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Study of graduates of the engineering career in productive systems of the Universidad Tecnológica del Norte de Aguascalientes

Estudio de egresados de la carrera de ingeniería en sistemas productivos de la Universidad Tecnológica Del Norte De Aguascalientes

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Abstract

The present study of Graduates of the Engineering in Productive Systems career of the Universidad Tecnológica del Norte de Aguascalientes seeks to show an overview of the situation of the graduates of this University. A study of graduates allows us to obtain the necessary information on the impact that the education that graduates acquired while they were students has had, likewise it allows us to know specific problems in the market and find areas for improvement in the educational system of our University. The analysis of a graduate study will allow to have a strategic vision in the short, medium and long term for the competent authorities of our institution, as well as to show current and future students the validity of their career through the opinion of our graduates.

Education, graduates, UTNA, quality, industrial engineering

Resumen

El presente estudio de Egresados de la carrera de Ingeniería en Sistemas Productivos de la Universidad Tecnológica del Norte de Aguascalientes busca mostrar un panorama de la situación de los egresados de esta Universidad. Un estudio de egresados permite obtener la información necesaria del impacto que ha tenido la educación que los egresados adquirieron mientras fueron estudiantes, así mismo nos permite conocer problemas específicos en el mercado y encontrar áreas de mejora en el sistema educativo de nuestra Univesidad. El análisis de un estudio de egresado permitirá tener una visión estratégica a corto, mediano y largo plazo para las autoridades competentes de nuestra institución, así como permite mostrar a los estudiantes actuales y a los futuros la válidez de su carrera por medio de la opinión de nuestros egresados.

Educación, egresados, UTNA, calidad, ingeniería industrial

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Introduction

This report presents a study of Graduates of the Engineering Career in Productive Systems of the Universidad Tecnologica del Norte de Aguascalientes.

A survey was conducted to determine the most important parameters to measure on the information of the graduates.

The areas that were considered during this study were:

- General data.
- Employment situation.
- Aspects of the career of Engineering in Productive Systems.

The results of the survey applied to a sample of 35 students from the generations 2015 to 2019 are shown below.

This project benefits the Universidad Tecnologica del Norte de Aguascalientes since it allows it to know the most important information about its graduates.

Methodology

According to Hernández Sampieri (2010), the study that was applied was a "Quantitative Exploratory" study where a survey-type data recovery tool will be used.

Sampling

The type of sampling that was carried out was stratified.

The advantage of this type of sampling is that it tends to ensure that the sample adequately represents the population based on selected variables. It also makes it possible to obtain more precise estimates and its objective is to obtain a sample that is as similar as possible to the population in terms of the stratified variable (s). The result was a sample of 35 students from the generations 2015 to 2019. The survey was applied from April to June 2020.

Background

The Universidad Tecnológica del Norte de Aguascalientes is part of the Subsystem of Technological Universities (UUTT). It was created in 2000, and is located in the Municipality of Rincón de Romos, it has two fundamental purposes:

a) relocate the higher education services of the State of Aguascalientes, adapting them to the geographic distribution of the population.

b) contribute to the diversification of the higher education offer in the entity.

Currently, apart from its programs at TSU, the university increased its educational offer by opening the Bachelor level in four of its programs:

- Accountancy
- Productive Systems
- Mechatronic
- Industrial maintenance
- Software Development and Management
- Virtual Environments and Digital Businesses
- Sustainable and Protected Agriculture / Plans and objectives
- Human Capital Management
- Business and Marketing Innovation
- Metal Mechanics
- Business and Project Management
- Design and Management of Logistics Networks [1]

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The objective of the career in Productive Systems Engineering is to provide a quality education to train Productive Systems Engineers with leadership, communication and collaborative work skills; with skills to design quality management systems, production processes through the implementation and management of projects using manufacturing and quality tools for technological and / or social development; committed to their professional and work development, with a high sense of social responsibility.

