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Strategic Innovation: Conception of Innovation among Social Sciences Researchers in Higher Education in Northwestern México

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Abstract
Researchers in universities are encouraged to produce innovative scientific research and participate in the international scientific community. In Mexico, public policies have intended to promote competitiveness in such social space. However, the lack of funding, researchers, and the polysemic conception of innovation in scientific production, amongst other factors, has scarcely promoted the economic, scientific and social progress in the region. This study (1) analyzes the concept of innovation among researchers in the field of Social Sciences to identify if they share a standard definition of such and if (2) the scholars have the impression that they perform innovations in their scientific production. The study compares researchers' conceptions from three higher education institutions of the State of Sonora, Mexico. The Northwestern region of Mexico is significant due to its research production in Physics and Social Sciences, which is mainly generated in Higher Education institutions. We conducted semi-structured interviews and analyzed their views about their scientific production over the last five years. We reflect on the different types of relations scholars tie the concept of innovation. The main results show the different conceptions of innovation, especially its fragmentary character among social science researchers and how this inhibits the development of innovation and competitiveness. This result is a virtual space for policymakers to open a formative space for innovation and is an invitation to investigate the innovative or non-innovative character of scientific production in northwestern Mexico.

Keywords Innovation · scientific production · Higher Education · social sciences · Mexico

Scientific production has evolved through the times on the grounds of the multiple shifts that society has experienced. Scientific production has adjusted to the agendas

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of each country, for which innovation is at its forefront (Puchet et al., 2002). In the global academic market, the race for scientific production, patents, journal publications, social and industrial innovation, the demand for solutions for macro and micro challenges is more significant than ever. The universities execute this task, which continues to be the source generators of research and development, innovation, and scientific production. However, it must link to the government, non-governmental organizations, producers, businesses, consultants, and environmentalists. It is a matter of knowledge that enables development with social meaning (Pescador, 2014; Zúñiga et al., 2018). In Mexico, the budget constrictions of its research and development programs have propelled higher education researchers to search for innovative scientific production practices.

Under the assumption that society will benefit significantly through innovation and scientific production in 'hard' and 'soft' sciences, we consider it essential to analyze the concept of 'innovation' amongst researchers to determine whether the researchers have the impression that their production generates it. More importantly, we are interested in the conception of innovation of social science researchers in Mexico and whether they consider their scientific production innovative.

The State of Sonora produces research that responds to local and national dilemmas: the *Universidad de Sonora* (Unison), the *Centro de Investigación en Alimentación y Desarrollo* (CIAD), and the *Colegio de Sonora* concentrate the primary production in this area, which makes them a critical case study. However, these institutions often neglect the innovation aspect of their projects. Several studies address knowledge production in higher education, but minor deal with innovation and researchers' understanding regarding their scientific production, whether it is innovative or not. In this sense, we are interested in knowing whether researchers share a definition of innovation.

This study intends to point out the importance of understanding the concept of innovation among researchers and to indicate the several approaches of such definition in various disciplines in Social Sciences. This study answers the question what is the shared notion of innovation among researchers from social sciences?

Literature

Studies on scientific production in higher education institutions (national and international) have been conducted by numerous authors. Pelz and Andrewz (1966) analyzed several factors involved in the output of individual researchers. On the other hand, Poole and Hollingshead (2005) described nine group theory and research perspectives. As interdisciplinary research continues to rise and demand, international research teams need to address several issues of group dynamics that affect scientific production (Hoffman et al., 2014). Expanding on scientific groups, Hamui (2010) focuses on analyzing the ethos of research groups in Mexico to highlight and drive their production towards the new generation of scientists. Also, Arechavala (2011) and Winfield et al. (2014) explored how research is conducted in Higher Education institutions and provided several key points to improve decision-making to produce science at a higher rate. Méndez and Remedi (2016) suggested a series of elements

to study the consolidation of some of the most productive research groups in the State of Puebla in Mexico. Regarding the northeastern State of Sonora, the idea of national and international recognition of small research groups in the State is highly likely because of their scientific production (Durand, 2011). Meanwhile, there is also a need to explore and compare Mexican research institutions to suggest different policies that favor scientific production in Latin America (Didou & Remedi, 2011).

