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ORIGINAL

Incubation of environmental projects through mobile learning

Incubación de proyectos medioambientales mediante aprendizaje móvil

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ABSTRACT

The concept of environmental projects is socially associated with the altruism of non-profit organizations. However, the green economy has shown that there are ways to make green ventures profitable by linking them to responsible consumption. One of the greatest difficulties in undertaking these environmental projects is the lack of information, support, financing and collaboration networks. As a proposed solution to this problem, a discussion group was held with young entrepreneurs from the Centro Universitario de Ciencias Económico Administrativas of the University of Guadalajara, to conceive proposals for the design of a mobile application that facilitates the incubation of environmental projects in Zapopan. A qualitative methodology with an interpretive approach was used to recognize the perceptions of young people about the environment, educational technology and environmental and social entrepreneurship. Finally, 10 proposals for mobile applications were conceived to incubate environmental projects in Zapopan. These proposals serve as a starting point to recognize the information needs and aspirations of the typical users of this platform: social and environmental entrepreneurs. Although there are previous references such as the Ecomentes application in Veracruz, they have not achieved popularity due to a series of factors that are analyzed in the research.

Keywords: Mobile Learning; Environmental Education; Environmental Projects.

RESUMEN

El concepto de proyectos medioambientales está socialmente asociado al altruismo de las organizaciones sin fines de lucro. Sin embargo, la economía verde ha demostrado que existen maneras de rentabilizar los emprendimientos verdes vinculándolos a un consumo responsable. Una de las mayores dificultades a la hora de emprender estos proyectos medioambientales es la escasez de información, acompañamiento, financiamiento y redes de colaboración. Como propuesta de solución a este problema, se realizó un grupo de discusión con jóvenes emprendedores del Centro Universitario de Ciencias Económico Administrativas de la Universidad de Guadalajara, para concebir propuestas de diseño de una aplicación móvil que facilite la incubación de proyectos medioambientales en Zapopan. Se empleó una metodología cualitativa con enfoque interpretativo para reconocer las percepciones de los jóvenes sobre el medio ambiente, la tecnología educativa y el emprendimiento ambiental y social. Finalmente, se concibieron 10 propuestas de aplicaciones móviles para incubar proyectos medioambientales en Zapopan. Estas propuestas sirven como punto de partida para reconocer las necesidades de información y aspiraciones de los usuarios tipo de esta plataforma: los emprendedores sociales y medioambientales. Si bien existen referentes previos como la aplicación Ecomentes en Veracruz, no han alcanzado la popularidad por una serie de factores que se analizan en la investigación.

Palabras clave: Aprendizaje Móvil; Educación Ambiental; Proyectos Medioambientales.

INTRODUCTION

Mobile environmental applications focused on generating changes in citizen behavior are examples of non-formal educational spaces that positively influence the construction of new frameworks for pro-environmental behavior. However, only a small proportion of these applications achieve success in the market. This could be linked to aspects as diverse as their place of origin, language, didactic strategy, or the design of the app itself.

Nielsen (2011) recognizes the main factors that discourage users from using applications: small screens, complicated inputs, download delays, and poorly designed sites. The truth is that an educator or an expert in instructional design is rarely involved in the conception of an educational app (S. Pastore and Martin, 2013; Arenales and Saldaña Barrios, 2024). This disciplinary separation has meant that much of the mobile learning content is far from the required quality (S. Pastore and Martin, 2013).

Observing that no study has been carried out to date analyzing environmental education through mobile learning in the municipality of Zapopan, Jalisco, the effort of this research was proposed. All the ecological applications available online in Spanish, English, and French were mapped to do this. They were classified according to their country of origin, number of downloads, type of content, main functionalities, target audience, didactic strategies, and business model.

Once the existing apps were analyzed, two discussion groups were organized with young social and environmental entrepreneurs from the Center for Support to Entrepreneurship and Innovation of CUCEA to learn about their perceptions of the environment, educational technology, and environmental and social entrepreneurship. Finally, they worked in groups of 3 and 4 to develop 11 proposals for mobile applications to incubate environmental projects in Zapopan.

Theoretical basis

Community environmental education

Environmental education refers to the "permanent interdisciplinary process aimed at education, whose main characteristics are the recognition of values, the development of concepts, skills, and attitudes necessary for a harmonious coexistence between human beings, their culture, and their surrounding biophysical environment" (Valera and Silva, 2012, p. 196).

Sauvé (2005) exhaustively describes fifteen different currents in the approach to Environmental Education. Gutiérrez and Pozo (2006) take on grouping these currents and summarizing the assumptions that affect Environmental Education. In this regard, they propose a series of sociological, psychological, and educational theories that explain the pro-environmental behavior of social groups and individuals. The present research is affiliated with sociocultural constructivist theories that explain pro-environmental behaviors as habituation processes, shared social facts, and collective legitimization.

The constructivist current starts from society's influence in the acquisition of knowledge. This model is based on constructing knowledge from previously acquired schemes integrated and consolidated in the cognitive structure. (Hernández, 2008; Campanario and Otero, 2000). It also subscribes to the problem-solving approach, which understands the need to adopt an environmental education focused on action and the search for solutions to specific problems through local communities' association and joint work.