The degree has a duration of 3.8 years [2].

According to Cabrero, E. "The new world economy is characterized by having an important component related to the knowledge economy. In other words, it is based on its dynamics in the creation of markets where ideas, processes and diverse knowledge are offered around the systems of production of goods and services ". Hence the importance of carrying out a study of graduates of the UTNA, as it is important to have knowledge of what the progress of the graduates of this university is. [3] The student was the one who received the education in the teaching institution, he is the main actor of the learning process. [4]

Education varies according to the conception of the world and of man, therefore it must be considered that education is proposed, fundamentally to transmit to the new generations a certain culture and specific knowledge and prepare them, in addition to the assimilation of new techniques, generally the result of technological changes5. For this reason, during this study a comparison was made on the real application of some subjects in the working life of graduates.

According to López, M. the quality has 3 supports:

- Evaluation, in terms of prior, simultaneous and subsequent knowledge. Reliable action support and in the right direction.

- Planning, as a resource that systematizes those aimed at improvement. Essential requirement of a job well done.

- Innovation to the extent that new values are incorporated or existing ones are improved, in the direction of the improvement learned [6].

Therefore, considering the last three quality supports, it is considered that this study of graduates is important for the UTNA because it will allow it to evaluate its graduates in order to plan and subsequently carry out an innovation in their teaching processes.

Background of the career of engineering in productive systems

Mission

Provide a quality education to train Productive Systems Engineers with leadership, communication and collaborative work skills; with skills to design quality management systems, production processes through the implementation and management of projects using manufacturing and quality tools for technological and / or social development; committed to their professional and work development, with a high sense of social responsibility.

Vision

To be an educational program in the area of Productive Systems, recognized for its relevance and quality standards with a high level of acceptance of its graduates in the labor field; for being a pioneer in the implementation of new technologies; be strongly linked to the business sector and offer a comprehensive training proposal for its students under a sustainable approach and social responsibility, aligned to the needs of specialized human resources demanded by the social, productive and services sector, with the skills to generate solutions innovative solutions to the problems faced by organizations as a result of globalization and technological changes.

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General Objectives of the Educational Program

Prepare engineers in production systems for successful practice in the administration, management, implementation and control of production processes through the analysis, synthesis and efficiency of production systems, achieving compliance with quality standards, regulations and customer requirements for the obtaining and / or transformation of a product and service.

Educational Objectives

EO1. They manage human, material, economic and technical resources of the company to ensure compliance with production.

EO2. They control production processes based on customer requirements through standards and regulations.

EO3. They manage continuous improvement projects for the development and increase the efficiency of processes, products and services.

EO4. They carry out the evaluation of the process to ensure the quality of the product.

Egress Attributes

EA1. Identify, formulate and solve engineering problems in industrial maintenance applying the principles of basic science and engineering.

EA2. Apply, analyze and synthesize production processes by designing maintenance strategies considering technical and economic factors and by managing quality systems.

EA3. Experiment, analyze and interpret data using engineering judgment for decision making.

EA4. Communicate effectively in a clear and detailed way, on concrete and abstract topics in their professional and sociocultural context.

EA5. Act with proactive values and attitudes of excellence in their personal, social and organizational development, in harmony with their environment.

EA6. Recognize the permanent need for updating and training to locate, evaluate, integrate and apply this knowledge in areas of maintenance engineering.

EA7. Directs and / or participates in work teams by defining their characteristics, coordinating efforts and evaluating their achievements, to contribute to the development of the organization.

Graduate Profile

1. Manage production through administration tools, to meet customer requirements.

2. Manage the supply chain, through logistics systems, to guarantee the availability of materials and products.

3. Manage auto parts production processes and the automotive industry through quality assurance and innovation, to contribute to the competitiveness of the organization.

