The Contribution of Action Research to Industry 4.0 Policies:
Bringing Empowerment and Democracy to the Economic Efficiency Arena

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Abstract

The article is written in the intersection of the fields of regional development and action research, which use different languages when referring to development. The first revolves around innovation revenues, market shares and competitiveness while the second focuses on emancipation, democratisation and empowerment. Based on an experience in Gipuzkoa, Basque Country (Spain), the case used in this paper tells us how a regional government, the Provincial Council of Gipuzkoa and eleven county development agencies are collaborating in order to avoid small firms falling behind in digitalisation processes. The main argument is that action research can help construct collaborative governance modes which, as well as helping specific firms become competitive, empower territorial actors as a collective subject that decides on its own future.

Keywords: regional development, action research, Industry 4.0., social construction, participatory governance

La Contribución de la Investigación Acción a las políticas para la Industria 4.0.: trayendo empoderamiento y democracia al ámbito de la eficiencia económica

Resumen

El artículo está escrito en la intersección de los campos del desarrollo regional y la investigación acción, que utilizan lenguajes diferentes para referirse al desarrollo. El primero gira alrededor de la innovación los ingresos, cuotas de mercado y la competitividad mientras la segunda se centra en la emancipación, la democratización y el empoderamiento. Basado en una experiencia en Gipuzkoa, País Vasco (España), el caso utilizado en este artículo nos cuenta cómo un gobierno regional, la Diputación Foral de Gipuzkoa y once agencias de desarrollo comarcal están colaborando para evitar que las pequeñas empresas se queden atrás en los procesos de digitalización. El principal argumento es que la investigación acción puede ayudar a construir modos de gobernanza colaborativa que, a la vez que ayudan a empresas específicas a ganar competitividad, empoderan a los actores territoriales como sujeto colectivo que decide sobre su propio futuro.

Palabras clave: desarrollo regional, investigación acción, Industria 4.0., construcción social, gobernanza participativa

1.   Introduction

Action Research is well known in certain fields like education, health, feminism, and rural development. Its emancipatory and democratising principles together with its goals of empowerment, though not necessarily mainstream, seem to sit comfortably in these fields.

This paper on action research is written in the context of regional economic development. To date, this context has primarily been dominated by the principles of economics and business, where frameworks are defined in terms of innovation revenues, market shares and competitiveness and where emancipation, democratisation or empowerment are not on the agenda. Is the demand for action research in this field worth the effort? We believe that it is, and the rest of the paper is oriented to showing the benefits of this intersection both for action research and regional development communities.

The case we use for our paper is inspired by Action Research for Territorial Development (ARTD) (Karlsen & Larrea 2014; Arrona & Larrea 2018). The reason why we use the term 'territory' and not 'region' is that from the perspective of action research and the co-generation of solutions for specific problems, a multilevel approach is needed where not only the region, but also other territorial levels will work together. Inspired by Alburquerque (2012), who proposed this definition in a dialogue process with policy makers in the context of the AR process we use as a case, we define territory as the actors who live in a place with their social, economic and political organisations, their culture and institutions as well as the physical environment they are part of. Territorial development is the process of mobilisation and participation of different actors (public and private) in which they discuss and agree on the strategies that can guide individual as well as collective behaviour.

In this context, we argue for ARTD not as a methodology for research, but as a strategy for territorial development, a strategy for the mobilisation and participation of the actors. Territory is, therefore, not an object but the subject of territorial development.

How does this connect to innovation revenues, market shares and competitiveness? The main territorial actors we work with are governments and their agencies (a provincial government and eleven county development agencies owned by municipalities) and, through them, small industrial firms.

We believe there are different approaches to interpreting the role of these firms in territorial development. We mostly focus on two aspects. First, they are relevant actors in territorial development because they provide employment and, second, because they often serve as anchors in decision capacity at a local level. However, without any doubt, they are weak actors in the economic system, which is precisely what makes action research useful. Empowering small firms is relevant to help them play their role in the development of the territory.

Concerning Industry 4.0, digitalisation is one of the challenges that industries are facing today and will face in the future. We define Industry 4.0 as the in-depth transformation in work modes linked to digital technologies. The way of doing business is changing and will continue to do so. Small firms run the risk of being left behind in this process. The goal of action research in the case we study is to create a new governance mode, dialogue-based and participatory, where governments will directly work with small firms to help them overcome the digital gap. The goal, as we mentioned earlier, is the development of territories to increase their capacity to decide on their future.