In other studies of Latin American countries, conditions and practices in scientific research in public universities in Argentina show how scientists and research groups have adapted public policies to improve their production and technological transfer (Barletta et al., 2017). Rueda-Barrios and Rodenes-Adam (2016) examined the need to understand the relationship between research and technological capital in research groups of Colombia and how it plays a significant role in the outcomes of scientific production. The urgency of developing robust and quality producing research teams in Latin American countries is highlighted by many scholars (Gómez-Vargas & Garcia-Alsina, 2015).

These authors have analyzed different conditions that limit, encourage or aid the scientific production of academic researchers. Such findings have not only added to the previous findings regarding research in higher education settings, but they have also suggested that institutional conditions highly impact the state of production amongst its researchers.

Some studies regarding scientific production have considered the organization, production, and management issues of the research groups themselves and their institutions (Hodgson, 2011; Morales & Luzardo, 2016). Such studies have emphasized the importance of a coherent and parallel collaboration amongst institutional leadership and scientific production initiatives to promote further and generate scientific production. The research of Dsilva (2019) and Hamui (2010) has strengthened the analysis of some conditions that researchers possess to produce scientific research in the field and what role the institutions play in the quality and quantity of scientific production. In Mexico, researchers are highly influenced by their peers and the ethos of their academic groups when producing research (Hamui, 2011). Such conditions as their ethos, values, beliefs, and behavior contribute to their research field and production patterns.

In Mexico social sciences, researchers have identified some of the components that influence the dynamic of innovation in scientific production, such as age, sex, and institution of affiliation (Pérez and Monfredini, 2011; Ramírez-Correa & Sanchez, 2016). However, various studies indicate that Mexico is aware of the importance to innovate and can do it (De Gunther et al., 2019; Germán-Soto et al., 2009; Sánchez et al., 2015; Santa and Herrero, 2010).

Nevertheless, there are still not enough researchers or funding to generate such innovations compared to other countries. However, Bozeman and Corley (2004), Hamui (2011), Valdés et al. (2019) and Vessuri (2013) observed the need to incorporate more studies that analyze the concept of innovation among researchers in order to innovate in their practices in scientific production and participate in the global academic field.

The study by Silva (2016) presents Mexico as a country that has a substantial potential to innovate since it acknowledges the economic investments it has made through the last two decades. Nonetheless, the absence of a shared conception of innovation within the scientific community has become an obstacle when identifying scientific production under new methods and solutions.

In northwestern Mexico, innovation processes in universities have mainly followed two routes. The first refers to changes in current regulations: for example, the *Estatuto del personal académico*. It establishes the guidelines and action guides of the universities and the mechanisms for hiring academic staff (Durand, 2009). It is a top-down innovation. The second refers to the activities carried out by the teaching staff since their production in the university social space, a discreet and little-studied production. It is known as "bottom-up" or "marginal." In the first case, we recognize that normativity works as objective conditioning of its output. In other words, it conditions the forms of production of academics, in others not. About the second, we know that it is oriented towards teaching activities far more than research ones.

This paper examines the conception of innovation and if the academic researchers have the impression that they perform it in their scientific production held in three higher education institutions in Northwestern Mexico (*Universidad de Sonora, Colegio de Sonora* and the *Centro de Investigación en Alimentación y Desarrollo, A.C.*). We are interested in identifying a conception of innovation in social science researchers and distinguishing whether their scientific production represents what researchers understand about innovation. Specifically, we analyzed researchers' conceptions and the presumed innovation in their scientific production.

A Standardized Definition of Innovation

Several definitions of innovation in sciences explain innovation as a planned change in a system or solution (Laursen & Salter, 2004; Li et al., 2018; McClure, 2015; Moya, 2016; Owen et al., 2012). In this research, we employed the definition given by the *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES) in their Strategic Document for Innovation in Higher Education of 2003. Universities have adopted this definition, and some researchers from these institutions developed this document from the leading higher education institutions in the country. The definition is supported and used by the universities that participated in this study. According to the ANUIES, innovation is a deliberate, intentioned, and planned action. On the other hand, the Organization for Economic Co-operation and Development views an innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD & Communities, 2007). We recognize that such a definition is normative; its value in this work is not that of a "correct definition," but a description that permeates the

development plans of higher education institutions and that, on many occasions, conditions the production of research and the understanding of researchers.

