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RINOE Journal-Labor and Demographic economics

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Support the international scientific community in its written production Science, Technology and Innovation in the Field of Social Sciences, in Subdisciplines of Demographic economics: Demographic trends and forecasts, Marriage, Marital dissolution, Family structure, Fertility, Family planning, Child care, Children, Youth, Economics of the elderly, Economics of minorities and races, Economics of gender, Value of life, Foregone income; Time allocation, Work behavior, Employment determination and creation: Labor force and employment, Size, and Structure, Time allocation and labor supply, Employment determination, Demand for labor, Self-employment, Human capital, Skills, Occupational choice, Labor productivity, Retirement, Retirement policies, Safety, Accidents, Industrial health, Job satisfaction, Related public policy; Wages, Compensation, and Labor costs: Wage level and structure, Wage differentials by skill, Training, Occupation, etc., Nonwage labor costs and benefits, Private pensions, Compensation packages, Payment methods; Particular labor markets: Contracts: Specific human capital, Matching models, Efficiency wage models, and Internal labor markets, Monopsony, Segmented labor markets, Agricultural labor markets, Professional labor markets and Occupations firm behavior, Public sector labor markets, Particular labor markets; Labor-Management relations, Trade unions, and Collective bargaining: Trade unions, Dispute resolution, Labor-Management relations, Industrial jurisprudence, Producer cooperatives, Labor managed firms; Mobility, Unemployment, and Vacancies: Geographic labor mobility, Immigrant workers, Occupational and intergenerational mobility, Turnover, Vacancies, Layoffs, Unemployment, Unemployment insurance, Severance Pay, Plant closings; Discrimination; Labor standards: National and International; Working conditions, Labor force composition, Workers' Rights.

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Professional labor markets and Occupations firm behavior, Public sector labor markets, Particular labor markets; Labor-Management relations, Trade unions, and Collective bargaining: Trade unions, Dispute resolution, Labor-Management relations, Industrial jurisprudence, Producer cooperatives, Labor managed firms; Mobility, Unemployment, and Vacancies: Geographic labor mobility, Immigrant workers, Occupational and intergenerational mobility, Turnover, Vacancies, Layoffs, Unemployment, Unemployment insurance, Severance Pay, Plant closings; Discrimination; Labor standards: National and International; Working conditions, Labor force composition, Workers' Rights with diverse approaches and perspectives, That contribute to the diffusion of the development of Science Technology and Innovation that allow the arguments related to the decision making and influence in the formulation of international policies in the Field of Social Sciences. The editorial horizon of RINOE® extends beyond the academy and integrates other segments of research and analysis outside the scope, as long as they meet the requirements of rigorous argumentative and scientific, as well as addressing issues of general and current interest of the International Scientific Society.

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The works must be unpublished and refer to topics of Demographic economics: Demographic trends and forecasts, Marriage, Marital dissolution, Family structure, Fertility, Family planning, Child care, Children, Youth, Economics of the elderly, Economics of minorities and races, Economics of gender, Value of life, Foregone income; Time allocation, Work behavior, Employment determination and creation: Labor force and employment, Size, and Structure, Time allocation and labor supply, Employment determination, Demand for labor, Self-employment, Human capital, Skills, Occupational choice, Labor productivity, Retirement, Retirement policies, Safety, Accidents, Industrial health, Job satisfaction, Related public policy; Wages, Compensation, and Labor costs: Wage level and structure, Wage differentials by skill, Training, Occupation, etc., Nonwage labor costs and benefits, Private pensions, Compensation packages, Payment methods; Particular labor markets: Contracts: Specific

human capital, Matching models, Efficiency wage models, and Internal labor markets, Monopsony, Segmented labor markets, Agricultural labor markets, Professional labor markets and Occupations firm behavior, Public sector labor markets, Particular labor markets; Labor-Management relations, Trade unions, and Collective bargaining: Trade unions, Dispute resolution, Labor-Management relations, Industrial jurisprudence, Producer cooperatives, Labor managed firms; Mobility, Unemployment, and Vacancies: Geographic labor mobility, Immigrant workers, Occupational and intergenerational mobility, Turnover, Vacancies, Layoffs, Unemployment, Unemployment insurance, Severance Pay, Plant closings; Discrimination; Labor standards: National and International; Working conditions, Labor force composition, Workers' Rights and other topics related to Social Sciences.

Presentation of Content

As a first article we present, *Proposal to imporve productivity for companies providing comprehensive automation and control services* by PÉREZ-PÉREZ, Iris Cristel & GARCIA-REYES, David Antonio, with adscription at the Tecnológico Nacional de México Campus Ciudad Madero and Universidad Autónoma de Querétaro, in the next article we present, *The perception of students of the Universidad Autónoma de Nayarit regarding sustainable development in organizations* by CARRILLO-BELTRÁN, Julio César Cuauhtémoc, SUÁREZ-FLORES, Marina, GONZÁLEZ-HERNÁNDEZ, Maricruz and AGUIRRE-BRAVO, Anna Alessandra, with adscription at the Universidad Autónoma de Nayarit, in the next article we present, *Entrepreneurial skills of the Millennials and Centennials generation in the North of state of Campeche, Mexico* by SANTOS-VALENCIA, Raúl Alberto, SOSA-ALCARAZ, Mayanin Asunción, MONFORTE-MÉNDEZ, Gustavo Adolfo and BACAB-SANCHEZ, José Rubén, with adscription at the Tecnológico Nacional de México / IT Mérida, Yucatán and Tecnológico Nacional de México / IT Calkiní, Campeche, in the next article we present, *Economic, social and environmental analysis of greenhouses in the Municipality of El Arenal Hidalgo, to determine if they are sustainable* by MEJÍA-NÁJERA, Carlos, VILLATORO-CRUZ, Tania, PONCE-CANO, Rosa Yetzira and CARBALLO-SÁNCHEZ, Álvaro Francisco, with adscription at the Universidad Politécnica de Francisco I. Madero.

Content

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Proposal to imporve productivity for companies providing comprehensive automation and control services

Propuesta de mejoramiento de la productividad para las empresas de servicios integrales de automatización y control

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Abstract

The concept of productivity has evolved over the years to represent more than an efficiency index. From issues of cost and quality, its scope has expanded to encompass social concerns such as job creation, job security, poverty alleviation, resource conservation, social responsibility, to business excellence, governance and environmental protection (Referred to as Green Productivity). Today, other concepts of productivity that have evolved include social productivity and knowledge productivity. There are several ways to understand productivity, but there are at least two essential definitions that are frequently used and adopted today. Productivity is key to maintaining competitiveness, both at the organizational and country level, and to ensure sustainable socioeconomic development. The various productivity-enhancing tools, techniques, methods and practices that have been developed and adopted over the years in the production and consumption of goods and services are essential for the dynamism of economies.

Productivity, Efficiency, Development

Resumen

El concepto de productividad ha evolucionado a lo largo de los años para representar más que un índice de eficiencia. Desde cuestiones de costo y calidad, su alcance se ha ampliado para abarcar las preocupaciones sociales, como la creación de empleo, la seguridad laboral, el alivio de la pobreza, la conservación de los recursos, la responsabilidad social, hasta la excelencia empresarial, la gobernanza y la protección del medio ambiente (Denominado como Productividad Verde). Hoy, otros conceptos de productividad que han evolucionado incluyen la productividad social y la productividad del conocimiento. Hay varias formas de entender la productividad, pero hay al menos dos definiciones esenciales que se utilizan y adoptan con frecuencia en la actualidad. La productividad es clave para mantener la competitividad, tanto a nivel de organización como de país, y para garantizar un desarrollo socioeconómico sostenible. Las diversas herramientas, técnicas, métodos y prácticas que mejoran la productividad que se han desarrollado y adoptado a lo largo de los años en la producción y consumo de bienes y servicios son esenciales para el dinamismo de las economías.

Productividad, Eficiencia, Desarrollo

Citation: PÉREZ-PÉREZ, Iris Cristel & GARCIA-REYES, David Antonio. Proposal to imporve productivity for companies providing comprehensive automation and control services. Journal-Labor and Demographic economics. 2023. 7-13: 1-5

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Introduction

Output generally refers to the result, i.e. the total capacity of work that is delivered by a person or team in a given context.

Productivity, on the other hand, is about how the process and people get to that delivery. It is where you can look at strategies, structures and tools that enhance the end result through the action of your agents.

Productivity is the ratio of the amount of output (Goods and services produced) to the amount of inputs (i.e. resources such as labour, materials, machinery and energy) used in production.

Productivity = Finished product/inputs

Productivity is concerned with the efficiency with which goods and services are produced and the value created by the production process. If a product is produced at the lowest cost with high quality and can be sold competitively in the market at a price higher than its cost of production, then its productivity level is considered high. The objective of productivity is to maximise output and minimise input.

