

WEB PLATFORM FOR POSITIONING SUSTAINABLE TOURISM IN THE MUNICIPALITY OF SANTA MARÍA YUCUHITI, TLAXIACO, OAXACA.

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Summary - The municipality of Santa María Yucuhiti is located in the Mixteca region of the state of Oaxaca in the Mexican Republic. It has a population of 6,551 inhabitants and is classified as one of the municipalities with the greatest poverty and social backwardness in Mexico; paradoxically, it has natural and cultural attractions with tourism potential.

Tourism is one of the most important and fastest growing sectors in the world that generates great expectations, but also important challenges in terms of technology to provide a service according to the times, and forces to strengthen sustainable actions and committed to environmental care.

Today Information and Communication Technologies and the Internet have changed the way tourists relate to service providers, but also the possibilities that the tourism sector can offer to its customers through the introduction of emerging Industry 4.0 technologies such as: mobile technology, virtual reality, social networks, Big Data, geolocation, cloud storage, augmented reality and the internet of things.

This document presents the development process of a tourism web platform according the methodology of Web Engineering based on UML (UWE), using Drupal, a content management system (CMS) for its usability, robustness, modularity and security features, in addition to fulfilling the purposes of the web.

semantics. In addition, social networks such as YouTube and Facebook are configured to promote tourism in this municipality.

This important technological strategy will make Santa María Yucuhiti known to the world with the possibility of becoming a tourist destination par excellence and thus triggering economic development and social welfare for its inhabitants along with a sense of responsibility, social, cultural and ecological awareness in tourists.

Keywords: Drupal, Internet, UML-based Web Engineering, tourism, semantic web.

INTRODUCTION

Since the end of the 20th century, the Internet, as a "network of networks", has become an indispensable tool for the acquisition of all kinds of services and products. The sector that has benefited most from this macro-network has been tourism and its environment. By the end of the 1990s, the impact of the Internet on travel and tourism marketing was greater than that of any other technology [1].

Sustainable tourism is tourism that follows the principles of sustainability, minimizing the impact on the environment and local culture, while contributing to generate income and employment for the local population.

Therefore, sustainable tourism is trying to occupy a space in the digital era, not only by offering a

alternative to traditional tourism rich in experiences, but also to face the challenge of making itself known due to its generalized oblivion in the media, which continues to bet massively on large international tours and consolidated tourism products. "Tourism is an information-intensive industry, and the Internet is the most effective means of information exchange worldwide" [2].

The object of study of this work is the Municipality of Santa María Yucuhiti, located in the northwest of the State of Oaxaca, in the Mixteca region, specifically in the micro region Mixteca Alta, belonging to the District of Tlaxiaco, is one of the Municipalities with more social backwardness of the Mexican Republic according to the 2015 report of the National Council for the Evaluation of Social Development, its population is in poverty in 85.5%, of which 43.49% corresponds to extreme poverty.

Paradoxically, Santa María Yucuhiti has a pre-Hispanic culture, which is manifested in its handicrafts, gastronomy and language, expressed to this day in its customs and traditions. Santa María Yucuhiti also possesses an extraordinary landscape richness with potential for sustainable tourism activities that allow the preservation of natural resources and at the same time generate economic and social development in its population.

The objective of this research project is to develop a tourism web platform for the Municipality of Santa María Yucuhiti, for the positioning of sustainable tourism, using the Web Engineering methodology based on UML from 2020. For the achievement of this objective it is necessary to carry out the following activities:

- Compile information on the tourism potential of Santa María Yucuhiti.
- Publicize the different attractions and tourist packages.
- Implement e-commerce and social communication with tourists.
- Measure the quality of interactive communication with indicators and web parameters.

The implementation of a web platform will position sustainable tourism by providing information related to the natural and cultural attractions of the Municipality, through a friendly, intuitive, interactive, responsive web application; in addition to an e-commerce module for the sale and post-sale of tourist packages, so that service providers and tourists can interact in social media, build loyalty among current tourists, and allow them to post comments, share photos, videos and experiences of the tourist destination from their computers, tablets or smartphones. This important technological strategy is intended to benefit the 9 communities that make up the Municipality of Santa María Yucuhiti by boosting the economy through the acquisition of goods or services such as: tourist packages, food, transportation, lodging and the sale of regional products.