Innovation in Scientific Production in Higher Education

In higher education, innovation within the scientific community is highly promoted through international research networks to help develop solutions and alternatives for systems. Previous studies showed that innovation in higher education focused on indexes, methods, and the performance of universities (Li et al., 2018). Prioritizing efforts to establish innovation in scientific research is critical due to its correlation between establishing authentic innovation and the survival and development of colleges and universities (Anderson and West, 1996; Pan, 2018). Without underestimating the importance of these ideas, our study focuses on the conceptions of innovation of the researchers themselves.

Despite multiple efforts by public policies, institutional authorities, and academic scholars to aim for innovation in scientific production at higher education institutions in Mexico, "the number of science and technology projects and the technology transfer revenue" (Li et al., 2018, p.1088) are the top priority for most universities instead of generating innovation. The authors refer to innovation as those products related to publications, patents, and the implementation of forms of knowledge or technology.

Most studies on innovation in higher education are centered on the climate and capacity to innovate and specific insights (McClure, 2015). Other authors (Li et al., 2018) suggest that funds intended for innovation in institutions are frequently not sufficient or not appropriately designated. The capacity to innovate and a well-founded climate to do so are factors that propel researchers to generate innovative scientific research (West & Anderson, 1996) and the need to explore innovations at higher education institutions (Clark, 1968). Embracing innovation by researchers at universities is considered a priority to generate scientific production that impacts the social and economic fields (McClure, 2015) and to stimulate an environment that invites innovation among its researchers and students alike (Berg & Östergren, 1979). Some innovation attributes are deliberate and planned (ANUIES, 2003).

Other studies have emphasized the process of educational innovation at universities, exposing the complexities of introducing new ideas to academic communities and institutions that have an insufficient culture, or lack of, to embraces change, creativity, and innovation itself (Caliskan & Zhu, 2021; Emeagwali et al., 2017).

Innovation in scientific production needs to be promoted and executed at higher education institutions to continue being a sustainable association and to supply a demand in the industry and knowledge market (Bajo, 2017; Blass & Hayward, 2014). However, the "role of universities as actors within the system and the role of the modern university" (Howells et al., 2012, p.717) has become more challenging to manage when the use of 'innovation' is misconstrued by institutions and scholars.

There could be challenges when understanding the concept of innovation and generating scientific research aligned to such. Researchers and students frequently mismanage innovation in higher education, which develops into a contextual, educational, and research issue. Researchers can confuse innovation in scientific production with any sort of definition they adopt. This attitude can weaken future studies regarding innovation in higher education, leading to further misinformation concerning innovation and instability in its studies (Berg & Östergren, 1979). Nonetheless, such obstacles can aid researchers to establish a standard definition of innovation within their group, field, and institution and strengthen their ability to generate legitimate innovations with their scientific production by sharing the concept coherently among the specific group.

Even though several studies draw attention to the definition of innovation, we press for a better understanding of innovation and the need to explore it through practice among researchers and the scientific community. Few researchers understand the downstream impacts of the potential for their research and how their scientific production must address it. Appropriating a general definition of innovation by researchers can be of great advantage in generating innovations that may impact a broader scientific level and encourage other researchers to produce research to innovate. By examining researchers' known definitions of innovation, we can begin to conceive of their perceptions of innovation and the distance between it and their scientific production. In other words, innovation is not only the deliberate and systematic application of innovation to produce it, but it also implies its transfer.

In general, there is a need to study the concept of innovation and the process behind it at universities for a greater understanding of innovative scientific research and those who generate it. We are interested in identifying a shared conception of innovation in the social sciences and distinguishing whether researchers thought their scientific production was innovative.