Productivity = Efficiency + Effectiveness

The other element of the productivity equation is effectiveness. This relates to the achievement of the objectives or desired outcomes set by the producer of a product or service. If customers are highly satisfied with the use of the product or service, this could mean higher revenues and repeat orders for the product or service. It could also mean a higher return on investment for investors and even a better image or reputation for the company or organisation.

Impacto de la Productividad

Productivity is an integrated concept, a combination of principles from various disciplines such as science, engineering, economics, finance and psychology. Productivity improvements or enhancements are generally achieved through collaborative efforts that address specific problems affecting an organisation. In short, achieving improved productivity involves a managed and systematic process; it does not happen by chance or accident.

Improvements can be planned once at the end of a phased process, incrementally from staged initiatives, or in stages through breakthroughs or innovations.

This paper shares the knowledge acquired in the research on productivity and competitiveness, all the information presented here was compiled from different reliable sources in order to present a clear and complete work.

Development

Pareto's Law applied to productivity

80% of the results come from 20% of the effort.

There is 20% of your activities that produce 80% of your results and vice versa.

In this case, improve your productivity by applying the Pareto principle:

- Dedicate the best hours to those activities that produce 80% of your results. Personally, I dedicate the morning to working with my clients to get the best results. The afternoons can be dedicated to personal training on those days when we are not going to a talk or networking event.
- Dedicate 80% of the time to the most important activities. It is different from the previous case because many times an important activity is the one that avoids an urgent situation in the future. It does not generate a great (economic) result but, for example, it will be saving you a lot of time avoiding problems in the medium term.
- Prioritise the tasks and decide which one you will continue with. By detecting which daily tasks generate 80% of our income or results, we will be able to decide almost without thinking which of them we are going to continue with. Nobody in their right mind would procrastinate a task from the 20% group as these are the ones that generate 80% of your results.

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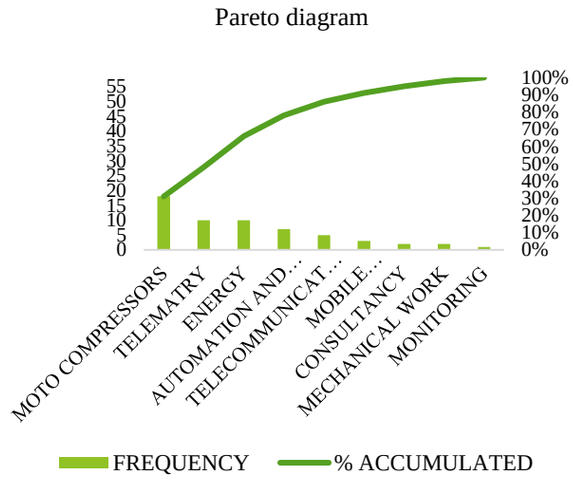
Results

After collecting information from the top management of the companies about the services provided by the companies in the last 5 months, an analysis was carried out with the support of the Pareto diagram to measure and analyse the productivity of the services provided. The analysis and graphing is presented below.

Services	Frequency	Percentage	Accumulated	% Accumulated
Moto Compressors	18	31%	18	31%
Telematry	10	17%	28	48%
Energy	10	17%	38	66%
Automation And Control	7	12%	45	78%
Telecommunications	5	9%	50	86%
Mobile Installations	3	5%	53	91%
Consultancy	2	3%	55	95%
Mechanical Work	2	3%	57	98%
Monitoring	1	2%	58	100%
	58	100%		

Table 1 information analysis
Source: Own Elaboration



Graph 1 Pareto diagram
Source: Own Elaboration

After carrying out the Pareto analysis, it can be seen that the services with the highest productivity index are the motor compressor service and the telemetry service, which are positioned with 20% of the productivity of the whole company, being the fundamental pillar for the company, with the highest number of services provided in the last 5 months, the rest of the remaining services are presented with 80%, thus becoming the services with the lowest productivity and the lowest requirement indexes.
Proposal

The model presented for the improvement of the productivity of the company that is proposed in this work consists of a series of actions that will allow the better functioning of the organisation, all this with a systematic approach to achieve working in harmony and efficiently, all following the same goal.

It should be known that for a system to function correctly, entropy must be reduced, that is to say, all those aspects that generate wear and tear in our organisation must be eliminated or reduced, which can be due to both internal and external factors. This counterpart that aims to reduce entropy will generate homeostasis, which is nothing more than the harmonious balance in the company that in turn leads to synergy, or what is the same, the sum of all efforts; if the whole system works together harmoniously, with a close relationship between its elements and with predefined goals and objectives, it will achieve the proper functioning and the fulfilment of what was planned.

Figure 1 proposed model
Source: Own Elaboration

1. The most important work to be done within the organisation in a Thought Revolution is a trend that is currently being followed in many world class companies. Raising the awareness of staff at all levels of the company makes possible the unification and integration of all the human resources of the organisation, from the workers to the management.

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This revolution in thinking aims to generate commitment among all workers towards the company, making all of them feel and be part of it, since it is a reality; it also encourages greater responsibility among the members of the organisation and promotes motivation among them. With all this, it is possible to start to generate creativity in people, which can be expressed through quality circles, in which ideas are presented, questions are analysed and the participation of the whole organisation is taken with a determined aim, the improvement of the company. If the company pays a lot of attention to these suggestions, in the end it will have committed people and, very importantly, it will manage the development of personnel and intellectual capital.

2. As one of the most common problems in all companies is leadership, measures must be taken to address it. In the Revolution part, the whole organisation is involved, including top management. Then, once the whole company is in sync, the only thing left to do is to appoint a good ship's capital, the sole administrator, who is the director of the company, must be the one to promote responsible work within the company together with the managers or those in charge of each area. Decision-making will be very important, so they must be cautious at all times in order not to fail and not to lose the trust they have with the staff. Always speaking the truth, being committed, listening to the voice of internal customers, being thorough and cautious, goal and objective oriented, high responsibility, orderly and with a tendency to plan are some of the many aspects that a good leader must cover in order to keep the company afloat and with the mentality of always looking for the best.

3. Teamwork is essential in all organisations as it facilitates the accomplishment of tasks, objectives and goals. Teamwork makes it easier and more possible to achieve success. Like awareness raising, it is not easy, but by focusing on what you really want, you can achieve anything you set out to achieve. Moreover, teamwork is the background for strategic planning.

4. Although the company does not have obsolete technology, it does need to be at the forefront of technology. We work with motors, compressors, telemetry instrumentation, so they are becoming more sophisticated and we must have the necessary tools to attack these new problems they may have. The trend is towards automation and the implementation of electronic circuits in the motor compressors, you must be aware of the changes that occur in the context, and have the ability to respond appropriately to these cases, obviously technology and staff training will be of paramount importance in this task. On the other hand, the implementation of technology not only helps in the mechanical area, but also in the administrative area, as it will speed up many activities. Also working on the website would be of great help for the company and it will be able to approach more potential customers.

5. Something very important in the organisation is the purpose, which refers to having the same goal within the company, but it is worth mentioning that the strategic plan establishes the ways of how we will reach that goal. When everyone works under the same motivation and on a specific goal, the sum of efforts is achieved and results are obtained.

In the end everything must be based on optimisation and learning, the result of our model will be an increase in productivity. All the above-mentioned points generate the necessary energy for the company to function properly and be productive.

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We must be careful not to use more energy than necessary because we would wear out the system and increase costs, but if we do not use the necessary energy our system will not have enough response capacity and will fall into entropy.

Conclusions

Productivity is, above all, an attitude of mind. It seeks to continuously improve everything that exists. It is based on the conviction that one can do things better today than yesterday and better tomorrow than today. Moreover, it requires endless efforts to adapt economic activities to changing conditions by applying new theories and methods. Measuring the practices we do today will help to improve the practices of tomorrow, that is the key, we need to encourage people to improve the things they do day by day, that is personal competitiveness. If a person is competitive, the company will benefit from that capacity in its staff.

Intellectual capital is the basis of any organisation, as are the clients, the goal is to obtain profits, the balance between both parts, money and clients, will determine the future course of the company. It is not possible to subsist only focusing on clients and leaving aside the economic part because the company will go bankrupt, but neither can it only focus on money because the company will not generate trust and client satisfaction.

A productivity improvement model must take this into account, the balance, our model puts forward this idea and from there it starts to propose the solution actions.

We can highlight what we consider to be the key points of the paper.

1. Whenever we seek to improve something, in any field, we must first verify that it is measurable.

2. There are many ways to evaluate the state of logistics in a company. The elaboration of a questionnaire is one of the easiest to carry out, however, one must be very precise when formulating the questions, so that the data obtained is as close to reality as possible.

