vulnerable variable. However, in the detailed review, an even more important and generalized field can be evidenced in four of the five study subjects of each group, such as managers, middle managers, operatives, and honoraries. that is, work stress.

The analysis shows that the operational and fee-based staff are the ones who feel the most vulnerability in rewards and recognition, is dissatisfied by the limitations in the provision of availability of resources, as well as professionalization. The foregoing is a matter of problems of belonging to the institution, an analysis would have to be carried out to review what is the percentage of that population that is temporary staff but that year after year has an employment contract, check if their annual hiring is necessary For a specific activity that has the criteria of temporality, completion of the project, or in reality it is staff that performs permanent functions of the institution, correctly defining the temporary and permanent staff will define a better result of the work environment survey, see details in the Figure 1.

Expenditure	Higher commands %	Managers %	Middle managers %	Operative %	Fee %	General
Rewards and recognition	94.1	83.16	84.19	73.82	70.83	76.51
Training and development	94.71	90.79	87.22	81.66	79.77	83.81
Improvement and change	97.64	92.13	89.63	84.92	85.47	86.89
Quality and user orientation	97.81	94.84	92.49	89.06	88.53	90.45
Labor equity	95.64	89.72	87.74	80.96	86.09	83.7
Communication Categories of analysis	96.67	92.23	89.26	83.88	78.22	86.25
Resource availability	95.1	89.13	89.23	81.19	85.74	83.98
Quality of work life	94.81	89.82	89.15	84.85	81.65	86.57
Work-family balance	95.59	89.74	88.7	85.44	81.47	86.45
Collaboration and teamwork	96.98	91.04	89.13	84.2	83.8	86.19
Leadership and participation	97.86	92.86	89.57	84.69	88.21	87
Identity with the institution	99.61	97.09	95.43	93.14	91.72	93.99
Focus on results and productivity	96.14	94.23	93.4	90.1	90.25	91.39
Regulations and processes	95.1	91.58	90.05	85.88	84.45	87.43
Professionalization	95.62	87.93	86.66	79.61	78.66	82.28
Impact of the survey in my institution	96.94	90.33	96.49	80.22	78.26	82.68
<b>General average</b>			<b>85.97</b>			

Figure 1 Overall average of dimensions assessed by job type

Source: STRC, (2021)

Public expenditure performance

Table 4 shows the behavior of public spending in the years 2019-2021 in the category of stimuli.

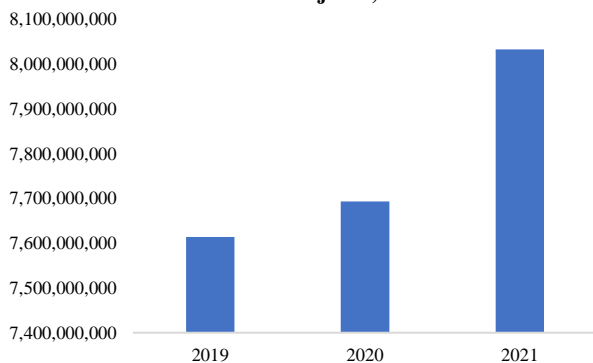
Year	Other social and economic benefits	Payment of incentives to public servants
2019	7,613,830,954.00	664,319,279.09
2020	7,692,996,584.00	689,518,145.00
2021	8,032,164,881.00	726,496,926.00

Table 4 Total expenditure paid for other economic social benefits and payment to public servants, 2019-2021

Source: Prepared by the authors with data from the annual public account of the Executive Branch of the State of Guajuato (2019-2021)

Regarding other social and economic benefits, an increase of 1.04% is shown for the year 2020 compared to the year 2019 and an increase of 4.41% for 2021 compared to the year 2020, see Graphic 1.

Total expenditure for other social and economic benefits of the executive branch of the state of Guanajuato, 2019-2021

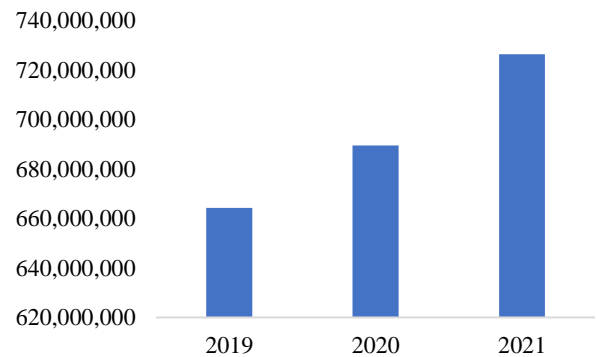


Graphic 1 Comparison of expenditure for social and economic benefits 2019-2021

Source: Own elaboration with data from the annual public account of the Executive Power of the State of Guanajuato (2019-2021)

Graphic 2 shows a consistent increase in the payment of incentives to public servants, with an increase of 3.79 for the year 2020 compared to the year 2019 and an increase of 5.36% for the year 2021 compared to the year 2020.

Total pasture for stimulus payments of public servants of the executive branch of the state of Guanajuato, 2019-2021



Graphic 2 Comparison of spending for stimulus payments 2019-2021

Source: Own elaboration with data from the annual public account of the Executive Power of the State of Guanajuato (2019-2021)

Figure 2 shows the results of the dimensions of quality in working life by type of position.

Dimension	Higher commands		Manager		Middle managers		Operative		Fee		%	
	Op	%	Op	%	Op	%	Op	%	Op	%	Op	%
I have safe and hygienic conditions to carry out my work	0	97.19	0	91.93	0.11	91.77	0.14	96.61	0.29	97.85	95.64	
In my area the treatment between public servants is respectful	0	99.55	0	96.06	0.15	93.81	0.21	90.82	0.43	92.36	92.2	
I feel happy doing my job	0	98.68	0	96.11	0.09	94.41	0.07	93.45	0.21	92.88	93.88	
In my work there are no situations that cause me stress or tension	0	83.31	0.10	75.68	0.11	76	0.32	68.94	0.43	69.83	71.63	
My institution responds in a timely manner to observations about cleanliness and security	0	95.54	1.32	89.32	1.46	89.95	1.11	84.42	1.86	83.5	86.49	

Figure 2 Quality dimension in working life

Font: STRC, (2021)

Work stress is the reaction that the individual may have to work demands and pressures that do not fit their knowledge or abilities, and that test their ability to cope with the situation (OMS, 2021).

Stress appears when that pressure becomes excessive or difficult to control, stress can harm the health of your employees and the results of your company (OMS, 2021).

According to the WHO (2021), some situations of stress or tension are: request for information, workload, delays, inaccurate information, additional requirements to those contemplated in their usual work, delays caused by lack of personnel, erroneous information, changes in information systems, new obligations, among others.

The only area in which managers showed weakness was the field of work life with evidence that they frequently present situations of stress or tension. According to the WHO (2021) it is important to know the existing strategies for reducing work stress, which can be reduced by:

Primary prevention: stress reduction through:

- Ergonomics.
- Job definition and environmental design.
- Improvement of organization and management.

Secondary prevention: stress reduction through:

- Worker education and training.

Tertiary prevention: reducing the effects of stress through:

- Development of more sensitive and responsive management systems, and improvement of the presentation of occupational health services.

A level of pressure that the worker considers acceptable can even keep him alert, motivated and able to work and learn, depending on the resources available to him and his personal characteristics. (OMS, 2021).

## Conclusions

The survey reveals the category of rewards and recognition as a vulnerable variable, however, the expense for payment of incentives to public servants has been growing in nominal terms, a consistent growth is observed in the payment of public servants with increases of 3.79% for the year 2020 compared to the year 2019 and 5.36% for the year 2021 compared to 2020, with an average annual general inflation of 7.36 for the year 2021.

As can be seen in table 5, the growth only occurred in nominal terms, since inflation was higher, it is concluded that in real terms payments for social and economic benefits and incentives to the worker decreased.

	INPC base 2018					
	2019		2020		2021	
	103,687		107,444		113,018	
Real values at prices de 2018						
	2019	2020	2021	Change	Change	
Personal services	26,713,724,278	25,706,240,568	25,068,134,019	-3.8	-2.5	
Remuneration for Permanent Personnel	10,703,737,763	10,278,490,291	10,045,121,067	-4	-2.3	
Remuneration for Temporary Personnel	581,960,148	621,395,028	509,007,981	6.8	-18.1	
Additional and Special Remuneration	4,906,499,250	4,601,840,004	4,392,800,003	-6.2	-4.5	
Social Security	2,537,739,146	2,402,762,956	2,371,411,300	-5.3	-1.3	
Other Social and Economic Benefits	7,343,091,182	7,160,005,756	7,106,978,429	-2.5	-0.7	
Payment of Incentives to Public Servants	640,696,788	641,746,533	642,815,238	0.2	0.2	

**Table 5** Real values at prices of 2018

Source: Own elaboration with information from the annual public account of the executive power of the state of Guanajuato and with INPC INEGI

What rethinks the fact of the search of employees for an emotional salary that integrates rewards and recognition, training, development and professionalization, as well as quality of working life for all officials, so many senior managers, managers, middle managers, operatives and fees.

It is assumed that it is necessary to adjust and improve the knowledge and skills of the officials, it is possible that many of the current workers do not have the profile for the position they occupy and even so, there are no training programs or generation of skills, we know that the challenges and technologies advance rapidly, which is why the staff must adapt to new knowledge, methods and technologies, which is why professionalization and competence are necessary.

It is proposed the development of skills in the workforce and whose communication skills, teamwork, innovation, time management, project management, work team management, will enable the way to reduce work stress and improve the organizational culture of the institutions

In this sense, the following proposals are made:

1. Definition of temporary personnel, according to the activities carried out, they should have a date of completion of their services.

2. Definition of permanent personnel, according to the skills and abilities required for the function of the position.
3. Permanent training program.
4. Motivation and career plan.
5. Real increases in the payment of salaries and incentives.

Secretariat of Finance, Investment and Administration of the State of Guanajuato. (2021). Public account of the executive branch of the state of Guanajuato 2021. Recuperated from:

<http://portaldgi.guanajuato.gob.mx/CuentaPublica/public/main>

Secretary of Transparencia and Rendición de Cuentas del Estado de Guanajuato. (2021). Measurement of work environment and organizational culture 2020. Recuperated from: [https://strc.guanajuato.gob.mx/wp-content/uploads/2021/09/ClimaLaboral2020\\_comparativo2019vs20.pdf](https://strc.guanajuato.gob.mx/wp-content/uploads/2021/09/ClimaLaboral2020_comparativo2019vs20.pdf).

## References

INEGI. (2021). Annual inflation 2021. Retrieved from [https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2022/inpc\\_2q/inpc\\_2q2022\\_01.pdf](https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2022/inpc_2q/inpc_2q2022_01.pdf)

INSP. (17 of 12 of 2021). INSP. Retrieved from: <https://www.insp.mx/avisos/3835-riesgos-estres-laboral-salud.html>

Instituto Nacional de Salud Pública. (2021). The risks of work stress for health. Retrieved from: <https://www.insp.mx/avisos/3835-riesgos-estres-laboral-salud.html>

WHO. (17 of 12 of 2021). The organization of work and is stress. Retrieved from [https://www.who.int/occupational\\_health/publications/pwh3sp.pdf?ua=1](https://www.who.int/occupational_health/publications/pwh3sp.pdf?ua=1)

UNWTO. (17 of 12 of 2021). World Employment and Social Outlook: Trends 2021. Retrieved from [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms\\_825200.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_825200.pdf)

Secretariat of Finance, Investment and Administration of the State of Guanajuato. (2019). Public account of the executive branch of the state of Guanajuato 2019. Recuperated from: <http://portaldgi.guanajuato.gob.mx/CuentaPublica/public/main>

Secretariat of Finance, Investment and Administration of the State of Guanajuato. (2020). Public account of the executive branch of the state of Guanajuato 2020. Recuperated from: <http://portaldgi.guanajuato.gob.mx/CuentaPublica/public/main>

## The increase in the discount rate in Mexico for investment projects over the last twenty years

### El incremento en la tasa de descuento en México para proyectos de inversión en los últimos veinte años

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#### Abstract

This article aims to show the increase in the discount rate in recent years, driven by constant inflation, by global events that increased speculation in financial markets and generated doubts among investors. In the corporate environment, the discount rate is used as a financial parameter to measure the risk that an investment can accept. There are many methodologies and tools used to calculate the discount rate, but particularly for this work the weighted average cost of capital (WACC) method will be emphasized. The quantification of the discount rate is an essential part of the financial decision-making process of a company, so it is extremely important to see and analyse its behaviour in recent years. This article will address the role of the discount rate during an investment decision, examining the different methodologies that exist for its analysis. The discount rate is a very important indicator within the financial environment and that is why this article will mention the causes and consequences of this increase.