Context

In the context of this research, we recognize the knowledge society, characterized by the transition from an industrial society to a knowledge society. It is a society oriented to producing knowledge through education, training, and investments in research and development. It implies a link between institutions, communities, people, markets, companies, information systems, and socio-cultural relations to innovate. The key, as we expressed above, has to do with the production of scientific knowledge with a clear social orientation, i.e., aimed at the development of the person, region, the country, and the world (Balam, 2011; Barros and Turpo, 2018; David & Foray, 2002; Pescador, 2014; Zúñiga et al., 2018).

We focus our attention on researchers from the social science programs of three public universities in northwestern Mexico. In these sciences, researchers usually produce studies that are a continuation of their peers in institutions and usually work individually or in pairs and even respond to objectives outside regional or national interests (see, for example, González (1967) critique regarding the forms of knowledge production). Researchers from higher education institutions in Sonora

Table 1 Institutions in Northwestern Mexico. Participants

Institution	Participants
Universidad de Sonora (UNISON)	7
El Colegio de Sonora (COLSON)	6
Centro de Investigación en Alimentación y Desarrollo, A.C. (CIAD)	8

Table 2 Disciplines of origin of the participants

Discipline	Participants
Economics	10
History	5
Sociology	6

collaborate with small groups and with external, local, and national researchers. Through various programs of economic incentives generated in the institutions, researchers in social sciences often adapt their agendas with the institutional agenda to expand their research with the resources it provides and those of their groups. Researchers generate a scientific production that encompasses the objectives of their institution and the community of their academic field.

Methodology

During the first four months of 2021, we invited researchers' social science from three northwestern universities of México. The voluntary participation was requested via email, requesting their agreement. Once obtained, we commented that they would expose their concept of innovation and the innovations perceived in their scientific research through interviews. Of the three universities chosen for our study, twenty-one academic researchers volunteered. The researchers were from different areas (Economics, History, and Sociology) and were actively producing scientific research and advising graduate students at the time. Understanding the importance of promoting innovation among researchers (Ellis 2015; Elrehail et al., 2018; Johannessen et al., 1999; Joshua and Edward, 2020), the concept of innovation by researchers is relevant since, we suppose, it must reflect that understood by public policies in the country.

This study revolves around two research questions: What is the shared notion of innovation among social science researchers? Also, how do they represent such understanding in their scientific production?

The study implemented semi-structured interviews with 21 researchers from three higher education institutions in northwestern Mexico who volunteered to be part of the study (see Table 1). The researchers came from different areas of knowledge: Economics, History, and Sociology (see Table 2). We set the objective of the study to all interviewees in an email inviting them to the study.

The University of Sonora (UNISON), College of Sonora (COLSON), and Center for Research in Food and Development, A.C. (CIAD), are at the head of the generators of scientific research in the state of Sonora. Researchers from these universities invested an hour and a half on average in the semi-structured interview. We consider the notes of each interview as additional information for the study. All the researchers agreed to participate in the said study and, in addition, to record their interviews for later analysis by signing a consent form. The number of researchers who accessed such interviews was a limitation when analyzing the results. The study investigators were reasonably uniform in terms of gender, and the majority were of Mexican nationality.

Following the ideas of Mohd et al. (2017), we piloted the interview to test the questions and get some training on it, as well as consideration of the length of time of its application and possible findings. A researcher from the University of Sonora participated as a volunteer in this test.

We conducted semi-structured interviews with the participating researchers during the first four months of the 2021 semester. One of the researchers conducted the interviews. She also filled in the notes of each interview. The interviews represent the conceptions of innovation offered by each researcher to compare with the participants' other conceptions. As mentioned above, the number of participants was low due to various issues (Covid-19 pandemic, technological difficulties, time constraints). The initial intent was for the interviews to take place at each researcher's workplace to capture the nature of their research climate. However, this was not possible. We used Zoom video-conferencing application for all interviews. The semi-structured interview explored their understanding of innovations and their understanding of innovation through their scientific output.