Project Planning

In 2018, through a collaboration agreement between the Municipality of Santa María Yucuhiti (SMYTO) and the Tecnológico Nacional de México, work began to formulate a project called "Sustainable Planning for Fair and Solidarity Tourism in Santa María Yucuhiti". From 2018 to 2019, field work was carried out touring its 9 communities with the support of the municipal authority, ejidal authority, villagers who acted as guides, researchers and students (Figure 1).



Figure 1. Collection of information.

As part of the office work, a situational diagnosis of the Municipality was carried out with the support of the PEST and SWOT analysis tools, using

The purpose of this study was to determine the feasibility of tourism development in Santa María Yucuhiti with a sustainable approach.

The PEST tool was used to analyze the political, economic, social and technological factors in the external environment of Santa María Yucuhiti, which may affect tourism activities and performance. This analysis was also carried out to evaluate the potential of a new market, i.e. a national and international market segment since currently the tourism that takes place is local and eventual (Figure 2).



Figure 2. PEST analysis.

Using the SWOT analysis as a tool for studying SMYTO's situation, internal characteristics (Strengths and Weaknesses) and its external situation (Threats and Opportunities) were analyzed in terms of tourism (Figure 3).

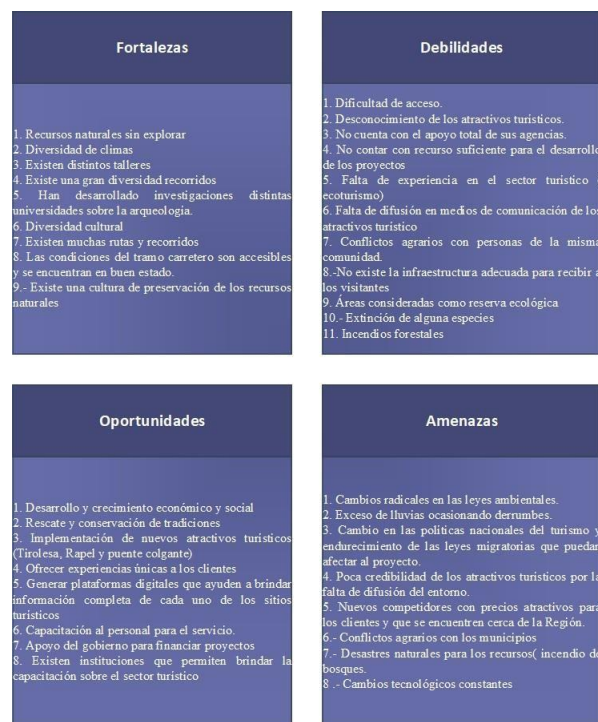


Figure 3. SWOT analysis.

Santa María Yucuhiti is an important producer of quality coffee and honey in the State of Oaxaca, which represents a great opportunity for growth; on the other hand, its natural and cultural resources are relevant and of great importance for the inhabitants and visitors to take advantage of it in a sustainable manner.

Therefore, the feasibility of the project "Sustainable Planning for Fair and Solidarity Tourism in Santa María Yucuhiti" is determined and the strategy to *promote sustainable tourism* is established, through the rational and responsible use of cultural and natural resources to improve the social welfare conditions of its inhabitants.

DEVELOPMENT

Software engineering is an engineering discipline that encompasses all aspects of software production from the initial stages of system specification to the maintenance of the system after it is in use [3]. Software engineering encompasses not only the technical processes of software development, but also activities such as software management, software development management, and software maintenance [4].

software projects and the development of tools, methods and theories to support software production.

Software development methodology is a structured approach that includes system models, notations, rules, design suggestions and process guidelines [4].

For the development of this tourist web platform, the UWE methodology (UML-based Web Engineering) is the most widely used for the development of web-based applications, in which iterative processes, workflows and checkpoints are considered. Like other methodologies, UWE is object-oriented and uses a standard notation for all models: the UML; it defines constraints (OCL, object constraint language) for the definition of its methods, so that certainty can be achieved in its models. UWE proposes the following phases (Figure 4):



Figure 4. UWE methodology.

Requirements Analysis

In accordance with the UWE methodology, in this phase it is necessary to define an elicitation process.

of requirements, identifying needs of the system. It is essential to schematize the behavior, action or activity of the actors through Use Cases aided by the UML (Unified Modeling Language) tool.

