The importance of the use of technology for life care in communities of Mexico

La importancia del uso de la tecnología para el cuidado de la vida en comunidades de México

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Abstract

The aim of this study was to examined how technology can constitute a fundamental tool for caring for life in communities in Mexico. Through a qualitative approach, the relevance of technology and its implementation in improving the well-being of communities in vulnerable situations was investigated. First, a systematic literature review was carried out to demonstrate the relevance of technology in marginalized environments. The essential theoretical concepts that are linked to the care and maintenance of life are presented. Second, an analysis of the case of Jiquipilco, of the local products that rural producers want to spread. Finally, technological strategies were studied by the implementation of the design of a virtual tour in Jiquipilco rural zone, to optimize both the productivity and well-being of this community.

Resumen

El propósito de este estudio fue examinar cómo la tecnología puede constituir una herramienta fundamental para el cuidado de la vida en comunidades de México. A través de un enfoque cualitativo se investigó la relevancia de la tecnología y su implementación en la mejora del bienestar de comunidades en situación de vulnerabilidad. Para ello, se realizó una revisión sistemática de la literatura que demostró la relevancia de la tecnología en entornos marginados, incluyendo los conceptos teóricos esenciales que están vinculados al cuidado y mantenimiento de la vida. A continuación, se realizó un análisis del caso de Jiquipilco, de los productos locales que desean difundir los productores rurales. Finalmente, se estudiaron las estrategias tecnológicas mediante la implementación de un recorrido virtual en dicha zona rural, con el objetivo de optimizar tanto la productividad como el bienestar de esta comunidad.

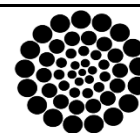**Virtual tours, Life care, Rural communities.**

Recorridos virtuales, Cuidado de la vida, Comunidades rurales

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Article

Introduction

Life care is a broad concept that incorporates practices and values aimed at preserving and improving the quality of life in various dimensions. In this context, technological advances have revolutionised different aspects of society, including the way in which life care needs are addressed in vulnerable communities in Mexico and Latin America. Thus, this documentary and interpretative study focuses on analysing the importance of technology today, exploring the referents of the notion of life care and presenting the case of Jiquipilco, a pulque trail of rural producers, where the impact of the use of technology for productivity is observed.

The problem addressed focuses on the adverse socio-economic and environmental conditions faced by many communities in the region, exacerbated by the lack of access to basic services, adequate resources and development opportunities. The objective of this study was to analyse how the use of technology can contribute to the care of life in these contexts, showing how some tools, for example, virtual tours, can reduce the technological gap, promoting the inclusion of remote communities and encouraging the support of distant populations.

The importance of the study lies in understanding how these technological tools can be used effectively to improve the care of life in vulnerable communities, providing insights to improve public policies and innovative development strategies, adapted to the specific needs of each community. It also seeks to contribute to the existing body of knowledge, offering practical ideas and informed recommendations that promote more inclusive and sustainable development in the region, and serve as a basis for future research focused on intervening in marginalised communities to improve productive conditions.

In this way, it also highlights the importance of integrating technologies in the care of life in vulnerable communities in Mexico and Latin America, considering their socio-cultural, economic and environmental characteristics. In recent years, the use of technology has become increasingly important, being a crucial element to improve the quality of life and promote sustainable development in these regions.

However, although technology offers significant possibilities, there are barriers that limit its access and use at the community level. It is precisely in this context that the relevance of this study emerges as it seeks to address these goals and contribute positively to the lives of individuals and communities, despite the obstacles present.

Background

Technology has been key to the development of productive communities in Mexico, improving both the quality of life and the sustainability of their economic activities. However, social inequalities generate gaps in access to these innovations, especially in rural and semi-urban areas. These communities face challenges such as resource scarcity, climate change and the need to optimise production processes, which requires the incorporation of appropriate technologies. These innovative tools not only increase efficiency and productivity, but also promote more sustainable and environmentally responsible practices, which are essential for the care of life in these environments.