The information provided by the researchers was analyzed first by starting from categories we established at the beginning of the study. Such categories were oriented by innovation definitions from la *Asociación Nacional de Universidades e Instituciones de Educación Superior* (ANUIES), the Organization for Economic Cooperation and Development (OECD), and various authors: innovation is a deliberate, intentioned, and planned action. Secondly, we coded the data recovered from the interviews with the aid of MAXQDA software, and finally, we uncovered other categories of analysis in the second round of coding.

It is important to note that we tried to include as many social science researchers as possible. We established telephoning and electronic communication with the heads of three higher education institutions in the region to gather more candidates. Even though we requested information from some of the researchers to include others, it was impossible. The conditions resulting from the pandemic have left other conditions to the research. In addition, we note that the researchers could offer more direct answers in some cases to finish the interview more quickly. The researchers could offer a lighter view of some answers due to their administrative positions in their institutions.

A doctoral student conducted the interviews. She was familiar with some researchers beforehand, which aided the conversations themselves. All the participants had previously been part of other studies regarding their scientific production. Through the duration of most of the interviews, participants shared their

conceptions and points of view of innovation and how they assumed they were innovating through their scientific production. Some researchers reflected heavily in their production and concluded that they were not innovating but continuing projects that did not add to the innovation problem. At the end of the interviews, all the audio and video were transcribed by four experienced students, ensuring that all the information would remain anonymous. Both authors of the study conducted the analysis and discussed through all the phases of the research.

Data was collected and sorted by institution and discipline (in that order). For example, University of Sonora participants in Sociology appear as follows: Professor of Sociology from UNISON; “UNISON" stands for University of Sonora, "COLSON" for *El Colegio de Sonora*, and “CIAD” for the *Centro de Investigación en Alimentación y Desarrollo, A.C*. Responses appear by institution, area of study, and by similarities to perceive and approach innovation by researchers in the study (Creswell, 2007). Questions from the interviews that reflected our objectives were analyzed and discussed profoundly to understand their conceptions of innovation. Participants of the study understood the importance of innovation in the research. However, they were also aware of the complexity of the concept when they tried to explain it in their research. Researchers understood the challenge of understanding the concept of innovation and tying it to their actual work. For this, we compared answers by field and institution to distinguish coherency among them.

Scope and Limits of the Study

During the research’s methodological development, we established a specific procedure to determine its scope and limits. In qualitative studies, the term used is trustworthiness. Others (Gonzales et al., 2021) state that this term contemplates at least four aspects to focus attention: transferability, credibility, reflexibility, and transparency. Regarding transferability, this research describes step by step the study interest and the procedure followed for the "construction of the data." We support credibility in the instrument’s design. It allows the information to be compared between the research participants, regardless of the institution or discipline and categorizes data in the ongoing discussion between the two researchers of the results obtained. Reflexibility implied examining three central aspects: (1) the assumptions of the methods constructed, (2) the socio-historical processes involved in their construction and acceptance, and (3) their relationship with different theoretical and epistemological positionings. Hence, the notions of innovation and modes of research in the social sciences were referents made transparent in the research approach. The study is transparent in its realization, 30 h of videotaped material, field notes, and transcriptions. It is also true that the participants’ answers can contain biases derived from the adjustment in the interview or the interests derived from their participation as administrative officials and researchers in their institutions.

Results

The analysis shows different results on the researchers' idea of innovation. They are partial ideas about innovation, which do not allow researchers to speak adequately about "innovation" in their research projects. Even so, it was possible to classify four primary conceptions of innovation. Our study suggests that social science researchers often have a partial or inaccurate idea of innovation. We observed that such a notion of innovation does not conform to what the literature on the subject offers. This is a problem, a constraint against researchers themselves when it comes to innovation and when it comes to promoting it among research groups. Insufficient funds, tools, and capabilities (and often interest) to innovate is a disadvantage for researchers seeking to compete in a global academic field.

Participants mentioned that their innovations related to the way they conducted their research but could not explain how exactly they would 'innovate'. The analysis also showed that researchers mentioned innovation as a highly important factor in scientific research and the development of the institutional agenda to improve society and industry. Even though they were aware of such information, the participants mentioned at the end of the interviews that they knew their scientific production was not promoting, generating, nor transmitting any innovation by itself. In addition, innovation in scientific production was mostly presented in projects by researchers with international grants and collaboration.

