The role of tech startups in the fight against COVID-19

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Abstract

Purpose – This study explores the contribution that tech startups can provide in the fight against COVID-19. The Tech4Covid movement is presented to that effect, which has joined several Portuguese tech startups. This initiative gathers more than 5,000 volunteers and 28 ongoing projects in several interdisciplinary areas, including science, technology, health and education.

Design/methodology/approach – Two qualitative methods are adopted: the case study and the field research technique. This joint approach allows exploring in-depth the relevance and impact of the different areas included in Tech4Covid movement. Data were collected both from primary sources, namely by the authors' participation in the movement and by the use of secondary sources from each project.

Findings – The findings reveal three main areas in which the 28 ongoing projects can be categorized, respectively: support to health professionals and hospital equipment, health and education services and business and leisure. These projects offer direct and indirect contributions to the fight against COVID-19. From a perspective, they were initially designed to support health professionals in gathering protective equipment and supporting screening for suspicious cases. From another perspective, they also offer indirect benefits to citizens and the local economy.

Originality/value – This paper addresses a recent phenomenon with a dramatic impact on public health, social and economic dimensions. The study provides essentially practical contributions by revealing how Portuguese technological startups were organized and worked together to respond to the COVID-19 pandemic. It is expected this study will serve as a reference for other countries and communities that intend to replicate this model.

Keywords COVID-19, Tech4Covid, Startups, Technology, Apps, Social innovation

Paper type Case study

1. Introduction

When at the end of 2019 a new infectious virus was reported in China caused by COVID-19, few people certainly imagined the repercussions and impact this virus would have on world health and the global economy. The impact of this global pandemic is worrying, with progressively more countries joining the quarantine regime, many in a state of emergency and the number of COVID-19 cases rising continuously. Their spread around the world has reached alarming levels, with the USA recently overtaking China, becoming the country with the highest number of recorded cases in the world. In Europe, the scenario is also very alarming. Data published by the European Centre for disease Prevention and Control on 15th april 2020 indicate a total of approximately 900,000 cases, with the most affected countries being Spain, Italy, Germany, France and the United Kingdom (ECDC, 2020).

In Portugal, although the situation is not as critical as in several European countries, there were more than 17,000 cases with 567 deaths. The country has been in a state of emergency since 18th March 2020. Furthermore, preventive measures have been implemented and regularly disseminated to the population to slow down and contain the spread of the virus. Social distancing is the best-known measure implemented by the General Health Board. Maintaining social distance and avoiding situations of contact with other individuals have been pointed out as the best way to prevent and contain the spread of the virus. Moreover, other basic hygiene, health and food care have been recommended.

A large part of the population is in quarantine and implementing social distancing measures. A very significant proportion of companies were forced to cancel their business

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activities. However, there is another part of the Portuguese that cannot stop, namely health professionals, elementary distribution, social support workers, etc. Goulart (2020) states the great concern of organizations at this time are to assess the impact of this pandemic on their revenues and their relationship with customers and employees.

The impact of COVID-19 on society occurs from multiple perspectives in areas such as public health, social development and economic sustainability. Innovation is essential as a response mechanism to the multiple challenges posed by the pandemic. In general, innovation can be understood as the exploration of new ideas with success. Several studies identify the advantages of innovation for access to new markets, increased invoicing, access to new technologies, among others (Ionescu and Dumitru, 2015; Rajapathirana and Hui, 2018). There are several possibilities for innovation. Those referring to product or process innovations are known as technological innovations. Other types of innovations can relate to new markets, new business models, new processes or organizational methods.

Another form of innovation that assumes great relevance is social innovation that can be understood as a process of transformation in the patterns of response to deep social needs. This can be achieved by breaking with the norms in place, with the values instituted and with the structure of the distribution of power and resources. According to Oeij *et al.* (2019), social innovation emerges as an initiative that escapes established standards and implies a clear, creative and meaningful change. The focus is mainly on the processes since the proposal for social change itself is at the procedural level. However, there are barriers to its adoption, namely resistance to change, emphasis on production optimization orientation and concern with the efficiencies of working models and methods (Chalmers, 2013). However, change occurs because these barriers begin to give way, and, in many cases, it is the minorities or young people who first realize the need for change and manage to force paradigm shifts.

