

## STRATEGIC PLANNING

### Case: Department of Topography and Transportation Roads at the Faculty of Civil Engineering - UNI

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#### *Abstract*

The objective of this document was to present a diagnosis of the Department of Topography and Transportation Roads of the Faculty of Civil Engineering - UNI from the Strategic Approach. This department is part of the Faculty of Civil Engineering-UNI and the laboratory. According to the organizational chart, both depend independently from the faculty; however, there is a strong relationship between the department and the laboratory in practice. On the other hand, the department has the board of directors of the technology transfer center among its members: Instituto Vial Iberoamericano. It is also important to mention the existence of an office for extension courses for external clients. Among the main conclusions reached by the researchers, it is found that the importance lies in the effectiveness of the goals and objectives set by an organization in its program schedule, as long as the established monitoring and indicator system.

Keywords: Strategic Planning, Topography, Civil Engineering, Higher Education.

#### **1. Introduction**

Planning is one of the most important management tools that allows an organization to achieve its objectives and goals. However, in a turbulent world, where it is not enough to have modern technologies to be competitive, a rethinking of the way of planning is generated because planning implies “thinking” about the future, that is, understanding the external environment and how this environment will evolve.

The EP needs to answer three basic questions:

Where are we going?

What is the environment in which we are operating today?

How do we get to where we want to be?

Thus, we will arrive at strategic planning, and three possibilities can be considered:

Repositioning. - line of business.

Innovation. - Technological changes.

Improvement. - Through productivity and quality indicators.

Thus, strategic planning is understood as a process of building the future within a time horizon.

Planning is interested in translating objectives into investment projects.

Strategic planning allows to evaluate organizational perspectives or trends based on a continuous self-evaluation, clearly identifying where we want to go, how and when, and based on this, to select the programs or projects to be implemented in the organization.

In short: those who do not plan strategically end up being surprised by market changes, are uninformed about their sector and the business line, and above all, are at the mercy of the economic situation, so they always need to reprogram themselves, depending on the day to day.

Since strategists such as Igor H. Ansoff, Peter Lorange, Russell Ackoff, John Argenti and Dan Schendel initiated the analysis of strategic planning, several experts have appeared on the subject, being lately Professors Michael Porter, Hans Ulrich, John Acker, Fred David and Henry Mintzberg, to name a few of them, the proponents of strategic planning and management.

Stringer Unchenick: The strategic planning process involves some potential pitfalls, such as:

- The bigger the better.
- Extending too far weakens too much.
- Stagnate in the middle.
- Not being customer oriented
- The more economical, the better.
- Underestimating our competence.
- If it is not broken, it does not need to be repaired.
- What they do not know will not affect them.
- Misrepresented communication.
- Eloquence is everything.
- Do not increase demands.

- Stop at the figures.
- A good athlete can handle any business.
- Analysis paralysis.
- Overlooking corporate culture.

Michael Porter established an intellectual bridge between the field of administrative policies and industrial organization. He also developed the concept of “generic strategies,” of which he noted three: cost leadership, differentiation and focus.

Peter Druker: Presents in his book “Managing the Future” a series of provocative and insightful essays under four broad categories: “Economics,” “People,” “Management,” and “The Company.” “The Trend Toward Partnerships for Progress” is a brief but precise set of principles for dealing with one of the significant business trends of the future.

George L. Morrissey: There are three phases in the process through which managers must pass. Each of them is characterized by a different mental process. The first phase is strategic thinking, which focuses on the process’ more intuitive aspects, enabling the execution of the organization’s mission, vision and strategies. The second phase is long-term planning, which requires intuitive and analytical thinking, resulting in projections of the future positions the organization wishes to achieve. Finally, the third phase is tactical planning, an analytical approach with intuitive allusions that will lead to specific actions affecting the organization’s ongoing performance. This phase is designed to produce the short-term results necessary to carry out the organization’s mission and to achieve projected future positions.

Phillip Kotler: The new century management strategy style that has arrived? - Probably the style of speed. “Speed will be crucial, competitors are moving fast. Opportunity appearances in the market are getting shorter, and customers want things now.”

Alfredo Pezo: Strategic planning considers three possibilities: Repositioning, innovation and improvement. Planning has one requirement -“the process of change” - reengineering or radical innovation.