Innovation in Scientific Production

Innovation in scientific production is an intentional goal taken by the State that can carry with it an array of complications (Anzaldo, 2019). Although State and institutions alike in Mexico aim to develop innovation in research at universities, university scholars also carry scientific production without specific importance in innovating, recording innovations, or examining if there are indeed innovations in the scientific production of scholars.

This study shows that the conception of innovation of researchers in social sciences in northwestern Mexican universities represents discrepancies when compared with other researchers from the same institution or the same field of study. It shows contradictions when giving examples of innovation in scientific production and exposes innovation as a policy discourse rather than an activity by researchers or universities. Researchers showed difficulty trying to explain their concept of innovation.

Researchers stated that they innovated by implementing new research areas for the case of the State of Sonora. In addition, they mentioned innovating through their scientific production by viewing their academic field from new and different points of view. The notion of" creating or inventing something new and valuable" (Edwards-Schachter, 2018, p.66) from a new perspective is about what innovation is. The introduction of new perspectives in scientific research can be innovative if

researchers connect their scientific production to social and economic needs, which the participants did not necessarily prove:

> "It is always difficult to apply innovation because many times and more in economic science we are talking about theoretical approaches or applying processes and it is difficult for those to land and translate into well-being [and] more wealth [...]. It is very difficult, but not impossible. For me innovation is to improve processes that allow you to find aspects that can improve the quality of life" (an Economics professor from CIAD).

Participants mentioned innovation as something difficult to achieve in social science production, but the majority also commented that they were innovating in their field through pioneering themes of research. The conceptions of innovations from researchers generated a discussion about how the term innovation is used in academic communities and research groups in the region. Researchers in social sciences assessed that their scientific production contributed less than others from the central region and other countries. This confirmation made them aware of the complexities of participating in global agendas that promote innovation among university scholars.

Arifin et al. (2021) mention Ismail et al. (2020) when stating that "most prominent universities' success story is [due to] management innovation, not technology innovation". In northwestern Mexican universities, researchers stated that innovation is not sufficiently encouraged by institutional leaders or the scientific group itself, alluding to several factors that need to be addressed by their institutions and colleagues.

Participants hesitated to state their conception of innovation since they were not completely confident of what they were about to express: "Well, what can be innovation? Notice that right now with, with everything, in this invitation that I was made to be part of the follow-up evaluation of graduates, uh, it is, it is a little word that we have to, to see how we make it operative" (an Economics professor from CIAD). Statements such as this one reflect the urgency to understand what innovation is, its purpose, and how one can create and implement it through scientific production. Some participants held administrative positions in their institution at the time of the interviews. It shows how many participants across several hierarchies shared the uncertainty of the concept of innovation in their institutions.

Most of the participants agreed that innovation is a planned implementation, creative alternative through scientific research that intends improvements in different areas: "[Innovation] is always looking for the improvement of things, I always think that everything is susceptible to improvement, […] a change can be made, so, yes I have applied it, I try to apply it, […] and in the studies that we do, I try to measure or evaluate things that, perhaps no one is doing, or they are not doing it yet" (an Economics professor from UNISON).

Participants who mentioned innovation due to their scientific production reported being involved with international and national scientific groups and universities that possess more capital. Participants also mentioned numerous times innovation as a key outcome of their research but also acknowledge that there needed to be an increase in the quantity and quality of it:

> "We work a lot with the border or with a team in Arizona, at the University of Arizona, uh, well, we have done things that nobody has done, so if that is innovation. Well, there is innovation but at the national level, because there are also things that have not been done as such, so well, let's say there is, there is a certain degree of innovation" (a Sociology professor from COLSON).