The problem statement that has inspired our paper is that not all firm oriented policies are sensitive to territorial development challenges in the long term. There are either speculative or productive trends that increase the mobility of decision centres and can diminish the capacity of a territory to decide on its own future in the long term. The rationale behind this paper is that action research can help develop policies that support firms while also being beneficial for territorial development because they help strengthen a territory as a collective subject with the capacity to decide on its future. In a nutshell, participatory governance can create collective capabilities that anchor decision capacity locally. This is also applicable to Industry 4.0. policies, and thus our research question is: how can action research contribute to making Industry 4.0 policies simultaneously beneficial for firms and territorial development?

In our paper we argue that the main contribution of AR to policies such as Industry 4.0 is a specific type of participatory and dialogue-based governance which, in addition to being more efficient in implementing industrial policies, empowers actors and generates conditions for the territory to develop its own path. We will call this type of governance *territorial governance*, meaning that it generates the conditions for territorial development (mobilisation and participation of territorial actors).

The paper has been structured so that a conceptual framework section follows this introduction. Section 3 makes an introduction to the case while Section 4 presents the AR methodology used. Section 5 then describes the case. Finally, in sections 6 and 7 we present the discussion and some closing reflections.

2.   Conceptual framework

The paper is built on the intersection of the research fields of regional development (including Industry 4.0) and action research. There are significant differences in these research traditions, some of which relate to the role of concepts and frameworks in the research process.

Research on regional development policies, among which we include innovation policies and thus Industry 4.0 policies, traditionally focuses on their *implementation*. This means that conceptual frameworks proposed by academics are often the source of recommendations to be implemented. Context specificity is used to argue the point that when policy makers implement the framework they should take into account that it will work differently in every context. However, little is said about how to handle specificity. There are critics of this linear approach to implementation in the literature. For instance, Kroll (2015) and Cappello (2014) claim there have been inconsistencies in the academic research on RIS3 (research and innovation strategies for smart specialisation) that have led to confusion when regional authorities have tried to implement the concept in practice. Kroll (2015, p. 3) states that "early RIS3 policy guidelines provided little in the way of helping regional policy-makers to make sense of local complexity and dynamism to the extent needed for solid policy-making".

Action research, through the concept of praxis (Freire 1996; Eikeland 2014), proposes a non-linear relationship between concepts and practice where concepts are not implemented but tested in practice, made more robust if they work and discarded if they do not. Practice is

not only a space to implement theory, but also to construct it. In this context, social constructionism, which is barely touched on in regional development literature, is accepted as part of action research. The connection between action research and social constructionism is explicit in AR literature (Gergen & Gergen 2008; Shotter 2014; Costamagna & Larrea 2018). The case described in this paper shows social constructionism from an empirical perspective, and includes an episode of how constructionism itself was discussed with policy makers.

Following Shotter (2014, p. 704) we argue that "social constructionism is […] a turn towards previously unnoticed features of social interaction as being of importance" and has "a focus on the ongoing, active, living relationships between people and the others and otherness in the surroundings, and on the creation amongst them all of what we take such things and facts to be". This language might feel strange to researchers in the regional development field. Nevertheless, we believe it can be very useful when trying to face the inconsistencies and intractable problems mentioned in previous paragraphs, and it is at the core of the discussion of this paper and our answer to the research question.

The role of action researchers in the case shows, as Gergen & Gergen (2008) write when referring to the dialogic relation between constructionism and AR developments, "an emphasis on research as political action, replacing methodological individualism with a collaborative epistemology, moving from a vision of research as mapping to one of world making".

In a nutshell, not only regional development and action research have different conceptual frameworks, but they use them in a different way too. Based on this we argue that cross fertilisation between regional development and action research oriented to integrating social construction in regional development could be a fruitful process. This is what the case shows, as governance in this case was not implemented following any framework in the literature, but learnt, negotiated and constructed collectively through interactive processes.

Finally, for our conceptualisation of governance, which is the core dimension of territorial development in the case, we follow Bevir (2011, p. 51) and his invitation to rethink governance as the result of "actions laden with meanings". He advocates the need of an approach to research that "encourages us to examine the ways individuals act on their beliefs to create, sustain and modify governance" (Bevir 2011, p. 58).

3.   Introduction of the case

ARTD has mostly emerged in the context of a specific AR project ongoing since 2009. The project started under the name of Gipuzkoa Sarean (meaning 'A networked Gipuzkoa' in the Basque language) and was renamed in 2017 as the *Territorial Development Laboratory* (TDLab).

TDLab as an AR project is developed by a team of researchers from Orkestra-Basque Institute of Competitiveness, policy makers from the Provincial Council of Gipuzkoa (one of the three provinces of the Basque Country, Spain) and county development agencies of this province.