Uses of Technology in Life Care

Technological innovations have transformed various aspects of human life, but its impact on life care is one of the most significant. In countries of the Global South, where it faces challenges in health, environment and economic development, it has become an essential tool for improving quality of life and promoting sustainability.

One example of the uses of technology is in the implementation of advanced agricultural technologies, such as automated irrigation systems, drones for crop monitoring and sensors for water resource management, which have proven to be effective in increasing yields and reducing resource wastage (Garcia, 2020).

Another example is renewable energies, such as solar and wind, which have provided viable and environmentally friendly alternatives to meet the energy needs of these communities. This has contributed to the reduction of dependence on fossil fuels, mitigation of environmental impact and consequent improvement of energy security (López & Pérez, 2019; IRENA, 2019).

A third example can be found in the field of health, where we recognise that in southern countries, limitations in infrastructure and access to health services are persistent challenges; however, through the use of telemedicine and mobile technologies, a viable solution was found by revolutionising access to medical services and allowing health professionals to provide quality care to remote communities without the need to travel long distances. This is particularly relevant in the Mexican context where geography can be a significant barrier to the provision of health services (Martínez, 2018).

Another example is the use of mobile devices for disease diagnosis and monitoring in rural areas of Africa (WHO, 2019). Similarly, the implementation of electronic health information systems has improved the management of medical data, as well as facilitating better patient monitoring and optimising available resources (UNAIDS, 2020).

Another area where technology has had a significant impact is in education and training, as online learning platforms have advanced access to education by enabling students from disadvantaged regions to access high-quality educational resources (UNESCO, 2020). In this regard, massive open online courses (MOOCs) have been particularly effective in providing technical and vocational training, preparing people for jobs in the digital economy (World Economic Forum, 2021).

Regarding the use of information and communication technologies (ICTs), they facilitate the creation of collaborative and supportive networks among productive communities by promoting education, knowledge sharing and access to wider markets (Rodriguez, 2021). In this way, when digital tools are socialised, they can be essential to empower local producers by improving their ability to compete in the global market and ensure the sustainability of their productive activities.

Finally, while all of these areas require attention for the development and improvement of quality of life and care, the environment and sustainability are also important, and it is in the fight against climate change and the management of natural resources in the South where the use of technology has been crucial.

In short, technology has played and continues to play a fundamental role in caring for life from Southern perspectives by addressing specific challenges in areas such as health, agriculture, education and the environment.

Classical sociological perspectives on life care

Care for life from the sociological perspective emphasises the importance of the protection and preservation of human life in society and the environment; it promotes the idea that all people should be responsible for caring for our own lives, the lives of others, and the lives of the animal and plant species that inhabit our planet. Among the authors who have put forward this proposal in sociology is Leonardo Boff, in his book *Ecology: Cry of the Earth, Cry of the Poor* (1992), who mentions the importance of caring for life in the construction of a more just and equitable society, and defends the idea that ecology and social justice are intrinsically linked, and that only through caring for life can we build a more sustainable and humane world.

Contemporary Sociological Proposals on Care for Life

Several sociological approaches to care for life have been studied. In the first instance, Joan Tronto's Theory of Care in her work *Moral Boundaries: A Political Argument for an Ethic of Care* (1993), where she proposes an ethic of care that challenges the traditional boundaries between the public and the private, and between the moral and the political. For Tronto, care is an essential activity for human life and must be recognised and valued in all its forms, for which he establishes four phases of care: attending, assuming responsibility, caring and receiving care, all with moral components (Tronto, 1993).

The second proposal is found in Harold Garfinkel's *Ethnomethodology and Care*, the founder of ethnomethodology, which offers a perspective on care, focusing on how people produce and sustain the social order in their daily lives. Furthermore, in his text *Studies in Ethnomethodology* (1967), Garfinkel explores how social actors use practical methods to manage their daily activities and care, as, from this perspective, care is understood as an everyday practice that requires situated skills and knowledge (Garfinkel, 1967).