#### Resumen

Este artículo tiene como objetivo mostrar el aumento de la tasa de descuento en los últimos años, impulsada por la constante inflación, por eventos globales que incrementaron la especulación en los mercados financieros y generaron dudas entre los inversionistas. En el entorno empresarial, la tasa de descuento se utiliza como parámetro financiero para medir el riesgo que una inversión es capaz de asumir. Hay muchas metodologías y herramientas utilizadas para calcular la tasa de descuento, pero particularmente para este trabajo se enfatizará el método del costo promedio ponderado de capital (WACC). La cuantificación de la tasa de descuento es una parte fundamental en el proceso de toma de decisiones financieras de una empresa, por lo que es de suma importancia ver y analizar su comportamiento en los últimos años. A lo largo de este artículo se abordará el rol de la tasa de descuento en medio de una decisión de inversión, examinando las diferentes metodologías que existen para su análisis. La tasa de descuento es un indicador muy importante dentro del entorno financiero y es por ello por lo que en este artículo se mencionarán las causas y consecuencias de este aumento.

#### Investment, Risk, Real value

#### Inversión, Riesgo, Valor real

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## Introduction

In today's business world, it is of vital importance to analyze an investment carefully and boldly, there are good and new business ideas all over the world, which attract the interest of investors, in order to obtain above-average returns. Such profitability is subject to the calculation and interpretation of the main actor of this article, the discount rate.

The discount rate is a fundamental tool at the moment of analyzing the real yield of an investment, since it is a thermometer of the risk that the investor is capable of accepting and at the same time, it shows a financial panorama in the present, using the cash flows of a future, in other words, the discount rate, is everything that the investor is capable of accepting, The discount rate is everything that we must demand that an investment pays me, so I have to discount it from my cash flows, once we discount the accounting and financial aspects of a cash flow and there is a return, we say that this project has an economic value added (EVA).

A vital element when analyzing an investment, is to estimate the opportunity cost of capital, in modern times there is a financial tool capable of measuring the systematic or market risk and unsystematic risk, it is known as CAPM method (Capital Asset Pricing Model), for its acronym in English. This and other financial variables together will yield the discount rate for each particular project.

The relevance of the discount rate in an investment is not in the number it has, but in the increase it has suffered over the last few years, since as part of the systemic or market risk, there are variables that directly affect it, such as inflation, the interbank interest rate, economic recession, etc.

At the time of determining the discount rate, the WACC (weighted average cost of capital) should be used average cost of capital), since it is a model that merges the analysis from an internal business approach and a systemic one, where the external aspects of an investment are analyzed.

## WACC (Weighted average cost of capital)

The WACC (weighted average cost of capital) is the rate to be discounted with respect to our economic flows, since it represents the average of the debt to be covered both externally and internally, now, the external debt is easy to interpret, it has to do with the financial expenses of a company, which is reflected in the cost of external financing, called interest.

But to determine how much it will cost to use the company's own funds, it becomes somewhat complex, since it is often thought that capital will not be required, and this is a mistake, since a company's capital is also a receivable, just like its liabilities, but the way to determine it is more complex.

The formula for determining the WACC (weighted average cost of capital) is presented as follows average cost of capital) is presented as follows:

$$WACC = (We * ke) + (Wd * kd) \quad (1)$$

Where

We: Weight of equity  
Ke: Cost of equity  
Wd: Weight of debt  
Kd: Cost of debt

If the formula used to obtain the WACC (weighted average cost of capital) is broken down, it can be seen that the first step is to consider the contribution to the capital that is managed for investment projects; this rate is obtained from a vertical analysis between the total investment versus the project's capital, where the percentage of capital that the investment project has is obtained. The next variable in this formula is known as the cost of equity, which is the rate of callability of the capital employed in the project and, as mentioned at the beginning, the CAPM (Capital Asset Pricing Model) tool is used to obtain it, which is described in more detail below.

The CAPM method (Capital Asset Pricing Model) as a financial tool shows the relationship between risk and return on an investment, therefore, the model assumes that investors seek the lowest possible risk with high profitability.



The CAPM method is presented in a simple way and is defined by a series of assumptions linked to the financial markets, although the assumptions embedded in the model are not always met, the CAPM method has shown good predictive efficiency in investment portfolios, the model assumptions are listed below:

1. Investors are risk averse and seek high returns where returns on investment are taken as parameters, risk is measured through BETA and neutral volatilities are sought.
2. Investors have an expectation of returns based on the market environment.
3. There is a risk-free rate that serves as a central pillar for return expectations, i.e., the return on an investment should be above the risk-free rate. The information is the same for all investors, this phenomenon is known as "perfect information".

The CAPM method (Capital Asset Pricing Model) involves different financial variables, such as the risk-free rate ( $R_f$ ), the Beta ( $B$ ), the market yield ( $R_m$ ) and the country risk ( $R_p$ ), and the formula for obtaining them is presented below:

$$CAPM = (R_f + B(R_m - R_f) + R_p) \quad (2)$$

In order to achieve the purpose of this article we will analyze and inquire into each of the variables of the CAPM (*Capital Asset Pricing Model*) method, in order to show its vital role in investment decision making today, starting with the risk-free rate.

### Risk-free rate

In the financial environment, the concept of risk-free rate is used to indicate that the profitability of a financial asset is obtained by investing in a financial product that is considered to be one hundred percent safe and for that reason is risk-free, the interesting thing is that when talking about an investment all involve risk.

In fact, the term risk-free has to do with the fact that the financial asset where the investment is made is a fixed income, this means that from the beginning the yield to be obtained is known, in addition to the fact that there is a guarantee by the person offering the asset, in reality the risk of non-payment by the offeror is null, hence the concept of risk-free is based on this.

For a financial asset to be considered as a risk-free rate, it is necessary that the financial entity offering the asset has a known solvency over a long period of time, so that investors will perceive that their investment can be safe, both in terms of yield and compliance.

At present, only the fixed income securities offered by the governments of countries around the world have a risk-free rate title, it should be noted that not all financial assets issued by countries are considered risk-free rate, they have this title, since it is practically impossible that the government does not comply with its payment commitment, it would have to go through a financial catastrophe to do so and even then it would have the tools to liquidate its debt commitments.

In Mexico, the central bank (Banco de México) is responsible for determining the risk-free rate. This rate is used as a financial thermometer, since it determines the yield of the CETES (Treasury Certificates), which are fixed income assets offered by the Government in order to finance its current spending, but it is also taken as a measure of interbank interest, in other words, it is the main rate from which banks and financial entities start to charge interest for the use of the money they lend to account holders.

### BETA Coefficient

Beta is a relative variable that is calculated as a comparison between the profitability of a financial product or that of the sector index where the asset is located and the profitability of the market, in other words, Beta buys the yield of an asset versus the yield of the market where the asset moves.

The Beta coefficient shows the sensitivity of the financial asset, with sensitivity referring to how much the financial product is affected by market speculation, i.e., how much the product's yield rises, or falls compared to other companies in the same sector.

There are parameters that explain in a more specific way the value of a Beta within an investment analysis, which are mentioned below:

- If the Beta is negative, we speak of an inverse relationship between the asset and the market, if the market earns returns, the asset suffers losses and vice versa, if the market presents losses the asset will obtain returns.
- If the Beta is equal to 0 or very close to 0, it is mentioned that the asset does not suffer alterations in reference to the market.
- If the Beta is positive, but less than 1, it means that the asset will suffer less profit or less loss with respect to the market behavior.
- If the Beta is equal to 1, the asset will gain or lose in the same proportion as the market.
- If the Beta is greater than 1, it means that the asset will suffer a greater gain or a greater loss with respect to market behavior.

The formula to obtain the Beta is as follows:

$$BETA = \frac{Ra-Rf}{Rm-Rf} \quad (3)$$

Rm: Yield per share

Rf: Risk-free rate

Rm: Market return

Whenever we talk about Beta in an investment, it will always be linked to risk, since it is responsible for measuring the sensitivity of an asset with respect to the market, which is why it is so important in the middle of an investment analysis, since it is an extremely important variable at the moment of knowing the feasibility of an investment.

### Market performance

Market profitability is a factor that deserves more attention when talking about investments. The profitability of a company is measured through three factors: ROA (Return on Assets), ROE (Return on Equity) and ROI (Return on Investment). The latter shows us what is the return on the money invested in it, so we can say that the market return is the average return on investment that has a sector or a niche in an economy.

But not only the ROI (Return on Investment) serves as a parameter when analyzing the market, another tool widely used are the price indexes and quotes within the stock exchanges around the world, the CPI (Index of prices and quotes), is an indicator that shows the performance of a sector in a given period of time, in most stock exchanges are grouped to companies listed in them by sector, technology sector, commercial, automotive, etc., also known as commodities.

Thanks to the IPC (index of prices and quotations) we can know how a particular sector behaves and we can take it as an opportunity cost in an investment, in other words, we will have to demand from our investment what the market is generating in returns.

### Country Risk

Country risk can be defined as the percentage of risk that an investor incurs by investing in a country, in other words, the risk rate that you should demand from that investment.

The weighting in the risk rating of a country is subject to several financial indicators, some examples are Inflation, growth rate, unemployment rate, international balance of payments, income from fiscal products, among others.

Those responsible for quantifying the country risk of a nation are the risk rating agencies, which are part of the international financial system and are supervised by the International Monetary Fund, among the most famous rating agencies are: Standard and Poors, Fitch, JP Morgan, which are based in the United States of America. The rating is based on five dimensions, which are presented below:

- a) Demographic indicators.
  - Population growth.
  - Population pyramid
- b) Economic indicators.
  - GDP growth.
  - Foreign direct investment.
  - Employment rate.
  - Per capita income.
- c) Financial indicators.
  - Trade surplus or deficit.
  - Tax revenue growth.
  - Expenditure growth.
  - Percentage of expenditures (Not financed with debt).
- d) Debt indicators.
  - Direct debt.
  - Indirect debt.
  - Total foreign debt.

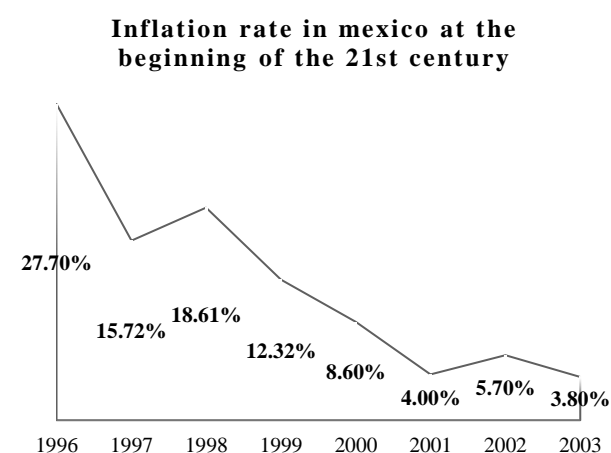
Each of these dimensions contains variables according to their measurement and therefore the rating agencies evaluate the behavior of a nation based on the points.

Each variable adds or subtracts percentage points depending on its performance, for example, if a nation has a good performance in its macroeconomic indicators, i.e., it has good economic growth, low inflation, etc., this will not add many risk points, but on the contrary, the more difficulties a country shows in its indicators, the more percentage points it will have to add.

If a country has, for example, 237 percentage points of country risk, then it will be said to have a risk rate of 2.37%, the higher the sum of percentage points of risk, the higher the rate assigned to a nation.

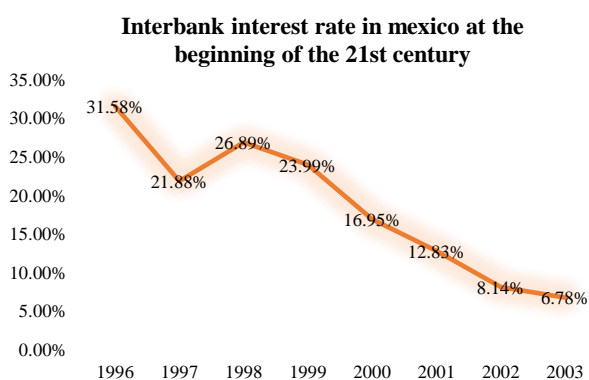
### The discount rate at the beginning of the 21st century in Mexico

Once the discount rate has been analyzed as a concept or a methodology, we will have to talk about it as a tool, at the end of the 20th century the average discount rate in Latin America was 7% (Edwards, 2016), if we consider that there was a hopeful scenario, where international trade flourished driven by the new North American treaties, it would seem that it was not a rate with such a high demandability, besides that particularly in Mexico there was a fairly controlled inflation rate of 4% on average according to the Bank of Mexico. (MEXICO, 2022).



**Graphic 1** Inflation rate in Mexico at the beginning of the 21st Century  
Source: (MEXICO, 2022)

Also in those days, the interbank interest rate was at a low, since in the last six years of the 20<sup>th</sup> century there was one of the worst economic recessions ever, specifically in 1994, at the hands of President Ernesto Zedillo Ponce De Leon, it was decided in consensus with the Bank of Mexico, to change from a fixed exchange rate to a flexible exchange rate, The dollar skyrocketed and the peso depreciated, consumption decreased and the country came to a standstill, interest rates at that time were very high and people had very little access to credit and as it was seen coming they began to reduce such rates, with the purpose of increasing consumption among Mexicans, according to the web page of proyectos México, the interbank interest rate dropped from 30% to 8.14% from 1996 to the beginning of 2002 (MEXICO, 2022).