3. The use of data processing tools such as Microsoft Excel and Microsoft Forms greatly speeds up the process of developing a project.

4. Improving logistics can be a difficult task if you do not have a good team in your organisation.

5. The implementation of Lean Manufacturing tools such as the 9s programme, Kanban system, Gemba and others would greatly help the improvement process.

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The perception of students of the Universidad Autónoma de Nayarit regarding sustainable development in organizations

La percepción de estudiantes de la Universidad Autónoma de Nayarit ante el desarrollo sustentable en las organizaciones

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Abstract

The main objective of this research is to know the perception that young students of different profiles have about the existing problems regarding sustainable development, their awareness and actions to be taken as agents of change. The perception of university students, specifically from the Bachelor's Degrees in Administration, Marketing and International Business who are currently in their second semester at the Academic Unit of Accounting and Administration. The study arises from the importance for our country to be proactively aligned with the 2030 agenda about the 17 goals of the United Nations. The purpose of the article is to make a qualitative statement, making a comparison with different researches. Due to its scope and approach, the research is descriptive in nature with a mixed approach. For the collection of data, an instrument was designed, which is the Google Forms survey, to know the perception of students on sustainable development in organizations. As main results, it is concluded that students have the vision to carry out concrete actions that have a positive impact on society

Sustainable development, Organizations, Perception

Resumen

El objetivo principal de la presente investigación es conocer la percepción que los jóvenes estudiantes de distintos perfiles tienen sobre la problemática existente acerca del desarrollo sustentable, su concientización y acciones a tomar como agentes de cambio. La percepción de los estudiantes universitarios, específicamente de las Licenciaturas en Administración, Mercadotecnia y Negocios Internacionales que actualmente están cursando el segundo semestre en la Unidad Académica de Contaduría y Administración. El estudio surge por la importancia que tiene para nuestro país el estar alineados de forma proactiva con la agenda 2030 acerca de los 17 objetivos de las Organización de las Naciones Unidas. La finalidad del artículo es enunciar de forma cualitativa haciendo una comparativa con distintas investigaciones. Por su alcance y forma de abordaje, la investigación es de carácter descriptivo con un enfoque mixto. Para el acopio de los datos se diseñó un instrumento que es la encuesta de Google Forms, para conocer la percepción de los estudiantes sobre el desarrollo sustentable en las organizaciones. Como resultados principales, se concluye que el estudiante tiene la visión de realizar acciones concretas que tengan un impacto positivo en la sociedad.

Desarrollo sustentable, Organizaciones, Percepción

Citation: CARRILLO-BELTRÁN, Julio César Cuauhtémoc, SUÁREZ-FLORES, Marina, GONZÁLEZ-HERNÁNDEZ, Maricruz and AGUIRRE-BRAVO, Anna Alessandra. The perception of students of the Universidad Autónoma de Nayarit regarding sustainable development in organizations. Journal-Labor and Demographic economic. 2023. 7-13: 6-13

† Researcher contributing first author.

Introduction

University students' perceptions of sustainable development in organisations is an increasingly important issue in higher education. In a world where concern for the environment and sustainability is increasingly evident, students are in a unique position to influence change and advocate for more sustainable practices in business. Research and studies have revealed that university students value sustainable development and believe that organisations must take concrete steps to ensure a better future. For them, it is imperative that companies take responsibility for their impact on the environment and society by implementing sustainable practices throughout their operations.

However, despite this widespread awareness, there is a lack of knowledge and understanding about the specific actions and policies that organisations implement to achieve sustainability. Many students are unaware of the efforts and progress that some companies have made in terms of environmental and social responsibility. This lack of information hinders their ability to adequately assess the real commitment of organisations to sustainable development.

It is therefore essential to promote education and the active participation of students in sustainable development. The Autonomous University of Nayarit plays a crucial role in this regard, as it can provide comprehensive training on sustainability and encourage critical reflection on current business practices.

Similarly, the Autonomous University of Nayarit, with its high commitment to society, can offer courses, diploma and/or master's degrees in business sustainability, where students can learn about best practices, case studies and the economic and social implications of adopting a sustainable approach.

Active student participation is also essential. Student groups dedicated to sustainability can be organised and participation in environment-related projects and activities can be promoted. This will allow them to apply the knowledge acquired in the classroom and contribute directly to positive change in their communities and organisations.

Furthermore, it is necessary to foster a responsible mindset towards the environment in future generations of professionals. This implies not only transmitting theoretical knowledge, but also cultivating ethical values and principles that promote sustainability in all areas of personal and professional life. University students' perception of sustainable development in organisations is a powerful driving force for change. Their voice and actions can influence business policies and practices, leading to a transformation towards more sustainable models. However, the lack of awareness and specific knowledge about business actions in this area needs to be addressed.

Education and active participation of students are key to overcoming these barriers. Universities and other educational institutions have a responsibility to provide comprehensive training in business sustainability and to foster an environmentally responsible mindset. Only in this way can we ensure a more sustainable future for generations to come and promote a business culture that values the well-being of people and the planet. University students' perception of sustainable development in organisations is an area of research that has gained relevance in recent years.

These young people represent a generation that is increasingly concerned about environmental and social issues, and their views on sustainable business practices can have a significant impact on business decision-making. Like almost every country in the world, Mexico faces a real challenge. Undoubtedly, the most important of all times: to achieve a new form of progress. Therefore, sustainable development emerges as a possible alternative, but what is meant by sustainable development? Bohne, A., Bruckman, M. & Martínez, A. (2019).

"Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" Estenssoro, F. (2018).

According to (Castro, 2018, p. 5-6), the conception of sustainability has undergone transformations. At the beginning it was limited to an approach focused on the deterioration of the environment; today it includes several aspects linked to the quality of life of human beings.

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It is based on the recognition of the limits and potential of nature and environmental complexity, which leads to a new understanding of the world in order to face the challenges of humanity. The concept of sustainability promotes a new form of organisational culture, by establishing a different economy, by reorienting the potentials of science and technology, and by building a new politics based on an ethic of values, beliefs and feelings that transform existential meanings, life and the way of inhabiting the planet.

One of the concepts that has raised controversy as to its definition is the term sustainable development (SD), also known as sustainable development. Some specialists in the field have affirmed that they are synonyms, with the differentiation of the term falling on how to translate it. Both come from the English translation "sustainable development". The term sustainable or sustentable establishes the same idea, in Spain the term sostenible is used, and in Mexico and other countries the term sustentable is adopted, which refers to the same definition. Larrouyet, M. C. (2015).

The mission of promoting sustainable development at a global level means the responsibility to ensure that the needs of today's societies in terms of consumption of natural resources, but also in terms of social and economic life, do not compromise the satisfaction of the needs of future generations. This concept was recognised in 1987 in the report Our Common Future, better known as the Brundtland Report. Thus, sustainable development is the fundamental commitment to ensure a decent future for the next generations (Government of Mexico, n.d. p.8).

On the other hand, according to (García-Arce et.al, 2021, p.1) the Sustainable Development Goals (SDGs) constitute a framework to fulfil the purposes of sustainability in its multiple social, economic and environmental dimensions. Higher Education Institutions (HEIs) can be considered as a decisive social actor to promote their fulfilment.

The Sustainable Development Goals (SDGs) provide guidelines for a necessary global transformation. (Rieckmann, 2020) refers to the 17 sustainability goals that constitute the 2030 Agenda for Sustainable Development.

The aim of these is to enable a sustainable, peaceful, prosperous and just life for all, now and in the future.

In another area, higher education is considered as a fundamental entity for sustainable development and should be geared towards the integration of transversal competences in the cognitive, methodological and attitudinal areas, which will enable students to think critically about socio-environmental problems, and to put into practice procedures and decision-making in order to carry out relevant actions in favour of the development of a sustainable society. (Solís-Espallargas, 2019).

Derived from the above, it can be inferred that sustainable development in organisations implies the integration of environmental and social considerations into all dimensions of business management. Environmental management, corporate social responsibility, employee involvement and sustainable supply chain management are some of the key aspects that need to be addressed.

Furthermore, it has been shown that the adoption of sustainable practices can have a positive impact on both the natural environment and the financial performance of organisations and with regard to university students' perception of sustainable development in organisations is a relevant issue in higher education. Their positive attitude and awareness of the importance of sustainability can influence future business practices. However, there is a need to address the lack of specific knowledge and to foster comprehensive education and experience.

Methodological strategies or materials and methods

The present research work on the perception of students of the Universidad Autónoma de Nayarit regarding sustainable development in organisations, specifically in the academic programmes of Bachelor's Degree in Administration, Bachelor's Degree in Marketing and Bachelor's Degree in International Business, who are currently in their second semester at the Academic Unit of Accounting and Administration, has been developed mainly with a qualitative approach.