## **2. General Objective**

To present a diagnosis of the Department of Topography and Transportation Roads of the Faculty of Civil Engineering - UNI from the Strategic Approach.

### **3. Diagnosis of the Department of Topography and Transportation Roads - Fic - Uni.**

The department is located within the University campus; however, its location belongs to the periphery of the Civil Engineering faculty. Laboratory No. 3 of Topography and Photogrammetry is located within the facilities of the department mentioned above, which facilitates the work of teaching and administrative staff.

There are four classrooms, a computer center, an auditorium, and administrative offices, as well as three multimedia projectors and two transparency projectors. The non-teaching staff includes a secretary, a janitor and a cleaner.

The head of the department is always a professor appointed by the Faculty Council, who in turn has a secretary chosen by him/her.

**Table 1. Courses in the area of topography and transportation routes.**

Courses	Credits	Nº sections	Nº students
Topography I	4	4	120
Topography II	4	4	105
Satellite geodesy	4	4	130
Photogrammetry	4	3	120
General cartography and cartographic design	4	2	41
Roads I	4	4	118
Roads II	3	2	60
Pavements	4	3	50
Ports	3	1	15
Traffic and road design	3	1	15
Railroads	3	1	15
TOTAL		29	749

Source: Own elaboration.

#### **3.1 Internal and external interaction**

##### **3.1.1 Internal interaction**

The department is part of the faculty of Civil Engineering-UNI and the laboratory. According to the organizational chart, both depend independently from the faculty; however, there is a strong relationship between the department and the laboratory in practice. In addition, the department has among its members the board of directors of the technology transfer center: Instituto Vial Iberoamericano (Ibero-American Road Institute). It is also important to mention the existence of an office for extension courses for external clients.

##### **3.1.2 External interaction**

Currently, external interaction is channeled through:

- The extension courses office; most of the students in these courses are technicians.

- The CTT- IVIA; Although it is made up of students, technology transfer is carried out at the level of engineers and students.

### 3.1.2.1 Strengths and weaknesses

Strengths and weaknesses of an institution are defined as the extreme qualities coming from within the institution.

**Table 2. Strengths and Weaknesses**

STRENGTHS	WEAKNESSES
Almost all teachers use multimedia technology in their classes.	Lack of English language proficiency among teachers and students.
We have an optimal workshop (UNI hill), which guarantees the normal performance of field practices.	Shortage of courses related to management and management courses.
The topography laboratory is practically integrated with the classrooms, which facilitates the execution of demonstration classes.	Little participation in national conferences.
Students are proficient in mathematics.	No participation in international conferences.
	Shortage of published books by teachers.
	We do not know exactly what technologies companies are using.
	Zero Masters, two Doctors.
	The teachers' meeting is very sporadic, it should be monthly.
	Low student attendance in class.
	Computers in poor condition.
	Lack of respect, both at the level of students and teachers.

Source: Own elaboration.

### 3.1.2.2 Opportunities and Threats

Opportunities and weaknesses of an institution are defined as the extreme qualities coming from external factors.

**Table 3. Opportunities and Threats**

OPPORTUNITIES	THREATS
The current policy of the mining, housing and transportation sectors increases the professional activity of our graduates.	Our relevance in the world ranking of universities is imperceptible.
The professional activity in civil engineering and in the area of transportation is in great demand in our country and its trend is projected for at least 10 years.	There is no body composed of graduates to promote our department.
The institutional image at the national level is still important, despite the fact that it has an almost null or even negative upward slope.	Government support for public universities is deficient.
	The first level private universities consider management courses in their curricula, which places us in a lagging position.

Source: Own elaboration.

#### **4. Technological prospective of the department; prioritizing the graduate.**

##### **4.1 Theoretical basis**

Technology foresight attempts to identify where technologies are headed in the long term, aiming to identify emerging technologies that can generate economic and social benefits. Its objective is to reduce the level of uncertainty that affects all medium- and long-term decisions. This uncertainty stems from accelerated technological evolution, the shortening of technology life cycles, the globalization of activities, etc.