Environmental education for incubation through mobile learning Kortabitarte et al. (2018) suggest that "apps, in particular, can help create learning scenarios where emotions play an important role through interactivity and sensory experience." (p.68) For their part, Cárdenas and Cáceres (2019) consider them an excellent means of providing educational content in terms of popularity and availability.

Castells (2011), referring to the social and economic effects of mobile technology, states that, from a sociological point of view, wireless technology distinguishes not mobility but permanent connectivity and the expansion of communicative capacity.

Castells focuses on the communicative potential of these devices and recognizes them as essential instruments of political participation since (mobile phones) "have generated instant communities of practice, that is, ephemeral organizational forms that are constituted around a practice based on the dissemination of a message."

However, few mobile applications for environmental education offer communication functionalities within the platform, the majority being those that work with a social network model. The fact is that an educator or an expert in instructional design is rarely involved in the design of an educational app (S Pastore and Martin, 2013; Arenales and Saldaña Barrios, 2024). That is why the effort of this research is necessary to provide an understanding, from the voices of young entrepreneurs, of what an environmental incubation application in Zapopan should be like today.

METHOD

A qualitative methodology was used because it is understood that the predispositions that determine the uses of environmental educational applications are determined by subjective factors that cannot be completely

reflected or analyzed by numerical quantification. The phenomenon of appropriation of educational technologies is crossed by multiple psychosocial factors that deserve their own exploration. A descriptive approach allows us to capture the wealth of perspectives and experiences of users and experts in educational mobile application development and offer a vision of the phenomenon in question.

The ethnographic method was used in the design and development of two discussion groups with young social and environmental entrepreneurs aged 17 and 23, respectively, who were participating in an entrepreneurship workshop at the Center for Support for Entrepreneurship and Innovation at the University Center for Economic and Administrative Sciences at the University of Guadalajara. The study subjects were selected from a non-representative random sample.

The ethnographic method has proven effective in environmental education as it focuses on human practices and the meanings that these practices establish in terms of environmental perception and pro-environmental behavior (Zappi, 2016). Likewise, ethnography is recognized as a multi-technical and not only qualitative method (Apud, 2013) where it is possible to mix observation and interviews with various psychometric techniques and questionnaires.

RESULTS

Availability of environmental mobile applications today

According to Fahri Hanafi, H. (2012), most mobile applications available today are developed on the Android system. This preponderance of the free operating system facilitates access to free non-formal knowledge for the general public. In the search for mobile applications for environmental education, more than 70 applications were found globally with diverse themes and approaches and some conclusions were drawn.

Taking the available data as a reference, the central countries producing environmental education apps are the United States with 14, France with 10, and Spain and Mexico with 7, respectively. In the case of other regions, Australia has three apps, Canada and Israel have two apps, respectively, and finally, India, Jamaica, Nigeria, Singapore, and Germany have one app each.

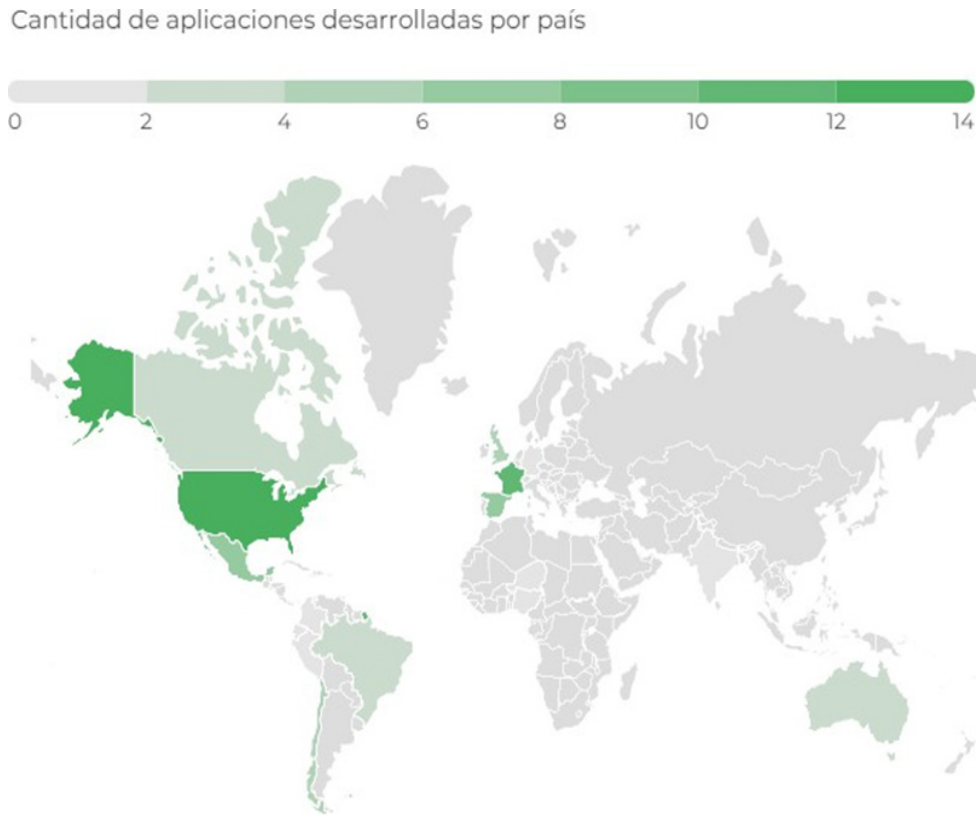

Figure 1. Number of applications developed by country

In the Latin American region, Chile stands out with 4 apps, Brazil with 3, Colombia with 1, Peru with 1 and Ecuador with 1.

