Inclusive Innovation Based on ICT: Lessons from the Maker Movement in Brazil

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Abstract

This research explores the concept of inclusive innovation based on ICT, examining collective practices and creations from the Maker Movement (MM) in Brazil. The research results show that this Movement, which exists as a network of overlapping practices based on the principle of 'making', tries to break through the black box around manufacturing items and open it up to look at innovation differently. However, although the main actors promote inclusiveness to the public, who, due to maker spaces, now have access to endless creative options, other actors, who have historically been ignored when discussing innovation, are still excluded from this Movement. Therefore, the very concept of inclusive innovation needs to be reconsidered.

Keywords: *Inclusive Innovation; ICT; Maker Movement*

1. Introduction

The majority of existing studies on innovation tend to conform to the "mainstream". They focus on technical, strategic, and management aspects of innovation, set within a formal organizational context (R&D laboratories, multinational businesses), for profitable purposes (Heeks, 2014; Patnaik & Bhowmick, 2020), leaving historical and political aspects related to innovation to other areas, and ignoring the population at the base of the pyramid (Prahalad, 2009) and who work informally. When the poor and excluded people are considered in the mainstream approach, the rhetoric for their inclusion and involvement in innovation is depoliticized, and this fails to address the power relations inherent in the processes of technological change and innovation. Also, it does not discuss the socioeconomic causes of inequality and exclusion (Pansera & Owen, 2018), preferring instead a supposed global economic development approach that does not meet local social developmental needs (Klochikhin 2012; OECD, 2013; Heeks et al., 2014).

In order to bridge the gaps in mainstream innovation, researchers have tried to develop a concept of inclusive innovation (George et al., 2012; Heeks et al., 2013; Foster & Heeks, 2013; Heeks et al., 2014; Foster, 2014; Smith et al., 2014; Sengupta, 2016; Smith et al., 2016; Pansera & Owen, 2018; Patnaik & Bhowmick, 2020; Pinzón-Camargo et al., 2020). This concept regards "the development and implementation of new ideas which aspire to create opportunities that enhance social and economic well-being for disenfranchised members of society" (George et al., 2012: 663). The groups who are seen as marginalized include women, young people, people with disabilities, ethnic minorities, informal entrepreneurs and the poor in general (OECD, 2013; Heeks et al., 2014). Inclusive innovation tries to encourage marginalized communities to empower them (Pinzón-Camargo et al., 2020). The aim is to create innovative solutions for low-income communities, including them in innovation to achieve positive results by, for example, creating qualified, relevant products and services that are economically, socially, and environmentally sustainable, with equitable profits and growth. However, it is questionable how much this exists in reality (Patnaik & Bhowmick, 2020). We also do not understand the role that new technology can play in inclusive innovation very well (Harsh et al., 2018). There are few empirical studies on inclusive innovation to support the development of evidence-based policies (Pansera & Owen, 2018; Patnaik & Bhowmick, 2020).

In order to bridge this gap, some researchers have focused on the study of inclusive innovation in grassroots movements (Smith et al., 2016) - typically those that encourage socially inclusive innovation in terms of the knowledge, processes, and results involved for local communities (Smith et al., 2014; Fressoli, 2015). One example of it is the Maker Movement. It is a decentralized and globally diffuse collective, based on the idea that ordinary people can build, repair, modify or manufacture any type of object or create any type of project themselves, working together, learning and sharing resources among themselves (Anderson, 2012; Dougherty, 2013; Lindtner et al., 2014; Lindtner, 2015). The MM has its origins in the hacker community (Lindtner & Li, 2012; Lindtner, 2015) and is an extension of the 'do-it-yourself' principle and has been supported by the vast proliferation of collective spaces, such as hackerspaces, maker spaces, and fab labs (digital manufacturing labs), by the advent of crowdfunding through collective funding websites and by the growth of open hardware platforms (like Arduino, for example). It is spread by various publications, such as Make magazine, websites, and maker events (maker Fairs, Arduino Day, Hackathons, among others), held worldwide (Lindtner et al., 2014).