When we look at the business environment of startups, we find an extremely worrying scenario. Data revealed at the end of March 2020 indicate that more than 70% of these companies already report negative impacts on their business activity and more than 75% of them expect to have to make redundancies (Ascenção, 2020). Nevertheless, these companies did not stand idle and began to question how they could organize themselves to face the challenges posed by COVID-19 to the population. Individually, each of these organizations would have a very limited capacity to have a social impact. However, together, and properly organized and articulated, tech startups can provide very relevant contributions with high social impact and improve the quality of life of our population.

This study aims to explore the contribution made by Portuguese tech startups through the Tech4Covid movement which brings together over 5,000 volunteers, 120 companies and 28 ongoing projects with high potential to help civil society fight COVID-19. This study provides essentially practical contributions by allowing us to understand the relevance of these projects, the challenges of their organization and the impact they can have on society. This study is organized as follows: first, a contextual analysis of the emergence of the Tech4Covid movement is performed in the introduction section. The methods used to explore the data are presented below. After that, the types of projects made available by COVID-19 are identified and categorized, and the relevance of some of them considering their effects on health professionals, citizens and the economy is explored in greater detail, particularly in the local business community composed mainly of micro-companies.

2. Materials and methods

This study employs a qualitative methodology through the adoption of a case study that is complemented by the field research technique. Yin (2017) recommends that in an interdisciplinary field of analysis, it becomes relevant to understand the conditions of the context in which this data is produced. In these situations, the qualitative analysis provides a

more comprehensive understanding of the dynamics of different human groups. The adopted methodology sought to describe and understand the characteristics of the context, in which tech startups were organized to respond to the immediate and profound challenges posed by COVID-19. This perspective captures the perception of opinions, feelings and experiences of those involved in this process. The adoption of field research has allowed the collection of data intended to understand, observe and interact with people in their natural environments. In this research area, field research is a method that proves to be adequate as it is able to interact in daily life with people who are on the front line, in multiple areas, in the response to COVID-19. Queirós *et al.* (2017) state that this research method should contemplate three essential phases: (1) observation of participants' behavior; (2) interaction with participants and collection of their opinions and (3) artifact analysis. All these phases have been included in this study.

Formalizing a case study involves several steps from collecting data from one or more cases, to preparing a report and presenting it. In this study, an individual report has been prepared on each of the identified apps. Creswell and Poth (2017) state that the case study enables the collection of in-depth data involving multiple sources of information rich in context. Considering the innovative and disruptive characteristics of the solutions identified in the fight against COVID-19, the case study offers in-depth knowledge of the advantages and challenges that have been posed to each project. The case study is also an empirical investigation investigating a phenomenon in its natural environment, when the boundaries between the phenomenon and the context are not well defined (Rashid *et al.*, 2019). In this study, this occurrence is notorious as the proposed solutions are constantly evolving in the face of feedback received by their users, the needs of people and companies and also national and European legislation.

Data from primary and secondary sources are used. Primary data are related to original data and collected for the first time by the researcher; secondary data are collected using available sources. According to Radina and Humble (2018), the adoption of these two types of data is desirable in situations where the study context is highly dynamic and where the exclusive use of primary sources is not sufficient to understand all dimensions of the phenomenon. Therefore, considering the highly dynamic and multifaceted reality of the response to COVID-19, the use of these two sources of information has become necessary. Moreover, Oladobe *et al.* (2019) consider that special care should be taken in the interpretation and analysis of the reliability of data obtained from secondary sources. In this sense, only official secondary sources of information issued by representatives of Tech4Covid were used, and the respective analysis of the data led to consider the period in which they were presented. This last factor is very important in the analysis of this phenomenon, since the evolution of COVID-19 and its responses undergo very significant changes daily and, consequently, it is fundamental to always perceive its temporal context.