Mexico shares the number three position with Spain as the largest producer of environmental applications. It is ranked sixth among the countries with the highest number of downloads of environmental applications worldwide.

Figure 2. Number of apps by country in Latin America

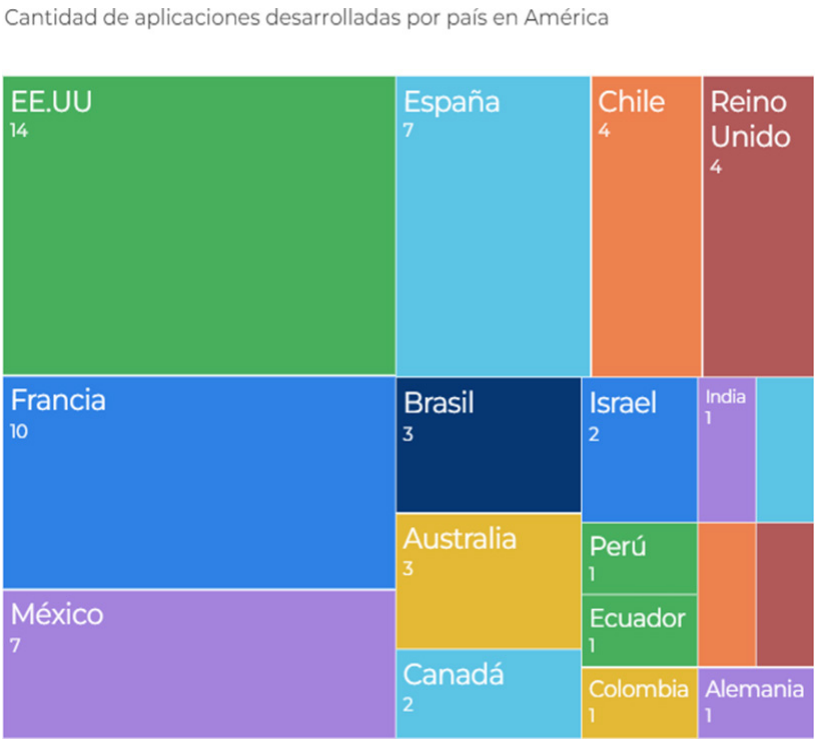

Figure 3. Number of applications developed by country in the Americas

On the other hand, there are applications developed by groups of countries or international organizations, such as three apps whose ownership is attributed to the European Union, two to the United Nations, and 1 to National Geographic

It is important to emphasize that the quantity of applications developed by each country does not determine their quality or commercial success. Although the application with the most downloads is the Weather Channel, developed in the United States, with 100 million downloads, the second most downloaded app is Ecosia, the only German app found in English, with 10 million downloads.

When analyzing the type of content or focus, it is found that most of the applications focus on recycling, followed by apps aimed at promoting an environmental lifestyle through small everyday actions. However, when the number of downloads is related to the type of content, recycling apps are fifth in number of downloads, with the most downloaded apps being those about the climate, reforestation, second uses, and environmental events and courses.

Figure 4. Number of applications developed by international organizations

Figure 5. Applications with the highest number of downloads

For their part, the applications with the highest number of downloads are not always so because of the type of content or approach they have. However, this is the case with most downloaded apps because of their functionalities and benefits. The first is a very accurate real-time weather update app (The Weather Channel), and the second is a search engine that promises to plant trees for every search made (Ecosia), followed by an app for exchanging and selling second-hand items. Thus, the app's functionalities and perceived usefulness for the user significantly impact its subsequent download and sustained use over time.

Continuing with the analysis of the functionalities, if they are linked to the total number of downloads, the applications with the highest number of downloads are those that offer weather forecasting functions, search engines, online exchanges, events, courses and internships, recycling guides and maps, energy consumption monitoring, food collection services, and strategy games.