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Both narrative and descriptive, generating a new perspective from a subjective point of view, analysing through logical reasoning a series of comparisons of different authors that lead to a discernment of the most relevant and important concepts and definitions of the topic in question.

At the same time, the research is of an exploratory type, since during the development of the research, a systematic review of the literature of various scientific articles on this topic has been carried out using the following scientific databases: Direct Science, Emerald, Scopus, Scielo, Redalyc, Google Académic. Likewise, for this article, search criteria were applied based on search engines or descriptors, achieving the best results with high impact articles.

In this research, variables that allow us to identify the disposition and perspective of students regarding this topic are analysed.

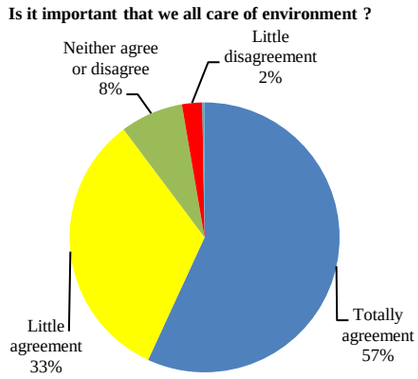
A population of 97 students was considered and a survey was used as a data collection instrument, randomly applied to a sample of 78 students who voluntarily answered. The survey was carried out on the Google Forms platform on a Likert scale and comprised 4 items relating to environmental care, the relevance of sustainable development in Mexico, the impact of university students on sustainable development and governmental implications.

Results and discussion

Analysis and interpretation of the surveys to determine the perception of the students of the aforementioned degrees.

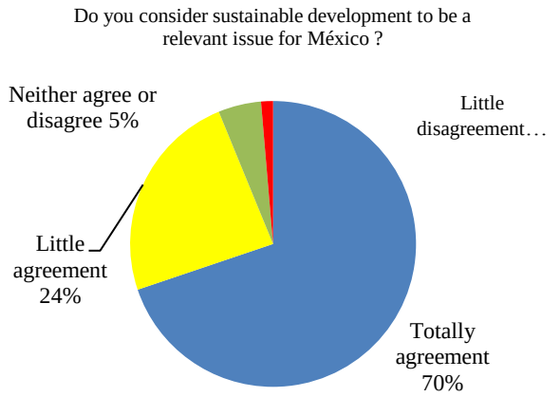
It should be noted that the results of the surveys of 78 students were analysed.

The detailed information is shown below:



Graph 1 It is important that we all take care of the environment?
Source: Own Elaboration

With respect to graph 1, the highest percentage of students who expressed a preference was that they totally agreed on the importance that we should all take care of the environment, which means that they are mostly aware of this situation that afflicts us in our country. A percentage of 33 % expressed a little agreement, due to lack of interest, knowledge or motivation to learn about the problems that this generates. The 8% of those who showed a little apathy or lack of interest in this item, which indicates a lack of awareness, and finally there are 2% of respondents who reflected a little disagreement, which is fortunately a very minor indicator of the students interviewed who are not interested in this topic of environmental care.



Graph 2 Do you consider sustainable development to be a relevant issue for Mexico?
Source: Own Elaboration

In relation to the interpretation of graph 2, the most outstanding percentage that students expressed the highest preference was that they totally agreed on the relevance and importance of sustainable development in our country, fortunately students perceive the relevance and what it means for a country as important as Mexico.

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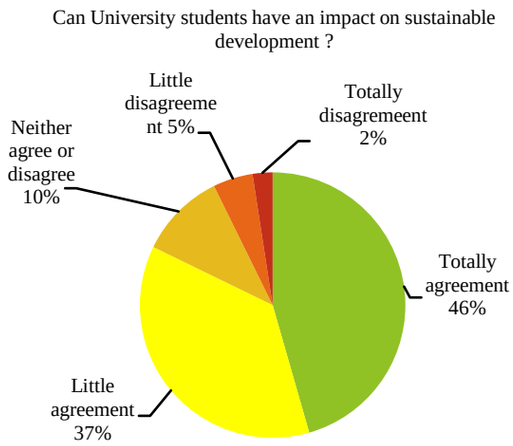
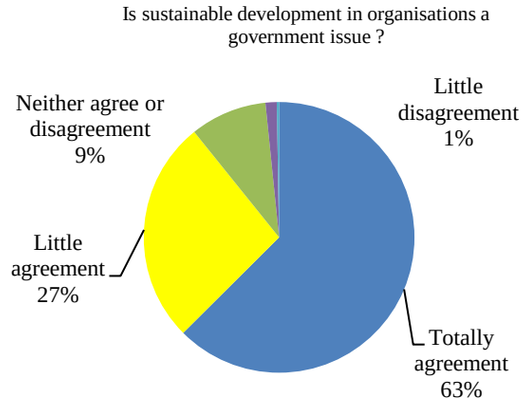
A percentage of 24 % expressed a little bit of agreement, due to the lack of interest or vision in recognising the seriousness of the problem that this represents. It is worth noting the 5% of those who showed a little apathy or disinterest on this item, which indicates a lack of awareness or knowledge and finally there is 1% of respondents who reflected a little disagreement, which is an indicator with a very low value of the students interviewed who are not interested in the issue of sustainable development.



Graph 3 Can university students have an impact on sustainable development?
Source: Own Elaboration

With regard to the interpretation of graph 3, the highest percentage was 46%, which corresponds to students who expressed total agreement, which can have an impact with favourable and effective actions on sustainable development. A percentage of 37 % expressed little agreement, due to a lack of interest or vision, to recognise the seriousness of the problem this represents. 10 % expressed apathy or disinterest in the issue, 5 % strongly disagreed, indicating a lack of awareness or knowledge, and finally 2 % of respondents expressed a lack of knowledge or commitment to the indicator, which certainly reflects a lack of relevance or commitment to the fact that, thanks to their youth and energy, university students could impact with well-executed actions for the benefit of sustainable development.



Graph 4 Is sustainable development in organisations a government issue?
Source: Own Elaboration

When interpreting graph 4, the most notable percentage of students expressing 63% strongly agree that the government has a very broad competence and could be of great support for public policies that are generated in sustainable development in organisations. A percentage of 27% of the students surveyed expressed little agreement, due to a lack of knowledge of the subject. Nine percent expressed indifference or lack of interest in the subject and finally, only 1% of the students surveyed expressed their opinion of not being in agreement, possibly because they perceive that the government is distant from this subject.

Conclusions

In conclusion, the perception of university students on sustainable development in organisations is of utmost importance in higher education. The above-mentioned research has shown that students recognise the need for organisations to adopt sustainable practices to ensure a better and more balanced future. However, there is a lack of awareness of the specific actions and policies that organisations implement to achieve sustainability.

It is essential to promote education and the active participation of students in sustainable development. Educational institutions play a key role in providing comprehensive sustainability training and encouraging critical reflection on current business practices. Higher education institutions should be committed to providing students with specialised courses and programmes that enable them to understand the challenges and solutions related to sustainable development.

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It is also important to provide students with practical opportunities to engage in related projects and activities, as these experiences will allow them to apply the knowledge acquired in the classroom and develop practical skills in the field of business sustainability. In addition, it is essential to establish partnerships with external companies and organisations to provide them with internships and real-world experiences.

The lack of awareness about the concrete actions that organisations implement to achieve sustainability can be addressed through transparency and disclosure of information by companies. Organisations should clearly and accessibly communicate their sustainability policies, practices and results. This will enable students and society at large to evaluate and support those organisations that are truly committed to sustainable development.

Furthermore, it is necessary to foster an environmentally responsible mindset in future generations of professionals. This implies not only transmitting theoretical knowledge, but also cultivating ethical values and principles that promote sustainability in all areas of personal and professional life. Students must understand that their role as future leaders and decision-makers is crucial in driving change towards more sustainable practices in organisations.

Proposal

This proposal aims to promote the linking of sustainable development in organisations through the active participation of university students. The importance of sustainability in business is recognised and it is proposed that future professionals become agents of change in the implementation of sustainable practices. To achieve this, a multidimensional approach is proposed that involves education, practical training, collaboration with companies and the promotion of a responsible mentality towards the environment. Therefore, it is considered relevant to mention the following points:
Sustainability education:

It is essential that management students receive a comprehensive education in business sustainability. The inclusion of specific subjects on sustainable development is proposed, where topics such as environmental management, corporate social responsibility and business ethics are addressed.

In addition, participation in seminars, conferences and workshops related to sustainability can be encouraged to broaden students' knowledge and awareness.