Professional occupations

- Product Engineer
- Design Engineer
- Eng. In Forming Processes
- Engine and Automotive Parts Designer
- Manager of metalworking companies
- Service Manager
- Supply manager
- Manager of your own company

Performance Scenarios

Companies in the automotive and auto parts industry for transformation including the Tier 1, 2 and 3 supply chain.

Companies in the industrial sector of Services for the Automotive industry.

Your own company in the supply chain and services to the automotive and auto parts industry.

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Syllabus

FIRST QUARTER	SECOND QUARTER	THIRD QUARTER
Linear algebra	Mathematical functions	Differential calculus
Basic Chemistry	Physical	Statistical Process Control
Industrial organization	Probability and statistics	Manufacturing Processes I
Metrology I	Electricity and magnetism	Manufacturing Topics
Industrial Drawing	Work Methods and Systems I	Integrator I
Technologies for Digitization	Distribution plant	Work Methods and Systems II
English I	Production costs	Safety and industrial hygiene
Oral and Written Expression I	English II	Production Management I
Sociocultural Training I	Sociocultural Training II	English III

FOURTH QUARTER	FIFTH QUARTER	SIXTH QUARTER
Structure and Properties of Materials	Fundamentals of Industrial Legislation	INDUSTRY INTERSHIP
Quality Management	Manufacturing Processes II	
Environmental management	Supply chain	
Integral calculus	Applied Manufacturing	
Production Management II	Chemical processes	
Advanced Industrial Drawing	Integrative II	
Fundamentals of Economic Engineering	English v	
English IV	Oral and Written Expression II	
Sociocultural Training III	Sociocultural Training IV	

SEVENTH QUARTER	EIGHTH QUARTER	NINTH QUARTER
Mathematics for Engineering I	Mathematics for Engineering II	Materials Logistics
Statistics Applied to Engineering	Physics for Engineering	Advanced Quality Topics
Thermodynamics	Industrial Metrology	Project Development and Monitoring
Lean Manufacturing	Materials Engineering	Integrator I
Market study	Elective I	Operations research
English VI	English VII	Elective II
Time management	Planning and Work Organization	English VIII

TENTH QUARTER	ELEVENTH QUARTER
Process engineering	INDUSTRY INTERSHIP
Process automation	
Investment projects analysis	
Integrative II	
English IX	
High Performance Team Management	
Business Negotiation	

Figure 1 Syllabus

Results

I) General data

In this section, age, sex, marital status, name and email were considered as questions, only that for reliability of the data the name and email will not be published.

a. Age

The age of the surveyed graduates ranges between 22 and 25 years.

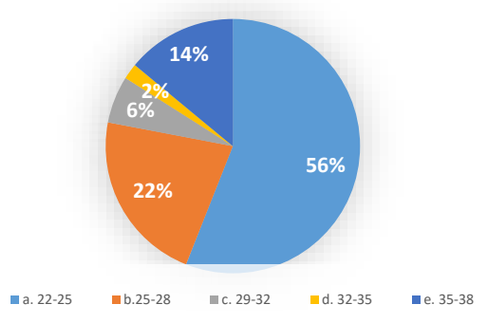

Figure 2 Age of the surveyed graduates

b. Sex

The composition by gender of the degree in Engineering in Production Systems surveyed corresponds to 37% female and 63% male.

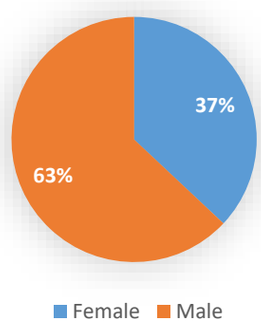

Figure 3 Sex of the surveyed graduates

c. Marital status

Regarding the marital status of the graduates surveyed, the category of married stands out with 74%; while 20% are married and 6% are in common law union.