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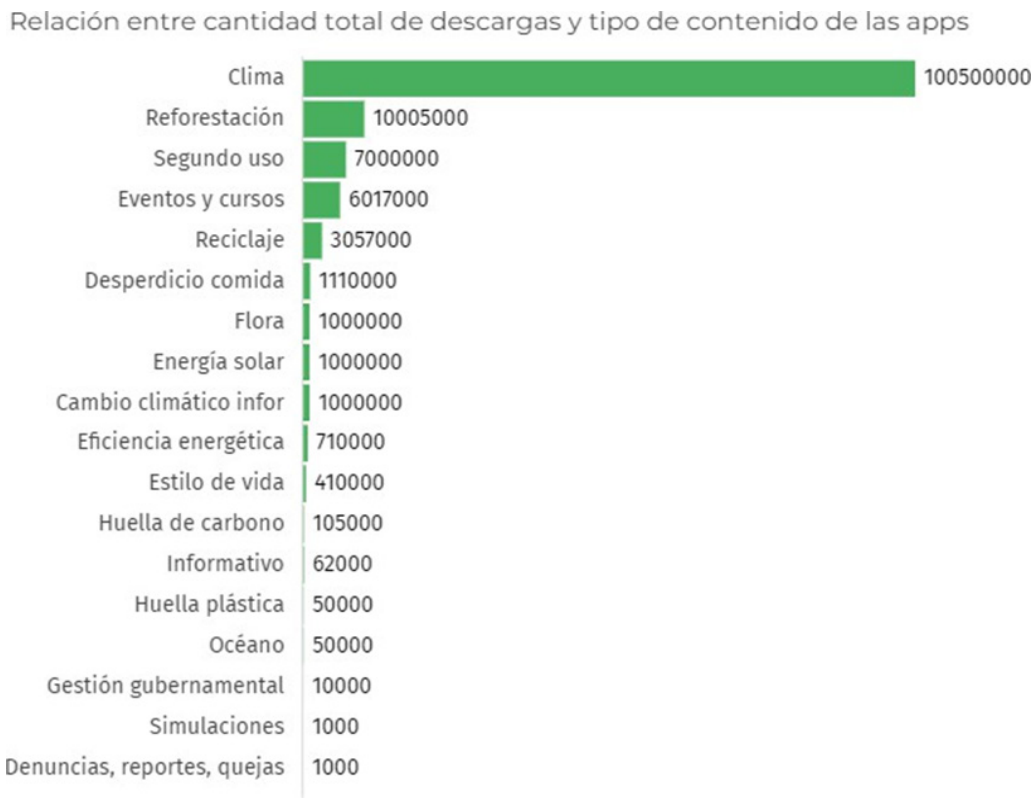

Figure 6. Relationship between total number of downloads and type of app content

Figure 7. Relationship between total number of downloads and functionalities offered by the apps

On the other hand, if we analyze the segment of the public at which the apps are aimed, we see that the majority are oriented toward offering environmental services for the home, which we define as (Home B2C). In second place would be the apps that focus on linking companies with the community, which we classify as (Community-Activism-Companies), followed by those applications that, without commercial mediation, aim to function as spaces for social organization and education in pursuit of environmental good; these we classify as (Activism). This coincides with the number of downloads, with the most downloaded applications oriented to the B2C Home, followed by those of Activism and Community-Activism-Business.