Today, countries use this tool as a fundamental weapon in technological innovation. States devote efforts and resources to use it as a privileged tool to define their technological innovation policies. Thus, the strategic planning process is based on the ability and the art of knowing how to interweave and relate the present with the future, the current situation with the future scenario. Only a vision of future scenarios can allow to know and foresee the demands of repositioning, innovation and improvement that every institution has to face permanently, as a consequence of the competitive dynamics of the environments in which it operates, within the framework of the process of internationalization and globalization that we are living.

#### 4.1.1 Definition of the time horizon

A plan of this nature must have a minimum time of 10 years, which is the time frame for opting. This will allow obtaining, in 2018, a graduating class of graduates with the expected qualities according to the plan. Likewise, the institution will count on a good number of teachers of international quality.

#### 4.1.2 Methodology used

There are several methods, the best known of which are:

- The expert panel method.
- The Delphi method
- Brainstorming.

The study employed a method similar to expert panels, assuming teachers as experts. The departmental head's meetings were official and their agenda only included the graduate's prospects.

#### 4.1.3 Profile of the graduate in the time horizon.

- To be an engineer with knowledge of GEOGRAPHIC INFORMATION SYSTEMS applied to Civil Engineering.
- The professional must be globally accredited.
- All graduates must have participated in events held abroad.
- Solid knowledge of Spanish grammar, spelling, literature and executive reporting.
- Have experience in fieldwork in the respective area (mandatory pre-professional internship).
- Have the ability to conduct research topics.
- To represent the earth's surface and materialize a project on it.
- To have the ability to make a preliminary project from the engineering point of view.
- Organizational and managerial skills.
- Analytical and problem-solving skills.
- Have the ability to interpret some software of your specialty.
- The professional must be able to speak and write in English.

### 5. Presentation of projects

#### 5.1 Project profile 1: Geographic information system

Objective:

- Each professor must include within the syllabus of his/her course at least two classes dedicated exclusively to the use of GIS about the field involved in the course.
- Form a staff of professors, engineers, graduates and students to disseminate GIS nationally and internationally, generating economic income, additional paid work for the staff and free training for our teachers.

Market:

- Demand. - Nowadays, the use of hardware and software is routine all over the planet; the conditioning factor is reduced to technology management. A first stage will consist of selling: teaching GIS management. Thus, our potential demand will be almost all Peruvian universities and companies.
- The Offer. - At present, we only have one expert in GIS management; however, we project that the number will increase by three in the next five years.

Estimated sales:

The project's useful life is 05 years and the income is estimated at S/. 120,000.00 (one hundred and twenty thousand and 00/100 Nuevos soles). With a cost of S/. 80,000.00

Size and location

The project's production contemplates ten students per course of 24 hours, distributed in two weekly classes. Two simultaneous courses are planned, using our equipment and facilities four times a week.

The installed capacity would be six times a week, leaving two days in blank, which means using only 75% of the installed production capacity.

The following personnel is employed: a manager, a secretary, a custodian, one teacher per course and one assistant per course. In addition, there is a computer center with 20 computers 10 of which the GIS will be installed. The premises are located on the campus of the National Engineering University and its facilities correspond to the Department of Topography and Transportation Roads.

Working capital:

It finances the start-up of operations and the required funds until the necessary money is obtained from the sales process for the company to become self-financed. The initial cash is needed for the project's liquidity in its pre-operational phase.

In this project, the production cycle lasts one month, and does not require major expenses since the materials and inputs are provided by



the department of topography and transportation routes, and operating expenses are paid at the end of each cycle, which is why the working capital is equivalent to the corresponding cost of the GIS (S/. 20,000). (S/. 20,000).

**Financing:**

It is expected that the School of Civil Engineering will cover the working capital (S/. 20,000) and the remuneration will be paid by the undergraduate classes given by each professor to his students.

**5.2 Project profile 2: Single text per course**

**Objective:**

- Generate an official text for each course prepared by the professors that comprise it.

With this, production and sale of knowledge will be obtained in addition to homogenizing each course's teaching by the professors. Furthermore, the university, the department and the professors will receive economic income under the sales obtained. However, the primary objective is to raise the level of the university.

**Market:**

- Demand. - There are two types of users: internal and external.

The interns constitute a number of 1200 per year, avoiding duplicity of purchases by the sending student.

External readers are national and international readers; without considering the latter, demand is projected at 4,000 copies per year.