Several of the collectives developed out of the digital revolution, many linked to the MM, have explored new approaches to innovation and technology. As a result, new ways of thinking about the dynamics of innovation and the concept of inclusive innovation must be studied empirically now, as there are many different interpretations and frames of reference (Pansera & Owen, 2018). Therefore, this article aims to contribute to developing the concept of inclusive innovation based on ICT by answering the following question: How does ICT-based innovation take place in the Maker Movement in Brazil, and to what extent does this Movement encourage inclusive innovation?

2. Method

The research method was inspired by the ANT- Actor-Network Theory (Law, 1992; Latour, 2005), which invites us to look at the material effect of innovation, both social and technological. The focus of the analysis is on the relationships and networks consisting of humans and non-humans. A study of the MM in Brazil was carried out, based on the principles of ANT, through three instances of field immersion. In all, the data collected involved 112 hours of observations by participants (77 pages recorded in a field diary) and 35 formal interviews (recorded and transcribed) with key actors in the MM in Brazil. Several informal interviews were also carried out at two maker spaces (POA Lab and Olabi) and during MM-related events - see Figure 1.

The 1st field immersion (exploratory) provided an opportunity to meet some of the prominent participants in the MM in Brazil, to talk with them informally, to take part in events, and to see how the Movement operated in Brazil, in general. The 2nd immersion consisted of observing participants at POA Lab, an active fab lab located in the south of the country, and taking part in another of the Movement's events. A semi-structured interview script was applied to 08 individuals who regularly attended the shared space, and each interviewee was asked to identify one or more people that they considered to be important in the MM in this country and any ideas or projects that they thought were particularly noteworthy. The actors and projects cited for the MM in Brazil, as a result, led to the 3rd field immersion. In this third and final stage of collecting data, another 21 semi-structured interviews were carried out, followed by taking part in two more maker events and a visit to a maker space (Olabi), located in Rio de Janeiro, southeastern Brazil.

On the basis that the Movement is made up of different actors who play different roles in the network, we identified four distinct but complementary roles: *users* (regular users of POA Lab and Olabi); *supporters* (actors who publicized the Movement, provided workshops and shared projects via social networks or in person at the maker spaces), *entrepreneurs* (actors who dedicated themselves to creating MM-related ventures, such as creating private or for-profit maker spaces and providing consultancy) and *authors* (creators of projects cited by other actors in the network as significant to the MM in Brazil). This classification was created for analytical purposes and only describes each actor's main role; each of them

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may undertake more than one role, and there may be other roles than these. In total, 35 interviews have been conducted with 33 people (two informants were interviewed twice): 6 users, 13 supporters, 6 entrepreneurs, and 8 authors. The participants will be described using their primary role when presenting results.
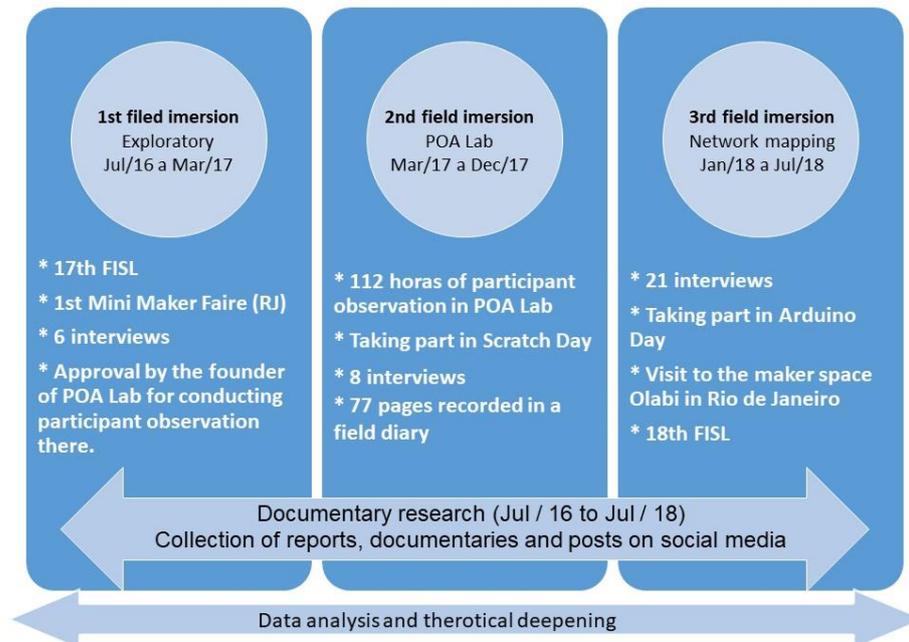