The use case diagram in Figure 5 represents the general business model that the villagers of Santa María Yucuhiti can offer to tourists through a web platform. This diagram exemplifies the performance of the villagers as tourism service providers duly constituted in cooperative societies with a corporate image.

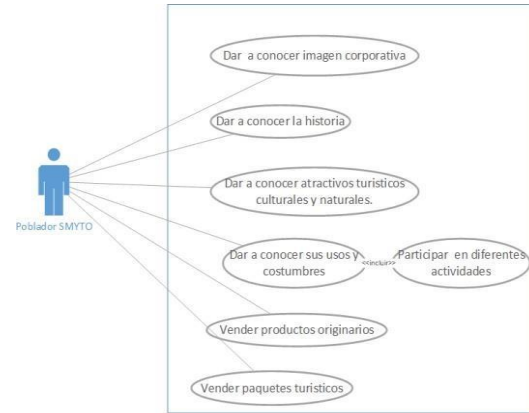


Figure 5. Use case.

In order to identify the preferences of national and international tourists in relation to sustainable tourism activities, an online questionnaire was applied by means of criterion sampling, according to the following formula.

$$n = \frac{Z^2 * p * q}{d^2}$$

Where

Z= confidence level,

p= probability of success, or expected ratio

q= probability of failure

d= accuracy (maximum permissible error in terms of proportion)

$$n = \frac{1.96^2 * 0.05 * 0.95}{0.032}$$

The infinite population for market is 203 surveys of the general population.

This is due to the fact that the inhabitants will be responsible for making known the history of the community, offering native products and showing the cultural and natural tourist attractions, promoting at all times their uses and customs, as well as promoting the conservation of biodiversity and its ecosystem.

Conceptual Design

In this phase, the use cases are transferred to a domain model, considering the requirements. Figure 6 shows the most important classes for the development of the tourism web platform.

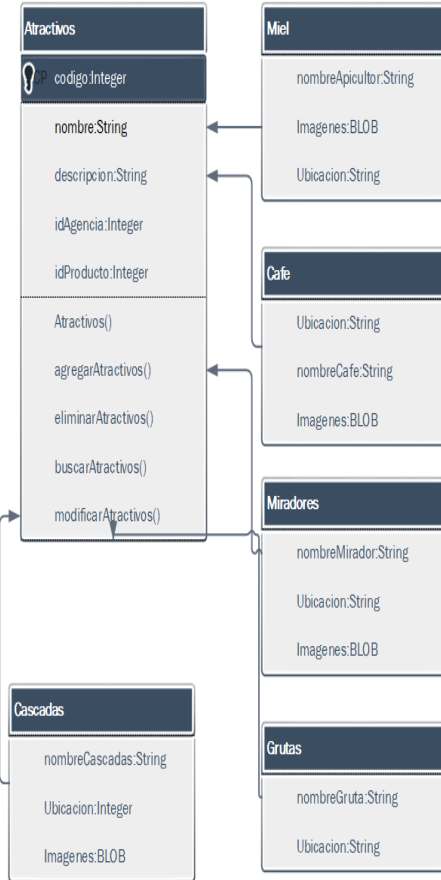


Figure 6. Class Diagram.

Navigational Design

In this phase, the way to navigate through the navigation space is visualized (figure 7). It is important that the end user is able to move easily through the different pages of the site and find what he/she is looking for quickly.