- The Offering. - It is composed of 14 full-time professors from the Department of Topography and Roadways; it also has the No. 3 laboratory of Topography and Photogrammetry.

**Estimated sales:**

The project's useful life is 10 years and revenues are estimated at S/. 130,000.00 (one hundred and thirty thousand and 00/100 Nuevos soles) per year with a S/. 57,000.00 in the same period.

**Size and location:**

The physical production of books covers 100 % of internal users and an average of 25 % of external users (domestic market).

The following personnel is employed: a manager and a secretary. The manufacturing of the material will be done on a contract basis. The premises are located on the campus of the National Engineering University and its facilities correspond to the Department of Topography and Transportation Roads.

Working capital:

In this project, the production cycle lasts one year and the expenses are divided into two: the cost of editing, which is a one-time cost, and the cost of the material (paper) and printing services; the costs of authorship by the professors will be paid at the end of the productive cycle.

Financing:

The initial investment amounts to S/. 150,000 (one hundred and fifty thousand and 00/100 Nuevos soles) and is expected to be covered by the Faculty of Civil Engineering as a loan.

5.3 Profile of Project 3: Promotion of Culture

Objective:

- Promote national and international culture in undergraduate students, obtaining, at the end of his career, a professional with significant development and ease in managing personal, social and corporate interrelationships.

Market:

-Demand. - The project contemplates 100 % of the undergraduate student body, distributed as follows:

- 1st, 2nd, and 3rd: Readings.
- 4th, 5th and 6th grades: Cinema.
- 7th and 8th: Poetry.
- 9th and 10th: Theater.

-The Offer. - It will be constituted by the department's professors in agreement with the university's diverse cultural entities.

Estimated sales:

Since this project will be carried out in conjunction with undergraduate courses, it will be free of charge; however, it will increase the cultural capacity of our students. Therefore, in order to make it mandatory, the work involved in this project will be included as a minimum in the grades of the exams of the regular undergraduate courses.

Size and location:

The premises are located on the campus of the National Engineering University and its facilities correspond to the Department of Topography and Transportation Roads.

Working capital:

There is no need to invest in tangible material; working capital is zero.

#### 5.4 Profile of Project 4: Intensive English

##### Objective:

- To ensure that undergraduate students can receive their senior English classes.

##### Market:

- Demand. - The project covers 100% of the undergraduate student body from the 1st to the 10th cycle.
- The Offer. - Professors hired by the faculty will constitute it, and the status and category will be as equal as any other university professor.

##### Estimated sales:

Since this project will be carried out in conjunction with the undergraduate courses, there will be no cost; however, it will increase the cultural capacity of our students and professors. Since these courses are not included in the curriculum and in order to make them mandatory, the courses of the last cycle will be taught in English.

##### Size and location:

The premises are located on the campus of the National Engineering University and its facilities correspond to the Department of Topography and Transportation Roads.

##### Working capital:

Finances the start of operations consists of installing the necessary software for its execution.

The productive cycle is 05 years and the fixed cost corresponds to the teachers' salaries.

##### Financing:

It is expected that the Civil Engineering faculty will cover the working capital, and the cost of the professors' salaries will be shared by all the departments and laboratories of our faculty.

#### 5.5 Project Profile 5: Consultancy

##### Objective:

- Form an office that provides consulting services to internal and external users of our university.
- The research conducted in our department will offer novelty, generating a competitive advantage over its peers.
- To generate economic resources for our institution.

**Market:**

- The demand. -It will be composed of private and public companies of our country, as well as the various faculties of the UNI.
- The Offer. - The core team will consist of professors from our department, while external professionals and students will be established as support staff to the consulting office.

**Estimated sales:**

The project's useful life is 10 years and revenues are estimated at S/. 360,000.00 (three hundred and sixty thousand and 00/100 Nuevos soles) per year with a S/. 280,000.00 in the same period.

**Size and location:**

The production of the project contemplates one project per month. It is staffed by the following personnel: a manager, a secretary and rotating technical personnel that may be composed of engineers from our department or from outside our university. In addition, equipment and software. The premises are located on the campus of the National Engineering University and its facilities correspond to the Department of Topography and Transportation Roads.

**Working capital:**

There is an initial investment amount for computers, software, etc. Expenses total S/. 20,000.00. Furniture is not included since it is assumed to be made up of existing furniture in the faculty. The working capital required for each project to be mobilized is S/. 15,000.00.