Other participants stated that they were aware that most of the scientific production limited the possibility of innovation due to pre-established policies, institutional administration, and other factors that prevented such results: "For me Innovation is to push, let's say to do something beyond what is established, for me that is Innovation […], it can be applied in any field, so those contributions are there, it's nice, but it's very difficult, it's nice to say it, but it's very difficult to contribute something of, beyond what is already established" (an Economics professor from COLSON). Participants who mentioned that they innovated through their scientific research also noted an insufficiency of trained and capable peers to innovate appropriately in the region, preventing other researchers from reinforcing their findings due to the need for qualified and willing fellows peers.

Proper training and qualifications to generate and implement innovations in emerging countries such as Mexico are essential for researchers at universities to collaborate and contribute to their scientific production. Martínez et al. (2021) mention that "in the educational, productive and business sectors, the creation and consolidation of multidisciplinary groups that incorporate specialists and professionals who have the equipment and instrumentation as well as material and budgetary resources should be strengthened" (p.78). Participants in the study that reported innovation through their research identified these inadequacies in their institution, area, region, or federal policies: "I have not been able to use [peers] that I have immediately next to me, […] I have had to look outside to be able to reinforce that work" (a Sociology professor from UNISON mentioned).

Statements of this kind reflect the distances between researchers and peers in their department or institutional division when collaborating in scientific research in social sciences. Most participants acknowledge that their scientific production and research group are well behind the rest of the country and abroad that are innovating. They do not have the desire to tackle projects that involve innovation. This lack of desire may be due to differences between researchers or institutions on research methodologies, research interests, or other factors. One participant noticed that:

> "In such a part [we are innovating] but we are hardly doing it here. In those terms perhaps, the contribution [in our region] is less" (a Sociology professor from COLSON).

Another participant who was currently in the patent pending process also mentioned that:

> "Innovation in social sciences is difficult, no? Not impossible and we are currently in copyright proceedings because it has taken us four years to be programming (repeat) programming and programming and we are going to do it in the coming months" (an Economics professor from CIAD).

Conception and Implementation

After analyzing the participants' answers, the concept of innovation among researchers was like the extent it shared characteristics and its importance to further the development of the country and science overall. Participants mentioned creativity, novelty, and originality as some of the traits regarding their concept of innovation.

Another property given to innovation by the participants was that it is a new alternative to solve a problem or improve a process or outcome:

> "I consider that when we talk about innovation, we would be talking about offering new alternatives to, let's say, situations that are already existing or new situations. So, there would be, let's say the issue of innovation, how are we trying to find new alternatives? In the field in which I work, innovation basically lies in finding recent methodologies that, let's say, have been promoted from other social sciences and how we incorporate them into our work" (a History professor from COLSON).

Some participants pointed out that their concept of innovation aligned with the definition given by the OECD (Organization for Economic Cooperation and Development), which characterizes innovation as "the introduction of a new, or significantly improved, product […], process, a marketing method or a new […] practice" (OECD & Communities, 2007, p.56):

> "For me, the classic concept of innovation tells me many things, that is, for me it works, thinking about modifications that you make to a process, to a product, and that is an improvement, right? being congruent [...] with the notion that I have [of] innovation, which is basically the one adopted by the OECD" (an Economics professor from CIAD).

Although some participants referred their conceptions of innovation to those given by international organizations, some researchers failed to tie their scientific production to specific expected outcomes of innovation: "Innovation well it is creating or improving something that you already have […]. In the studies we do, I try to measure or evaluate things, which, maybe nobody is doing it, or they are not yet doing, […] then, um, either to contribute, something, and, also well to know,[…] but, yes, definitely yes I think that I am trying to innovate" (an Economics professor from UNISON). The participant refers to innovation as the creation or improvement of an existing process or method but hesitates to offer a particular innovation in his scientific research to the extent that she acknowledges an attempt to innovate.

Few participants also quoted imagination, creativity, and management as traits that were part of their concept of innovation. These actions and other individual and organizational factors determine the climate for innovation (Imran et al., 2010).

Nonetheless, participants noted that efforts to innovate in social sciences tend to be more complex than those in hard sciences, leaning them towards scientific production that does not look to be innovative. Even though all three higher education institutions that participated in this study boost innovation as a priority in

their mission statements and policies, the scientific production of the participants, in general, did not reflect on being innovative as they mentioned. Participants who stated not to have innovated through their scientific research noted the lack of infrastructure and human resources.