Figure 1: Research Method - Field immersion phases - Source: Research Data

The data collected from interviews, documents, social media and recorded in field diary notes were saved in a single database using NVIVO software. The content was coded inductively, i.e., based on the data and not the theory (Saldaña, 2015). It was possible to identify common themes by creating the codes from the large amount of data collected. In the first cycle of coding, 93 codes were generated, which resulted in a need for a second cycle (Saldaña, 2015), in which some codes were merged because they were similar in concept. Infrequent codes were assessed for their usefulness as part of the general coding scheme, and some codes were discarded; the entire body of data was reviewed, resulting in a total of seven primary and twenty-one secondary categories. All of them were registered in a codebook, which recorded the analysis process and identified the main themes, actors, and projects for the MM. The use of multiple sources of data and informants, and also the use of the codebook to guide the data analysis helped us to handle validity issues regarding researcher and respondent bias. The research results are described in the next section.

3. The Maker Movement in Brazil: the "Gourmet" and the "Grassroots" versions

According to Supporter16, the term "Maker Movement" first appeared in Brazil in the middle of 2009, when Neil Gershenfeld (a professor at MIT and one of the creators of the fab lab concept) visited the Faculty of Architecture and Urban Design at the University of São Paulo (FAU-USP), where he gave a lecture and visited the Laboratory of Experimental Models, which had digital manufacturing machines, and therefore was a type of *fab lab*. Although it was created partly to interest the MIT professor, the FAU-USP *fab lab* brought together a group of people who wanted to develop a network of laboratories throughout the country. In 2012, some members of this group created the Fab Lab Brazil Association, a non-profit organization, whose objective was to help establish *fab labs* in Brazil, spread the network's ideology, publish material in Portuguese on the subject of digital manufacturing and link together the

different laboratories nationally and internationally, acting as a connection between the Brazilian *fab lab* community and the *Center for Bits and Atoms* at MIT, also called 'Fab Central'.

According to Supporter16, disagreements among the Association members led to it shutting down after a few years. In 2011, Supporter16 and other actors in the Movement created the Fab Lab Brazil Network, a non-profit organization that tried to join up the *fab labs*, promote events, and support new *fab labs* to open in the country. In 2016, the creation of the Free Fab Labs of São Paulo and other independent *fab labs* began to attract the media's attention, which started to report about "maker spaces" and the promises of the MM in Brazil. As you can see, when the term arrived in this country, it was closely connected to the *fab lab* network and *maker spaces* of North America.

A characteristic of the MM in Brazil is that it is concentrated in the fab labs and maker spaces, which are generally part of universities or business locations, and are used by people with a higher level of education and income: "Like everything in Brazil, while it isn't a feature of MM, it's not universally available. We joke a lot that the future has arrived, but it is not everywhere" (Author23). Entrepreneur17 backs up this statement. They recognize that the media attention and large corporations' interest in the so-called 'maker culture', maked people think that the Movement is expanding in Brazil. Supporter4 criticized this apparent expansion: "We continue to exclude people who are already doing it, because doing something for yourself, doing it together, solving problems with whatever you have at hand, that is something that is part of Brazilian culture everywhere. So, suddenly, we are building an elitist place, and now we think these things are worth doing before they were frowned upon, right? (Supporter4).