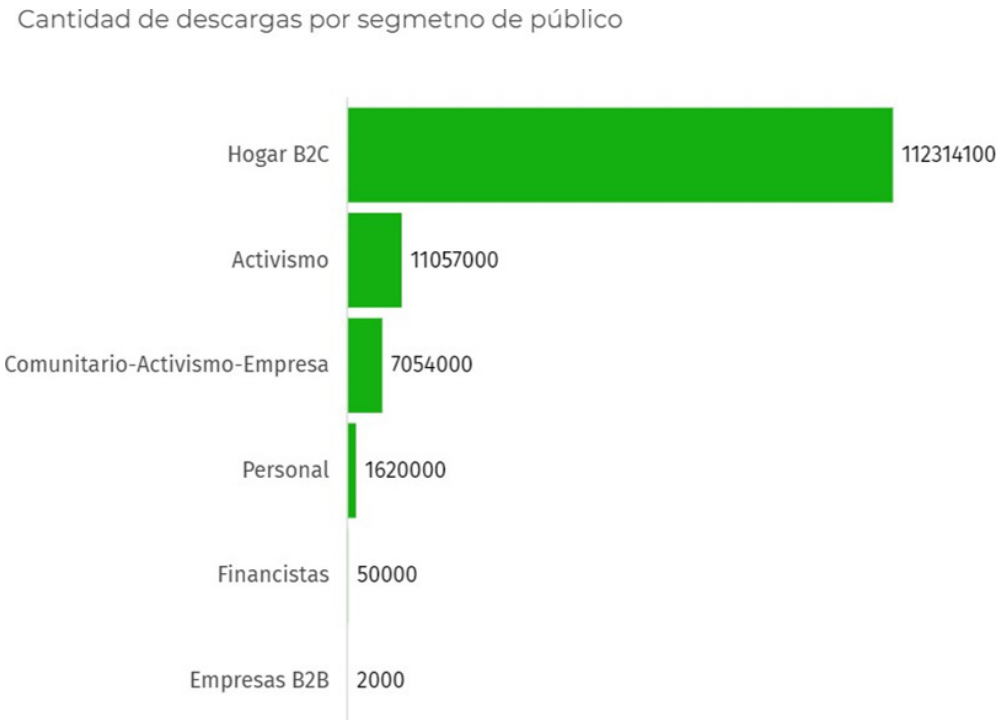

Figure 8. Number of downloads by audience segment

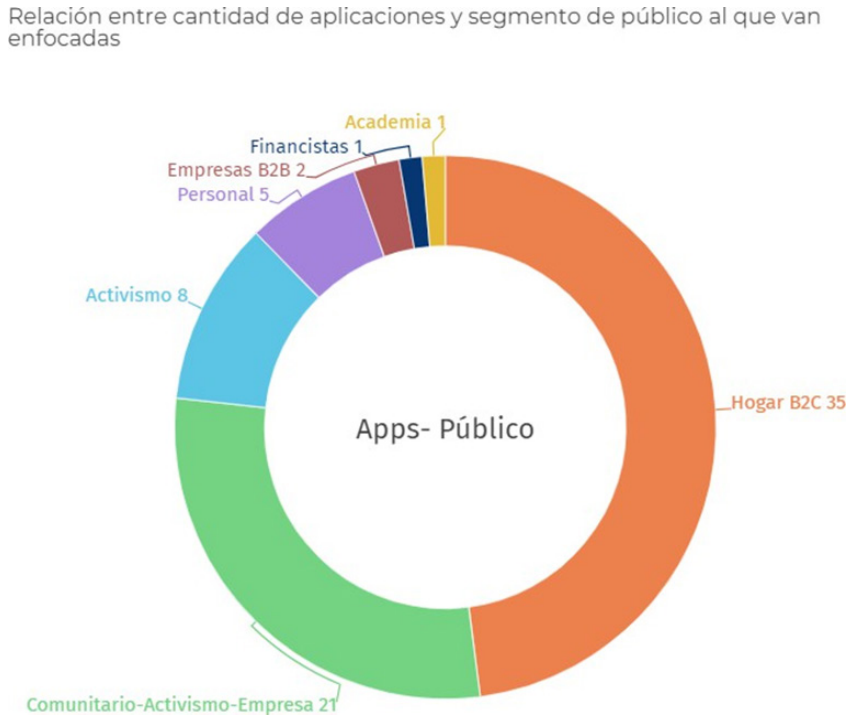

Figure 9. Relationship between the number of applications and the target audience segment

In addition, the predictive power index shows that the Business Model and Instructional Strategy are strong predictors for the Audience Segment. When grouping by Instructional Strategy and retention strategies, it is evident that specific categories have a significant impact; for example, the "Gamification" strategy mainly attracts a "personal" audience since this type of app is aimed at solitary and immersive play. The "Challenges, Competitions and Rewards" have more Community-Activism-Business users. "Quizzes," "Online Courses," and "Project-Based Learning" are strategies that connect more with the Activist audience.

On the other hand, the retention strategy focused on "Prizes, rewards, digital wallet" and "Sales and discounts" target the Home B2C triad. At the same time, the "Social Network" brings together the Community-Activism-Business audience. This suggests that challenges and social interaction may attract a more community-oriented audience, while services and material benefits bring companies into contact with a family audience.

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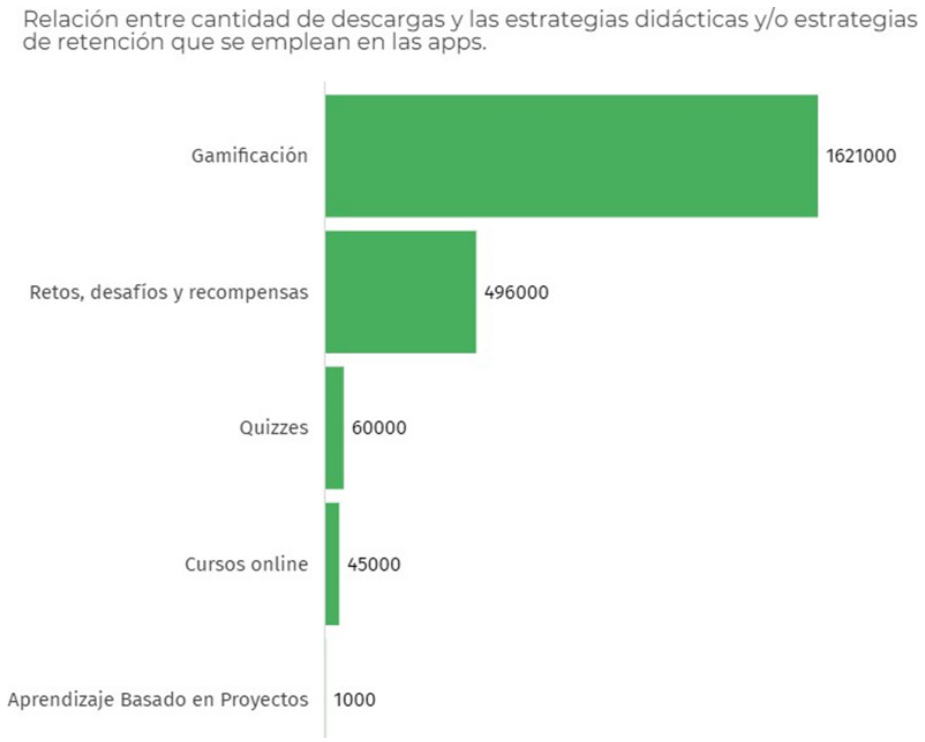

Figure 10. Relationship between number of downloads and didactic strategies and/or retention strategies used in the apps