Practical training:

Theory must go hand in hand with practice. It is suggested that university students undertake internships in companies committed to sustainability. These internships will allow them to apply the knowledge they have acquired, to learn about the sustainable policies and practices of organisations and to develop practical skills in the implementation of sustainable strategies.

Collaboration with companies:

It is essential to establish partnerships between universities and companies to promote sustainable development. Joint research and development projects can be carried out, where students and professors work in collaboration with organisations to identify areas for improvement and develop innovative solutions in terms of sustainability. In addition, mentoring and internship programmes can be set up in companies, where students can receive direct guidance and feedback on their ideas and projects.

Creation of networks and exchange spaces:

It is important to create spaces where university students can share experiences, knowledge and ideas related to sustainable development. This can be achieved through the creation of discussion groups, clubs or student associations focused on entrepreneurial sustainability. These networks will enable students to strengthen their commitment to sustainability and generate joint proposals for the implementation of sustainable practices in organisations.

Awareness raising and advocacy:

University students can play an important role in raising awareness on sustainable development. The organisation of events, awareness-raising campaigns and informative talks in the university community and in society in general is proposed. Student social responsibility projects can also be developed, where students collaborate with non-governmental organisations or local communities to promote sustainable actions.

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Linking sustainable development in organisations through the active participation of university students is a promising strategy. Sustainability education, practical training, collaboration with companies, networking and exchange, awareness raising and advocacy are key actions to achieve this goal. University students have the potential to become agents of change and contribute to building a sustainable future in business. It is essential that universities, businesses and society in general support and promote these initiatives to achieve long-term sustainable development.

This research shows that students believe that organisations should adopt sustainable practices to ensure a better future. However, there is a lack of awareness of the concrete actions and policies that organisations implement to achieve sustainability. It is paramount to promote education and active participation of students in sustainable development, thus fostering an environmentally responsible mindset in future generations. Sustainable development has become an imperative for organisations seeking to balance economic growth with social and environmental responsibility.

University students represent a potential force for driving change towards more sustainable practices in business. This proposal aims to present a series of actions that enable students to play an active role in linking sustainable development in organisations. In summary, university students' perception of sustainable development in organisations highlights the need to promote education, active participation and awareness of sustainable business practices. Educational institutions, business and society must work together to ensure that future professionals are prepared to address the challenges of sustainable development and contribute to building a more balanced and environmentally responsible future.

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Entrepreneurial skills of the Millennials and Centennials generation in the North of state of Campeche, Mexico

Competencias emprendedoras de la generación Millennials y Centennials en el Norte del estado de Campeche, México

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Abstract

Many young people of working age find it necessary to leave their places of origin to find work due to the characteristics of the economic conditions of the moment, but also, it occurs over time between decades and generations. Mastering skills in the area of entrepreneurship is of vital importance today to mitigate migration from rural areas to urban areas, to self-employ and improve their abilities to know how to generate a business. The objective of this work is to compare the entrepreneurial skills of the Millennials and Centennials generations in the north of the state of Campeche, Mexico. It is a quantitative study, with a descriptive scope and non-experimental cross-sectional design, since the variables of entrepreneurial skills are compared at two different times, that is, the year 2011 and the year 2021. Some of the results found are that for the Millennial Generation, the least developed competencies were Previous technical experience with 3.7 and Tolerant society with 3.8. For the Centennials generation, it was observed that the most developed entrepreneurial competencies were Family Culture, Credibility and Need for the business to exist with a value of 4.4 each.

Entrepreneurial competencies, Millennials, Centennials

Resumen

Muchos de los jóvenes en edad de trabajar se ven en la necesidad de salir de sus lugares de origen para conseguir trabajo por las características propias de las condiciones económicas del momento, pero también, se da con el paso del tiempo entre décadas y generaciones. El dominio de las competencias en el área del emprendimiento es de vital importancia en la actualidad para mitigar la migración de las áreas rurales a las zonas urbanas, para auto emplearse y mejorar sus capacidades de saber generar una empresa. El presente trabajo tiene como objetivo comparar las competencias emprendedoras de las generaciones *Millennials* y *Centennials* en el norte del estado de Campeche, México. Es un estudio cuantitativo, con alcance descriptivo y diseño no experimental transversal, ya que se comparan las variables de competencias emprendedoras en dos momentos diferentes, es decir, el año 2011 y el año 2021. Algunos de los resultados encontrados son que para la Generación *Millennials*, las competencias menos desarrolladas fueron Experiencia técnica previa con 3.7 y Sociedad tolerante con 3.8. Para la generación Centennials, se observó que las competencias emprendedoras más desarrolladas fueron Cultura Familiar, Credibilidad y Necesidad de existir del negocio con un valor de 4.4 cada una.

Competencias emprendedoras, Millennials, Centennials

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Introduction

In Mexico, as in many parts of the world, entrepreneurship is one of the tools with which many young people can have their own employment, better income, satisfaction, autonomy, personal satisfaction, and government support for entrepreneurship has been varied and of different scopes. In 2001, the National Programme of Financing for Micro-entrepreneurs (PRONAFIM) was created to help entrepreneurs to start their businesses until they reach consolidation through microcredits.

In 2013, a government programme called Instituto Nacional del Emprendedor (INADEM) was created with the aim of promoting and guiding everything related to entrepreneurs, and thus giving them the support they need, whether it be machinery or instruments and support in the implementation of projects with training courses; however, the number of entrepreneurs has been reduced in the last three years, until its disappearance in 2018.

Taking into account the aforementioned data, it has been seen that the *Millennials* and *centennials* are not attracted by the idea of entrepreneurship; it is perceived that a large percentage of them have become, to a certain extent, conformist, they no longer have as much ambition, that desire that past generations had to get ahead, and although a part of the generation seeks that desire to carry out an entrepreneurial project, this is only temporary and they do not give it the importance.

However, it is more feasible and there is more motivation to undertake an entrepreneurial project for people who already have a partner and children and for divorced women, but for those who already have a family, entrepreneurship is done to have an extra income and they are happy with that. Something similar happens with young people who want to start a business, in this generation, they see entrepreneurship as a way of not having the responsibility of working, of not having a boss and much less a timetable, they do it out of economic necessity.

In the Yucatan Peninsula, in the capital cities of the states of Yucatan, Quintana Roo and Campeche, people over 45 years of age have a better chance of making their entrepreneurship successful, as they have work experience, fiscal knowledge, acquaintances who can support the business and most importantly the capital for the initial investment, compared to young people, who have the desire but do not have many points than the other group of people who are more effective at carrying out the business, or entrepreneurship. For this reason, entrepreneurship is 50% more difficult than in other countries.

The objective of this paper is to present a comparison of the entrepreneurial competencies of Millennials in 2011 and *Centennial*s in 2021 in the Mayan Region of Camino Real in the Yucatan Peninsula, Mexico.

Millennials and *Centennials*

According to Cataldi and Dominighini, (2015), members of the Millennials generation, whose period of birth was from the early 1980s to the late 1990s, are attributed a childhood with activities and a culture of immediacy, which has marked their lives and consumption. They are young people who were born during the change from analogue to digital technology, therefore, they grew up with the birth of the internet, social networks and different styles of virtual entertainment, it is vital for them to be connected to electronic and communication devices where they socialise. They have a strong ability to multitask and seek personal and professional development. They are also very self-confident. They seek the quickest path to success and immediate gratification. For this reason, some are entrepreneurial and succeed in excelling. Kurz, García and Mcllvena (2013).

As for the *Centennials* (Z) generation, this generation is totally linked to digital technology, they use different platforms to find friends, shopping or activities for entertainment, they are dependent on technology nowadays. Marc Prensky (2011), quoted by Villoria (2015), calls this generation "digital natives", this generation stands out because it is difficult for them to understand that there are other technologies that preceded the digital one, however, they understand that technological advances are made in relatively short periods of time, impacting the way of life of communities.

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Ortega and Lara (2016), point out that this generation has made potential use of digital tools in different sectors such as the social, labour or cultural sectors; they are creative young people who are adaptable to changing environments, in particular, to labour, social and cultural ones.

They distrust the education system because, in their opinion, it does not respond to their development needs or guarantee them a more comfortable way of life; for this reason, they tend to be self-taught in the subjects of their interest and use different ways of learning; this generation is familiar with technology in real time, living virtually with family and friends through mobile devices, sharing and creating new content.

According to Fernández and Fernández (2016) the *Centennials* generation is represented by those born at the end of the 1990s, and is also called Generation V (for virtual), Generation C (for community or content), Silent Generation, Internet Generation or even Google Generation, taking into account that they are defined by information technologies (ICT). Ortega and Lara, (2016) mention that the *Centennials* generation groups together people born with the World Wide Web already fully developed and present in most homes.