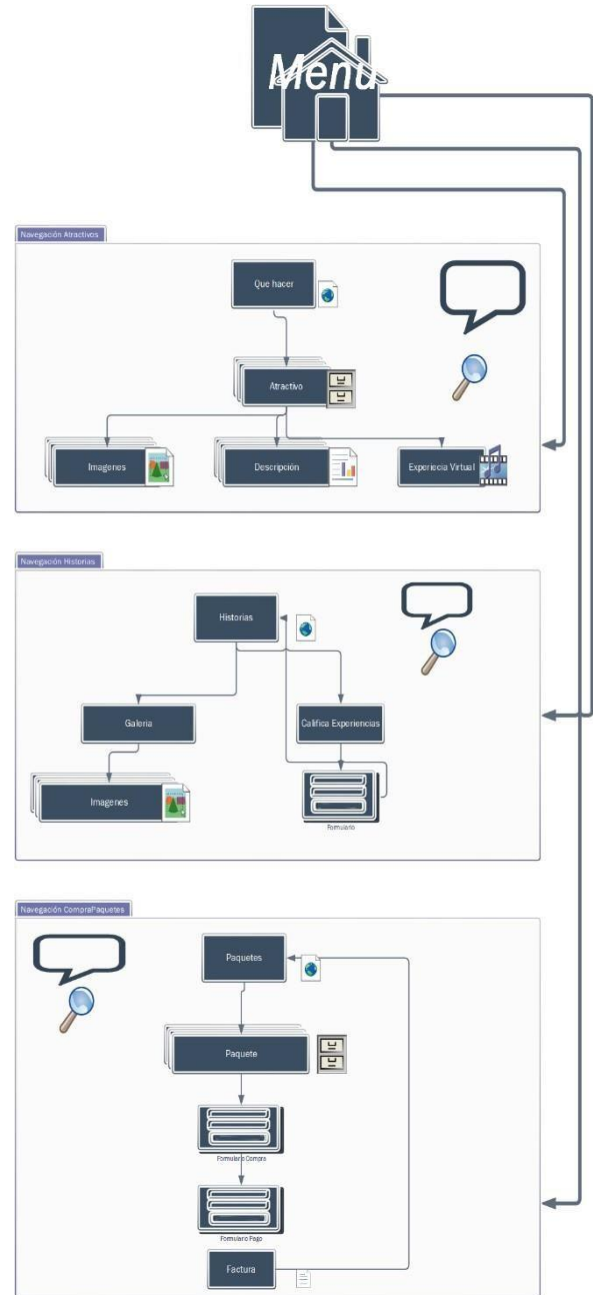


Figure 7. Navigation Model.

Presentation Design

In this phase, the user interface views are represented using standard UML interaction models (Figure 8).

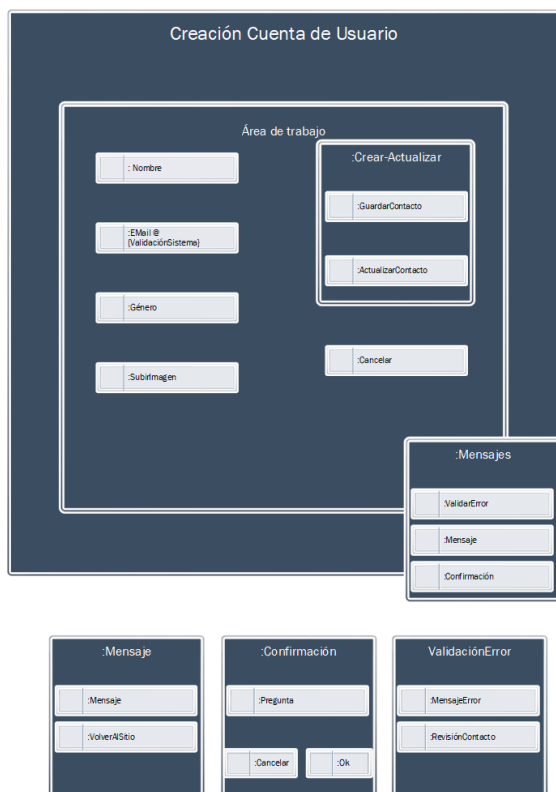


Figure 8. Presentation Model.

To develop a tourism web platform in line with the technological changes of the 21st century and the fourth industrial revolution, Drupal, a content management system better known as CMS (Content Management System), was chosen for its usability, robustness, modularity and security features.

Emerging industry tools are considered in the implementation of this platform.

4.0 such as cloud storage, geolocation and responsive web application on mobile devices, as shown in Figure 9.

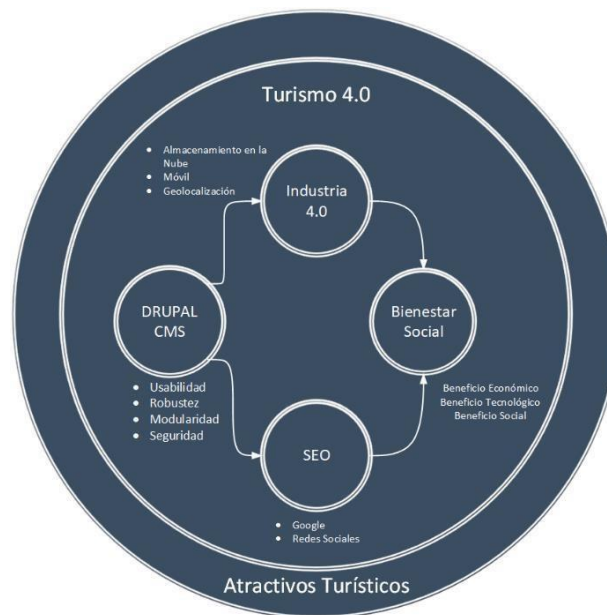


Figure 9. SMYTO tourism model.