Finally, the data analysis sought to explore the role of each project included in Tech4Covid. For this purpose, the relevance and impact of these projects on Portuguese society were assessed. Furthermore, this analysis was complemented by exploring and discussing the approach used, namely whether these types of proposed solutions are already duly confirmed in the literature or whether, on the contrary, they constituted innovative solutions as a response to the emergence of COVID-19.

3. Results and discussion

The Tech4Covid movement arose from an informal conversation between founders of Portuguese technology startups in early March 2020 and quickly evolved into a movement that seeks to find technological solutions to help the country in the fight against COVID-19. Initially, the initiative was based on a Slack channel, an online platform for collaboration,

where ways of helping to mitigate the pandemic were discussed. Within 48 h the movement was able to bring together a group of over 600 people in Slack with various established channels to develop new projects. The idea was to create better solutions and faster than the contagion by COVID-19. Presently, it is a large community with more than 5,000 people willing to find and expedite solutions to several of the direct and indirect problems posed by this pandemic. The use of social networks as a response to natural disasters has been reported by authors such as Reuter and Kaufhold (2018) and Simon *et al.* (2015), in which their role in the rapid dissemination of information and sharing of experiences is highlighted. In this sense, the approach adopted by this movement is inspired by the good practices identified by the community in response to extraordinary phenomena, as has already happened in scenarios of terrorist attacks and natural disasters. However, some distinct aspects should be highlighted. In the current scenario, social networks may assume an even more predominant role, since the response to COVID-19 requires mechanisms of social isolation, which greatly reduces the traditional mechanisms of socialization and direct contact between people. Accordingly, social networks can act as alternative channels of socialization.

Tech4Covid has 28 active projects on 15th April 2020. These projects are distributed in three categories: (1) support to health professionals and hospital equipment; (2) health services and education and (3) business and leisure. Table 1 provides a comprehensive overview of the various types of projects launched by category. At the beginning of the project, only the first category was available, but the community quickly became more dynamic and proposed solutions in other areas. Nevertheless, the second category is the one that currently has the highest number of projects, but the highest growth rate of projects in the last week is registered for the last category. In this sense, a relevant response pattern is visible in this area. Initially, the focus was almost exclusively on direct support to health professionals, but the impact that tech startups could have on other areas like support to local commerce and support to leisure activities, which are equally important from a health and economic perspective, was quickly realized.

3.1 Support to health professionals and hospital equipment

Two of the first projects that were at the foundation of this initiative were the donation of personal protective equipment and the raising of funds to purchase medical equipment.

Category	Description
Support to health professionals and hospital equipment	Includes projects to support the national health system and its professionals. These are the people who are on the front line in the response to COVID-19 and deserve very short-term support. This category offers projects for fundraising, donation of personal protective equipment, accommodation for health professionals and access to technical information
Health and education services	This is the category with the largest number of projects and includes a very diverse set of projects focused on health and education. Here there are projects to help patient screening, identification of infected people, symptom screening, free video consultations, distance learning and electronic equipment provision
Business and leisure	In this category are mainly found projects of indirect support to the effects of COVID-19 on business and leisure activities. Several projects can be identified in areas such as shopping delivery, store affluence analysis, help to local retailers and business cooperation

Table 1.
Overview of Tech4Covid projects

The first project had as a fundamental objective the collection of donations counting on the precious help of research centers inside and outside the higher education institutions that changed their research lines giving priority to the production of this type of protective equipment. Even with small-scale productions, this help when aggregated has been of great importance for the protection of health professionals who are on the front line. There are also many individual donations here, such as old acetates that have been converted into visors for health professionals. The fundraising so far has gathered about $50000, which has allowed the purchase of ventilators, surgical masks, gloves, protective suits and goggles. This equipment proves to be fundamental for the protection of health professionals, preventing the exposure of professionals to risky situations and, thus, contributing to reduce the spread of the virus. Volunteer initiatives are very relevant to face the immediate challenges of a social crisis, but to ensure their sustainability there must be a model that promotes transparency in the application and beneficiaries of these actions.