In this context, the aim of this work was to apply technological tools for the development of a virtual tour of a community in the State of Mexico and to evaluate how the implementation of this technological tool affects the care of life and the sustainable development of the area.

Methodology

Selection of a rural area as a case study

The case study was selected through purposive sampling, looking for a locality that illustrated different geographical, socioeconomic and cultural contexts, representative of Mexico and Latin America. In this context, Jiquipilco was selected as the site for this case study.

Jiquipilco is a municipality located northeast of the Toluca Valley in the State of Mexico, widely recognised as a producer of maguey and, particularly, of pulque. However, given its geographic location, it has faced significant challenges due to the lack of technology that would allow them to make their products known at a national level.

Therefore, in collaboration with the Universidad Politécnica del Valle de México and the Universidad Politécnica de Atlacomulco, technologists, experts and students developed a 'Virtual Tour of the Pulque Trail', taking into consideration two lines of action: 1) methodology to explore and digitally represent the route associated with the cultural route and 2) as a technological tool to maximise the production of maguey and thus have a positive impact on the care of the lives of the inhabitants.

Virtual tour

The development of the virtual tour was carried out in two stages: the identification of nodes or access points and the development and implementation of the virtual tour.

Identification of nodes

In order to understand the context of the municipality of Jiquipilco and to identify the stages of an itinerary that fully represents the local customs and traditions of the municipality, semi-structured interviews were conducted with maguey producers.

Through this means, the most appropriate nodes (access points) for the virtual tour were identified, as well as the main services and tourist attractions that should be highlighted in it.

The nodes were selected on the basis of factors such as:

1) **Cultural and productive importance**, i.e. strategic points were selected with reference to the elaboration of pulque and other items made from maguey;
2) **Social and economic impact**, according to their relevance for community welfare, with the goal of improving the living conditions of rural farmers;
3) **Interconnection with the user experience**, as the nodes provide a meaningful experience for users of the virtual tour, delivering valuable data about pulque production, regional culture and ongoing sustainability initiatives.

Thus, these factors allowed for the creation of a real and informative virtual tour of Jiquipilco, with the potential to promote traditions and market regional products, to encourage care for the lives of the inhabitants of this rural area.

Development and implementation of the virtual tour

The development of the virtual tour was divided into two stages: 1) image capture and 2) image processing. The first stage consisted of carrying out a photographic survey in the Jiquipilco area in each of the previously established nodes, combining internal and external shots via land. The images and interactive video were captured with a 360° camera (RICOH-PENTAX, Theta Z1 - 51GB, Japan) with a resolution of 23 megapixels and a professional camera (Nikon, D7000, USA).

The second stage was to process the images in order to develop the virtual tour website. The virtual tour entitled 'La Senda del Pulque' was designed with the software Virtual Tour Pro (V. 2023), a programme specialised in the generation of virtual environments and immersive 360° experiences.

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Application of surveys and interviews

After the launch of the website, a qualitative and quantitative analysis was carried out by means of surveys directed at visitors to the tour and follow-up interviews with producers to measure the impact of the virtual tour on the visibility and commercialisation of the products and on the producers' livelihoods.

Finally, the frequency of visits to the site and the sale of pulque (one of the products of greatest economic income for the producers) during the first six months after the publication of the virtual tour were counted, with the intention of evaluating the impact of the publication of this technological tool on the care of the lives of the people of Jiquipilco.

Results

Publication of the virtual tour

The virtual tour was published on the server *https://proyectosva.com.mx/RVSP/*; it was designed to give access to visitors through any device, desktop or mobile, in order to reach a wider audience.