Drupal presents competitive advantages to the software developer in areas of web development and SEO configuration, as listed below:

- It is a very complete CMS because it includes many features by default so you do not need to install extensions or modules to create any type of web. It offers the possibility of adapting to many formats in a simple way. It has great capacity for user administration.
- Drupal also allows SEO (Search Engine Optimization), which can be achieved by optimizing the page including elements such as: titles, content, URL, layout, tags, etc.

Before starting with the installation and configuration of Drupal, it is necessary to adhere to the deployment model, which considers the necessary services for the proper functioning of the web platform such as: hosting, web server, database management system and web browser compatibility (Figure 10).

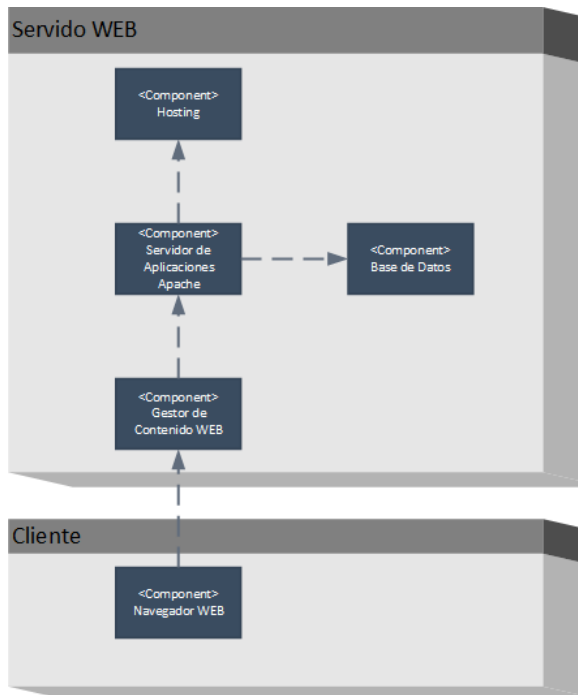


Figure 10. Deployment Diagram.

It is necessary to make prototypes through the design of Mockups (figure 11), in order to present them in a schematic and intuitive way to the client, this activity was carried out through a meeting with the municipal authorities, the proposal was presented through an open dialogue and feedback applying the principles of the Science, Technology and Society (STS) philosophy.

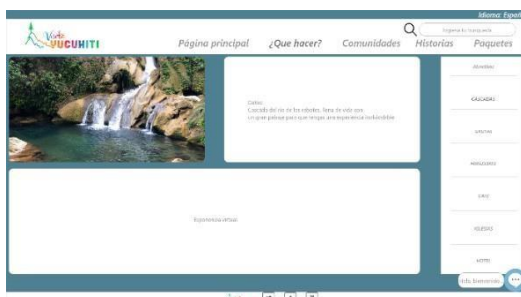


Figure 11. Mockup design.

DISCUSSION AND ANALYSIS OF RESULTS

The following are the results of the research project **Web Platform for the Positioning of Sustainable Tourism in the Municipality of Santa María Yucuhiti, Tlaxiaco,**

Oaxaca compliance with the objectives set.

During the field work, natural resources with tourism potential were identified, classified, evaluated and ranked, as shown in Table 1.

Table 1. Natural Resources.

Agency	Resources	Name
The loneline ss Caballo Rucio	Drainage	Drainage
Reyes Llano Grande	Ojo de Agua	Ojo de Agua
San Felipe de Jesus Pueblo Viejo	Geological Outcrop	Outcrops Zone
San Isidro Peace and Progress	Rio	The Bounces
San José Zaragoza	Waterfall	Zaragoza Waterfall
San Lucas Yosonicaje	Cavern	La Escondida
	Cave	Casa de Lluvia Chica Rain House
Santa María Yucuhiti	Waterfall	Yucuhiti Waterfall
Guadalupe Miramar	Ojo de Agua	Ojo de Agua

Cultural resources with tourism potential were also identified, see Table 2.