**Financing:**

The amount of the investment is expected to be covered by the faculty and the initial working capital per project (S/.15,000.00) as a loan.

## **6. Construction of the future scenario**

### **6.1 Theoretical basis**

The strategic planning process is based on the ability and the art of knowing how to interweave and relate the present with the future, the current situation with the future scenario. Only a vision of future scenarios can allow us to know and foresee the demands of repositioning, innovation and improvement that every institution has to face permanently, as a consequence of the competitive dynamics of the environments in which it operates, within the framework of the internationalization and globalization process we live in.

The construction and formulation of future scenarios require every planner and member of an institution to have the information and a minimum of critical analysis of the following:

- The main megatrends, present and in development, make up the current process of internationalization and globalization.
- The medium and long-term projects, plans or programs of the institution's sector. Above all, the plans, projects or programs assumed and developed by government agencies.
- Benchmarking case studies and results, insisting on the so-called critical success factors.
- The results extracted from the opinion survey techniques on quality expectations on the part of the user.

This information and critical analysis constitute the basic inputs for constructing future scenarios. Therefore, this information should be one of the essential components of the general information system (GIS) that every institution should have.

Thus, for example, today's young professional is obliged to think about the social needs that his or her skills will be able to satisfy, that is, the market towards which he or she will be oriented as a professional or as a company in the future, and how to generate value with what he or she knows; he or she can no longer devote himself or herself only to accumulating technical skills in the expectation that someone will hire him or her and make him or her socially useful.

Trends. - It is everything that, being present today, will dominate soon. Trends are new dynamics or processes, new expectations, tastes or preferences, new products or services, new methods or concepts, and new materials or conditions, which constitute a yellow or amber light, announcing changes and demanding repositioning or innovations of what we are doing today, if we want to remain in force, that is to say, to remain competitive. On the other hand, if the trend is not assumed today, it may leave us out soon; everything depends on the opportunity and speed with which our personnel and institution assume this trend.

## **7. Definition of strategic objectives**

### **7.1 Formulation of strategic objectives**

- 1.- To elaborate on a project for professors to attain a master's degree.
- 2.- To elaborate an investment project related to bibliographic production.
- 3.- A head of research should be appointed in the Department of Topography and Transportation Roads.
- 4.- An annual budget from own resources should be established.

5.- The head of the department should appoint a teacher to coordinate cultural and sporting events. 6.- The head of the department should designate a head of investment projects.

7.- Establish a budget from its resources to develop investment projects. 8.- The laboratory personnel should be more friendly and increase coordination with the professors for equipment loan purposes.

9.- The practice leader must involve all the members of each group. 10.- IVIA: They must organize ordinary and extraordinary events.

11.- There must be security personnel that involves the permanent opening of the bathrooms. 12.- There must be security personnel that involves the permanent opening of the computer center.

13.- Change all the computers and install the original software, including the antivirus. 14.- The teacher must research and update.

15.- Implement classrooms with multimedia projectors and internet access and modernize the classrooms. 16.- The professor and head of practices should prepare all their classes.

17.- The classroom environment must be improved.

18.- There should be security personnel on duty during the day. 19.- Purchase more digital equipment

20.- The secretary should always be in the office and improve how she deals with the students. 21.- A new location for the IVIA should be planned.

22.- The organization and dissemination of extension courses should be improved. 23.- Installation and training of a general information system.

24.- Installation and security of a multimedia projector in each classroom.

25.- To increase the cultural exchange of each teacher and student, inviting them to travel abroad.

## **8. Formulation and programming of the Development Plan and Operational Plan.**

### **8.1 Application of the Logical Framework Method for each project**

The logical framework method

It is a tool for project planning and control that consists of organizing information and activities so that some different points of view can be brought together simultaneously and completed instead of opposing each other. The logical framework method is a set of interwoven concepts that must be used together in a dynamic way to elaborate a well-designed, objectively described and evaluable project.

## Elements that make up the logical framework

### Project management

Management always exists to achieve results; therefore, managers are expected to be accountable for these results.

Inputs. - These are the resources that are consumed and the activities that are carried out. In our case: Incoming students, professors, infrastructure, equipment, and know how.