**Graphic 2** Interbank interest rate in Mexico early 21st century  
Source: (MEXICO, 2022)

Derived from the changes in economic matters, the Mexican Stock Exchange, found yields not so productive and as mentioned in the main financial premise that the higher the risk the higher the profits and vice versa, the risk in which an investment was infringed in the late 90's was not so high, as shown in the Investing.com page, where it shows an average VAR (Value at Risk) of 1% in the index of prices and quotes (IPC), which shows that at that time investing in the stock market was not so risky.

Datos históricos S&P/BMV IPC

Plazo: Diario

Descargar datos 07/03/1997 - 05/04/1997

Fecha	Cierre	Apertura	Máximo	Mínimo	Vol.	% var.
04.04.1997	3,752.47	3,741.30	3,758.93	3,734.10	47.40M	0.30%
03.04.1997	3,741.30	3,717.24	3,752.92	3,717.04	43.95M	0.68%
02.04.1997	3,716.18	3,714.26	3,717.78	3,687.98	30.40M	0.05%
01.04.1997	3,714.26	3,747.98	3,747.98	3,684.27	52.13M	-0.90%
31.03.1997	3,747.98	3,842.94	3,843.85	3,731.03	38.61M	-2.47%
26.03.1997	3,842.94	3,837.46	3,842.94	3,819.21	33.08M	0.14%
25.03.1997	3,837.46	3,827.99	3,860.89	3,826.54	44.72M	0.25%
24.03.1997	3,827.99	3,809.90	3,829.85	3,787.67	45.08M	0.47%
20.03.1997	3,809.90	3,867.38	3,869.49	3,807.92	61.36M	-1.48%
19.03.1997	3,867.20	3,797.05	3,867.20	3,793.01	83.23M	1.85%
18.03.1997	3,797.05	3,760.61	3,797.05	3,756.56	57.03M	0.97%

**Figure 1** Historical IPC in Mexico 1997  
Source: (Investing.com, 2022)

Similarly, speculation was almost nil at the end of the 20th century and the beginning of the 21st century, the commercial monsters such as Facebook, Twitter, Apple, etc., The markets with the highest yields were those of the manufacturing sector, specifically the automotive sector, it was very popular to invest in government bonds, since the interest paid by the government through the CETES (Treasury Certificate) was much higher in percentage points than inflation, but we must remember that government bonds are risk-free assets, it is clear that investing without risk and with good returns is a matter of the past, that today is just a utopia.

At the beginning of the 21st century there were no financial crises in sight, the concept of financial bubbles was very distant, the mortgage crisis of 2008 was not even seen coming in the most catastrophic scenario, this helped emerging economies of those times, since they maintained a constant acceleration and their gross domestic product (GDP) growth was regularly positive.

Among those emerging economies was Mexico, with the large injection of foreign direct investment driven by large American manufacturers, the collection of taxes for the first time in many years had a surplus, as mentioned by Paulo Cantillo in his research concerning the tax behavior of Mexico in recent years (Cantillo, 2018), there was a large income derived from oil, since the price budgeted for crude oil by the Ministry of Finance and Public Credit always fell short, the barrel of black gold always exceeded expectations, this together with other macroeconomic variables resulted in a Country risk between 150 and 200 percentage points, which was a very acceptable risk premium for a Country like Mexico that has always struggled to maintain healthy Public Finances.

Regarding the country risk in Mexico at the beginning of the 21st century, one of the most notable risk rating agencies within the financial sector, JP Morgan, together with Mr. Manuel Aguirre Botello, shows in one of his works, the historical risk of some emerging economies (Botello, 2020), where it can be noted that, in the past, Mexico enjoyed a risk premium much lower than the current one.

INDICE DE RIESGO PAÍS DE PAÍSES EMERGENTES EMBI+ --> Emerging Markets Bond Index Plus								
PAÍS	MÉXICO	CHILE	RUSIA	PERU	COLOMBIA	URUGUAY	PANAMA	BRASIL
Fin. 1999	363							
Fin. 2000	392							
Fin. 2001	308	152	978	513	693	0	441	749
Fin. 2002	323	125	514	621	645	1706	446	1445
Fin. 2003	199	84	256	318	435	624	439	468
Fin. 2004	166	66	356	220	332	373	290	382
Fin. 2005	126	80	108	206	238	275	246	311
Fin. 2006	98	83	96	120	151	175	148	196
Fin. 2007	149	151	147	178	195	243	184	222
Fin. 2008	362	336	743	509	474	685	516	428
Fin. 2009	165	97	188	169	201	241	175	192
Fin. 2010	144	124	199	135	137	186	162	189
Fin. 2011	175	161	321	216	195	213	201	223
Fin. 2012	126	122	128	114	112	127	129	142
Fin. 2013	155	159	181	159	166	194	199	224
Fin. 2014	181	172	472	181	196	208	189	259
Fin. 2015	232	250	243	246	321	280	218	523
Fin. 2016	232	162	152	175	227	244	166	328
Fin. 2017	189	118	178	111	174	146	112	240
Fin. 2018	251	133	214	141	233	207	276	276
Fin. 2019	172	149	130	82	161	148	214	214

Fuente:  
J.P. Morgan

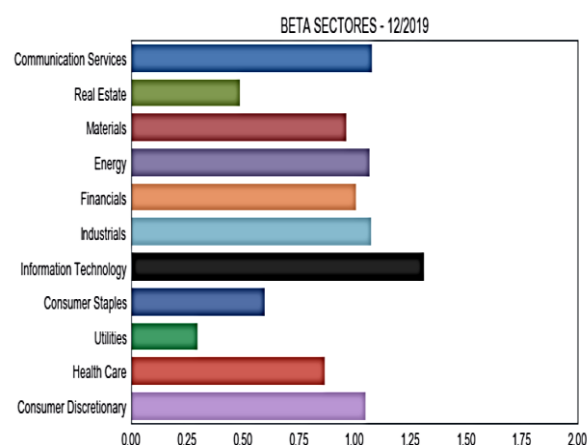
**Figure 2** Risk index in emerging countries

Source: (Botello, 2020)

### The discount rate in Mexico today

With the decrease in interest rates, access to credit was easier, but also less controlled, the clear example was the mortgage crisis of 2008 in the United States, the American Central Bank had to go out to rescue thousands and thousands of private banks in bankruptcy, since the citizens of the country of the stars and stripes had stopped paying their mortgages, This generated an economic recession comparable to the Great Depression crisis of 1929, which obviously had a worldwide repercussion, but very clearly in Mexico, where, in addition to being trading partners, there is a geographical proximity that makes macroeconomic issues more evident. With the continuous growth of the technology sector, this market was seen as a good investment tool, but it also increases speculation, there is a great dependence between fundamental analysis and the behavior of stock exchanges, fundamental analysis is understood as the measurement of qualitative variables within the financial sector, in other words, those variables that cannot be measured, but that have an impact on the performance of the shares, an example of a fundamental variable can be Politics, specifically in the case of the last elections in the United States, where the financial markets specifically the currency sector saw with good eyes the government of Hillary Clinton, this will have an impact on the Dollar-Peso exchange rate, since investors thought that with the arrival of Hillary to the Presidency there would be a greater investment in Mexican land, since in her political campaign she always saw with good eyes the National territory, but could speculators ensure that this would happen with the arrival of Clinton to the Presidency?

The answer is no, that is why the fundamental analysis or better said the speculation that is lived today, does not compare at all to that of twenty years ago, since there is currently a voracious competition for the creation of value in companies, but many times it is an unfair competition based on speculation or trade wars, where the goal is to try to hit the enemy where it hurts the most, its value in the market. But does this affect the discount rate? Of course, and for a very simple reason, by increasing speculation among investors, systemic risk increases, meaning that we will have to demand a higher return on investment for our money, since the risk to which we must expose ourselves is greater. To demonstrate the risk to which an investment is exposed depending on the sector, the following figure is attached:



**Figure 3** BETA by S&P 500 sectors

Source: (Rodriguez, 2019)

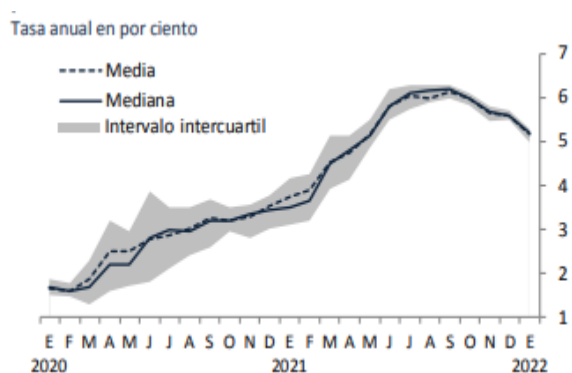
As can be seen, the technology sector is the one that shows a higher BETA, but there are few sectors that are close to the goal of 1, which is the desired one when talking about an investment, this shows the constant fluctuation that currently shows the financial markets in the world.

Another extremely important variable in the current financial scenario is the post-pandemic era, if we can speak of a post prefix, since the COVID-19 pandemic has not yet been completely overcome, there are still after-effects in the health sector, but also in the economic sector.



After the pandemic, the financial sector changed, since investment strategies did not respect a defined algorithm, the stock exchanges in the world handled minute by minute changes, no investment was safe, even fixed income investments presented changes due to increases or decreases in the interbank interest rate, human priorities focused on savings, investment routes took a different direction, investors began to turn to the health sector or green industries as a new option and, as expected, the technology sector, driven by e-commerce, exploded at an accelerated pace.

As expected, after a great economic recession, there is recovery, by way of analogy, it is like a dying person who feels better before dying, maybe there is no constant improvement, but by the mere fact of presenting better symptoms, we speak of a recovery, even the Bank of Mexico in its annual projections for 2021, predicted a growth of almost 6%, with a slowdown to 4% by 2022, Mexico had not grown to 6% for more than 25 years, but obviously, this has to do with the great recession that was experienced. (MEXICO, Mexico Projects, 2022)



**Figure 4** Forecast of economic growth in Mexico  
Source: (MEXICO, Survey on Expectations of Private Sector Economic Specialists: 2022)

This growth, which is not based on economic fundamentals but on speculation, has a direct impact on the discount rate, since when economic growth is budgeted as mentioned above, it generates uncertainty in the markets. There are factors that are responsible for activating or deactivating an economy, one of them is consumption, since it is responsible for circulating money in the three economic elements that are government, business and people in general, as mentioned by John Maynard Keynes in one of his theories on consumption (Ros, 2012), it is normal that after a period of recession the economic elements consume more goods and services.

Thousands of Mexican families suffered the quarantine originated by the COVID-19, once the sanitary measures were relaxed and with the support of the different vaccines that circulated around the world, the virus began to be tamed, people left their homes for tourism, recreational places, such as cinemas, parks, etc., students returned to the classroom and small and medium-sized companies obviously benefited from this, as shown in the following table, which shows the market performance of the Mexican Stock Exchange (BMV) at the beginning of the year 2022, the best performance seen in the last 11 years with 20.89%.



**Figure 5** BMV Yield 2021  
Source: (Santiago, 2022)

Another important variable in the analysis of the contemporary discount rate is the country risk, according to El Economista, the rate assigned for Mexico in 2021 was 3.74% (Economista, 2022) since rating agencies such as JP Morgan or Standard and Poors, agreed that the pandemic scenario and the Political reforms promoted by the Mexican Government would generate an environment of financial uncertainty.

The Ministry of Finance and Public Credit (SHCP) through the Official Gazette of the Federation (DOF), in the section of guidelines for the preparation and presentation of the cost and benefit analysis of public investment programs and projects in section I, mentions the following "The social discount rate to be used in the cost and benefit analysis will be 12 percent per year in real terms" (Federación, 2018), such rate has not been modified at present but what can be noticed from the beginning, which is the justification for this article, is the following, if we consider what is mentioned by (Edwards, 2016) at the beginning of the 21st century where the average discount rate in Latin America was 7%, such rate has suffered an increase of 71.42% , it should be noted that it is taken as the last parameter the discount rate used for public investment projects, of course for the private sector there is a higher risk, this will undoubtedly affect such rate.

The increase in the discount rate for investment projects has a considerable relevance, since in the informal sector of Mexican territory is not used as it should, many SMEs notice the lack of return on their money, including the loss of purchasing value that money suffers over time, but do not realize that with a discount rate above 12% as mentioned by the government of Mexico itself, its return on investment (ROI) should be above this parameter, because today in green and white territory, if an investment is not able to give you a return above 12%, you do not have a real profit as a company, maybe nominal, that is why the importance of studying the discount rate, since there are many SMEs that are losing money in a real way and do not notice it, in other words, their returns are not able to cover the annual inflation, the risk and the opportunity cost implicit in an investment.