The public *fab labs* of São Paulo are mentioned by some of the actors as an important attempt to bring digital manufacturing knowledge to the periphery, "where people are already well used to doing things off their own initiative" (Supporter26). Still, this is not enough to make the Movement in this country less elitist. The expansion of the Movement often seems to be leaving Brazilians on the margins, those who could and would benefit from it, as Author31 suggests. "The MM is really only talking to itself. This isn't just the MM's issue, it is an issue for the whole movement for innovation, entrepreneurship, technology ..." (Author31). Entrepreneur27, when talking about a visit to the Sustainable Periphery Institute (a space located on a favela of São Paulo that aims to introduce renewable energy generation and distribution systems to communities in São Paulo), emphasizes that making the MM inclusive does not mean, or at least it shouldn't mean, a posture of 'taking' knowledge to those who 'don't have it'. Instead, it is about getting to know and discuss and learn with the actors from the diverse range of communities that exist in this country: "It always has to be an exchange. I listen to academics and companies saying that solar power energy is expensive, but then I come here, somewhere extremely poor in São Paulo, and I see what some guy is doing, and we have to get together with the **grassroots makers** (...). I think the main point here is to realize that we are not providing something ... we may have something new, but it is an exchange, we are exchanging all the time with the people who are already doing it here" (Entrepreneur27).

The elitist form of the MM in Brazil has caused some actors to refer to it as '**gourmet**': "We end up importing things in a hollow way, leaving only the shell, the name, the mystique, but it ends up losing its content. In Brazil, the MM is almost completely taken over by what I call **gourmet** craftsmen, who are craftsmen only, a '*DIYer*', but who isn't connected to the MM, doesn't pass on the knowledge from what they are doing. The product is much more than an elaborate craft, or a mini creation, more than a product maker, which provides access to something. The *fab labs* are mainly in the universities, unavailable to the general public, making it difficult (Entrepreneur1). In the words of Author31: "What I see in these places is people thinking about issues that are no use to normal Brazilians and that are not really

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innovative because people do not understand the Brazilian people (...). I see a lot of people creating products and services for people who already have products and services, you know? So, the market is saturated with applications, for what, I don't know, with solar energy projects, but if you're not talking about solar energy for those who can't afford a solar energy panel, you're thinking about solar energy for practically no-one in Brazil!" (Author31).

In contrast to the *gourmet* MM of Brazil, there is what some call the **grassroots** MM (Entrepreneur27), which is based on doing things in ways that have been shared among Brazilians for a long time; those people are "born makers", and therefore "natural makers" (Author32). The grassroots MM can be seen in projects for communities in the city periphery, which, being 'peripheral' to the 'center' of the network - in other words, marginal compared to the gourmet movement - makes up the 'periphery' of the MM. In this 'periphery', digital technology does not have any more importance over other technologies, which are referred to by Author32 as "low technologies" or improvisations, which are any solution designed to solve a local problem. In the grassroots MM, the practice of improvisation is treated the same way as "that which is cutting edge in the Brazilian maker culture" (Supporter30). It is considered much more inventive, creative and better related to solving real problems than imported maker culture (Supporter4). Popular knowledge is not treated as an indication of ignorance, nor as inferior, but as a different type of knowledge that, when articulated technically and scientifically, can create some mutual learning points. This is the case for solar energy, which Entrepreneur27 thought of as something costly until they came across Author28 - whom he acknowledged as a "grassroots maker" - who develops such technology, at low cost, in one of the most impoverished communities in São Paulo.

When talking about the real situation in the favelas of Rio de Janeiro, Author32 points out: "The favela is by nature a maker. Most of the places where they talk about innovation, creation, and creativity at the moment are basically full of white, middle class, men mainly, right? Whereas what poor people create, their innovation, is not recognized as such, but just as 'you know... the Brazilian way', but not as something innovative, right? And the poor; they have always been makers, because they have always had to come up with their own solutions, think of creative answers when things are scarce or there is no support from the State; they are born makers" (Author32).

The consensus is that the MM's potential for innovation lies in democratization, providing access to specific machines, tools, and knowledge. What is new is not digital manufacturing: "I always like to say that MM is a Movement to democratize access and knowledge" (Supporter5). Next, we analyze this Movement's innovation through four projects, which were cited by the research participants as significant projects for the Brazilian MM. The first two projects were developed in a university or business context, and represent the people usually included in the MM; the second two projects were developed in the context of the favelas, representing people usually excluded from the MM. These projects help us to get a better understanding of the practices and contrasts that exist in the MM in Brazil.