Outputs. - These are the results or elements that managers are committed to producing. In this case: Knowledge.

Purpose. - It is the reason for which it is produced.

In this case: the knowledge (books, speakers, magazines, web, professionals, CDs) will be used by national and international companies and your quotation will be taken to a high level.

### The basic scientific method

It assumes that all activities are uncertain. Therefore, it assumes every project must be considered a set of chain hypotheses. It should be noted that in the chaining of hypotheses, the probability of success varies among the assets. As can be seen, the first is less uncertain than the second and the second is less uncertain than the third. Therefore, a project manager responds only up to reasonable limits.

### Systems analysis

It is based on the criterion that we have not specified a system and that we have not explained the relationship that this system has with a larger system. Therefore, for the above case, i.e., the three-level hierarchy of objectives, we would have to add another higher level called FIN.

We define END as the highest level objective immediately above the purpose.

The end, then, shows that the purposes are at the level of the institution; some objectives go beyond the institution and relate the program to national objectives, which may be common to many institutions.

## 9. Conclusions and recommendations

### 9. Conclusions

#### 9.1 General conclusions

A.- Importance of strategic planning.

The importance lies in the effectiveness of the organization's goals and objectives in its program schedule, as long as the established monitoring and indicator system is effectively enforced.

In other words, the institution is not at the mercy of the economic situation.

B.- Importance, usefulness and applicability of the Alfredo Pezo Model.

The importance of this model lies in its applicability to each of the instruments used to prepare the institutional development plan. Thus, emerge the ideas of organizational culture, vision and mission formulation, situational analysis, business strategies, etc.

C.- Main theoretical and information requirements of the Model.

Theoretical requirements:

- Technology foresight.
- Management strategies.
- Market research.
- Project management.
- Philosophical and psychological approaches.

Information requirements:

- Current product profile.
- Product profile at the end of the time horizon.
- Measurement of the change attitude of senior management and staff.
- Measurement of the level of strategic thinking of senior management and staff.
- Time horizon trends.
- SWOT diagnosis (strengths, weaknesses, opportunities and threats) for each trend.
- Internal and external surveys.
- Demand analysis.
- Offer analysis

D.- Main organizational culture requirements of the model.

- Attitude of top management to change.
- Attitude to change of the personnel.
- Flexibility in production and service strategies.



- Capacity for flexibility in the organizational structure and human capital.
- Multi-skilling of human capital.
- Senior management leadership action.
- Analysis of the level of strategic thinking of senior management and staff.
- Governance capacity of senior management.

E.- Fields of application of the Alfredo Pezo Model.

The philosophical concept of strategic planning is valid for all types of institutions.

However, the Alfredo Pezo model has the particularity of coming from a theoretical-experimental analysis carried out (on average 15 years) in a group of educational institutions; that is why, being the Department of Topography an educational entity, the concepts, guidelines, instruments and methodologies formulated by the present model have efficient applicability in our institution.

In general, this model has its application in all types of institutions, but if you are looking for an area where its application is direct, these are the educational organizations.

## 9.2 Specific findings related to the Strategic Planning of the Surveying and Roadways Department.

A.- Referring to the graduate:

Current graduate diagnosis:

- He is knowledgeable about the mathematical-physical principles of phenomena.
- It can handle the necessary software.
- He is predisposed to work in any engineering area.
- Weakness in personnel management.
- Weakness in the management of a company.
- Lack of English language proficiency

Profile of graduates in 2008

- To be an engineer with knowledge of GEOGRAPHIC INFORMATION SYSTEMS applied to Civil Engineering.
- The professional must be globally accredited.
- All graduates must have participated in events held abroad.

- Solid knowledge of Spanish grammar, spelling, literature and executive reporting.
- Have experience in fieldwork in the respective area (mandatory pre-professional internship).
- Have the ability to conduct research topics.
- To represent the earth's surface and materialize a project on it.
- To have the ability to make a preliminary project from the engineering point of view.
- Organizational and managerial skills.
- Analytical and problem-solving skills.
- Have the ability to interpret some software of your specialty.
- The professional must be able to speak and write in English.