## Results

In order to show the results obtained in this article, two companies will be compared, with the same percentage weighting of debt and equity, the only thing that will change will be the variable of the cost of equity obtained by the CAPM (Capital Asset Pricing Model) method, since for this analysis, the appropriate variables will be used in each time, in this way it will be possible to better observe how the mentioned variables affect and the increase of the discount rate over time.

The data to be used in the WACC (weighted average cost of capital) methodology are presented below, for two companies conditioned by time, since the variables are in accordance with the data obtained in this research, both at the beginning of the 20th century<sup>1</sup> and at the present time.

Beginning of the 21st century	Present time
We = 50 %	We = 50 %
Ke = 5.4 %	Ke = 31.4%
Wd = 50 %	Wd = 50 %
Kd = 10 %	Kd = 10 %
Rf = 6.78 %	Rf = 7.01 %
B = 1	B = 1.25
Rm = 10 %	Rm = 28 %
Rp = 1.99 %	Rp = 3.74 %

**Table 1** Variables for WACC method

Source: (Own Authorship)

## WACC weighting for companies at the beginning of the 21st century vs. the present era

Once the data for the methodology to be used have been obtained, the CAPM (*Capital Asset Pricing Model*) will be obtained as the first result, therefore, the following formula is shown.

### Beginning of the 21<sup>st</sup> century

$$CAPM = (6.78 \% + 1 (10 \% - 6.78 \%) + 1.99 \%) = 5.4 \% \quad (4)$$

### Present time

$$CAPM = (7.01 \% + 1.25 (28 \% - 7.01 \%) + 3.74 \%) = 31.4 \% \quad (5)$$

In this way, the variable Ke (Cost of Equity) is obtained, which will indicate what will be required of the capital invested by the company's partners. Once Ke (*Cost of equity*) is obtained, the second step is to obtain the WACC (*weighted average cost of capital*), the result obtained will show the weighting of the discount rate in both scenarios.

### Beginning of the 21<sup>st</sup> century

$$WACC = (50 \% * 5.4 \%) + (50 \% * 10 \%) = 7.7 \% \quad (6)$$

### Present time

$$WACC = (50 \% * 31.4 \%) + (50 \% * 10 \%) = 20.7 \% \quad (7)$$

Based on the data collected for this article, it can be considered that the weighted discount rate in Mexico at the beginning of the 21st century was between 7% and 8%, which coincides in some way with the data presented throughout this paper.

While the discount rate currently suffers a considerable increase, using the WACC (*weighted average cost of capital*) methodology, it yields 20.7%, which seems congruent if interpreted from a fundamental analysis.

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### Conclusions

The increase in the discount rate is an organic consequence of the loss of the purchasing value of money over time, it is natural that the rate maintains an upward trend, what is not a good indication and is also worrying, is the abrupt jump it made in only 20 years, since if we consider the nominal discount rate given by the Ministry of Finance and Public Credit (SHCP) in recent years of 12%, the increase was over 70%. This means that it is increasingly difficult to invest in Mexico, since the expected return on such investments, to consider a business as profitable, has to be above 20%, but in an environment with so much speculation, with so much financial sensitivity, it becomes difficult to find these returns.

Now, most financial analyses based on a methodology approved by science and supported by macroeconomic and financial indicators, are regularly used for formal economies, companies that are already positioned in the market, that have a well-designed financial structure and that are able to measure their economic performance, but what about the informal economy? The small and medium-sized companies, who see that it is becoming increasingly difficult to pay their company's bills, who notice that their company is becoming less profitable, in the vast majority of cases, are not even aware that there is a financial environment that must be considered when investing in a company, such as country risk, perhaps their company is not listed on the stock exchange and it seems that this variable is focused on the stock market sector, but it is not so, in the economy of a country there are three economic agents, the private sector, which is composed of companies unrelated to the government, The private sector, which is made up of companies not linked to the government, ordinary people involved in the consumption of goods and services, and finally the government, which is responsible for generating financial certainty so that the aforementioned economic machinery works according to the expectations of each country. For this reason, we cannot separate small and medium-sized companies from large corporations, since both coexist in the same economic scenario.

A well analyzed and interpreted discount rate will help to find the real value of an investment over time, in other words, when making financial forecasts, it will always add value to have a well-studied discount rate, since this variable is the pivot where many financial analyses take shape, for example, the net present value (NPV), internal rate of return (IRR), among others.

In conclusion, if we start from an important economic premise, which tells us that the economy arises from scarcity, money must be considered as a scarce resource, where every time there is an investment, financial factors not visible to the naked eye must be analyzed, these factors are grouped in the discount rate and as a result of the increase of the same, It becomes vital to know the variables that affect it, since not having a good financial analysis runs the risk of forecasting a current value that does not correspond to the investment being made and this can generate an economic imbalance within the company that is making the forecast.



## References

- Botello, M. A. (11 March 2020). *MexicoMaxico*. Retrieved from: MexicoMaxico.com: <http://mexicomaxico.org/Voto/Riesgo.htm>
- Cantillo, P. (17 April 2018). *Excelsior*. Retrieved from: Excelsior.com: <https://www.excelsior.com.mx/nacional/shcp-recaudacion-historica-en-2018-preven-batir-record-tambien-en-2019/1232941>
- Economista, E. (16 February 2022). *El Economista*. Retrieved from: El Economista: <https://www.americaeconomia.com/economia-mercados/finanzas/riesgo-pais-de-mexico-subio-un-1455-esta-semana-alcanzando-los-244-puntos#:~:text=El%20riesgo%20pa%C3%ADs%20de%20M%C3%A9xico%2C%20medido%20a%20trav%C3%A9s%20del%20C3%8Dndice,nivel%20del%20cierre%>
- Edwards, G. (2016). Estimación de la tasa social de descuento a largo plazo en el marco de los sistemas nacionales de inversión. *El Trimestre Económico*, 83. <https://www.eltrimestreeconomico.com.mx/index.php/te/article/view/193>
- Federación, D. O. (2018). *Diario Oficial de la Federación*. Ciudad de México: Diario Oficial de la Federación. <https://www.dof.gob.mx/#gsc.tab=0>
- Investing.com. (06 April 2022). *Investing.com*. Obtenido de Investing.com: <https://mx.investing.com/indices/ipc-historical-data>
- MÉXICO, B. D. (2022). *Encuesta sobre las Expectativas de los Especialistas en Economía del Sector Privado*. Ciudad de México : BANCO DE MÉXICO. <https://www.banxico.org.mx/publicaciones-y-prensa/encuestas-sobre-las-expectativas-de-los-especialis/%7BD4AEF415B-4E6F-451B-2D1F-BD55E968C5A0%7D.pdf>
- MÉXICO, B. D. (05 April 2022). *Proyectos México*. Retrieved from Proyectos México: [https://www.proyectosmexico.gob.mx/por-que-invertir-en-mexico/economia-solida/politica-monetaria/sd\\_tasas-de-interes/](https://www.proyectosmexico.gob.mx/por-que-invertir-en-mexico/economia-solida/politica-monetaria/sd_tasas-de-interes/)
- Rodriguez, A. (12 December 2019). *Sala de inversión*. Retrieved from Hispatrading: <https://www.saladeinversion.com/articulos/evolucion-de-la-beta-en-los-sectores-del-sp500-con-python/>
- Ros, J. (2012). *La Teoría General de Keynes*. Ciudad de México: Redalyc. <https://www.redalyc.org/pdf/601/60123307002.pdf>
- Santiago, J. (02 January 2022). *El Economista*. Retrieved from El Economista: <https://www.eleconomista.com.mx/mercados/Bolsa-mexicana-gana-20.89-en-el-2021-su-mejor-rendimiento-desde-2009-20220102-0070.html>

## Development and deployment of a web application to control and query school assessments

## Desarrollo y despliegue de una aplicación web para el control y consulta de calificaciones escolares

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### Abstract

This document describes the development and deployment of a web system based on open-source technologies and dedicated to the control and query of school grades, which is a flexible and easily administrable method for people who do not have notions of databases or systems.

**Assessments, Control, Deployment, Development, Databases, Web application**

### Resumen

El presente documento describe el desarrollo y despliegue de un sistema web basado en tecnologías de código abierto y dedicado al control y consulta de calificaciones escolares el cual es un método flexible y fácilmente administrable para personas que no tienen nociones de bases de datos o sistemas.

**Calificaciones, Control, Despliegue, Desarrollo, Bases de datos, Aplicación web**

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## Introduction

Social distancing due to the expansion of COVID-19 has caused changes and has forced us to take on various challenges in all sectors; the educational field is no exception. According to the National Institute for the Evaluation of Education (INEE), the pandemic affected approximately 30 million students of all educational levels, forcing both them and all those involved in the teaching-learning process to move to an online or Telesecundaria system. For all the mention above, one of the main problems behind the economic and geographical differences has consisted in providing the necessary tools for students and teachers to avoid the greatest number of problems regarding to communication and in order to obtain the maximum benefit from distance education, so the communication of grades where usually exists the greatest number of problems. The before is because of parents and students are often not fully aware of the large number of options of technological tools, which is why there is usually a high failure rate. The present work consists of showing the development and validation of a software dedicated to the control and consultation of school grades, which addresses the need to have a system solely dedicated to this task and thanks to which communication and knowledge of the student are facilitated. work history and grades assigned.

## Objetives

- Create and validate a software that allows control and query school assessments.
- Benefit as many people as possible by making an open-source software.
- Make the software have the least possible number of requirements for its administration and update.
- Allow the software to be flexible enough that it can be used for any kind of subjects.

## Concepts and definitions

### PHP

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely used open-source general-purpose scripting language that is especially suited for web development and can be embedded into HTML.

Instead of lots of commands to output HTML (as seen in C or Perl), PHP pages contain HTML with embedded code that does "something" The PHP code is enclosed in special start and end processing instructions `<?php and ?>` that allow you to jump into and out of "PHP mode", what distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client.

The best things in using PHP are that it is extremely simple for a newcomer, but offers many advanced features for a professional programmer [1].

### Bootstrap

Bootstrap is the most popular CSS Framework for quickly design and customize responsive mobile-first sites and nowadays is the world's most popular front-end open source toolkit, featuring Sass variables and mixins, responsive grid system, extensive prebuilt components, and powerful JavaScript plugins [2].

### Database

A database is a tool for collecting and organizing information. Databases can store information about people, products, orders, or anything else. Many databases start as a list in a word-processing program or spreadsheet. As the list grows bigger, redundancies and inconsistencies begin to appear in the data. The data becomes hard to understand in list form, and there are limited ways of searching or pulling subsets of data out for review. Once these problems start to appear, it's a good idea to transfer the data to a database created by a database management system (DBMS) [3].

A database is usually controlled by a database management system (DBMS). Together, the data and the DBMS, along with the applications that are associated with them, are referred to as a database system, often shortened to database. Data within the most common types of databases in operation today is typically modeled in rows and columns in a series of tables to make processing and data querying efficient. The data can then be easily accessed, managed, modified, updated, controlled, and organized. Most databases use structured query language (SQL) for writing and querying data [4].

### *Comma-Separated Value File: CSV*

A comma-separated value (CSV) file is a type of file used to exchange data between disparate applications, such as multiple spreadsheet programs [5].

Although there are several specifications and implementations for the CSV format, it has never been formally documented; that is, there is no existing specification, and this allows for a wide variety of interpretations for CSV files. The most recognized format is the one in which the rows are separated by line breaks, while the columns are separated by commas [6].

These files are often used as databases and due to their simplicity, anyone can create one with a text editor or a spreadsheet processor, the second option being more recommended as it allows applying a series of filtering operations, order and generate detailed reports from the available information. Files in this format will have the extension .csv.

### *Web hosting*

Web hosting is a service that allows organizations and individuals to post a website or web page onto the Internet. A web host, or web hosting service provider, is a business that provides the technologies and services needed for the website or webpage to be viewed in the Internet. Websites are hosted, or stored, on special computers called servers [7].

Although hosting services usually have a cost, it is possible to obtain some for free with certain limitations such as: limited bandwidth, little storage space or advertisements of the provider.

### *Domain name*

A domain name (often simply called a domain) is an easy-to-remember name that's associated with a physical IP address on the Internet. It's the unique name that appears after the @ sign in email addresses, and after www. in web addresses. For instance, the domain name example.com might translate to the physical address 198.102.434.8. Other examples of domain names are google.com and wikipedia.org.

Using a domain name to identify a location on the Internet rather than the numeric IP address makes it much easier to remember and type web addresses. Anyone can purchase a domain name. You just go to a domain host or registrar, find a name no one else is using, and pay a small annual fee to own it [8].

## **Materials and methodology**

### *Materials*

- Personal Computer.
- Web host.
- Domain name.

### *Methodology*

- Download or create a CSV file based on school assessments.
- Acquire a free or paid web hosting.
- Acquire a free or paid domain name.
- Generate the proposal in PHP7 for backend and Bootstrap for frontend.
- Create an intuitive and customizable interface for the user.
- Validate the proposed software.