Tonic App is another application that already existed before the emergence of COVID-19 but is now gaining more importance. With the proliferation of apps in the health field, it is essential to manage them to avoid redundancy and facilitate their access. This app aggregates the various medical tools and provides a platform for secure discussion of clinical cases. It also includes a section dedicated to COVID-19, with information constantly updated. Figure 1 shows an illustration of the process of including a new clinical case, in which a description of the situation, tag association and level of urgency is provided. Reliability and privacy are two key elements in the practical implementation of this app. Tonic App is registered as a medical device in Infarmed, which is the Portuguese national authority for medication and health products. Furthermore, Tonic App complies with the rules established by the General Data Protection Regulation (EU GDPR).

3.2 Health and education services

COVID-19's symptom screening through the use of an app that offers a virtual screening assistant for this pandemic and a video consultation system is one of the most used applications in this category. Using this app, citizens can consult a doctor free of charge from home. This process offers comfort and safety and is free of contamination risks for the user and doctor. Furthermore, in the case of a medical prescription, the user will have access to the electronic prescription on his smartphone, whose prescription can be picked up in a pharmacy. This app stands out for offering high standards of usability based on a simple and versatile design. According to Almeida and Monteiro (2018), offering high usability standards in a mobile environment is fundamental for quick adoption of the app by the community. This is a key factor particularly in a scenario where citizens' needs are immediate and having a confusing navigation app can be an impediment to its adoption especially with elderly or disabled users.

In combating the COVID-19 pandemic it is also of great importance to register those infected or potentially infected. This information is essential to prevent the emergence of contagion networks (del Rio and Malani, 2020). An App, entitled Covidography, is made available to evaluate in real-time the evolution of COVID-19 symptoms in the community. This collection allows users to perform a live follow-up of the symptoms of other users in the same geographical area. This update is made based on the contribution given by users. This is a core principle on the concept of m-participation, in which applications are made available as tools for interaction between citizens and promoting their electronic participation (Arnstein, 2019; Wimmer *et al.*, 2013). The promoters of this project ensure that the privacy of users is guaranteed. Only aggregated information will be shared with health authorities to enable them to make decisions that help protect citizens from this pandemic. Covidography shows on its initial screen the number of individuals affected, the number of suspected cases,

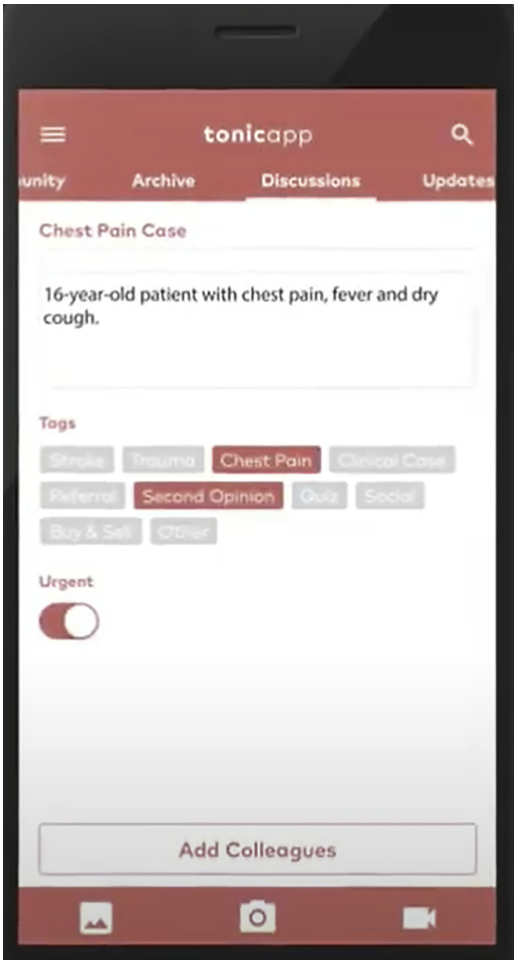

Figure 1.
Tonic app

the number of people in isolation, the number of people recovered, among others, for each geographical region (see Figure 2).