B.- Referring to senior management

Current diagnosis of top management's attitude to change

- Vitality: Medium-high.
- Proactive attitude: Medium
- Positive attitude towards oneself: Medium.
- Positive attitude toward others: Medium-low.
- Personal flexibility: Low.
- Social flexibility: Medium.
- Ability to structure reality: Medium

Corrections

- Attend programs related to innovation.
- To raise the level of self-esteem by increasing professional competencies.
- Improve the objective quality of the relationship with others - teamwork.
- Increase the cultural exposure of each individual by inviting them to travel abroad.
- Modify and expand the social environment of the department in order to make it more flexible, denser and of higher quality.
- Enhance creativity.

C.- Referring to teachers.

Current diagnosis on the attitude of teachers to change.

- Resistance to the use of geographic information systems.
- They do not require the student to read literary works.
- Resistance to English language proficiency
- Resistance to book publishing.
- Shortage of professors with Master's or Doctorate degrees.
- Low incidence in undergraduate thesis advising.
- Most of the professors only fulfill their academic load.
- Slowness in the handling of information with senior management.

Corrections

- As teachers, we must encourage our students to read literary works, requiring them to read at least 5 works in each academic year.
- Execute a project in which in 2018, 100% of the professors in this department will have a Doctorate or Master's degree.
- Thesis advising should be extended to all professors, including assistant professors.
- By 2012, all teachers must be able to handle geographic information systems.
- In 2014, all teachers must be proficient in English.
- In 2014, all teachers must have at least one published book to their credit.
- Generate a general information system in which all teachers participate continuously.

Diagnosis of the level of strategic thinking of teachers

- Professors are on their way to becoming strategic thinkers; that is, we do not know in detail the situation of our institution.

Corrections

- Conduct surveys to the different private and state-owned companies regarding:
  - The technologies they use.
  - The university origin of its professionals.
  - The contribution of professionals.

- To carry out a ranking of the contribution of inter-university professionals.
- Organize conferences (through IVIA) having as central theme: technologies and methods used in engineering.
- Sign agreements with private and state companies, where the best students of each course are integrated as interns, to present a report to our department at the end of their period.
- Obtain information about the curriculum of the Civil Engineering Faculty of each Peruvian and South American university.
- To carry out statistical work in each Peruvian and South American university regarding the incidence of the area of transportation concerning the Faculty of Civil Engineering. (The number of credits can be considered as a reference parameter).
- Conduct an internal survey in the Department of Topography and Transportation Roads- FIC- UNI on the professors' preference of the courses to be taught.
- Generate three courses (minimum) per professor, which must be taught on a rotating basis according to the schedule established in the strategic plan.
- Design a cost and budget analysis format to calculate each cycle's total expenditure incurred in the Department of Topography and Transportation Roads.

D.- Strategic objectives and formulation of investment projects.

- Installation and training of a general information system.
- To increase the cultural exposure of each teacher and student, inviting them to travel abroad.
- The teacher must research and update himself/herself.
- Purchase more digital equipment.
- Laboratory personnel should be more friendly and increase coordination with professors for equipment loans.
- Headquarters must designate an investment project manager.
- The organization and dissemination of extension courses should be improved.
- IVA: must organize ordinary and extraordinary events.
- The teacher and the internship leader must prepare their classes.
- Change all computers and install original software, including antivirus.

- The head of the department must designate a teacher to coordinate cultural and sporting events.

## 9.2 Recommendations

A. To develop the projects proposed in this thesis at the profile level.

- Installation and training of a general information system.
- Conferences abroad.
- Research in action.
- Acquisition of digital topographic equipment.
- Extension courses.
- IVIA
- Scheduled renovation of the computer center.
- Friendliness and cordiality.
- Culture and sports.

B. To carry out the operation of the indicators system in order to continuously monitor the execution of strategic planning.

C. To materialize the following control system.

INPUTS	Ud	Goal
Multimedia projector, security and internet in all classrooms.	You	5
Incoming teachers must be proficient in English.	Prof.	10
The concentration of manuscripts.	You	12
ACTIVITY		
Channel study abroad for students.	You	50
Channel studies abroad for teachers.	You	20
Editing and publication of class materials, respecting copyrights.	You	12
Development of the general information system.	You	1
Geographic information system management.	Prof.	22

Monitoring of investment projects.	You	1
Direct coordination with laboratory N° 3 (0-10) per year.	You	100

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