In addition, elements were implemented to provide a user-friendly, understandable and easy-to-use design and access for all types of users. Some of the elements used were: direction or guide arrows to go through the whole 'Senda del Pulque'; information capsules identified with a *, to* provide information of interest to the visitor; photographs and videos, which are of interest and encourage the permanence in the virtual tour, but above all to promote the visit to the rural spaces of Jiquipilco, and, thus, highlight the artisan and field work that is done in these communities.

On the one hand, Figure 1 shows a full screen of the main page of the virtual tour 'Senda del Pulque', visualised on a desktop device.

Figure 2, on the other hand, presents several screenshots of the same site, but from a mobile device. In both views it is possible to visualise clear, dynamic and 360° images.
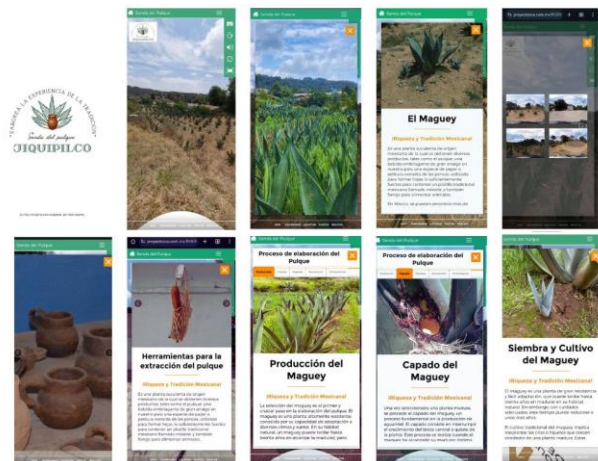
Box 1
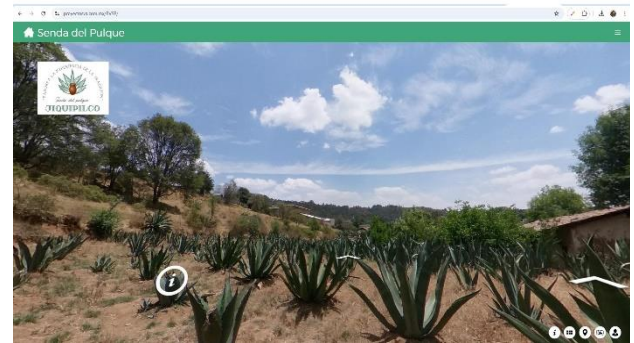
Figure 1

Main screen of the virtual tour "Senda del Pulque" from a computer on the server: https://proyectosva.com.mx/RVSP

Own source

Box 2

Figure 2

Screenshots of the virtual tour "Sendero del pulque" published on the server: https://proyectosva.com.mx/RVSP

Evaluation of the socio-cultural and life-care impact after implementation of the virtual tour

In the surveys, platform users highlighted both the immersive and educational experience provided by the virtual tour and also expressed a greater interest in maguey products, which translated into an increase in both enquiries and potential sales.

On the other hand, producers, in addition to the increase in sales, reported an increase in the visibility of agricultural activities and in obtaining strategic allies.

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Thus, Figure 3 shows graphically the unique visits to the virtual tour 'Sendero del Pulque' and the litres of pulque sold before and after the launching of the website; in each of these parameters it is highlighted that month by month the interest in visiting the virtual site increased, as well as the sale of pulque. It can be seen that the increase is relevant, as increased visibility resulted in more occasions for customers to become familiar with the product and the maguey tradition.