## **Results**

In summary, the proposed software has only two restrictions:

The first one is that a column in CSV file should be named as "correo", this column will be where the ID of each student is entered, it can be an email or student number; the second one is that the file should be named "lista".

Some software systems as classroom make it easy to download the total grades in CSV format, reducing the work to rename the downloaded file. To illustrate this, the process is described in Figures 1 and 2.

First is selected any classwork as is shown in Figure 1:

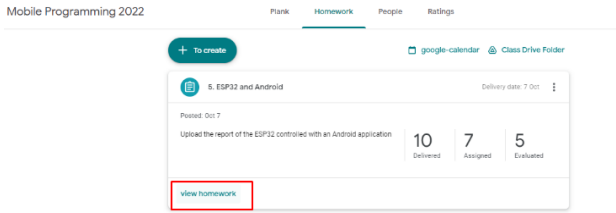


Figure 1 Classwork selection process

Then in options is selected the option which avoid us to download all the assessments this process can be seen in Figure 2:

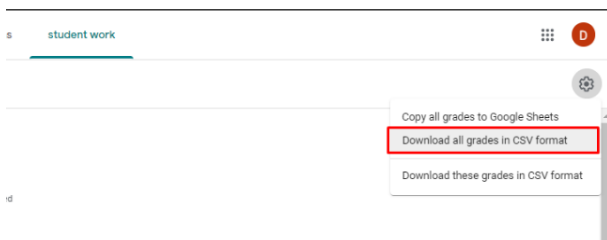


Figure 2 Download process for assessments file in CSV

As a result, the file obtained from the above process can be opened using excel and then only the final score is calculated with the spreadsheet to get a file as is shown in Figure 3

	A	B	C	D	E	F	G	H	
1	Surnames	Name	Email	0. Diagnostic	1. Class activ	2. My first ap	3. Farm App	4. WebView	5. E
2	ALMAZAN CE ADALID		rt20100041@	100	100	100	100	100	
3	GALEANA DI ANDRIV JOSI		rt20100005@	100	80	100	79	100	
4	NARVAEZ CC BRAYAN		rt20100028@	100		100	100	100	
5	ORTIZ MARTI EROS YERED		rt20100008@	80		100	100	100	
6	MARTINEZ E EVERLIN		rt20100002@	100		0	100	100	
7	ORTIZ MARTI IRAD YOAS		rt20100009@	100		100	100	100	
8	DOMINGUEZ IVAN		rt20100027@	100			100	100	
9	AVILA LEON/JOSE JARED		rt20100044@	100		100	100	100	
10	JUSTINIANO JOSE LUIS		rt20100012@	100		100	100	100	
11	PITA HERNAN JUAN CARLO		rt20100017@	100		100	100	100	
12	VALENTIN HI JUAN CARLO		rt20100031@	100		0	100	100	
13	HERNANDEZ JUAN FRANC		rt20100024@	100		100	100	100	
14	MARQUINA KAROL ELVIR		rt20100039@	100		100	100	100	

Figure 3 CSV final file

After the file is done, is needed to get a web hosting service, then it is update with two PHP files which are the search interface (see Figure 4) and the result interface (see Figure 5)

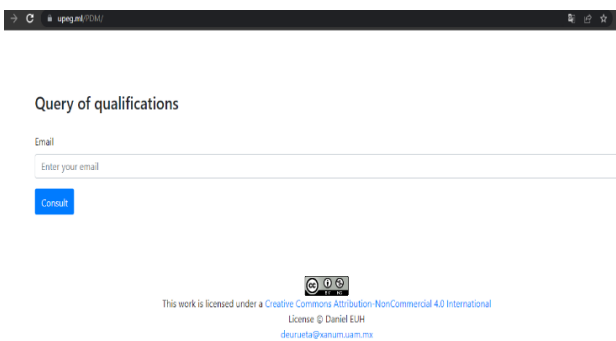


Figure 4 Search interface

Name	Email	0. Diagnostic test	1. Class activity: Mobile OS	2. My first application
BRAYAN	rt20100028@upeg.edu.mx	100		100

Figure 5 Results interface

Consequently, since the frontend was made using bootstrap, both of the interface is responsive (see Figure 6).

### Query of qualifications

Email

Consult



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Figure 6 Search interface seen from a mobile device

In addition to the system, it is important to mention that as long as the restrictions of the file name and the field called "mail" are met, it is not necessary to make additional modifications and in case of wanting to update the grades, simply download the CSV file again. or edit it manually, therefore the system is flexible enough and easy to use with minimal knowledge.

Currently the described system is being implemented in the networks and telecommunications career of the Universidad Politécnica del Estado de Guerrero (see Figure 7 and 8), this system can be consulted from [9]

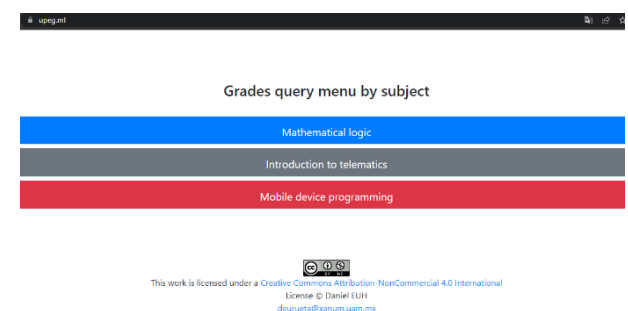
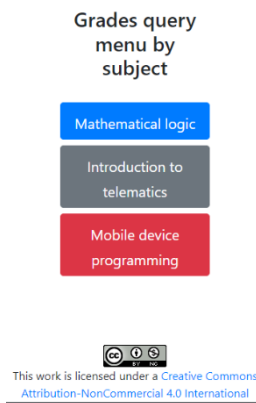


Figure 7 System implementation



**Figure 8** Responsible system implementation

## Conclusions

In conclusion, the proposed software was correctly validated in terms of functionality, this software allows the common users to have a system for free and in few steps to control and query school assessments.

Thanks to the structure in which the project is developed, if the user needs to update the database, it can be done using excel o downloading the CSV file from classroom without the needed to edit the code. However, is the flexible enough to modify this code according to the needs of the end user.

On the other hand, the system has as a result that fewer students having doubts regarding their current grade and has allowed teachers to have a more private way of communicating final grades.

Finally, as future work, it is expected to improve the visual design, create multi-language support and create a section to configure the file name and required field without having to open the source code.

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## References

[1] PHP, “PHP: What is PHP? - Manual,” 2009. <https://www.php.net/manual/en/intro-what-is.php> (accessed May 04, 2022).

[2] Mark Otto, Jacob Thornton, and Bootstrap, “Bootstrap,” 2022. <https://getbootstrap.com/> (accessed May 04, 2022).

[3] Microsoft, “Database basics,” 2021. <https://support.microsoft.com/en-us/office/database-basics-a849ac16-07c7-4a31-9948-3c8c94a7c204> (accessed May 04, 2022).

[4] Oracle, “What is a database?” 2021. <https://www.oracle.com/database/what-is-database/> (accessed May 04, 2022).

[5] Microsoft, “Database basics,” 2019. <https://support.microsoft.com/en-us/office/database-basics-a849ac16-07c7-4a31-9948-3c8c94a7c204> (accessed Sep. 28, 2020).

[6] Y. Shafranovich, “Common Format and MIME Type for Comma-Separated Values (CSV) Files,” Internet Engineering Task Force, Request for Comments RFC 4180, 2005. doi: 10.17487/RFC4180.

[7] Mozilla, “¿Cuál es la diferencia entre la página web, el sitio web, el servidor web y el motor de búsqueda? - Aprende sobre desarrollo web | MDN,” 2020. [https://developer.mozilla.org/es/docs/Learn/Common\\_questions/Pages\\_sites\\_servers\\_and\\_search\\_engines](https://developer.mozilla.org/es/docs/Learn/Common_questions/Pages_sites_servers_and_search_engines) (accessed Mar. 16, 2022).

[8] Google, “Conceptos básicos de los nombres de dominio - Ayuda de Administrador de Google Workspace,” 2022. <https://support.google.com/a/answer/2573637?hl=es> (accessed Mar. 16, 2022).

[9] D. E. Urueta, “Consulta calificaciones,” 2022. <https://www.upeg.ml/> (accessed May 04, 2022).

## Diagnosis of Technostress, its causes and repercussions in the teaching staff of the Instituto Tecnológico Superior de la Sierra Norte de Puebla

## Diagnóstico de Tecnoestrés, sus causas y repercusiones en la planta docente del Instituto Tecnológico Superior de la Sierra Norte de Puebla

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### Abstract

The objective of this study has been to diagnose the psychosocial damage of Technostress, caused by technodemands and technoresources; as well as the psychological, psychosomatic and physical repercussions on the teaching staff of the ITSSNP (Higher Technological Institute of the Sierra Norte de Puebla). In a sample of 80 teachers (men and women); Through a questionnaire, topics related to the types of Technostress, its dimensions, causes and physical effects have been explored. The methodological aspects used in this research are based on a qualitative and quantitative research approach. I approach a type of Case Study research, the Sequential Exploratory design (DESXPLOS) was applied. The type of research is non-experimental. The design is Transversal (transectional). The objective or scope in this study is Explanatory - Correlational (Hernández et al, 2010). For the statistical analysis, variance (ANOVA) was applied. Statistically, the results show the existence of Technostress in ITSSNP teachers in 2019 and 2020, with an increase in the period of the COVID-19 pandemic. The predominant types of technostress in the pandemic are technofatigue and technoanxiety; The causes are work overload (techno-demands) and the state and availability of computer equipment and internet service (techno-resources). Women teachers presented higher levels of technostress in a pandemic due to work overload (technodemands) and by the state, as well as availability of computer equipment and internet service.

**Technostress, Teachers, Physical effects**

### Resumen

El objetivo del presente estudio ha sido diagnosticar el daño psicosocial del Tecnoestrés, ocasionado por las tecnodemandas y tecnorecursos; así como las repercusiones psicológicas, psicosomáticas y físicas en la planta docente del ITSSNP (Instituto Tecnológico Superior de la Sierra Norte de Puebla). En una muestra de 80 docentes (hombres y mujeres); mediante un cuestionario se ha explorado temas relacionadas con los tipos de Tecnoestrés, sus dimensiones, las causas y efectos físicos. Los aspectos metodológicos empleados en esta investigación parten de un enfoque de investigación cualitativa y cuantitativa. Abordo un tipo de investigación de Estudio de Casos, se aplicó el diseño Exploratorio Secuencial (DESXPLOS). El tipo de investigación es no experimental. El diseño es Transversal (transectional). El objetivo o alcance en este estudio es Explicativo - Correlacional (Hernández et al, 2010). Para el análisis estadístico se aplicó varianza (ANOVA). Estadísticamente los resultados muestran la existencia de Tecnoestrés en los docentes del ITSSNP en 2019 y 2020, con incremento en periodo de pandemia COVID-19. Los tipos de tecnoestrés predominantes en pandemia son la tecnofatiga y la tecnoansiedad; las causas son la sobrecarga de trabajo (tecnodemandas) y el estado, así como disponibilidad del equipo de cómputo y del servicio de internet (tecnorecursos). Las mujeres docentes presentaron mayores niveles de tecnoestrés en pandemia por sobrecarga de trabajo (tecnodemandas) y por el estado, así como disponibilidad del equipo de cómputo y del servicio de internet.

**Tecnoestrés, Docentes, Efectos físicos**

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## Introduction

In the current context in organizations, it is increasingly common to find environments of maximum competitiveness in which work groups need to optimize their productivity to obtain maximum benefits and differentiate themselves from the competition, something that depends largely on the adaptability of their collaborators (Sanchez, 2021) and Information and Communication Technologies (ICT) play an important role in meeting the demands. The COVID-19 pandemic has affected human beings, directly disrupting lifestyles and quality of life. ICTs are an ally for the work environment or for situations such as the COVID-19 pandemic, but on the other hand, they can be triggers of tension and stress (Arredondo, 2022). Occupational technostress is a negative psychological state that is linked to the perception of a mismatch between the demands and resources related to the use of ICTs. It is intimately related to the repercussions that the disruptive implementation of ICT has originated; negatively transgressing the physical and mental well-being of people (Government of Spain, State Foundation for Occupational Risks, Foment del Treball Nacional, 2018).

In these times, Technostress punctuates the syndrome of receiving a large amount of information, which produces a cognitive overload due to excessive activation of neuronal connections and this produces a state of stress or alarm (Martin, 2020).

Technostress in the ITSSNP teaching staff is due to technological work demands (González, 2019); such as the generation of reports in different platforms, being integrated to several WhatsApp groups, the constant invitation to participate in various courses for the management of platforms and applications. As well as receiving information by mail and WhatsApp at all hours and on weekends. Another cause detected corresponds to the lack of internet service and having obsolete computer equipment. The lack of labor Technorecursos can generate alterations in stress levels that can even affect health (Ruiz, 2019). Teachers suffer a high level of stress in their work, and with the pandemic, the demands and excess of bureaucratic activities have increased (Robinet and Perez, 2020). Every teacher is susceptible to be affected positively or negatively in their emotional state by family, work or educational issues (Ossa et al, 2015).