The PLUVI.ON Project - Pluvi.On was the most mentioned project by the interviewees. It turned into a startup and received international recognition and awards. The startup, which has the same name as the product, was run by five partners - including Author23, who graduated in civil engineering from USP - and created a range of low-cost rain gauges, which collect data and help the technicians and the community interact (https://cutt.ly/5jsbcXh). The Pluvi.On system records the amount of rainfall in millimeters so that, in the future, it will be possible to calculate the likelihood of flooding in a region based on the data from a connected network of rain gauges. The community can access this data through various interfaces that take the data from the nearest station. Author 23, one of the creators of PLUVI.ON, attended the *open days* at Insper's *fab lab* (a higher education institution in Brazil). The first prototype,

made from a plastic bottle in 2016, began its development at the Red Bull Basement, a corporate *maker space* that provides a base to develop promising ideas. Once they joined the program, the prototyping phase sped up rapidly with the support of mentors from the areas of electronics, design, hardware, and software, who helped develop the project; 'Pluvi.Ons' were now made from laser-cut acrylic, with parts printed on a 3D printer. It took two months of intense work on several versions of the product to produce the *open-source* version, available on Instructables website, with more than 1,500 views. Besides, Red Bull helped to promote the project, including to public agencies: "Thanks to the exhibition there, we were approached by Climatempo and the Regional Government of Lapa (SP) in 2016 (...). So, we set up a pilot project for a network of 110 sensors in São Paulo" (Author23). Between 2016 and 2018, the startup developed into a business. By 2018 they were developing the seventh version of the meteorological station, which had more sensors and was more linked to the new IoT protocols. "Our dream is to be able to have *open-source* hardware that can distribute the data collected in a more democratic way (...) we have never intended to kill off this branch, and we will always dedicate some of our efforts to it (...) it's what the company is about" (Author23). A version of Pluvi.On was developed using funding provided by Embrapii (The Brazilian Industrial Research and Innovation Company), which was a patented version: "The patented version was only because of an intellectual property issue relating to the Embrapii project, which is where we got the funding from. It meant that we needed to establish intellectual property rights. (...). In reality, what is the point of a patent? It is there to cover various bits of bureaucracy and it supports the company's *valuation*, because when you say you have a patent, you have an intangible asset that increases the value of your company, that's all" (Author23). The company's innovation is the rain gauge, which according to Author23, is more economical, practical and accessible than imported equipment: "Because the project has been developed commercially, on a larger scale, it means that the price is lower and we can make more people aware of it".

Project "Connected Drains" - Connected Drains began in mid-2013, as a result of the research of Author24, who was a design student at USP at the time. One day, while watching the building of the gutters at the University Campus, the sidewalks and culverts, he had an idea: "My God! Drains! It's not something digital, it's from Roman times, the aqueduct, all run by gravity (...). I was thinking about the floods, and that was the moment I thought about mixing digital technology with archaic technology". (Author24). Thus, the idea of Connected Drains was born. It is a service, a product, and a digital application, which links citizens with the city's drainage system in order to prevent flooding or accidents caused by poorly maintained drains. The idea was developed along the lines of a research project in the design course. Author24 created the visual identity, developed the prototype of what would be the application and a prototype for the hardware, "which I made with Arduino, with the help of a friend of mine at the time, because I was not that proficient in Arduino" (Author24). With a prototype of a navigable application, the prototype of the hardware printed in 3D and with the electronics (Arduino), he presented the research work, and it was approved, but according to him, from a practical point of view, Connected Drains (https: // cutt.ly/BjsbEqa) never made it past that stage. The project received an award in the area of design and became well known, which led to interviews with the media, contact with accelerators, involvement in a challenge promoted by Cisco, during a Startup Weekend, where it featured among the finalists for the contest. However, Author24 comments that: "Then it ended up like this ... I started to get the idea, due to all the conversations that I had and with all the connections I was making and such, that I felt that I needed to treat it as a startup. Well, a startup comes as a package, you need to have investment, you need to have investors and each investor needs to have an angle, and whatever it is here, business model, make a PITCH there, fill in the boxes they want you to, and that's when I started to distance myself from what was the original idea, which was: "I'm going to take this here, I'll put it there and I'll see what happens". The initial idea was to make an open-source solution available for everyone to make. "But what assurance do I have that each one will get built? None. Who'll invest money? Who'll pay for it? I began to think really seriously about this. So, it had to be low-cost, but what about hidden costs, which we don't know about yet?" (Author24). When his research was complete, Author24 started making his idea public, and many people advised him:" 'You have to find a partner',

'you have to get the government to pay for this '... then I started to go away from the maker's way of doing things" (Author24). "Man, I would like to create all this (...), but do I want to deal with councilors, with deputies? (...) It was from that moment I began to distance myself from the Drains project".