The provincial council is a regional government with competencies in innovation policy, complementary to those of the Basque Government which leads industrial policy in the

region. Counties in the Basque Country are infra-provincial and supra-municipal entities, with no political or administrative representation but with county development agencies created by various municipalities that get together in order to achieve critical mass for development policies.

This paper focuses on a specific period, from April 2016 to June 2018, which helps see how Industry 4.0 is specifically addressed. It is nevertheless important to underline that this could not have been done without the learning processes developed since 2009 regarding territorial governance. The period we analyse inherited from previous stages of the AR process what we call *spaces for dialogue*. These spaces are where challenges are shared, developing a shared interpretation of them and where potential solutions are discussed and negotiated.

There were three spaces operating at the beginning of the period analysed:

a) The promoting group. This is a group made up of policy makers in the provincial council and researchers at Orkestra which meets weekly in order to follow the whole process and help the facilitation of the other dialogue spaces. The role of researchers is to generate the conditions for policy makers to reflect, decide and act on the process.
b) The Intercounty Table (ICT). This is a group composed of policy makers in the provincial council (elected politicians and civil servants), presidents of the eleven agencies (mayors of one of the municipalities in each county) and the directors of county development agencies. In the period analysed they met three to four times a year in order to establish the annual priorities for collaborative policies and make the decisions about which projects to launch and how to fund them. Researchers contribute with expert knowledge and methodologies for decision making, negotiation and evaluation.
c) The facilitators' action research process. This is a process where policy makers from the Council and the agencies participate in order to design and put into practice the policy decisions made in the Intercounty Table. The group holds monthly workshops and it is the space where action research is more explicit, including naming the particular space.

The case will mainly focus on describing how, through the workshops developed in the facilitators' AR process, a new governance mode for SME policies emerged that was later used to develop Industry 4.0.

4.   Methodological approach to the case

The methodology used in TDLab is action research for territorial development (ARTD) (Karlsen & Larrea 2014; Arrona & Larrea 2018; Costamagna & Larrea 2018).

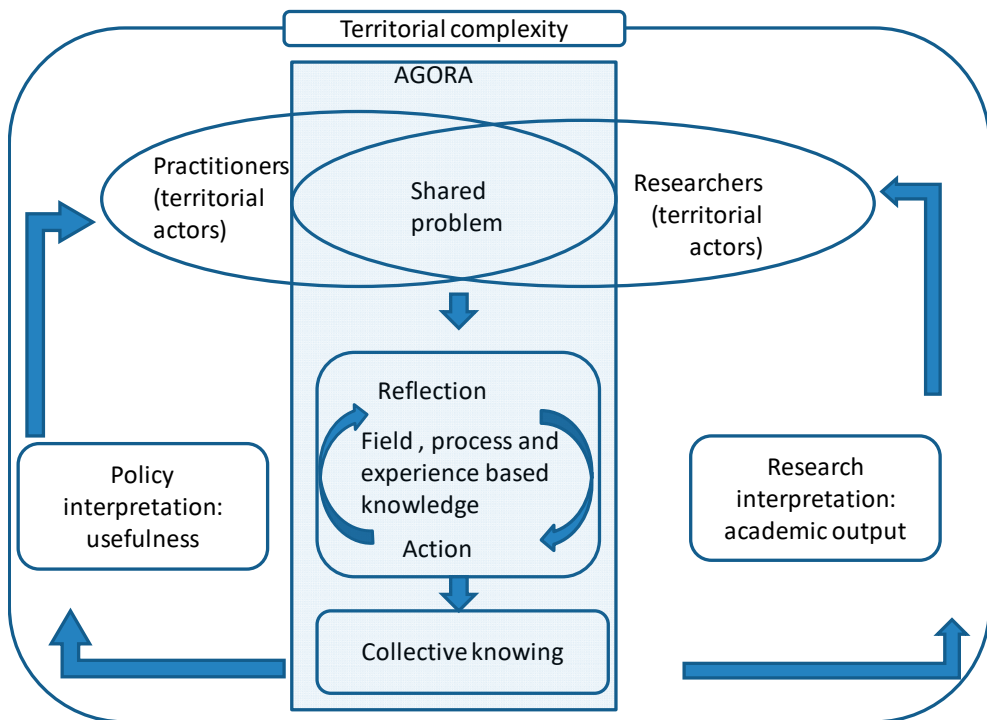Figure 1 synthetises the type of AR process followed in the case.