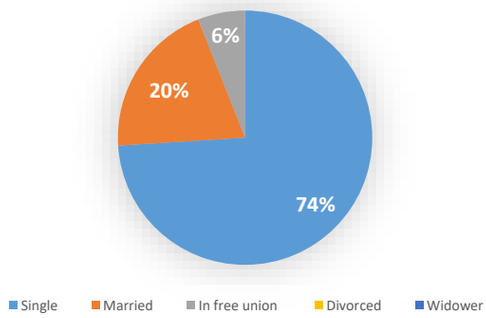

Figure 4 Civil Status of the graduates

II) Employment situation

The most important items on the current situation of our graduates are shown below. In this area, they were asked if they worked, monthly income, number of hours worked per week, duration of work, as well as their current job position.

a. Employment situation

During the survey, the students reported that 97% were working.

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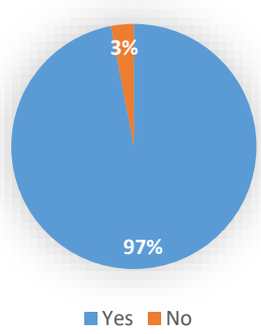

Figure 5 Employment situation

b. Monthly income

The item that stands out in the monthly income is $ 10,001 to 15,000 with a percentage of 63%, while there is also a percentage of 14% that mentions earning only $ 5000. Likewise, there are no graduates of this survey who are earning more than $ 20,000.

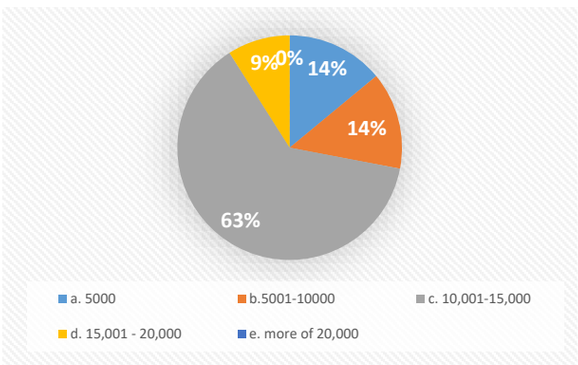

Figure 6 Monthly income

c. Number of hours worked per week

The average number of hours worked per week is 45 hours, followed by 40%, 50 hours per week.

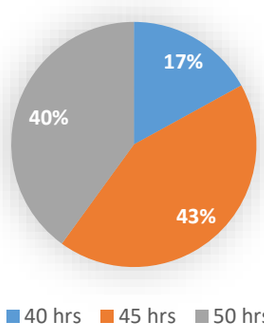

Figure 7 Number of hours worked

d. Working time

The duration of work that graduates have oscillates in 43% with 2 years in their workplace. It is followed by 26% with some who have been working from 6 months to 1 year.

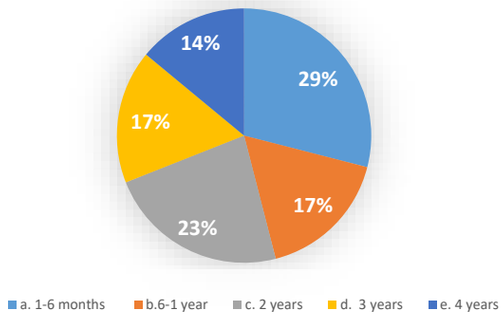

Figure 8 Working time

e. Main activity you do at work

The area in which most of our graduates work is Quality with 29%, followed by the Production area with 23%.

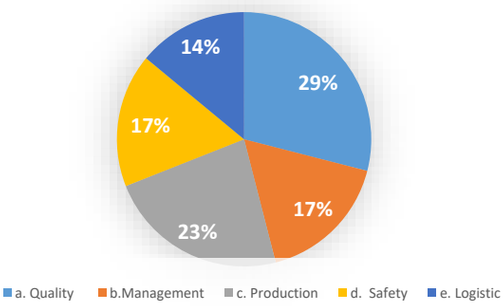

Figure 9 Main activity carried out

f. Primary means through which you found current employment

46% of the graduates got a job by sending CVs, while in 31% the students found a job after having completed their professional internships.