The "Gato Midia" (Cat Media) Project - The Gato Midia project (https://gatomidia.com/) is a media and technology learning space for young people who live in the favela. The idea started in 2013, in the Alemão favela complex in Rio de Janeiro, as a way of giving residents a voice, through telling stories about what the favela is like and who lives there. Initially, the focus was on providing free open courses to encourage people to use new media to talk about important topics within the favela, such as human rights, the democratization of information, urban mobility, and how to use Facebook, YouTube, and Twitter to put these issues on the table. Over time, Author32, whose project it was, realized that it was more important to train young people to create digital platforms than to teach them how to use the tools. "So, it's not just about understanding how I can make a video to put on YouTube, it's that I have the knowledge to be able to make a YouTube, make a mobile app, etc." (Author32). With that in mind, Gato Mídia adopted a residency model: intensive courses that aimed at producing a project by the end of the course. For example, the Residência Favelados 2.0 teaches not only how to make videos for YouTube (write scripts, film, edit and publish), but also teaches them how to create blogs and websites. The final result of one of the classes was a joint production of a documentary, 'Who Are the Makers in the Favela?', which was a debate about innovation from community spaces. Another product was the Wagikisa Residency course. In northeastern Angola, *Mutwo Wagikisa* refers to a strong person, with a strong body. The use of the term in the course title was because its objective was to think about "how to make the most of the bodies of women, black people, LGBT and marginalized people during a military intervention? How to use technology to subvert logic?". This training focused on learning programming. During the residency, participants were encouraged to create games and apps that dealt with the challenges they experienced daily in the favela. The last class, for example, developed a Transphobia Game, where the game aimed to find a way for the (transgender) character to manage to exceed their life expectancy "of only 35 years" (Author29). In this, the player had to use the arrows to get past obstacles such as prejudice, stray bullets, shootings, religious oppression, and having to collect coins along the way. Author31, who develops and teaches some of the classes for Gato Mídia, spoke about the dynamics of the training: "It's a job that is about the creative process, which I think is very important. Our residency courses start with this type of content (...) because it is something that seems quite intangible, something that doesn't seem connected to life in the favelas, because it seems like such a destructive, unfertile world, from the point of view of those who see themselves as creators. This lack of self-esteem... Usually the young people who come to us, they don't understand how to be creators, they don't understand themselves what power they have around them. So, first we try to work on their creativity, by making these young people see themselves as creative (...), then we start on more technical content" (Author31). The project raises funds from companies and foundations to carry out the training without having to charge students. The bureaucracy involved in trying to raise money from the government means that the State is not a viable partner: "Often we can't wait for the State to authorize anything, so we prefer to get it where we can, where we have contacts, where people recommend us, we even go and knock on the doors". (Author31). To provide young people from the favela with the chance to work in the media and technology, Gato Mídia has a partnership with an agency that hires these young people as interns or *freelancers* depending on demand. According to the interviewees, this is an opportunity for them to get into a job market dominated by middle / upper-class people in this country.

"Afro Engenharia no Mundo do Cinema" (Afro Engineering in the World of Cinema) Project - "Making audiovisual equipment with low-cost materials to help the black population, who have always been at a disadvantage when working in the film and television industry"; this is the mission of the Afro Engineering project, from Author29 (https://cutt.ly/njsnv1G). Author29 is an electronics technician and computer engineering student who, in 2015, started working in the film and television industry on the back of recording an award-winning documentary. He wanted to improve the quality of his videos, but