Likewise, teachers have presented resistance to using new platforms. This resistance to change is understood as an observable behavior as a consequence of the displeasure or challenge experienced by teachers as a result of the introduction of new ideas, methods or devices, and which is also inevitable in educational organizations (Corica, 2020).

The repercussions are nervousness, anxiety, listlessness, lack of motivation and weariness; with effects on their academic (students and fellow teachers), family and social relationships. They have presented pathologies such as the following: Mild neurosis, several cases of peripheral neuritis, anguish, anxiety and stress.

The hypothesis put forward is that Technostress is a psychosocial damage caused by Technodemands, which involves the use of Technoresources and affects in different ways the health conditions of the teachers of the Tecnológico Nacional campus Zacatlán, presenting consequences such as mental fatigue, sleep disorders, stress, anxiety, psychosomatic and physical complaints.

This work is divided in the methodology chapter which specifies a qualitative and quantitative research approach. I approached a Case Study type of research, the Sequential Exploratory Design (DESXPLOS) was applied to the research. The type of research is non-experimental. The design is Transversal (cross-sectional). In the results chapter it is inferred that the predominant types of technostress in the ITSSNP teaching staff are Technofatigue and Technoanxiety and the causes are Technodemands and Technoresources. The physical effects range from

## Methodology to be developed

### *Participants*

A total of 86 ITSSNP teachers participated in the present study, of whom 31 were men (55.9%) and 26 were women (44.07%). The sample was divided into two groups; the first group was made up of male teachers and the second of female teachers.



The careers in which the teachers collaborate (men and women) are: Division of Information Technologies and Systems, Department of Basic Sciences, Division of Economic Administrative Sciences, Division of Gastronomy, Division of Electromechanical Engineering, Division of Engineering in Food Industries, Division of Engineering in Innovation, Sustainable Agriculture, Division of Forestry Engineering, Division of Industrial Engineering, Department of Extracurricular Activities, Division of Industrial Engineering.

### *Instruments*

To carry out this study, two instruments were used, which are described below:

A scale based indicators such as skepticism, fatigue, anxiety, inefficiency, work overload, digital resources and physical effects. It was structured with grade anchors from 0 to 6, with 0 being "Never or Not at all" and 6 being "Always or all month". This scale has 24 items.

To assess the types of technostress, 16 items from the RED-TIC questionnaire (Resources, Emotions/Experiences and Demands in ICT Users Questionnaire) were used (Llorens et al, 2011). Nine items were added to assess the causes of technoestrés such as technodemands, technoresources and the physical effects of bibliographic material: Foundation for the Prevention of Occupational Risks (2015). This instrument in total consists of 24 items that allows to evaluate in two different years before and during the pandemic (2019 and 2020), where the response scale is Likert type and goes from 0 to 6, being 0 "Never or Nothing" and 6 "Always or all month".

The RED-TIC Questionnaire of Technostress (Llorens et al, 2011) is grouped into 4 indicators: Fatigue, Anxiety, Skepticism and Inefficacy. The items and the likert scale were modified for better understanding. The items formulated from information from Fundación para la prevención de riesgos laborales (2015) are grouped into 3 indicators: Work overload, status and availability of computer resources and physical effects.

### *Procedure*

To carry out this study, a protocol was developed in three blocks. In the first block, the objective of the research project was presented and the voluntary and confidential nature of the collaboration was clarified. The second block was divided into two parts; in the first part, sociodemographic data such as age, gender, and the division in which they work were asked; in the second part, the instructions and the scale were explained. In the third block, the Tecnoestrés questionnaire was presented with the respective adaptations to the RED-TIC questionnaire (Llorens et al, 2011) and information from the source Fundación para la prevención de riesgos laborales (2015).

This protocol was sent through the Microsoft® Teams Forms platform, for voluntary completion to a minimum total of 80 (according to the probabilistic sampling) ITSSNP teachers. The invitation guaranteed anonymous participation and a duration of 10 minutes.

### *Statistical analysis*

Once the data from the volunteer teachers were collected in Excel, they were treated with an analysis of variance (ANOVA) with 95% reliability; for comparison of means in two different years before and during the pandemic (2019 and 2020). For comparison of means, the Tukey test statistic ( $\alpha=0.05$ ) was used.

The software used was Minitab® 19. Descriptive statistics were performed for the sociodemographic data, as well as for items 22, 23 and 24 related to the technoresources dimension. The scale of question 22 'I acquired new computer or cellular equipment during the pandemic' and question 23 'I have needed to contract internet service' were transformed; indicating as No the negative answer and indicating as YES the positive answer. Item 24 'Indicate which of the following symptoms you have experienced while working with ICT'S (cell phone, tablet, PC, internet, WhatsApp, e-mail, educational platforms), as well as the intensity' had to select a physical symptom from eleven options.

Cronbach's alpha was obtained for all the items of the instrument.

## Results

The internal consistency analysis of the instrument was carried out to find out if the reliability was good. It was found that within the Tecnoestres instrument, the internal consistency was  $\alpha=0.952$ . Given these results, the internal consistency of the instrument is considered to be good.

ICT (Information and Communication Technologies) are work tools commonly used by teachers in any educational institution. According to the circumstances of the SARS pandemic COVID-19, the teachers resorted to educational platforms, acquisition of computer and cellular equipment, hiring of Internet service and unforeseen training in the use of these technologies; as a consequence, the work schedule and academic load increased, resulting in Technostress. The academic community of the Tecnológico Nacional de México, Zacatlán campus has a teaching staff of 106 members. The present investigation diagnoses cause, repercussions and the level of Technostress of the teachers of this house of studies.

The table (see Table 1) shows the results of the analysis of variance (ANOVA), comparing two different years; before the pandemic (2019) and during the pandemic (2020) in which it is observed that there is no significant statistical difference ( $=0.05$ ). Dimension one (D1): attitudinal manifests as the type of technostress called Technoanxiety, and the indicator skepticism (indifference, denial) as well as dimension four (D4): cognitive which verifies the manifestation of Technoanxiety with the indicators Inefficiency (low capacity and low ability) in the management of ICT. The teachers (men and women) of the Tecnológico Nacional de México campus Zacatlán already presented Technoanxiety; this type of Techno-stress is originated by the skepticism provoked by the indifference and denial of the contribution of ICT at work (attitudinal dimension) and by the inefficiency generated by the low capacity and skill in the management of ICT (cognitive dimension). Therefore, it is inferred that the Covid-19 pandemic did not influence the type of Technostress called Technoanxiety, both cognitively and attitudinally; it could be said that levels of skepticism and beliefs of low capacity and skill in the management of ICTs were present in both periods (2019-2020), the Technoanxiety already existed.

In dimensions two (D2) and three (D3) corresponding to the type of technostress: Technofatigue and Technoanxiety; and in dimensions five (D5) and six (D6) concerning the causes of technostress: Technodemands and Technoresources; as well as dimension seven (D7) referring to psychological, psychosomatic and physical consequences, there was a significant statistical difference. Dimension two (D2): affective, corresponding to the manifestation of Technofatigue and the fatigue indicator that is measured by stress and tiredness, did increase during the pandemic period, that is, the teachers (men and women) of the Tecnológico Nacional de México campus Zacatlán, the longer the work time using ICT, the greater the affective fatigue (Cardenas et al, 2020). Dimension three (D3): affective, which is manifested with Technoanxiety and the anxiety indicator that is evaluated through restlessness and insecurity, increased during the pandemic period in male and female teachers of the Tecnológico Nacional de México campus Zacatlán; it can be inferred that they felt tense, anxious and uncomfortable when working with ICT and nervous and insecure because they thought they could destroy the information or make mistakes in the handling of ICT (Arredondo, 2022).

In dimension five (D5): Cognitive, which corresponds to the manifestation Tecnoansiedad por tecnodemandas, it is measured through indicators such as work overload and the large amount of data to process through ICT; the impact was significant due to COVID19 since teachers (men and women) of the Tecnológico Nacional de México campus Zacatlán manage the accounts in educational platforms and whatsapp groups of school-age children; it is inferred that technology led them to do more work than they can handle, to change work habits to adapt to new technologies and to train in an unplanned way to manage ICT (Capanegra et al, 2016). Dimension six (D6): Cognitive concerning the manifestation Technoanxiety due to lack of Technoresources (state of computing resources and the availability of internet service), was evaluated by means of the indicators anxiety (restlessness, insecurity); evidencing an increase in this type of Technostress.

Male and female teachers of the Tecnológico Nacional de México campus Zacatlán required to perform maintenance and updates of hardware and software to their computer equipment, acquired new computer equipment, cell phones and / or hire internet service; all these factors lead to greater Technostress and a predisposition to physical symptoms (Ruiz et al; 2019). In dimension seven (D7): Physical (psychological, psychosomatic and physical symptoms), it is manifested through the types of Techno-stress: Technofatigue and Techno-anxiety and is estimated through indicators of physical effects such as pain, constipation, nausea, respiratory diseases, vertigo and facial paralysis to mention a few. Therefore, according to this research, male and female teachers of the Tecnológico Nacional de México campus Zacatlán did present greater psychological, psychosomatic and physical symptoms during the pandemic (Coppari et al; 2017), such as headaches, sleep disorders, diarrhea, constipation, respiratory diseases, numbness of the face, limbs, facial paralysis, vertigo, increased consumption of coffee, alcoholic beverages and tobacco, among the most common.

Demonstration	2019	2020
D1	1.330 <sup>A</sup>	1.593 <sup>A</sup>
D2	1.650 <sup>B</sup>	2.651 <sup>A</sup>
D3	1.147 <sup>B</sup>	1.647 <sup>A</sup>
D4	1.051 <sup>A</sup>	1.049 <sup>A</sup>
D5	2.163 <sup>B</sup>	3.285 <sup>A</sup>
D6	2.538 <sup>B</sup>	3.538 <sup>A</sup>
D7	0.878 <sup>B</sup>	1.487 <sup>A</sup>

D1 = Technoanxiety/attitudinal/skepticism.  
D2 = Technofatigue/affective/fatigue.  
D3 = Technoanxiety/affective/anxiety.  
D4 = Technoanxiety/Cognitive/inefficacy.  
D5 = Technodemands/cognitive/work overload (TICS).  
D6 = Techno-resources/cognitive/Resource availability (computer equipment).  
D7 = Technofatigue/physical/physical effects.  
A,B Means with the same letters in rows are statistically equal ( $\alpha$  0.05).

**Table 1** Evaluation of the causes, levels and repercussions of Technostress in teachers (women and men) of the Tecnológico Nacional de México campus Zacatlán  
Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al, 2011) (Fundación para la prevención de los riesgos laborales, 2015)

Table 2 shows the results of the analysis of variance (ANOVA), the causes, levels and repercussions of Technostress in teachers (women) of the Tecnológico Nacional de México campus Zacatlán, compared in two different years, before the pandemic (2019) and during the pandemic (2020). It is observed that there is no significant statistical difference ( $=0.05$ ) in dimension one (D1): corresponding to the attitudinal dimension that manifests itself as Technoanxiety, and the identifier is skepticism (indifference, denial) as well as dimension four (D4): The cognitive dimension also assesses the manifestation of Technoanxiety with the indicators Inefficiency (low capacity and low ability in the handling of ICT), that is, the academic women of the Tecnológico Nacional de México campus Zacatlán already presented Technoanxiety; this type of Technostress is originated by skepticism caused by the indifference and denial of the contribution of ICTs at work (attitudinal dimension) and by the inefficiency generated by the low capacity and skill in the management of ICTs (cognitive dimension). Therefore, it is inferred that the COVID-19 pandemic did not influence the type of technostress called Technoanxiety, both cognitively and attitudinally; it could be said that there are levels of skepticism and low capacity and skill in the management of ICT in both periods (2019-2020), the technoanxiety already existed.

In dimensions two (D2), three (D3), five (D5), six (D6) and seven (D7), there was a significant statistical difference in the pandemic period (2020). Dimension two (D2): affective, corresponding to the manifestation of Technofatigue and the fatigue indicator that is measured by stress and tiredness, did increase in the pandemic period, that is, the teachers (women) of the Tecnológico Nacional de México campus Zacatlán, the longer they work using ICT. Women are more prone to suffer affective fatigue; it is due to the burden of social responsibility, linked to their status as mothers and wives (Gaytán et al, 2019).

Dimension three (D3): referring to the affective dimension, through the manifestation Technoanxiety and the anxiety indicator that is evaluated through restlessness and insecurity, was manifested with greater impact in 2020 in the teachers (women) of the Tecnológico Nacional de México campus Zacatlán; it can be inferred that they felt tense, anxious and uncomfortable when working with ICT and nervous and insecure for thinking that they could destroy the information or make mistakes in the handling of the same (López, 2021). In dimension five (D5): which is Cognitive and corresponds to the manifestation Technoanxiety caused by technodemands, which is measured through indicators such as work overload and the large amount of data to process through ICT; the impact was significant due to SARS VOC 2 since the teachers of the Tecnológico Nacional de México campus Zacatlán manage the accounts in educational platforms and whatsapp groups of school-age children. It is inferred that technology led them to do more work than they can handle, to change work habits to adapt to new technologies and to train in an unplanned way to manage ICT (Domínguez et al, 2021).