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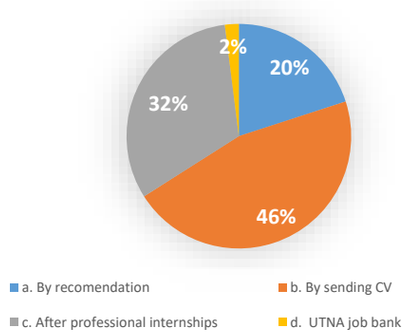

Figure 10 Primary means through which you found current employment

g. In addition to your job, do you have any other paid activity?

97% of the students stated that they do not have any other paid activity, while 3% stated that they do carry out another activity in addition to their work.

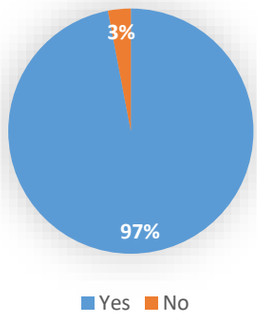

Figure 11 Extra paid activity

h. Match your job with the career you study

91% of the graduates surveyed mentioned that their career coincides with their work, however, 9% stated that their work does not coincide with what they studied.

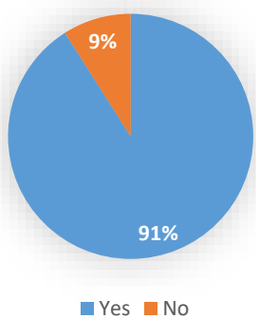

Figure 12 Coincidence of work with what I study

i. Below is a comparative table of the level of satisfaction with their work of the respondents

Item	Totally satisfied	Regular	Little
a) Putting into practice the knowledge acquired in the degree.	28.6 %	62.9%	8.6%
b) The possibility of making your own ideas	65.7%	34.3%	0%
c) Professional recognition achieved	68.7%	28.6%	2.9%
d) Teamwork	68.7%	28.6%	2.9%
e) Possibility of coordinating a work team.	68.7%	28.6%	2.9%g
f) Possibility of responding to work problems.	74.3%	25.7%	0%
g) The content of work.	60.0%	37.1%	2.9%
f) The work environment	60.0%	40.0%	0%
g) Salary (income and benefits)	25.7%	65.7%	8.6%
h) Actual position	57.1%	42.9%	0%

Figure 13 Work satisfaction

III) Aspects of the career of Engineering in Productive Systems

In this area, the most important aspects of the graduate's perception of their career are considered and likewise it seeks to detect areas of opportunity in order to be improved.

a. Career Option

In the degree in Engineering in Productive Systems, 54% of the graduates surveyed from the UTNA were their first choice while 46% were not their first choice at our university.

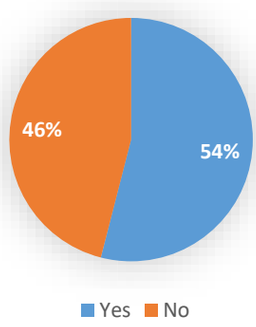

Figure 14 Career Option

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b. Reason why you chose the UTNA

The highest percentage by which our students choose to study at the Universidad Tecnológica del Norte de Aguascalientes is because of the location with 37%. It is followed by the cost of fees with 23% and the academic model with 20%.

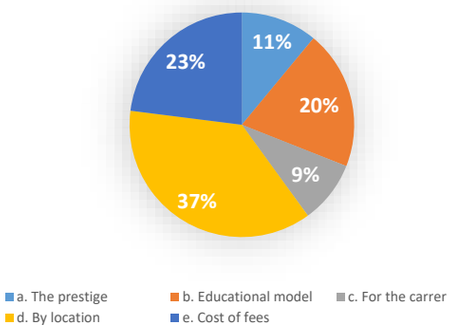

Figure 15 Reason why you chose the UTNA.

c. His financial life improved after graduating from college

89% of our students affirm that their life improved after graduating from the degree, however 11% affirmed that it did not change their life.