soon faced the problem of high cost, which gave him the idea of building his own equipment: "All of this equipment here works on principles that I have already used on other projects, this is very simple to replicate, the electronics for this design here, cost BRL 15,000.00 ... man, if I have BRL 50.00 I can put it together and develop all the smart part of it myself" (Author29). That way, he was able to produce equipment of similar quality to that sold on the market for twenty times less, and he could share this knowledge with the community. As a result, the demand increased. Colleagues who had the same requirements started to order equipment to buy or rent, which created a business opportunity. Soon, I started worrying about the aesthetics: "The first equipment was made in PVC, which made me think about coloring it black because inside the film industry everything is black to give it that air of standardization and to help things sort of disappear into the shadows because if anything is very colorful, they say that it distracts the actor, or takes people's attention away etc. But black items have different effects in different contexts. For example, I am a black guy, who lives in the favela, but if I am making a film, if I have a shoulder rig (...), if I am with that and I run into a police officer in the favela, I could get shot because of that. I don't even need to be in the favela, I can be in the middle of the street, in the city with that thing on the street, running, doing a tracking shot and, unfortunately, they might think I'm a robber, mistake it for a gun, and, unfortunately, there is plenty of data showing that this is not just something in my head, right?" (AuthorE29). His concern reflects the growing rates of violence in Rio de Janeiro's communities - shootings, confrontations, and deaths of innocent civilians - including children - in Rio's communities. "So, there is this whole black body dynamic working in different situations, so I thought: "Man, I can't color this thing black", it was a natural reaction, "man, I can't walk around with this because it could be mistaken for a gun", so then I had the idea of covering the equipment with African fabric." In parallel with developing and producing equipment like the Rig, Author29 also holds workshops where he teaches how to produce simpler equipment, which he no longer produces himself, these are dedicated to research and the development of more elaborate projects. His production is based on work and research in electronics, 3D modeling and printing, mechanics, embedded electronics, and programming. For this reason, he makes a point of making it clear that his projects "are far from being 'improvisations'". When talking about his products' innovative nature, he points out that "empowering black people to create their own environment, tell their own stories, this is innovative, this is revolutionary" (Author29).

4. Discussion and Final Remarks

Since there is no consensus on what inclusive innovation is, the existence of different interpretations (Pansera & Owen, 2018) indicates a lack of empirical studies that would allow us to understand better how it works in practice (Pansera & Owen, 2018; Patnaik & Bhowmick, 2020) and what is the role that emerging technology plays in inclusive innovation (Harsh et al., 2018). The study of the MM in Brazil provides a number of ideas and thoughts on how this concept has been developed.

First, it is worth considering that even a movement that, in principle, supports autonomous creation ("doing it yourself") and advocates for technology and innovation to be open and shared (Lindtner, 2015), it still retains many of the features of so-called "mainstream innovation" (Heeks *et al.*, 2014) when it comes to Brazil. For example, the assumption that technology-based innovation is synonymous with economic development predominates (Schumpeter, 1934); that innovation refers to its successful commercial application (Schumpeter & Fels, 1939; O'Sullivan & Dooley, 2008), carried out within the influence of traditional formal organizations (Schumpeter, 1934; Teece, 1996). It has led some authors of innovative projects within the MM to try to develop them through the startup model: sometimes successfully - like the Pluvi.On project - and other times not so successfully, such as the Connected Drains project, which failed to become a product because its author could not identify with the business and institutional dynamics involved in the mainstream development model.

Although the "*gourmet*" MM encourages the public to be included through *fab labs*, *makerspaces* and *hackerspaces*, which provide access to countless creative options, based on people's connections and the material resources that these places provide, it still leaves out other actors, those who have been

historically excluded from debates on innovation in Brazil. According to our research data, we identified as excluded mainly people from favelas and low-income communities, especially black people, and people that do not have contact with Universities and other spaces dedicated to entrepreunership endeavors, such as incubators and technology centers. Even a movement that aims to innovate through the way we create, make and relate to technology is still blind when it comes to some of the actors and settings excluded from the Movement, and consequently this significantly reduces its potential for social transformation in Brazil.