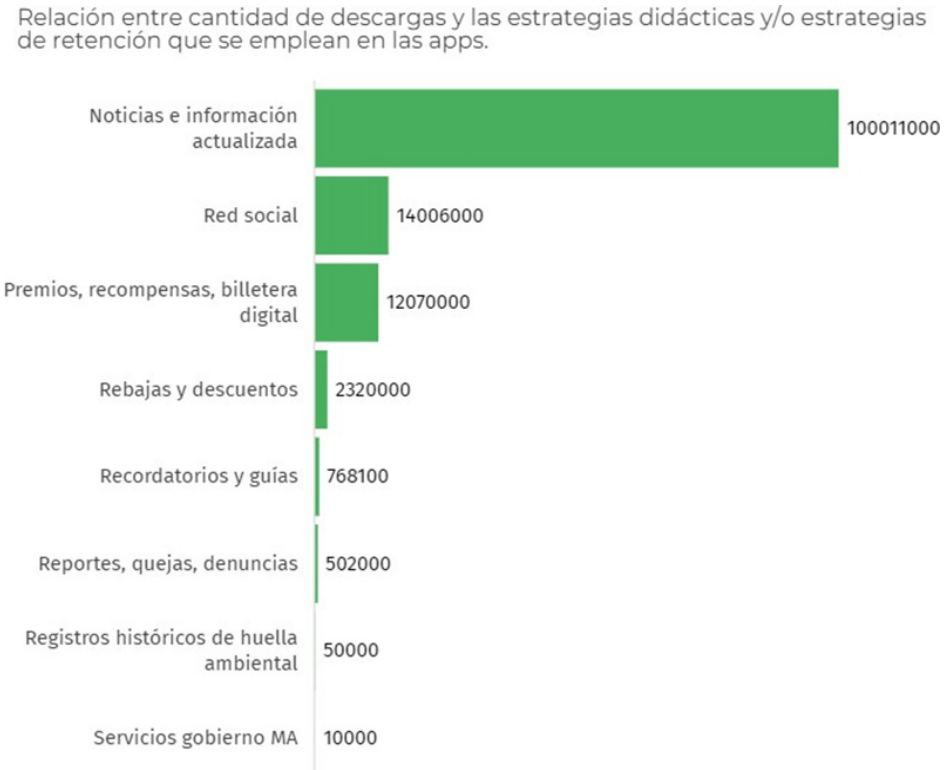

Figure 11. Relationship between number of downloads and didactic strategies and/or retention strategies used in the apps

Considering the teaching and retention strategies used, the apps that offer the updated climate news service obtained the highest number of downloads. In second place are those offering the social network learning model, connecting with environmental services and community organizations. These are followed by apps that offer prizes, rewards, and access to a digital wallet that compensates you for recycling. Sale and discount apps were the fourth most downloaded, followed by video games and those that offer environmental challenges within a limited time frame.

As with the teaching and retention strategies, when grouping by Business Model, specific categories affect the composition of the Audience Segment. For example, the business model based on collaboration with brands and advertising seems to be the primary funding source for applications with a higher percentage of

an “Activist” audience. At the same time, Marketplace and Home Recycling Service make applications with a higher percentage of B2C households public profitable. This indicates that the service sector and e-commerce are attractive to the family public. At the same time, the most common way of financing activism-oriented applications is online advertising and association with pro-environmental brands.

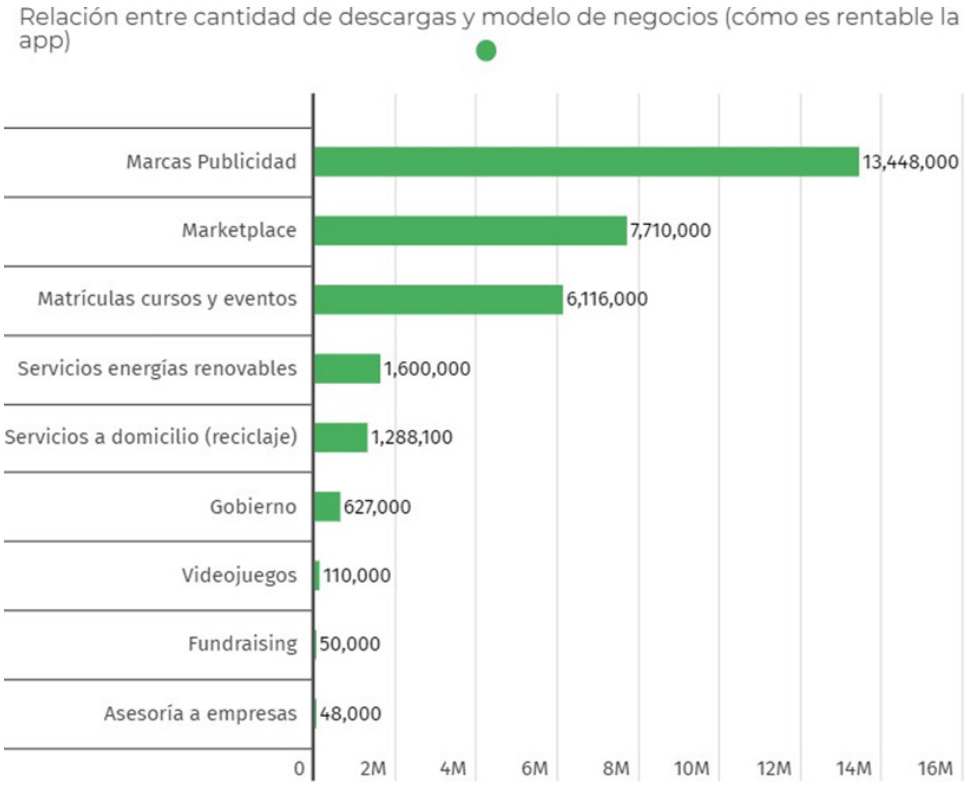

Figure 12. Relationship between number of downloads and business model (how the app is profitable)

Once the available environmental applications had been analyzed, two discussion groups were held with young social and environmental entrepreneurs to find out their perspectives on the environment, educational technology, and the link between the two, and finally, to design together some mockup proposals for environmental applications to incubate projects in Zapopan, Jalisco.