Table 2. Cultural Resources.

Agency	Resources	Name
Guadalupe Buenavista	Techniques and Knowledge Productive Traditional	Process of the Honey
		Process of Coffee
Guadalupe Miramar	Crafts and Arts	Handicrafts
	Techniques and Knowledge Productive Traditional	Process of the Honey
		Process of Coffee
La Soledad Horse Rucio	Techniques and Knowledge Productive Traditional	Process of the Honey
		Process of Coffee
Reyes Llano Grande	Music and Dance	Dance (Native Dance)
	Techniques and Knowledge	Coffee Processing

	Traditional Productive	
San Felipe from Jesus Pueblo Viejo	Archaeological Area	Zone Ino-Itún Archaeological Site
San Isidro Paz y Progress	Traditional Productive Techniques and Knowledge	Coffee Processing
San José Zaragoza	Techniques and Knowledge Traditional Productive	Honey Processing Coffee Processing
San Lucas Yosonicaje	Archaeological Area	Zone Ino-Itún Archaeological Site
	Arts and Crafts	Handicrafts
	Scientific Technical Achievements	Marmolera
Santa María Yucuhiti	Ethnography	The Language Mother tongue (Mixtec)
	Religious Festivals, Traditions and Popular Beliefs	Traditions and Customs
	Traditional Medicine	Traditional Medicine
	Music and Dance	Dance Music
Santa María Yucuhiti (Center)	Arts and Crafts	Handicrafts
	Gastronomic Events	Gastronomy Exhibition
	History / Vernacular	Santa Maria Yucuhiti Church
	Cultural Infrastructure	Museum Community

Based on the identified inventory, three tourism packages were designed (From the mountain, The Perfect Scent, and A Walk of a Thousand Waterfalls), taking into consideration the break-even point by applying the following formulas.

$$P.E (= \frac{\text{Costos fijos totales}}{\text{Precio} - \text{Costos variables}} - \frac{\text{Costos fijos}}{\text{Costos variables}} \times \frac{1}{\text{Ventas netas}})$$

For the development of the web platform, the domain name <https://visitayucuhiti.mx> was registered and the content was configured and edited in the Drupal CMS as shown in Figure 13. The most relevant modules to consider in this platform are: e-commerce, internal search engine, language change, forum, online chat, geolocation and SEO.

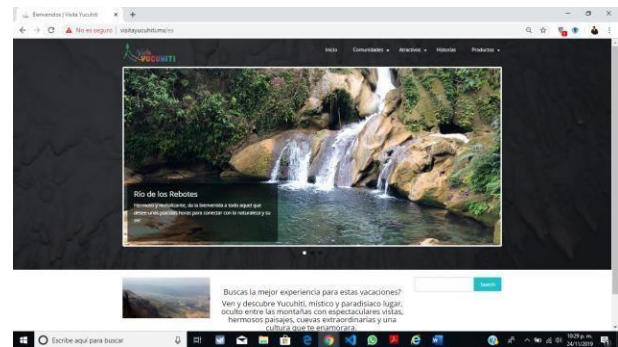


Figure 13. Tourism web platform.

As part of the digital marketing strategies, Google My Business was configured to register the name "Visita Yucuhiti" as a brand to position tourism in Santa María Yucuhiti (Figure 14).



Figure 14. Google My Business.

The Facebook fan page "Visita Yucuhiti" was configured, incorporating the previously designed corporate image (Figure 15).



Figure 15. Facebook configuration.

Figure 16 shows the traffic that is generated when publications of natural and cultural tourist attractions are made, this allows directing to the tourism web platform that is still under development.