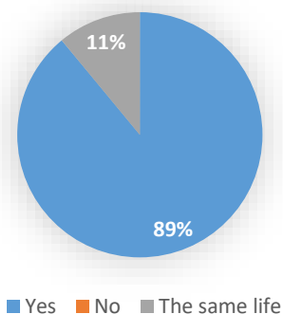

Figure 16 Improves after having studied at UTNA

d. When did you get a job after graduation?

49% of our graduated students affirm that they already had a job before graduating. However, 9% affirm that they found work after more than 1 year of having graduated.

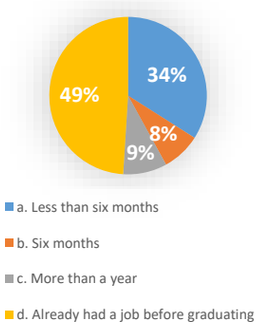

Figure 17 Time to get a job after graduation

e. Does the PSE career allow you to identify, formulate and solve problems?

97% of the students consider that the career allows them to identify, formulate and solve problems, while there is 3% who consider that it does not.

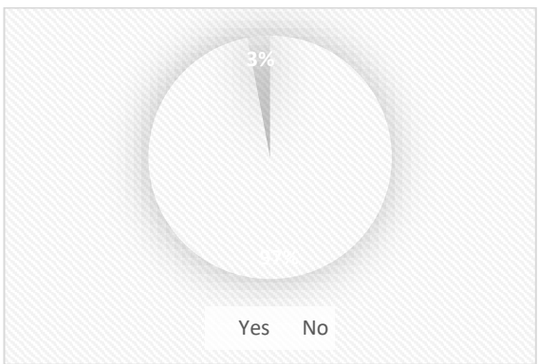

Figure 18 PSE career allows you to identify, formulate and solve problems

f. Do you consider that you have applied, analyzed and synthesized Productive Systems Engineering strategies through human, technological, economic and financial factors?

71% of the graduates consider that they have applied, analyzed and synthesized Engineering strategies in Productive Systems through human, technological, economic and financial factors.

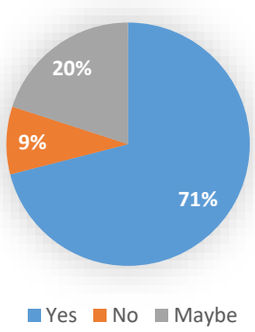

Figure 19 Estrategias de PSE

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g. Do you consider that the UTNA gave you the necessary elements to communicate effectively in the development of your work?

69% of those surveyed consider that the UTNA gave them the necessary elements tocommunicate effectively in the development of their work, however 23% consider that perhaps it gave them the elements, however 8% consider that No.

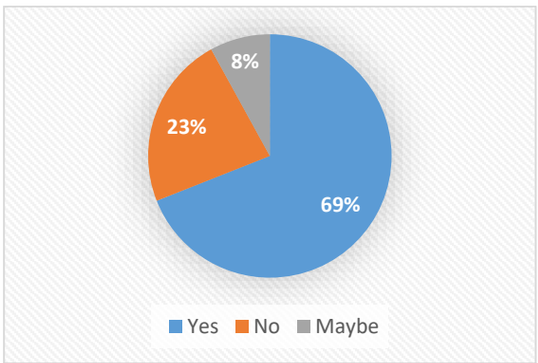

Figure 20 Communication Competence

h. Do you consider that the training that the UTNA gave you today helps you to act with values, proactive, personal, social and environmental attitudes?

83% of those surveyed consider that the training given by the UTNA currently helps them to act with values, proactive, personal, social and environmentally friendly attitudes, while 14% consider that perhaps.