Innovation is known to have several definitions given by authors, organizations, and institutions alike, some of the core traits that define innovation are that it can be "a learning process oriented towards the implementation of major changes, redesigns or reorganizations in organizations" (Tejada et al., 2019). Since many public universities in Mexico have limited budgets and their scholars have an overload of activities, an innovation in scientific production is not known to be a common outcome for most researchers in social sciences. As previously mentioned, participants mentioned that they knew they were innovating because they were producing research but were aware that innovation is not only the introduction of something new to the field of study but a more difficult task of achieving. A few other participants noted that their 'new' implementations were not necessarily that but innovative since they were new to the context of the State of Sonora.

Researchers who participated in the study and mentioned they were innovative were eager to talk about their research projects and note that their methodology was considered innovative. When pressed to explain, participants would use the word new, but would not elaborate further.

> "In the methodology you innovate because when you analyze different theoretical postures to approach a phenomenon and use your imagination to attend to a fraction of that phenomenon that has not been approached, [you are] innovating. Innovation is not something miraculous, it is something we do every day, it is the product of effort" (an Economics professor from CIAD).

Some participants noted that stating that something was new was being labeled as innovative, which has been adopted by many researchers of this study and in the region. One participant explained:

> "Innovation is the same as intervention. I believe that research must be innovative if it allies with the changes of context. So, I believe that [...] we need to do other types of research when [..] we send an article to a journal. It must be original and everyone's [article is nowadays], everything is new, everything comes from a different person therefore it is, but it is not" (a Sociology professor from UNISON).

Other participants reported that they were unaware and not interested in innovating through their scientific production:

> "I don't know [if I innovate]. Maybe I am very critical, but maybe I am not innovative either. What I try to do with my research line [...] is to leave the quantitative part aside, the quantity does not matter [...], what I care about is how [the people] feel, how I can connect with that [issue] [and] how solidarity is generated" (a Sociology professor from UNISON).

Conclusion

This study contributes to regional, national, and international studies related to innovation and their impression of it. In addition, it promotes further studies in the main scientific production institutions of all Mexico and in other Latin American countries. It also revealed multiple conceptions and vague concepts about innovation from researchers who enjoy prestige in their field of study, hold administrative positions in their institution of affiliation, and are considered by their peers as pioneers in their institution.

Previous studies on innovation in higher education institutions have pointed to specific products and systems that are considered successful but have not explored the areas of academia that are not aware, motivated, or qualified to generate innovation. The study results also showed that there is a fragmented notion of innovation among researchers, but the idea that innovation is like a door to change is perceived. In this sense, it is crucial to building a standard conception among researchers, which with the collaboration of the different actors involved: institutions, scientific groups of the State of Sonora, businesspeople, community, and others, allows to guide them in the generation of innovative knowledge and provides the adequate tools and knowledge to carry it out. The development of this research shows that its absence inhibits the creation of research products in this direction and constricts the possibilities of entering fully into the competitive global academic market. The results also indicate lines of action for policymakers, particularly the aspects of training and education in innovation. It is essential to evaluate the scientific production of Northwestern Mexico from the perspective of whether what is produced as science is innovative.

Future Studies

With the purpose of furthering innovation studies in the social sciences, in the State of Sonora and in the Northwestern territory of Mexico, it is imperative to continue to broaden such studies to other areas (Education, Anthropologie, among others) and to the Humanities as well. Finally, with the intention of expanding such studies in the field, we are encouraged to engage in research that identifies innovations in scientific production in the main research and Higher Education institutions in the country and in other Latin American countries as well.

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Data Availability The data of this study is available upon request to authors.

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Declarations I, Elsa Catalina Olivas Castellanos, am the corresponding author for this article. I attest that all authors agreed on the analysis and submission of the present article. We reiterate that this study has not been published nor presented elsewhere.

Ethics Approval The methodology and the study itself was approved by the Doctoral in Education Innovation Program of the Social Science Division of the University of Sonora.

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