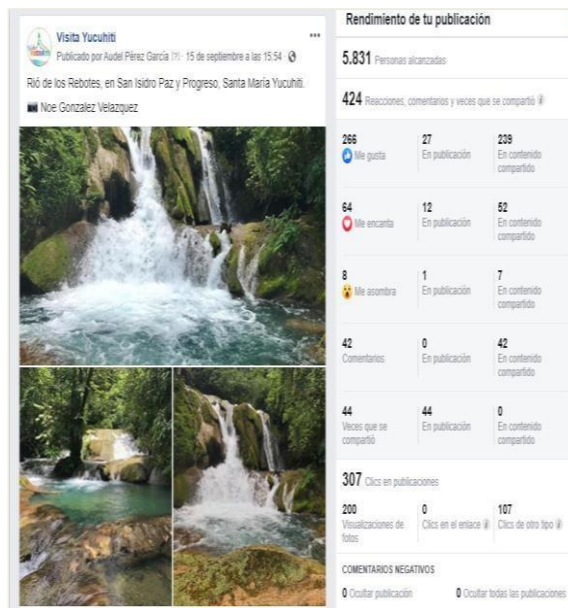


Figure 16. Traffic in social networks.

The quality of interactive communication was measured with indicators and web parameters as shown in Figure 17.

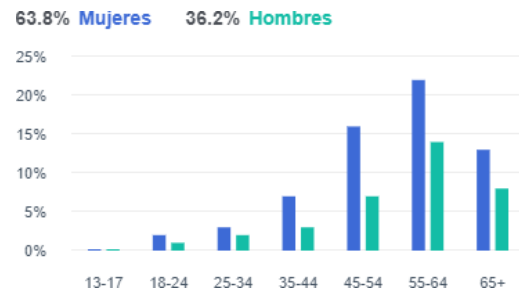


Figure 17. Market segment.

CONCLUSIONS

It is concluded that the use of emerging technologies of industry 4.0 should be promoted in Santa María Yucuhiti as an alternative to promote the tourism potential of this municipality, and with this create a sense of responsibility, social, cultural and ecological awareness in tourists.

These types of avant-garde projects have significant short-term economic, social and technological impacts on the community, as shown in Figure 18.

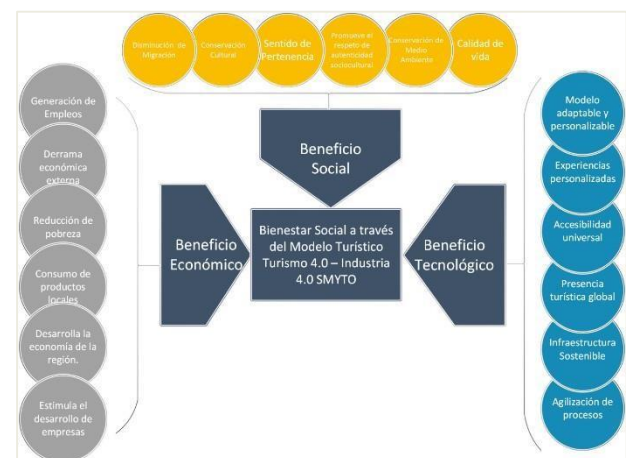


Figure 18. Benefits of Tourism in SMYTO.

The economic benefit has a direct impact on the population of SMYTO through the generation of direct and indirect jobs, external economic spillover, and consumption of local products;

This will contribute to poverty reduction, generate economic development in the region and stimulate the development of businesses with a sustainable approach.

In the social aspect, migration is reduced, culture is preserved, the sense of belonging and respect for socio-cultural authenticity is promoted, contributing to improve the quality of life of its inhabitants.

In the technological aspect, a robust, transferable and socially responsible tourism model is generated for tourism companies such as Santa María Yucuhiti with universal accessibility, generating global tourism presence as it is a sustainable infrastructure that will also streamline the communication process and exchange of experiences between locals and tourists (Figure 19).

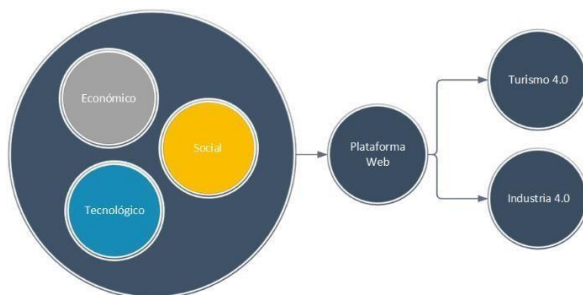


Figure 19. Sustainable Technology Model.

This tourism web platform based on the Drupal CMS is accessible to multiple search engines, with the influence of artificial intelligence, significantly impacting web positioning. Currently there are more eleven thousand visits with organic advertising and there are plans to invest in paid advertising to have a greater impact. Future projects for this tourism web platform are to incorporate the use of data mining and augmented reality according to tourism 4.0.

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