Proposals for application designs to incubate environmental projects in Zapopan:

Initially, the whole group was asked open questions about the possible advantages and disadvantages of a mobile application for incubating environmental projects. Afterward, they worked with the following instruction: “If you had to design a mobile application on environmental education that would allow other entrepreneurs like you to incubate their projects and show their results, what would that application be like?”

To work with the instruction more clearly, other supporting questions were added:

- What content does the app prioritize? What is it focused on?
- What does it look like? (visual design)
- What should we be able to do about it? (functionalities) What learning strategies should be included?
- How do we guarantee the profitability of the application?

In order to work in a more organized way, the discussion group was divided into small working groups of 3 or 4 people, and they began to work on ideas and a mockup sketch for their application proposal. At the end of the workshop, all the work was shown, and a consensus was reached on which ideas resonated most with the rest. The results were as follows:

Regarding the possible advantages of a mobile application for incubating environmental projects, 29 % agree that it “facilitates the connection between various actors and projects,” 26 % identify “constant updating” as a benefit, 17 % value the possibility of geolocation based on mobile GPS, 14 % recognize the “ubiquity-mobility” and 14 % the possibility of “offline connection.”

As for the disadvantages of this application, 30 % indicate as a disadvantage the particular audience to which it is dedicated, as it would be “focused on a user who is very involved with environmental issues, which is not the average user,” 28 % see as a disadvantage that ” you would have to be willing to download the app,” 26 % recognize that it could be disadvantageous that its use ‘requires digital skills’ and 15 % recognize that the ‘small mobile screen’ as a possible disadvantage.

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Among other disadvantages mentioned in the open questions are the possible technical failures of the application, that the focus of the application is not eye-catching for users, that the application does not allow the business to grow and differentiate itself from its competitors, that the project is exposed to plagiarism and others can copy its idea and, finally, the disadvantage that the project gets lost among many others and does not stand out.

Finally, in an open question, they were asked if they believed there was potential for integrating mobile technology and environmental entrepreneurship in the context of Zapopan. All the answers were affirmative. The precise wording of each one is shared below:

"Yes, if the foundations are clear and the ideas are good and realistic, it can be achieved." 'Yes, because many projects are in development,, I can find a match for my application.' 'Yes, because it would be easier to publicize a small enterprise, and there would be greater opportunities to grow it.' 'Yes, but a traditional enterprise will not have less potential.' "Yes, because young people are familiar with this." "Yes, it may have difficulties, but if it has a good structure and broad segmentation, it can work." 'For me, it has the potential to integrate it into the entrepreneurial society and thus activate interest in undertaking by seeing the projects.' "I think so, as the population becomes interested in environmental issues in a helpful and fun way. With support from the government and accessible advice." "Yes, they have potential because, considering that it is for the common good, it can be used for different purposes but all with a good purpose." 'Yes, I think there is great potential in Zapopan for integrating mobile technology and environmental entrepreneurship. Mobile technology can be a handy tool for promoting sustainable practices.' " many people would be willing to undertake environmental projects in the Zapopan area." "If it is all a question of making information known, such as the problems it brings, solutions we can take, actions we can take, benefits of it, etc." 'If I believe there is much potential, but if there is a lack of culture and information about the environmental aspect, which complicates it.' "If concern for the impact on the environment has sparked interest in things that are positive for the environment."

In terms of the ideal structure of an application for incubating environmental projects, both groups of young people worked in affinity groups of 3, 4, and 5 people. They delivered 11 mockups of their applications. The results of the designs are detailed below:

Design 1

The first design proposes an application called Trender App that works as a social network where the user can create their profile and that of their project and associate them with each other. They can enter through two categories: the first would be Investor, where investors interested in putting their money into environmental ventures with potential enter, and the second would be Discover Projects, where users interested in learning about the range of projects hosted by the app would enter. This is considering that the users would be, above all, other entrepreneurs. Therefore, the central actors in their app design are the Entrepreneurs and the Investors. Considering the social network model, they propose a functionality similar to Match, where the app suggests other projects with which you may be interested in collaborating.

In the design, they consider the need to divide the different pages into sections and interests and use filters to personalize the content according to the tastes and interests that the user has already declared at the beginning. Among the specific functionalities they propose is the option of forums where users can discuss entrepreneurship and give advice. As a method of financing the app, they are considering a paid membership that would benefit your venture in terms of visibility within the app, and if the membership is not paid, they are considering exposing users to advertising. Investment advice or mentoring would also be offered to improve projects, it is not clear whether these would be free or at an additional cost.