Dimension six (D6): Cognitive concerning the manifestation of Technoanxiety caused by lack of Technoresources (state of computer resources and availability of internet service) and was evaluated by means of the anxiety indicators (restlessness, insecurity); showing an increase in this type of Technostress. The teachers (women) of the Tecnológico Nacional de México campus Zacatlán required to perform maintenance and updates of hardware and software to their computer equipment, acquired new computer equipment, cell phones and/or contracted internet service; all these factors lead to greater Technansieda and a predisposition to physical symptoms (Ruiz et al; 2019). In dimension seven (D7): Physical (physical symptoms), it is manifested through the types of Techno-stress: Techno-fatigue and Techno-anxiety and is estimated through indicators of physical effects such as pain, constipation, nausea, respiratory diseases, vertigo and facial paralysis to mention a few.

Therefore, according to this research, the teachers (women) of the Tecnológico Nacional de México campus Zacatlán did present greater physical symptoms during the pandemic (Montes de Oca et al; 2021), such as headaches, sleep disorders, diarrhea, constipation, respiratory diseases, numbness of the face and extremities, facial paralysis, vertigo, increased consumption of coffee, alcoholic beverages and cigarettes, among the most common.

Manifestación	2019	2020
D1	1.578 <sup>A</sup>	1.767 <sup>A</sup>
D2	1.974 <sup>B</sup>	3.259 <sup>A</sup>
D3	1.414 <sup>B</sup>	2.147 <sup>A</sup>
D4	1.207 <sup>A</sup>	1.155 <sup>A</sup>
D5	2.250 <sup>B</sup>	3.655 <sup>A</sup>
D6	2.655 <sup>B</sup>	4.172 <sup>A</sup>
D7	0.958 <sup>B</sup>	1.890 <sup>A</sup>

D1 = Technoanxiety/attitudinal/skepticism.  
D2 = Technofatigue/affective/fatigue.  
D3 = Technoanxiety/affective/anxiety.  
D4 = Technoanxiety/Cognitive/inefficacy.  
D5 = Technodemands/cognitive/work overload (TICS).  
D6 = Techno-resources/cognitive/Resource availability (computer equipment).  
D7 = Technofatigue/physical/physical effects.  
A, B Means with the same letters in rows are statistically equal (Tukey=0.05).

**Table 2** Evaluation of the causes, levels and repercussions of Technostress in female teachers at the Tecnológico Nacional de México Zacatlán campus

Source: Own elaboration with data obtained from the adapted *Tecnoestrés* questionnaire (Llorens et al, 2011) (Fundación para la prevención de riesgos laborales, 2015)

Table 3 shows the results of the analysis of variance (ANOVA), the causes, levels and repercussions of Technostress in teachers (men) of the Tecnológico Nacional de México campus Zacatlán, compared in two different years, before the pandemic (2019) and during the pandemic (2020). And it is observed that there is no significant statistical difference ( $=0.05$ ) in dimension one (D1): Attitudinal corresponding to the manifestation of Technoanxiety through the indicators skepticism (indifference, denial), dimension four (D4): Cognitive related to the manifestation of Technoanxiety and indicators ineffectiveness (low capacity and ability) and dimension (D6): Cognitive referring to the manifestation Technoanxiety due to lack of Tecnorecursos (state of computer resources and availability of internet service) which is measured by indicators such as anxiety (restlessness, insecurity).

The teachers of the Tecnológico Nacional de México campus Zacatlán already presented Technoanxiety due to distrust and thoughts of ignorance in the use of ICT; that is, due to skepticism caused by deference and denial of the contribution of ICT at work (D1) (Sanchez et al., 2021), inefficiency due to low capacity and ability in the use of ICT at work (D4) and anxiety due to lack of resources such as computer or cellular equipment and internet service to cope with work activities (D6) (Ruiz et al., 2019).

In dimension two (D2) and three (D3) corresponding to the variables types of techno-stress techno-fatigue and techno-anxiety respectively, dimension five (D5) evaluates the rate of techno-stress due to technodemand and dimension seven (D7) referring to physical or psychosomatic affectations; it was evidenced that there was a significant statistical difference in the levels of techno-stress in teachers (men) of the ITSSNP in time of pandemic (2020).

Dimension two (D2): affective, referring to the manifestation of technostress (type of technostress) and the fatigue indicator that is measured by stress and tiredness, did increase during the pandemic period; it could be said that the teachers (men) of the Tecnológico Nacional de México campus Zacatlán, when increasing the work time using ICT, manifested greater fatigue (Rodríguez et al; 2021). In dimension three (D3): affective, through the manifestation Technoansiedad and the anxiety indicator that is evaluated through restlessness and insecurity, was externalized with greater intensity during the pandemic period and the teachers (men) of the Tecnológico Nacional de México campus Zacatlán; it can be glimpsed that they felt tense, anxious and uncomfortable when working with ICT and nervous and insecure for thinking that they can destroy the information or make mistakes (Aragüez, 2017). Dimension five (D5): cognitive and corresponds to techno-stress caused by the cause called technodemand; it is manifested by techno-anxiety; it is measured by work overload or the amount of data to work; the impact was significant due to the pandemic in teachers of the Tecnológico Nacional de México campus Zacatlán; it is inferred that technology led them to do more work than they can handle, to change work habits to adapt to new technologies and to train in an unexpected way to handle ICT (Government of Spain. Ministry of Labor, Migration and Social Security, 2018).

In dimension seven (D7): Physical (psychosomatic and physical symptoms), it is manifested through the types of Techno-stress: Techno-fatigue and Techno-anxiety and is estimated through indicators of psychosomatic and physical effects such as pain, constipation, nausea, respiratory diseases, vertigo and facial paralysis among others. Therefore, according to this research, the teachers of the Tecnológico Nacional de México campus Zacatlán did present greater physical and psychosomatic symptoms during the pandemic, such as headaches, sleep disorders, diarrhea, constipation, respiratory diseases, numbness of the face and extremities, facial paralysis, vertigo, increased consumption of coffee, alcoholic beverages and cigarettes (Ávila, 2020).

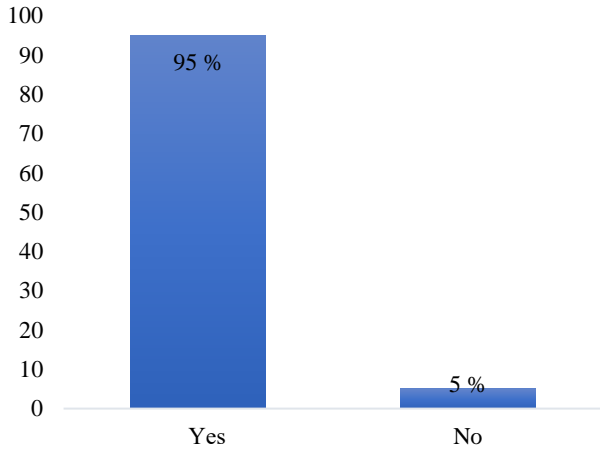
Demonstration	2019	2020
D1	1.184 <sup>A</sup>	1.490 <sup>A</sup>
D2	1.459 <sup>B</sup>	2.291 <sup>A</sup>
D3	0.990 <sup>B</sup>	1.352 <sup>A</sup>
D4	0.959 <sup>A</sup>	0.980 <sup>A</sup>
D5	2.112 <sup>B</sup>	3.066 <sup>A</sup>
D6	2.469 <sup>A</sup>	3.163 <sup>A</sup>
D7	0.830 <sup>B</sup>	1.249 <sup>A</sup>

D1 = Technoanxiety/attitudinal/skepticism.  
D2 = Technofatigue/affective/fatigue.  
D3 = Technoanxiety/affective/anxiety.  
D4 = Technoanxiety/Cognitive/inefficacy.  
D5 = Technodemand/cognitive/work overload (TICS).  
D6 = Techno-resources/cognitive/Resource availability (computer equipment).  
D7 = Technofatigue/physical/physical effects.  
A,B Means with the same letters in rows are statistically equal ( $\alpha$  0.05).

**Table 3** Evaluation of the causes, levels and repercussions of Technostress in teachers (men) of the Tecnológico Nacional de México campus Zacatlán

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para la prevención de riesgos laborales, 2015)

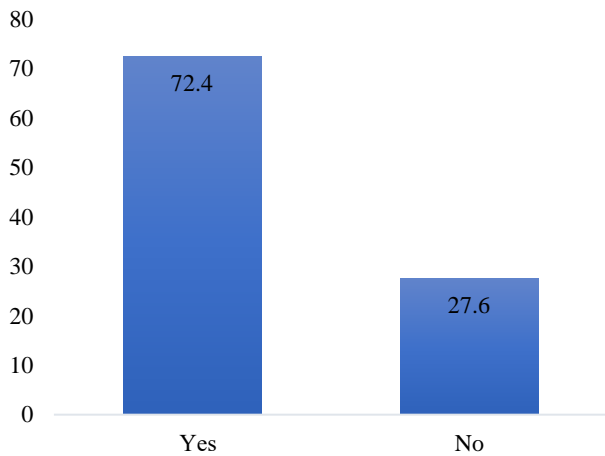
Graphic 1 shows that 95% of ITSSNP female teachers acquired computer equipment in 2020.



**Graphic 1** Women teachers of the Tecnológico Nacional de México campus Zacatlan who acquired new computer equipment in pandemic (2020)

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para prevención de riesgos laborales, 2015)

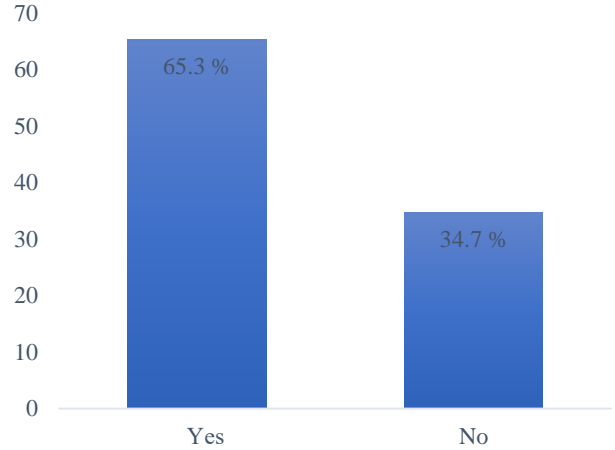
In Graphic 2 (See Graphic 2) it is evident that 72.4 % of ITSSNP female teachers contract internet service in 2020.



**Graphic 2** Women teachers of the Tecnológico Nacional de México campus Zacatlán who contracted internet service in pandemic (2020)

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para prevención de riesgos laborales, 2015)

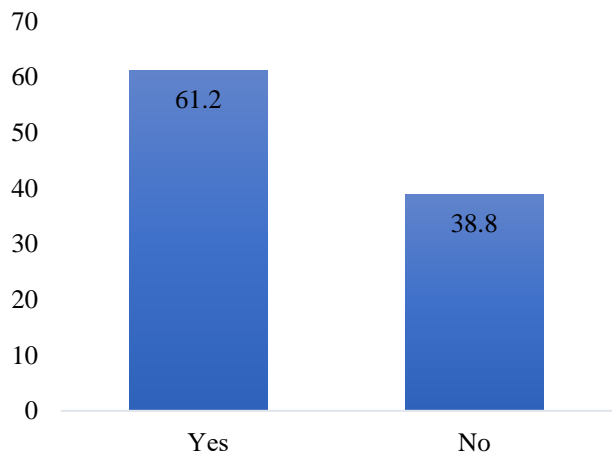
Graphic 3 shows that 65.3% of male ITSSNP teachers acquired new computer equipment in 2020.



**Graphic 3** Male teachers at the Tecnológico Nacional de México campus Zacatlán who contracted Internet service in pandemic (2020)

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para la prevención de riesgos laborales, 2015)

Graphic 4 shows that 65.3% of male ITSSNP teachers contracted internet service in 2020.



**Graphic 4** Male teachers of the Tecnológico Nacional de México campus Zacatlán who contracted internet service in pandemic (2020)

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para la prevención de riesgos de riesgos de riesgos laborales, 2015)

The psychological, psychosomatic and physical effects of technostress on male and female teachers increased during the pandemic period.

Table 4 shows psychological, psychosomatic and physical effects experienced by female ITSSNP teachers.