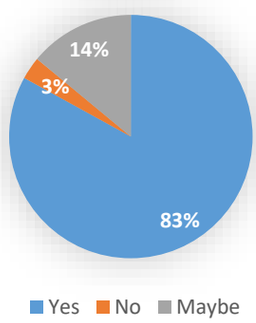

Figure 21 Values and attitudes

i. The students answered to what degree the following subjects contributed to the development of their work.

Subject	Litle	Regular	More
a. Chemistry	51.4%	42.9%	5.7%
b. IT tools	60.0%	34.3%	5.7%
c. Working methods	65.7%	25.7%	8.6%
d. Distribution plant	51.4%	28.6%	20.0%
e. Statistical Quality Control	5.7%	40.0%	54.3%
f. Safety and hygiene	8.6%	54.3%	37.1%
g. Industrial drawing	14.3%	34.3%	51.4%
h. Supply chain	14.3%	31.4%	54.3%
i. Lean Manufacturing	14.3%	22.9%	62.9%
j. Materials Engineering	25.7%	31.4%	42.9%
k. Operations research	22.9%	22.9%	54.3%
l. Manufacture	17.1%	22.9%	60.0%
m. Process engineering	8.6%	17.1%	74.3%
n. Investment projects analysis	20.0%	51.4%	28.6%
o. Thermodynamics	51.4%	37.1%	11.4%
p. English.	8.6%	37.1%	54.3%

Figure 22 List of subjects and their contribution to the development of your work

j. The students answered in what percentage they carry out the following competences for their professional development acquired in the UTNA

Entry	Percentage
Manage the quality management system	25.4%
Manage the necessary resources of the organization to ensure planned production according to customer requirements	41.8%
Develop and innovate manufacturing systems	18.2%
Manage the industrial security of the company	9.1%
Manage and create ergonomic systems	5.4%

Figure 23 Competences for your professional development acquired at the UTNA

k. When asking students which courses they recommend should be taught in the educational program, they mentioned:

- Industrial design
- Development of new projects

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- Planning and development of new projects
- Core tools, CNC machining (practical), advanced CAD CAM, practical PLC, programming, advanced Excel
- Conversational English
- Gemba kanri
- Sap
- Advanced Excel
- Cnc programming
- Advanced English,
- Metrology
- Focus on leadership and coordination of groups, CNC practices (machines and Tools)
- Personnel management
- ANPQP / APQP
- Welding and use of tools such as lathe, milling machine, grinding machine etc.
- Values and treatment of staff
- IATF, BQS, CORE TOOLS ,, VDA
- Cutting tools, PLC, types of motors, CNC programming, solidworks, oils and coolants.
- Current methodologies

Conclusions

According to the research carried out, the following points can be highlighted:

During the survey, the students reported that 97% were working.

The item that stands out in the monthly income is $ 10,001 to 15,000 with a percentage of 63%, while there is also a percentage of 14% that mentions earning only $ 5000. Likewise, there are no graduates of this survey who are earning more than $ 20,000.

The duration of work that graduates have oscillates in 43% with 2 years in their workplace. It is followed by 26% with some who have been working from 6 months to 1 year.

The area in which most of our graduates work is Quality with 29%, followed by the Production area with 23%.

The highest percentage by which our students choose to study at the Universidad Tecnológica del Norte de Aguascalientes is because of the location with 37%. It is followed by the cost of fees with 23% and the academic model with 20%.

89% of our students affirm that their life improved after graduating from the degree, however 11% affirmed that their life did not change.

71% of the graduates consider that they have applied, analyzed and synthesized Engineering strategies in Productive Systems through human, technological, economic and financial factors.

69% of those surveyed consider that the UTNA gave them the necessary elements to communicate effectively in the development of their work, however 23% consider that perhaps it gave them the elements, however 9% consider that No.

83% of those surveyed consider that the training given by the UTNA currently helps them to act with values, proactive, personal, social and environmentally friendly attitudes, while 14% consider that perhaps.

Acknowledgment

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