This generation was born and grew up with smartphones and tablets, as well as using WhatsApp and other digital platforms intensively to communicate, which makes it more difficult for them to speak in public, write complex texts and stay concentrated for long periods of time.

Entrepreneurial skills and entrepreneurship

During the review of the literature on Entrepreneurial Competences, we found the work of Céspedes, Pacheco and Vázquez (2020), who point out that entrepreneurship consists of the generation of ideas to take advantage of opportunities or to implement them in different contexts in order to generate a company or project. Entrepreneurial competences can be defined as the set of knowledge, skills, abilities, skills, experiences and values that people possess to successfully carry out a business Santos, Barroso and Ávila (2014).

Regarding entrepreneurship among young people in the Yucatan Peninsula, we found the work of Barroso, Santos and Patrón (2014), where they published the results obtained in knowledge management, entrepreneurial skills and organisational performance in micro and small entrepreneurs. This study was conducted in the interior of the State of Yucatan. These authors mentioned that the most developed competencies in entrepreneurs were Family and Values, desire to have a business and credibility, while the lowest scores were for previous technical experience and teamwork.

For their part, Santos, Barroso and Ávila (2014) measured and analysed entrepreneurial competences for the creation of agribusinesses in various Mayan areas of the state of Campeche, finding that the most developed competences were: Problem-solving orientation, Risk assessment, Family business formation; while the competences with the lowest scores were Knowledge and experience in business, Leadership and teamwork, and Competence orientation.

Chávez (2020), in a study of higher education students in the northern region of Mexico, found that the most developed competencies in these students were: leadership, creativity, teamwork and communication; results similar to those found by Barroso, Santos and Patron (2014).

Establishing the problema

The Camino Real of the Yucatan Peninsula is the Mayan area between the capitals of the states of Campeche and Yucatan, and is made up of two parts; the upper Camino Real which includes the municipalities of Halachó, Maxcanú, Chocholá, Kopomá, Umán and Mérida, in Yucatan, and the lower Camino Real which corresponds to the municipalities of Campeche, Tenabo, Hecelchakán and Calkiní in Campeche. According to the National Council for the Evaluation of Social Development Policy (CONEVAL, 2020) this region is among the poorest in the country, as Campeche ranks ninth in poverty and Yucatan ranks twelfth out of thirty-two states.

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It has been a decade (2011 - 2021) since there have been programmes to support entrepreneurship that include: training, economic support, advice and management by the different levels of government and private institutions, serving two generations. These programmes have been offered in governmental institutions, upper secondary schools (Bachilleratos) and higher education institutions. According to the National Institute of Statistics and Geography (INEGI, 2020), it mentions that 32.4 % of the Mexican population is made up of young people belonging to the Millennials and Centennials generations and, even when governments develop programmes for the creation of jobs, these do not usually have a significant impact on the productive sectors, for this reason, these generations have been relegated in obtaining a job, which translates into few opportunities for paid work.

The purpose of entrepreneurship is the creation or strengthening of new companies, the creation of products and services that can be relevant to society, for this reason, it is imperative to help these young people in the creation of their own sources of employment. However, even though various forms of support have been offered, there is a lack of information on the development of entrepreneurial skills in the Yucatan peninsula, as little research has been carried out in this regard.

This paper offers the results of comparisons of the entrepreneurial competencies of Millennials and Centennials in the Mayan region called Camino Real in the Yucatan Peninsula.

Methodology to be developed

The study had a quantitative approach, descriptive scope and non-experimental longitudinal design of trend, since the entrepreneurial competences variables were compared at two different times: in 2011 the survey was conducted for 35 Millennials entrepreneurs and in 2021 the survey was conducted for 17 Centennials entrepreneurs; in both cases, the participating entrepreneurs lived in one of the towns that make up the northern area of the state of Campeche, Mexico. The method was the hypothetical deductive method carried out through fieldwork and the technique was the survey.

The subjects of the study were young people who had shown an interest in starting a business and had enrolled in a public or private institution supporting entrepreneurship.

The instrument administered was based on the eleven entrepreneurial characteristics proposed by Palacios (1999) and conditioned, using a Likert scale, by Santos and Barroso (2011). The eleven competences proposed were:

1. Entrepreneurial spirit: This refers to the business idea that entrepreneurs have with the desire to make it a reality.

2. Necessity of the business: This refers to the dispositions or sacrifices made by the entrepreneur in order to achieve the business.

3. Previous technical experience: This refers to the technical knowledge of the processes, products or services that the business requires in order to develop.

4. Risk tolerance: This refers to the entrepreneur's capacity to face calculated risks based on studies or through a previously established plan.

5. Hard work: This refers to the entrepreneur's willingness to dedicate time, effort and dedication to the achievement of the business, often without immediate reward.

6. Ability to bounce back and learn: This refers to the entrepreneur's tenacity and perseverance in order not to feel defeated in the face of failure.

7. Tolerant society: This refers to the ability of the entrepreneur to get along with partners or to listen to advice from people with knowledge of the business.

8. Credibility: This refers to the entrepreneur's ability to perform quality work that satisfies customers, suppliers and collaborators, and to act with principles and values.

9. Prioritising: It is the ability of the entrepreneur to establish priorities and to fulfil them in the agreed time.

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10. Family culture: It is the capacity of the entrepreneur to adequately manage family relationships, as well as the capacity to establish the functions of each family member within the company and succession.

11. Professionalism of the entrepreneur: It implies the capacity to develop the necessary skills, practices and strategies to ensure the start-up and growth of the business.

The scale of values was carried out according to table 1:

Response	Value
Strongly Disagree (SD)	1
Disagree (D)	2
Indifferent (I)	3
Agree (A)	4
Strongly Agree (SA)	5

Table 1 Scale of values used in the measurement of entrepreneurial skills
Source: Own Elaboration

The Hypotheses of this study were:

– H0: There are no significant differences in the entrepreneurial skills of Millennials and Centennials.

– H1: There are significant differences in entrepreneurial skills between Millennials and Centennials.

The Mann Whitney U test statistic was used to test the hypotheses, with a confidence level of 95%. The Minitab statistical package was used for the data analysis in its version.

Results

According to the data obtained in 2011 from young Millennials, it was observed that the most developed entrepreneurial competencies were Family culture with a score of 4.6 on a scale of 1 to 5, Credibility, Ability to bounce back and learn, Need to exist of the business with a score of 4.3. The least developed competencies were Previous technical experience with 3.7 and Tolerant society with 3.8 (see figure 1).

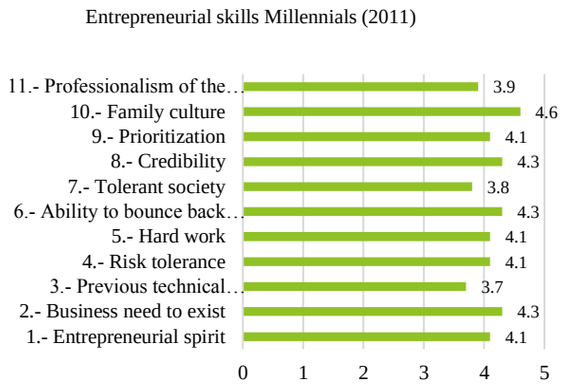

Figure 1 Entrepreneurial competencies of young Millennials. *Research data*

Regarding the data obtained in 2021 for young people of the Centennials Generation, it was observed that the most developed entrepreneurial competencies were Family Culture, Credibility and Need to exist of the business with a value of 4.4 each and the least developed were Previous technical experience with 3.6 and Tolerant society with 3.9 (see figure 2).

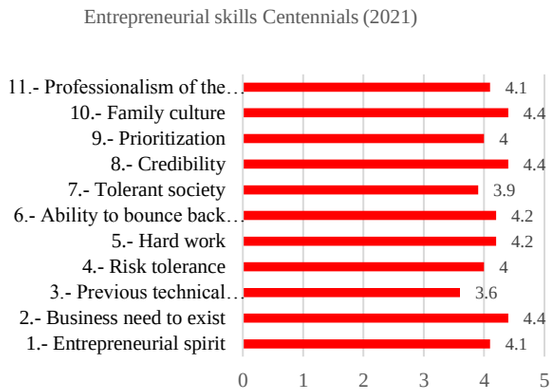

Figure 2 Entrepreneurial skills of young Centennials
Research data

Table 2 shows the comparison between the entrepreneurial competences of the young people of the Millennials Generation and the Centennials. Differences can be observed in the averages of the competences of Professionalism of the entrepreneur, which increased 0.2, need to exist of the business 0.1, hard work 0.1 Tolerant society and Credibility 0.1, however, a decrease was also observed in the competences: family culture 0.2, Previous technical experience 0.1, Tolerance to risk and prioritisation 0.1 in the Centennials.