In this category, it is also worth mentioning the availability of a free digital platform that connects teachers, students and parents. The objective of this platform is to provide access and support material on e-learning digital tools that enable the process of distance learning and assessment. Associated with this project appears the Student Keep app, which intends to manage the processes of donation, temporarily or permanently, of electronic equipment that helps needy students to have access to distance learning. This app is of great importance to foster greater social cohesion and help families with children in need have access to technological equipment to attend online classes. This is a fundamental approach to prevent the emergence of new social asymmetries. This initiative arises in the context of the studies carried out by Mutisya and Makokha (2016) and Sridharan *et al.* (2018), in which it is mentioned that one of the main difficulties in accessing e-learning activities is the existence of Internet and equipment for this purpose (e.g. computers and tablets). This is an area in which

Figure 2.
Covidography app

Tech4Covid had to pay special attention in the current panorama, while distance learning remains the main means of communication between teachers and students, there will be a worsening of inequality in access to education.

3.3 Business and leisure

In this category appear projects whose focus is to help make and receive purchases in comfortable ways, to help small businesses, or to watch cultural shows remotely. A relatively heterogeneous group of projects can be found in this category. Generally, three sub-domains can be identified: (1) projects supporting online shopping and local commerce; (2) access to and provision of information on live events and (3) business cooperation.

In the area of support for local purchases and trade, we find three projects of great practical utility and with an economic impact on local communities, especially for micro-companies that live off local trade and which, according to Lee *et al.* (2017) are the most vulnerable to economic crises. Interhelp is an e-marketplace that helps companies and volunteers to advertise the products and services they have available for sale and delivery. In this way, customers can access these products and services without leaving home. Jung and Wook (2011) state the adoption of e-marketplaces gives small businesses greater visibility and takes advantage of cost-saving factors that allow a higher individual return. Another project of great relevance to local commerce is the purchase of vouchers. Due to COVID-19, a substantial part of the local commerce had to close temporarily. However, this temporary closure can, in many cases, have drastic consequences, since according to Repp (2020) most of them will not make it without customers, and they will have to make dramatic decisions such as firing staff or going bankrupt. In this sense, the acquisition of vouchers is relevant to inject liquidity into these small businesses. Finally, one of the most prominent projects in the national media is "Quietinho em Casa". This is essentially an extremely practical app that has arisen in the context of the long queues of access to essential services. Initially, it was applied only to pharmacies, but quickly covered other areas such as supermarkets and post offices. The app indicates to the customer how long will he/she has to wait to be served and prevents the client from being on the street waiting to be served. The app considers four levels of estimated expected time: no queue, average, long or unknown (see Figure 3).

The leisure sector was doubly affected. On the one hand, customers were no longer able to consume leisure products as these spaces are now closed; from another perspective, these professionals were no longer able to exercise their professional activity. Parnell *et al.* (2020) state that the leisure and sport sectors are potentially two of the areas most affected by COVID-19, since they are not considered fundamental activities of a country, and consequently, they will have difficulties in accessing national and international funds (e.g. from the European Union). This is a clear example of the dynamics of social innovation, since the most disadvantaged groups or those most affected by a natural disaster are not necessarily sealed off and may also include segments and social classes that would be more protected at the outset. The "Vejo em Casa" project offers a platform of diversified content in a free streaming format that allows connecting artists and viewers. The model works as follows: (1) the creators join the initiative; (2) a calendar of events is suggested by the creators; (3) the user has access to an updated agenda where he can subscribe to the events that interest him/her most; (4) live streaming of the event and (5) voluntary support to the created through online payments such as MBWAY or PAYPAL. These two electronic platforms were chosen because of their popularity in Portugal and for being easily integrated and accessed by a mobile device. The great challenge of this initiative is the management of intellectual property since several artists have exclusive agreements with agencies. However, and in face of the fall in turnover, there is an opening for the emergence of new business models that can guarantee some type of revenue in times of pandemic. For example, in addition to attending concerts at home, there are also initiatives for innovative venues to hold these concerts, such as in parking lots, where people stay in their cars and attend the concerts there.