Design 2

The second design proposes an app called PlanetCare.com focused on e-commerce. They also propose a news application vision where users have access to all the updated information on green entrepreneurship in their locality, country, region, and the world in general. In addition, they have access to the contact details of some NGOs working on similar issues. Among the options is creating a profile for your project where you can share all the information, products, and services you offer with their respective prices, promotions, and discounts as appropriate. Therefore, the central actors of this app would be the owners of environmental projects and the users, who would have a profile of potential consumers interested in green consumption. No further details about the application were offered.

Design 3

In the third design, an app called Yawi was proposed to make it possible to show ventures and obtain relevant information. It will be possible to access the contacts of financiers for our projects, suppliers, and advisors. They propose to use Artificial Intelligence to enhance the personalization of the experience when it comes to obtaining information using cookies. They add a section to receive updated news. They propose

that how the app will obtain income will be through commissions for transactions made through the app, i.e., payments for consultancy services as well as direct financing that some ventures may receive from interested investors. They add advertising spaces where your venture can be promoted if you pay for it and sections for promoting the most outstanding projects. They also propose a side menu with categories encompassing the different venture types.

Design 4

The fourth design comprises an e-commerce site with a sales section where each venture can offer its green products and services. The core users of this app would be entrepreneurs and potential green consumers. In their design, they specify the need to generate categories to group the ventures and offer a catalog of products and services based on these categories. Each project must include data, images, and prices. The app would also have special offers and promotions to increase sales.

Design 5

The fifth design proposes an e-commerce where ventures can promote and sell their green products or services. In their description of the app, they identify that the ventures access through one of two windows, either identifying your project as a supplier of a Product or a Service. After selecting the option, the entrepreneur enters and creates a profile of the project with its name, contact details, location, mission, vision, statistics showing how sustainable the business is, its environmental impact, and a link to other social networks. Then, they must select the branch to which their enterprise belongs, and local enterprises of interest with which they can collaborate will appear. The proposed design of the app has entrepreneurs as its central users; although some ideas take into account the possibility of selling a product or service, they do not explicitly refer to the potential buyer as another user of the app. They propose a window displaying percentages and statistics about the businesses so that the user can identify how green the business is and and how much it contributes to the environment. The app's home page will feature local businesses, your profile, and events. The events will include environmental activities, bazaars, and conferences.

Design 6

The sixth design proposes an application called Life Green with two main sections, one for consumers and one for suppliers. It proposes a simple interface with a brief tutorial that highlights the site's main functionalities. The business model consists of a marketplace where the app charges a commission for transactions. A reward or discount is proposed on the first purchase. They add the facility of making green shipments.

Design 7

The seventh design is an application called Be Green, the central concept of which is that you do not need much capital to consume green. It allows you to create a profile where you can find Workshops, News, and Market Place. It also has a section to find investors interested in financing environmental projects. It provides access to a global search engine to search for the ventures, products, services, or ideas you need. It offers discounts on the first products and other seasonal products. It guarantees free home delivery of some products registered with a specific quality seal. Finally, it offers advice on how to undertake environmental and sustainable projects.

Design 8

The eighth design consists of an application called EcoReto, which offers recreational activities such as walks in the forest and visits to nature reserves. The user creates an account on the app and pays an annual fee. When the user indicates their location, the app suggests environmental and social events nearby. Each event attended awards points or badges, and these points can then be used as discounts for purchases of products or services offered by the app. The app will have a social network-style wall where users can share photos of the events they participate in to demonstrate their participation and accumulate points. It also has a marketplace where products related to sports, healthy eating, etc., are sold.

Design 9

The application is called All 4 You. It is divided into two sections like a marketplace, with one section for products and the other for services. The products section would sell everything tangible, and the services section would offer a variety of free courses and events, as well as financial education advice, support, and commercial services. It has a membership scheme with benefits. Some specific services would cost extra, while for members, products and services would have discounts.

Design 10

The tenth application is Green Market and focuses on second-hand products, giving them a second life in

the market. The app allows you to create a user profile where you accumulate your activity history. It has a shopping section where second-hand resources for sale are listed by category. In another section, it has consultancies, a financial advice segment, psychological advice, information, and news.

Design 11

The eleventh application, Lotus, focuses on buying and selling second-hand goods and waste collection. It connects waste collection companies and users who wish to offer recyclable products. It also allows users themselves to sell second-hand products. By generating a purchase or sales history, you can purchase promotions in the app. It has categories for each type of recyclable waste, as well as the valuation of that product's purchase and sale price according to the weight that you wish to sell/buy.

CONCLUSIONS

Analysis of existing applications showed that there are very few applications Environmental mobile applications focus on promoting the incubation of environmental projects. However, the study of existing applications offers clues as to the most commonly used content, teaching strategies, and financing models that allow some of these apps to be profitable and successful in the long term.

The work with young entrepreneurs offers a starting point for designing an application for the incubation of environmental projects in Zapopan. It shows the main topics and functionalities they expect from this type of application. The joint work made it possible to identify a lack of knowledge of government policies that favor and stimulate environmental incubation. At the same time, it revealed negative perceptions related to working on projects of this type and offered an optimistic view regarding the municipality's potential to implement these technologies to support local green entrepreneurship.

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FINANCING

None.

CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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