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Entrepreneurial skills	Millennials (2011)	Centennials (2021)	Difference (C-M)
1.- Entrepreneurial spirit	4.1	4.1	0
2.- Business need to exist	4.3	4.4	0.1
3.- Previous technical experience	3.7	3.6	-0.1
4.- Risk tolerance	4.1	4	-0.1
5.- Hard work	4.1	4.2	0.1
6.- Ability to bounce back and learn	4.3	4.2	-0.1
7.- Tolerant society	3.8	3.9	0.1
8.- Credibility	4.3	4.4	0.1
9.- Prioritization	4.1	4	-0.1
10.- Family culture	4.6	4.4	-0.2
11.-Professionalism of the entrepreneur	3.9	4.1	0.2
Averages	4.1	4.1	

Table 2 Differences between the entrepreneurial skills of Millennials vs. Centennials. Research data

As for the analysis of the averages of the two generations, it was observed that they have a mean of 4.11 (see table 3).

Descriptive statistics		
Sample	**N**	**Median**
Millennials (2011)	11	4.1
Centennials (2021)	11	4.1

Table 3 Measures of central tendency for both groups. Research data

However, although some differences were observed between Millennials and Centennials in the development of competencies, these differences were not significant, as a p-value of the t-test for related samples of 0.922 was observed (see table 4).

Test		
Null hypothesis		
Hypothesis alterna		
Method	**W-value**	**P-value**
Unadjusted for ties	124.5	0.922
Adjusted for ties	124.5	0.921

Table 4 Results of the Mann Whitney U test. Research data

The decision on hypothesis testing. It can be seen in table 5.

Hypothesis chosen	Level of significance	Interpretation
H0: There is no significant difference between the entrepreneurial skills of Centennials and Millennials in the Camino Real of the Yucatan Peninsula.	α= 5%	Since the calculated P-value is above the significance level, the null hypothesis is accepted, which means that no significant differences were found in the comparison of the Centennials and Millennials groups.

Table 5 Interpretation of the Mann Whitney U test. Research data

Discussions

As for the results obtained from young people of the Centennial Generation, these are in line with the results found by Barroso, Santos and Patrón (2014) and Santos, Barroso and Ávila (2014). In both studies, it was observed that the most developed competences were: family business formation and the desire to have a business, while the least developed were previous technical experience and teamwork, results similar to those found in this research.

Acknowledgement

The TecNM is thanked for the support and facilities provided for this study.

Conclusions

Even though increases were observed in Centennials' competencies in terms of entrepreneurial professionalism, hard work, tolerant society, and credibility, which implies that they find it more and more attractive to be owners of their business and their time. It is also true that there are competencies that are no longer growing, such as family culture, the ability to bounce back and learn, and previous technical experience, which indicates that they tend to be less dependent on family decisions, as is the case with the Millennial generation.

As for hypothesis testing. It was found that the t-test for independent samples had a p-value of 1.00 while the significance level was set at 0.5, for this reason, we accept H0, which means that there are no significant differences in the entrepreneurial competences of the Millennials Generation with the Centennials. This result leads us to reflect that, after a decade of supporting entrepreneurs with various programmes and despite the technological advances that exist and which allow information to be obtained at a global level, there is no difference in the entrepreneurial skills of the generations studied, which leads us to ask ourselves another series of questions such as: How effective have the entrepreneurship programmes been in this area? Are the current entrepreneurship programmes attractive to young Centennials? What should be considered to improve the entrepreneurial skills of Centennials? What factors should be considered in an entrepreneurship model to make it attractive to Centennials?.

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Economic, social and environmental analysis of greenhouses in the Municipality of El Arenal Hidalgo, to determine if they are sustainable

Análisis económico, social y ambiental de los invernaderos del Municipio de El Arenal Hidalgo, para determinar si son sustentables

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Abstract

The present investigation is aimed at analyzing whether the greenhouses of the Municipality of El Arenal, located in the eastern area of the Mezquital valley, Hidalgo, are sustainable from an economic, social and environmental point of view. Food production, being one of the fundamental activities for society, should be a sustainable activity to ensure food supply. This is where the importance of determining whether the productive activity of greenhouses is sustainable or not is important. Due to the aforementioned, this work will be carried out by collecting and analyzing relevant information that allows determining the operating characteristics of the greenhouses established in the municipality of El Arenal Hidalgo, with the purpose of determining whether they comply with the conditions of economic, social and environmental sustainability, this through the application of a survey.

Greenhouse, Sustainability, economic, social, environmental

Resumen

La presente investigación va dirigido a analizar si los invernaderos del Municipio de El Arenal, ubicados en la zona este del valle del Mezquital, Hidalgo son sustentables o sostenibles desde el punto de vista económico, social y ambiental. La producción de alimentos al ser una de las actividades fundamentales para la sociedad, debería ser una actividad sustentable para asegurar el abasto alimentario, es aquí que la importancia de determinar si la actividad productiva de los invernaderos es sustentable o no. Por lo anteriormente comentado, este trabajo se llevara a cabo mediante la recopilación y análisis de la información relevante que permita determinar las características de operación de los invernaderos establecidos en el municipio de El Arenal Hidalgo, con la finalidad de determinar si cumplen con las condiciones de sustentabilidad económica, social y ambiental, esto mediante la aplicación de una encuesta.

Invernadero, Sustentabilidad, Económico, Social, Ambiental

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Introduction

El Arenal has a surface area of 125.90 km2, which represents 0.60% of the total surface area of the state, it is located 20 kilometres from highway number 85 Pachuca - Actopan, it is located between parallels 20° 13' north latitude, 98° 55' west longitude, with an altitude of 2,040 metres above sea level. Two rivers are located in its territory; the Panuco and the Moctezuma River Basin, as well as some streams and wells. Its soil is from the Mesozoic stage, of a calcareous type because it has lime in its components; the use of the soil is seasonal agriculture and pasture (INAFED, 2010).

Greenhouses, being a controlled production system, increase the effectiveness of production, but do not ensure its sustainability. In the case of protected crops (greenhouses), it is known that they have an impact on the environment, such as chemical waste, plastics and organic waste; however, this type of crop provides protection against adverse environmental factors, regardless of geographical location.

It is estimated that a 2000 m2 greenhouse generates 4 direct and 10 indirect permanent jobs, which is why this technology should be considered as a factor for rural development in marginalised areas. The impact of the introduction of protected crops brings with it a positive increase in the quality of life, food security, economy of a region and therefore in the overall progress of the nation (Hernández-Díaz et al., 2006).

The sustainability of greenhouses depends on many factors such as: the type of substrate used, nutrients (post-harvest waste generated), energy, income (economic profitability), and must also include the modifications that greenhouses generate in the ecosystem (changes in the landscape, modifications in the composition of water and soil) (Montero et al., 2008; Alonso, 2004).

The simultaneous distribution of water and fertiliser can generate losses in terms of fertilisation efficiency (Montero et al., 2008). Fertigation in the long term can also bring problems that affect the sustainability of the system, changing the characteristics of the water, for example: salinity increases, due to the accumulation of sodium chloride and increasing concentration of nitrates and pesticides, and when released into the environment it would contaminate surface and groundwater, as well as the physicochemical modification of the soil (texture, structure, electrical conductivity, pH, bulk density, cation exchange capacity, etc.), intoxications and deaths, and the use of fertilisers (Montero et al., 2008).), intoxications and deaths caused by pesticides are largely due to the lack of protective equipment, poor handling, as well as ignorance of their handling, representing a high risk of direct or indirect contact with these substances (Gómez-Arrollo et al, 2013).

Methodology

This work was approached in four stages and was aimed at producers in the primary sector, specifically in greenhouse production. In the first stage, a census of greenhouses in the municipality of El Arenal was carried out. As a second stage, a questionnaire with two sections (economic-social and environmental) was structured in order to identify the main social, environmental and economic risk factors. In the third stage, students of the Industrial Design Engineering programme of the Polytechnic University of Francisco I. Madero were trained in the mechanics of the application of the designed questionnaires. In the fourth stage, the questionnaire was applied and the information collected was analysed.

Results and discussion

This section shows the analysis of the socioeconomic, environmental and productive factors in the 30 greenhouses present in the municipality of El Arenal, Hidalgo, in order to determine the conditions in which the greenhouses are found in these areas and to determine if they are sustainable or not.