Finally, a platform for business collaboration is offered through a temporary service of teams and employees between businesses. Team loan is aimed at both small businesses and large companies. Several sectors are included, such as food and non-food retail, accommodation and catering, passenger and goods transport, food industry, among others. This allows the team of a given company to collaborate with another company temporarily. This platform acts as an e-marketplace and, by enabling the temporary sharing of teams; it minimizes the impact of the state of emergency on these companies. The challenge of this initiative is essentially administrative in light of current legislation. Bureaucratic challenges arise here related to labor legislation, which establishes a set of rigid rules

Figure 3.
"Quietinho em Casa" app

regarding remuneration policies, tax regime and protection in the illness or unemployment. Furthermore, it is difficult to implement this model when we are dealing with two organizations with different typologies (i.e. public and private). Its implementation is easier when there is some link between the two companies (e.g. belonging to the same economic group and existence of partners).

4. Conclusions

During the COVID-19 pandemic in Portugal, the Portuguese technological community has joined to develop a movement that intends, through technologies, to provide the necessary tools to mitigate and respond to the challenges posed by this crisis. In this way, the

Tech4Covid movement was born, which, from an informal conversation between founders of Portuguese technological startups, originated a team with more than 5,000 volunteers. The goal was to gather several areas of activity for a common purpose. The non-profit movement brings together volunteers from the most varied areas, from health professionals, scientists, engineers, educators, among other specialties, in order to develop numerous projects that can mitigate the consequences of the pandemic, as well as promote support to health professionals and access to hospital material. Currently, there are 28 ongoing projects running simultaneously that aim to address different issues.

This movement includes a diverse set of social innovation projects that are promoted by tech startups. It involves a series of multidisciplinary teams that support each other to maximize the value of the projects and develop them as quickly as possible so that support reaches the people who need it. Several startups participating in this initiative needed to create new technological solutions and adapt the business model. The findings allow us to categorize the projects into three key areas like support to health professionals and hospital equipment, health and education services and business and leisure. Several specific projects can be found aimed directly at health professionals such as the collection of donations, the production and collection of medical equipment and support in screening potential patients with COVID-19. However, their scope is not limited exclusively to the healthcare field, and projects can also be found in the education, leisure and business fields. These projects are also relevant in supporting citizens and to enable the economy to continue to operate, such as the identification of contagion networks, support for supermarket shopping, distance learning, consumption of leisure events from home and support for local commerce. These projects assume a double mission of helping the populations most directly affected by COVID-19 and also the various social and economic sectors that suffer the effects of social distancing measures and the temporary closure of their economic activities. Three challenges emerge in the organization of these initiatives: ensuring the sustainability of tech startups in times of pandemic that have changed their business model to meet the challenges of COVID-19; the sustainability of this project in a post-pandemic scenario; and the sustainability of companies that benefit from the effects of these apps, but who also know that the revenues obtained in this period are a tiny part of their needs and will have to adapt to a new normal in which the paradigms existing so far are under strong pressure and instability.

This study offers essentially practical contributions by exploring how Portuguese technological startups have responded to the challenges posed by COVID-19. This study will be mainly useful to assist in the revitalization of this initiative and also to replicate this model in other countries that face similar challenges. Some limitations can be presented in this study. COVID-19 is a constantly evolving and highly dynamic phenomenon and, therefore, the results presented must always be contextualized to the period of its analysis. Moreover, it is not clear at this stage what the life cycle of these solutions will be after the pandemic crisis. Within the COVID-19 movement, there are distinct lines that outline various scenarios, such as the closure of this initiative after the pandemic's period of urgency, the broadening of the movement's scope and action or a possible adjustment to a less urgent context, in which it is possible to find a new course that is coherent and consistent with the spirit of Tech4Covid. Furthermore, this study did not intend to exhaustively consider all projects to combat the direct and indirect effects of COVID-19 promoted by tech startups. Therefore, only projects promoted by tech startups members of the Tech4Covid movement were included. As future work, there are several types of scientific projects that can be developed to understand this phenomenon in greater depth. In the first place, it would be relevant to conduct a comparative study to identify similar initiatives in other countries. Second, and after this initial phase of the OVID-19 pandemic, it would be interesting to conduct a quantitative study to assess the impact of these projects on the lives of people and organizations, considering multiple perspectives like social and economic impact.

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