Number	Female teachers		Physical Symptom
	2019	2020	
1	87.2 %	93.1 %	Headache.
2	62 %	82.7 %	Sleep disturbances.
3	31 %	58.6 %	Diarrhea and constipation.
4	24.1 %	44.8 %	Nausea and dizziness.
5	13.7 %	37.9 %	Chest pains.
6	44.8 %	51.7%	Respiratory diseases.
7	24.1 %	51.1%	Numbness of face and extremities.
8	27.5 %	27.5 %	Smoking.
9	79.3%	89.6 %	Coffee.
10	27.5 %	31 %	Alcohol.

**Table 4** Psychosomatic symptoms experienced by female teachers (female) in 2019 and 2020.

Source: Own elaboration with data from the Technostress questionnaire

Table 5 shows psychological, psychosomatic and physical effects experienced by male ITSSNP teachers.

Number	Male teachers		Physical Symptom
	2019	2020	
1	41%	46%	Headache.
2	32%	42.8%	Sleep disturbances.
3	30.6%	49.8%	Diarrhea and constipation.
4	28.5%	38.7%	Nausea and dizziness.
5	24.4%	28.5%	Chest pains.
6	30.6%	32.6%	Respiratory diseases.
7	22.4%	38.7%	Numbness of face and extremities.
8	22.49%	20.4%	Smoking.
9	85.7%	85.7%	Coffee.
10	48.9%	44.8%	Alcohol.

**Table 5** Psychosomatic symptoms experienced by female teachers (men) in 2019 and 2020

Source: Own elaboration with data obtained from the adapted Tecnoestrés questionnaire (Llorens et al., 2011) (Fundación para la prevención de riesgos de riesgos de riesgos laborales, 2015)

## Conclusions

The results of the present study suggest that Technostress in the ITSSNP teaching staff is caused by Technodemands and by the lack of Technoresources. The physical repercussions that are manifesting themselves in ITSSNP teachers were identified: mental fatigue, sleep disorders, stress, anxiety and psychosomatic complaints. The analyses reveal that the physical repercussions were present in both men and women; but with greater intensity in the COVID-19 pandemic in women teachers. And they range from fatigue or mental tiredness, stress to psychosomatic manifestations such as headache, sleep disorders, diarrhea and constipation, nausea and dizziness, chest pains, respiratory diseases, numbness of the face and extremities, consumption of coffee, alcohol, cigarettes, facial paralysis and vertigo. These findings, despite the need for further research, highlight the need to design and implement actions in favor of male teachers and especially female teachers of the ITSSNP.

## References

Arredondo Hidalgo, María Guadalupe; Caldera González, Diana del Consuelo (2022). Tecnoestrés en estudiantes universitarios. Diagnóstico en el marco del covid- 19 en México. Retrieved from: <https://revistas.unisimon.edu.co/index.php/educacion/article/download/4491/5376>. DOI: <https://doi.org/10.17081/eduhum.24.42.4491> [Consultation Date: June 14, 2022]

Ávila Jiménez, María Dolores; González Rodríguez, Sergio Manuel (2020). El tecnoestrés y la salud en trabajadoras administrativas de un centro universitario de la Universidad de Guadalajara. Retrieved from: <https://webcache.googleusercontent.com/search?q=cache:6tml6skrpVAJ:https://www.piensoenlatinoamerica.org/storage/pdf-articles/1625547784-5%2520Art%25C3%25ADculo%2520Original.pdf&cd=7&hl=es-419&ct=clnk&gl=mx>. [Date of Consultation: 27 August 2022]

Capanegra, Horacio Andrés; Cabrer, Gabriela; Aguilar, María Laura; Jorda, María Sol (2016). El empleo de las tecnologías de información y comunicaciones (tics) en el ámbito universitario. Retrieved from: <https://revistas.unisimon.edu.co/index.php/educacion/article/download/4491/5376>. [Date of Consultation: 27 August 2022]

Cardenas Velasquez Alex José, Bracho Paz Desireth Carolina (2020). El Tecnoestrés. Una consecuencia de la inclusión de las TIC en el trabajo. Retrieved from: <https://dialnet.unirioja.es/servlet/articulo?codigo=7390786> [Date of Consultation: 11 July 2021]

Copari Norma, Bagnoli Laura, Codos Gerónimo, Montanía Maureen, Martínez Úrsula, López Humada Heidi (2017). Uso de Tecnologías de la Comunicación e Información y Tecnoestrés en Estudiantes Paraguayos: su relación con la edad. Retrieved from: <https://www.redalyc.org/journal/4396/439656187009/html/> DOI: <https://doi.org/10.7714/CNPS/11.3.210>. [Consultation date: 31 August 2022]

Corica, José Luis (2020). Resistencia docente al cambio: Caracterización y estrategias para un problema no resuelto. Retrieved from: <https://www.redalyc.org/jatsRepo/3314/331463171013/html/index.html> [Consultation Date: 11 June 2021]

Domínguez-Torres, L., Rodríguez-Vásquez, D. J., C., Totolhua-Reyes, B. A. y Rojas-Solís, J. L. (2021). Tecnoestrés en docentes de educación media superior en el contexto de confinamiento por COVID-19: Un estudio exploratorio (Technostress in high school teachers in the context of COVID-19 confinement: An exploratory study). *Dilemas contemporáneos: Educación, política y valores*, 9 (Ed. Esp.), 1-21. [Consultation Date: 13 June 2022]

Fundación para la prevención de Riesgos Laborales (2015). Tecnoestrés. Retrieved from: [http://www.ugtbalears.com/sites/url-nuevo-sitio/files/29\\_-\\_tecnoestres.pdf](http://www.ugtbalears.com/sites/url-nuevo-sitio/files/29_-_tecnoestres.pdf) [Consultation Date: 23 June 2021]

Gaytán Jiménez, Efraín; García Vargas, Gonzalo; Gaytán-Hernández, Darío; Rosales-González, Manuel; Reyes Hernández, Humberto; Sánchez Armás Capello, Omar; Calderón Hernández, Jaqueline (2019). Sintomatología depresiva, estrés y funcionamiento familiar en madres adultas del norte de México Retrieved from: [https://www.scielo.org.mx/scielo.php?script=sci\\_arttext&pid=S0188-62662019000100157](https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0188-62662019000100157). <https://doi.org/10.15174/au.2019.2063>. [Consultation Date: 31 August 2022]

Gobierno de España, Fundación Estatal de Riesgos Laborales, Foment del Treball Nacional (2018). Tecnoestrés: Qué es, cómo nos condiciona y como gestionarlo. Retrieved from: <http://webcache.googleusercontent.com/search?q=cache:EjMFS43mvxMJ:www.infocoponline.es/pdf/20191213091737.pdf&cd=1&hl=es-419&ct=clnk&gl=mx> [Date of Consultation: 11 July 2021]

Gobierno de España. Ministerio de trabajo, migraciones y seguridad social (2018). Tecnoestrés: Qué es, cómo nos condiciona y cómo gestionarlo. Retrieved from: <http://webcache.googleusercontent.com/search?q=cache:EjMFS43mvxMJ:www.infocoponline.es/pdf/20191213091737.pdf+&cd=17&hl=es-419&ct=clnk&gl=mx>. [Date of Consultation: 14 June 2022]

González-Menéndez Eva, López González M<sup>a</sup> Jesús, S González Menéndez Ilvia, García González Guillermo, Álvarez Bayona Teresa (2019). Principales consecuencias para la salud derivadas del uso continuado de nuevos dispositivos electrónicos con PVD. Retrieved from: [https://scielo.isciii.es/scielo.php?script=sci\\_arttext&pid=S1135-57272019000100011](https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1135-57272019000100011). ISSN 2173-9110. [Date of Consultation: 13 August 2021]

Hernández Sampieri, R.; Fernández Collado, C. y Baptista Lucio P. (2010). Metodología de la Investigación. Quinta Edición. México: Mc. Graw-Hill/Interamericana Editores S. A. de C.V.

Llorens Susana, Salanova Marisa, Ventura Mercedes (2011). Guía de Intervención. Tecnoestrés. España. Editorial Síntesis. ISSN: 978-84-975678-2-4

López Loya, José (2021). Estrés en los docentes de secundaria por la educación virtual ante la COVID-19. Retrieved from: <http://webcache.googleusercontent.com/search?q=cache:HotXWcf8M8MJ:ensech.edu.mx/pdf/maestria/libro6/TP6-3-4Lopez.pdf+&cd=4&hl=es-419&ct=clnk&gl=mx>. [Consultation Date: 13 June 2022]

Martin Rodríguez, Olaya (2020). El tecnoestrés como factor de riesgo para la seguridad y salud del trabajador. Retrieved from: [https://www.researchgate.net/publication/347918042\\_El\\_tecnoestres\\_como\\_factor\\_de\\_riesgo\\_para\\_la\\_seguridad\\_y\\_salud\\_del\\_trabajador](https://www.researchgate.net/publication/347918042_El_tecnoestres_como_factor_de_riesgo_para_la_seguridad_y_salud_del_trabajador) [Consultation Date: 10 July 2021]

Montes de Oca López Juan Carlos, Alcántara Ramírez Sandra Miriam, Domínguez Bond Alejandro (2021). Tecnoestrés en docentes y alumnos universitarios: medición en tiempos de covid-19. Retrieved from: <https://www.eumed.net/es/revistas/rilcoDS/16-febrero21/tecnoestres-docentes-alumnos>. <https://doi.org/10.51896/rilcods>. [Consultation date: 31 August 2022]



Ossa Carlos J., Quintana Ingrid M., Rodriguez Felipe F (2015). Valoración de salud mental en formación de profesores en dos universidades chilenas. Retrieved from: <https://dialnet.unirioja.es/descarga/articulo/5475217.pdf>.  
<http://dx.doi.org/10.20511/pyr2015.v3n1.70>  
 [Consultation Date: 14 June 2022]

Robinet Serrano, Allisson L; Pérez-Azahuanche, Manuel. Estrés en los docentes en tiempos de pandemia Covid-19. Retrieved from: <https://dialnet.unirioja.es/descarga/articulo/8042542.pdf>. DOI: 10.23857/pc.v5i12.2111.  
 [Consultation Date: 14 June 2022]

Rodríguez-Vásquez, D. J. , Totolhua-Reyes, B. A., Domínguez-Torres, L., Rojas-Solís, J. L. y De la Rosa-Díaz, B. E. (2021). Tecnoestrés: Un análisis descriptivo en docentes universitarios durante la contingencia sanitaria por COVID-19. *Enseñanza e Investigación en Psicología*, 3(2), 214-226. Retrieved from: <https://www.revistacneip.org/index.php/cneip/article/view/198/124>. [Consultation Date: 14 June 2022]

Ruiz Domínguez, Veronica Esperanza; Ríos-Manríquez, Martha; Sánchez-Fernández, María Dolores (2019). Los tecno recurso laborales y su impacto en el tecnoestrés. un caso empírico. *International Journal of Innovation*, vol. 7, núm. 2, 2019. Retrieved from: <https://www.redalyc.org/journal/4991/499165598008/499165598008.pdf>. DOI: <https://doi.org/10.5585/iji.v7i2.247>.  
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Sanchez Gomez, Martin; Adelantado Renau Mireia; Beltran-Valls, Maria Reyes (2021). Tecnoestrés docente: la importancia de las competencias digitales y la edad. Retrieved from: [https://www.researchgate.net/publication/358046957\\_Tecnoestres\\_docente\\_la\\_importancia\\_de\\_las\\_competencias\\_digitales\\_y\\_la\\_edad](https://www.researchgate.net/publication/358046957_Tecnoestres_docente_la_importancia_de_las_competencias_digitales_y_la_edad).  
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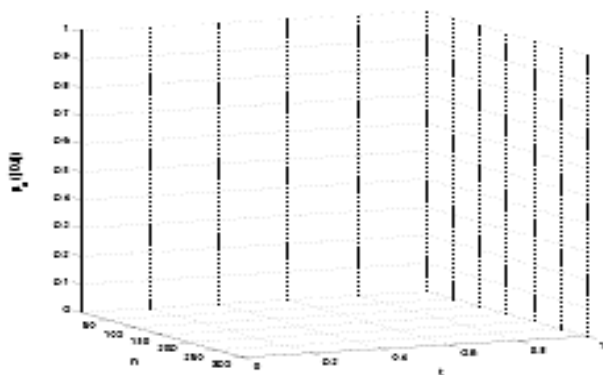
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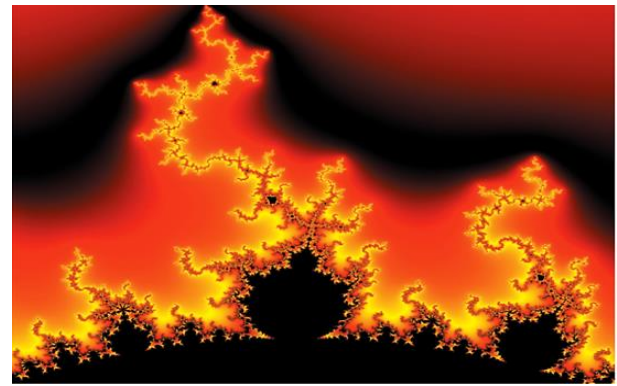
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