When studying the MM in China, Lindtner (2015) examined how Chinese makers were moving away from the western idea of innovation (which physically separates the idea conception phase from its materialization/manufacturing phase, based on the assumption that only the first phase is innovative). They were beginning to adopt a new ontological and political approach, which assumes that China's technological innovation is based not just on its technological *know-how* but also on the country's cultural methods of production. Therefore, the term "maker" has become a term for new entrepreneurs who are looking to move from "*made in China*" to "*made with China*" or "*created in China*", in order to make the country a center of technological innovation (Lindtner *et al*., 2014; Lindtner, 2015). Such potential for the MM could act as an inspiration to create unique technological methods, more inclusive and based on specific challenges, environments, and objectives, especially concerning developing countries, which tend to follow the technology and innovation paths set by developed countries (Medina et al., 2014; Dias & Smith, 2018).

Our research suggests the MM's potential to be transformed, as evidenced when the interviewed actors share a common criterion to which they attributed the innovative nature of the projects in this research. They unanimously refer to **access** as the main criterion to identify relevant innovations. The projects that were highlighted as significant were recognized as innovative solutions, not because they used sophisticated ICT, or because they generated immediate economic results, but because they provided access to something: knowledge, technology, information, empowerment, for a **community**. Once innovation begins to depend on the level and type of access and how inclusive it is, its political dimension can then be considered as part of its process. It constitutes an alternative way of looking at the mainframe of reference in which innovation takes place, instead of something that takes place within the sphere of traditional formal organizations, which are concerned with economic profit and intellectual property and their competitiveness in the global market (Schumpeter, 1934; Teece, 1996; Tidd & Bessant, 2015). However, while access and production of technology are limited to a select group, most Brazilian people are not represented, the dominant frame of reference will be reinforced and the *gourmet* MM and the innovation it produces will continue to maintain and worsen the inequalities.

Carrying out innovation based on access means that we consider the relations that exist as a result of the local conditions or situations. When we examine innovation taking place locally, in a less generalized way, we can look at the various environments (diverse and unequal) that surround us and that enables us to reconsider innovation based on these relationships. The literature review shows that the studies already carried out on the concept of inclusive innovation have approached inclusion from different perspectives (George et al., 2012; Heeks et al., 2014; Pinzón-Camargo et al., 2020), the most common of these are: (a) exploring the potential for the low-income population to be a potential market; (b) multinationals directing the focus to meet the needs of people at the base of the pyramid; (c) the poor as citizens who should be included in the process of developing local technology, as "co-creators"; (d) innovation as something that provides a positive impact for certain communities.

Our research suggests a more mature and refined version of this concept. It points out the need to go beyond the notion of inclusion in these works and to do more to overcome the unequal relationships, beginning with the inclusion of different actors (not just low-income ones) in creating alternative ways to develop technology and innovation. We need to take into account and involve the local community and its knowledge to develop solutions that are relevant to them and accessible, but, above all, which will help to redefine what it is to innovate and to include. This is similar to the highest levels of inclusion,

in other words, those that involve epistemological and discursive aspects (Heeks et al., 2014; Harsh et al., 2018; Pinzón-Camargo et al., 2020).

The contribution of this article to the concept of inclusive innovation is based on the argument that inclusive innovation is not about involving people in the dominant frame of reference. The discussions woven throughout this article suggest that this idea is much more than this: inclusive innovation means providing the right conditions for actors excluded from the 'center', and enable them to have an impact on naturalized practices, considered 'truths', contesting or changing *mainstream*/imported frames of reference, by bringing their knowledge, methods, and ideas to the table, which are based on different frames of reference, in order to discuss and take part in the process of innovation and making.

This research empirically shows what several authors, such as Schumacher (2011), Klochikhin (2012), George *et al.* (2012), and Heeks *et al.* (2014) have already stated: that the promise that economic growth would bring development and social well-being is no longer supported, therefore it is necessary to develop new ideas, and new approaches to (re)think innovation and technological development. It opens up the question of how inclusive the concept of inclusive innovation is. Who can be part of developing this concept? By whom and from whom is it being created? We suggest that future studies dedicated to problematizing the literature on inclusive innovation are invited to rethink it from other perspectives that try to take into account its political dimension from a critical approach. We need to provide advances that are significant and relevant not just for academic debate but also for the development of government policies, especially in so-called less developed countries.

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