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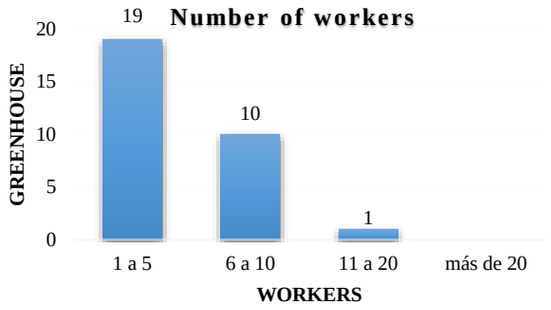
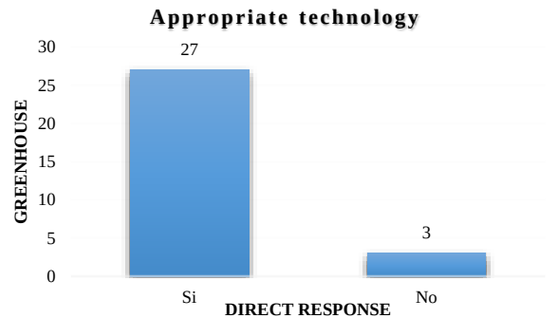


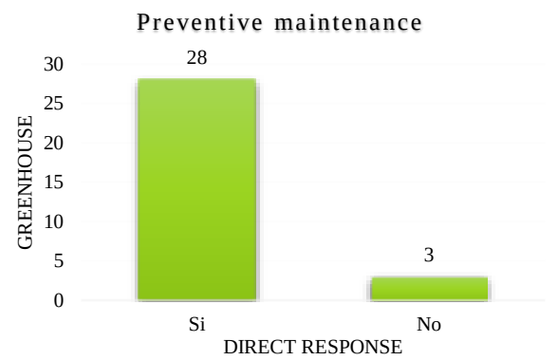
Graphic 1 Number of workers

Graphic 1 shows the number of workers employed by the producers, showing that 63.33% have between 1 and 5 workers, 33.33% between 6 and 10 and between 11 and 20 workers only 3.33%, so it can be considered that they do not generate good economic conditions (profits, contribution to public expenditure) and social conditions (direct and indirect employment, social security, etc.).



Graphic 2 They have adequate technology.

Graphic 3 shows whether or not the greenhouse has adequate technology for its operation. On average, almost 90% responded that it does have adequate technology, while only 10% responded that it does not.



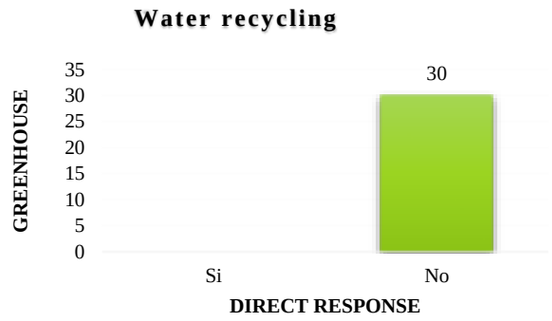
Graphic 3 Preventive maintenance is carried out

Graphic 5 shows whether or not preventive maintenance is carried out on their installations and/or machinery, 93.33% answered yes, only 6.67% did not.

The implementation of a preventive maintenance programme will increase production efficiency, as it prevents the failure of infrastructure and/or equipment due to use and the passing of time. In the event of corrective maintenance, it will affect yields because it will cause a degree of stress on the crop, i.e., there will be failures in the irrigation system and in temperature control, mainly

Graphic 4 Types of financing.

Graphic 7 shows that 96.66% of the surveyed producers use their own resources, 3.34% are only financed by a banking institution, i.e. they do not have financing from a governmental institution.



Graphic 5 Tax registration

It is noticeable that 60% of the greenhouse owners are not registered with the tax authorities, only 40% are registered.

In the ecological aspect, in graph 6, it is observed that 100% of the respondents do not recycle water, in general the producers, regardless of the product (crop), have not considered the term agricultural sustainability, because they have not implemented the technology of using biofertilisers or good agricultural practices..

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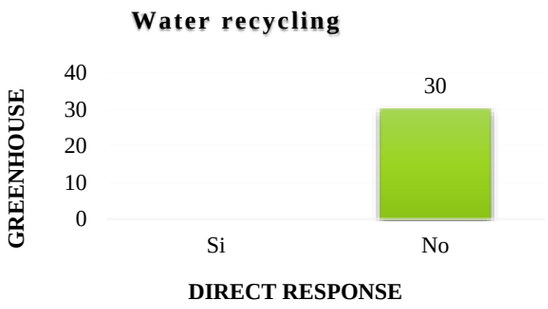
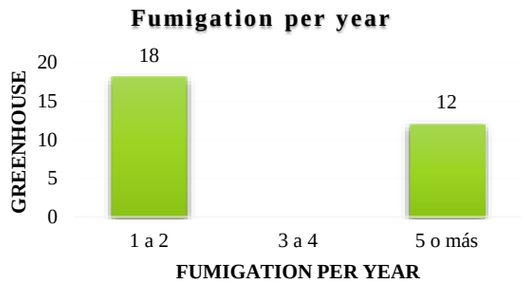
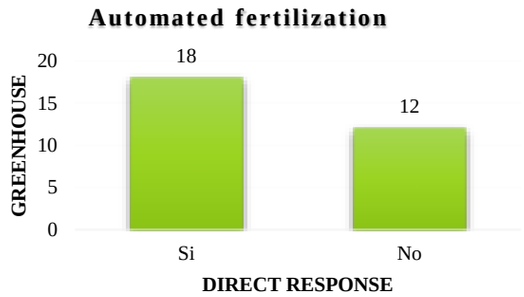


Graphic 6 Recycle water

Irrigation and fertigation are widely used in greenhouses because they allow an easy distribution of nutrients. Fertiliser use efficiency is still very low, as only 30-50% of nitrogen (N2) and 45% of phosphorus (P) is taken up by the plant. In order to make efficient use of fertilisers, it is necessary to make formulations with a better nutritional balance that cover all their requirements without affecting production, as well as to design strategies for integrated pest management (Good Agricultural Practices) (Alonso, 2005; Montero et al., 2008).



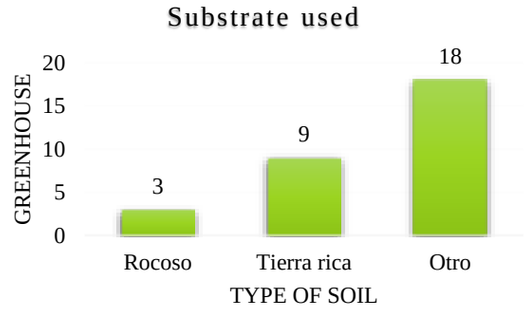
Graphic 7 Frequency of spraying per year



Graphic 8 Automated fertilisation

Regarding the use of pesticides and fertilisers in the greenhouses, it can be seen in graph 7 that 60% of the greenhouses are sprayed 1 to 2 times a year, while 40% of the greenhouses are sprayed more than 5 times a year.

On the other hand, 60% of the respondents have an automated fertilisation system and 40% do not have an automated fertilisation system (graphic 8), which may indicate that they make irrational use of fertiliser and/or pesticide products. The average consumption of fertilisers is estimated at 1700 kg/ha and pesticides at 35 kg/ha for vegetable crops.



Graphic 9 Type of substrate

Finally, the type of soil (substrate) used in the greenhouses in the municipality of El Arenal is more predominant other than rocky and rich soil, with 60% (graphic 9).

Conclusions

Most of the greenhouses are small, so it can be considered that they do not generate the economic conditions, they do not have financing from a governmental institution, 60% of them are not registered with the tax authorities. Another important fact is that the surveyed producers responded that they do not implement any type of training in their production unit, that their personnel require training in at least one area, such as specialised courses in the agronomic management of the crop and in the proper handling of pesticides and fertilisers. 100% of the respondents do not recycle water, do not use biofertilisers, nor do they implement good agricultural practices.

From the above it can be concluded that the majority of the greenhouses are not sustainable in economic, social and environmental aspects, the latter being the one that is not fulfilled in all greenhouses and requires the most attention.

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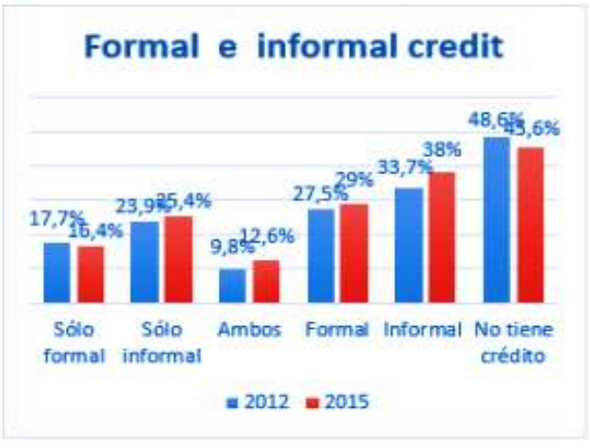

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