Box 3
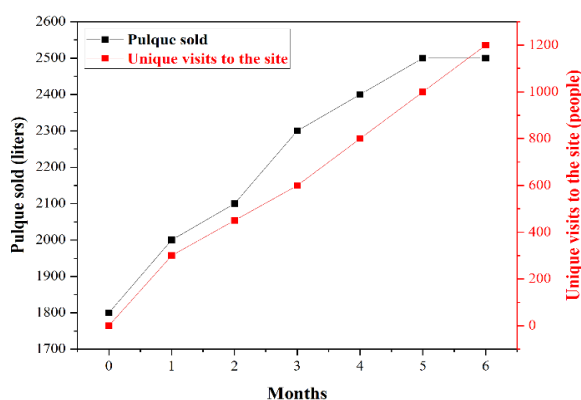
Figure 1

Graphical representation of the unique visits to the "Sendero del Pulque" virtual tour and litres of pulque sold before and after the launch of the technological tool

In this sense, it can be observed that pulque sales increased by 15% during the first quarter of the tour's launch and by 38% six months later, according to the producers. In this way, the increase in sales is attributed to the visibility of the product, facilitated by the implementation of the virtual tour; in addition, this same tour made the agricultural activities known, which resulted in new consumers, the formation of strategic alliances and the strengthening of demand, both locally and in larger markets.

The interviews also explored the progress made with the sale of other maguey-related products, which rose from 10 to 150 pieces, according to the producers, in the same period of time.

Similarly, another important fact is the rapprochement of commercial associations, from 1 to 5, in the six months analysed, as well as the participation in fairs and other events.

Finally, user satisfaction stood at 90% of positive responses after completing the tour. The findings show the positive effect of the virtual tour on the visibility and promotion of local products. This made it possible to observe a significant increase in the purchase and sale of pulque, as well as products derived from the maguey.

Conclusions

This study highlights the fundamental role of technology in the care of life and economic development of vulnerable rural communities in Mexico, as seen in the case of the 'Senda del Pulque' in Jiquipilco. The implementation of the virtual tour made it possible to overcome geographical and economic barriers, facilitating the connection of producers with a wider public, without the need to travel, which contributed both to productivity and to the strengthening of local cultural and tourist identity. In addition, accessibility, through technology, has encouraged community participation in training workshops, promoting the use of technological tools to optimise production processes and improve efficiency in resource management, key elements for the care of life in these environments.

The visibility provided by this platform also expanded the demand for maguey-derived products, such as pulque, and attracted the interest of investors who see growth potential in this production, thus fostering strategic partnerships that support the expansion of infrastructure and technological development in the community.

Following Smith's assertion that virtual tour technologies can be a powerful tool for education and awareness-raising about sustainable practices, it is particularly relevant in this context, as these tours allow knowledge about traditional and sustainable agricultural techniques to be shared with a global audience, facilitating the transmission of knowledge that contributes to the replication of these practices elsewhere. This global access also opens doors to financial and volunteer support through donations and volunteer programmes, increasing the possibilities for sustainability and expansion of rural productive projects.

Furthermore, technology acts as an essential pillar for the care of life in these communities, improving the productivity and well-being of their inhabitants. Sociological perspectives on the use of technology underline the importance of designing tools that not only increase efficiency, but also respect and value local care practices and promote equity and genuine communication at the community level. Thus, the design and application of technologies should focus on these values in order to maximise their positive impact.

The case of the 'Senda del Pulque' represents a significant initiative in terms of food security, environmental education and social inclusion, promoting practices that contribute to sustainability and resilience in the face of modern challenges. To ensure the continuity of these benefits, constant support from both the community and institutions is required, so that the sustainability of these initiatives is guaranteed in the long term.

Ultimately, the implementation of virtual tours and other innovative tools in rural areas reflects the transformative potential of technology to care for life in Mexico. The integration of these resources allows for building a future in which accessibility, wellbeing and sustainability are within the reach of all productive communities, demonstrating that, through technology, it is possible to promote inclusive and just development for those who face the greatest challenges.

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the article reported in this paper.

Authors' contribution

Flores-Azcanio, Nancy P: Conceptualisation, methodology, software, validation, analysis, research, resources, writing-drafting, writing-revising and editing, visualization.

García-Hernández, Alitzel B.: Validation, writing-revision and editing, visualization.

Abbreviations

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