Figure 1. Cogenerative framework (Karlsen & Larrea 2014, p. 100)

The framework shows a cyclical process where researchers and policy makers from the provincial council and county development agencies have co-generated the solutions to the challenges that emerged when trying to respond to the main goal: to construct a new mode of governance for economic development in Gipuzkoa. In the following paragraphs, we briefly describe the different parts of the framework, focusing primarily on how they have materialszed in the case.

The whole process has been framed by the *territorial complexity*, which means that there has been an explicit reflection about the existence of diverse actors in the territory that can have different interpretations of what governance means, what the main challenges of governance are and how to solve such challenges. Furthermore, no actor occupies a hierarchical position to instruct the others on how to proceed and consequently, collaborative and dialogued solutions need to be sought. The case shows different perspectives of the provincial council and county agencies.

The *agora* is primarily where the facilitators' AR process and its workshops took place. The case focused on two cycles of reflection and action to solve specific problems. The first of the *shared problems* was that the provincial council programmes oriented to SMEs were not working as desired. In the words of one of the policy makers "The Council is not reaching small firms and small firms are not reaching the Council". This led to a process of monthly workshops between members of the Provincial Council of Gipuzkoa (PCG) and

the staff of county development agencies to reflect on how to solve this particular problem. There was also engagement on the part of all organisations to make use of these reflections through specific programmes. The challenge was to improve the way they were working with SMEs, which meant pursuing two objectives. The first was to reach not only more but also different SMEs, as the Council felt that they always worked with the same firms and wanted their programmes to be open to firms that had never been part of such policies. The second was to reach them more efficiently in that the programmes should address what SMEs considered to be their main problems, rather than what policy makers thought the main problems were.

Once the shared problem was agreed upon, *cycles of reflection and action* were initiated. Reflection took place in monthly workshops where representatives of the PCG and staff of the county development agencies worked together with researchers. After these workshops, the results of the dialogue were systematised and presented to all participants, so that they could make decisions to improve their approach to SMEs. This meant that each participating organisation could improve their own policies based on what they were learning, although this was not the final goal of the process. Following the framework in Figure 1, the process aimed to generate *collective knowing*, a shared capability to act together to solve problems. This was at the core of the new mode of governance, since the goal was to be able to work together to define policies that would be constructed in collaborative ways. This capability for collaborative work would translate into the capability of the territory to decide on and construct its own future.

The second *cycle of reflection and action* derived from a redefinition of the *shared problem,* first in the promoting group and then in the ICT. Instead of improving the way the provincial council and the agencies were reaching SMEs in a generalised manner, the goal was redefined into reaching SMEs to help them develop their capabilities for Industry 4.0. The methodology used was similar to the previous stage, and through workshops with action researchers, participants defined the methodology to work with SMEs and then started a dialogue process with more than 404 small firms. Thus, 404 firms were integrated into the new governance by being part of the reflection-action cycles of the co-generative framework of ARTD.

The following section goes into greater detail on how the process developed in the two ARTD phases previously described, and which are named as stage one and stage two.

5.   Description of the case: building territorial governance for Industry 4.0 step by step

Stage one: negotiating a generic mode of governance for SME policy

This stage was developed through 11 monthly workshops between April 2016 and April 2017. During the **first workshop** the Director of Economic Promotion of the PCG informed the county agency representatives that the process had two goals: the first was the modernisation of small firms, and the second was the development of a new mode of governance to build relationships with small firms. This put governance at the core of the pro-

cess. But how were they to create a new governance? One of the researchers presented the co-generative framework (see section 4) as the method to be used, and participants agreed.

In the **second workshop,** we (action researchers) discussed with participants the relevance of the analytical frameworks we would construct based on their dialogue process. Through these analytical frameworks we could discuss with the members of the Council and the agencies our interpretations of what they were saying about the new governance.

A researcher said the following:

"this process is constructed by all of us and it is important that you all feel identified with these frameworks. They will be our working tools, and we will commit to the issues represented in them"
(Extract from the memo of the workshop held on 12th of May, 2016)

During this workshop representatives of the Council and the agencies worked to identify, based on their previous dialogue with SMEs, the main problems that the new governance mode should address. Going to firms and directly asking was still considered premature.

A list of the problems of small firms was agreed upon: lack of strategy, low participation of the staff, no own products, too small to internationalise, difficulties to fund technological innovation, and to relate with actors in the knowledge system. Also, the problems of agencies when working with SMEs were identified and categorised into the following types: structural problems for territorial development, co-ordination problems, organisational problems and capability problems. The first list was discussed with two firms per agency and adapted.

With the group having a shared perspective on which problems the new governance should help solve, **the third workshop** examined directly the contribution of constructionism to these problems. This was considered by part of the AR team as a risky move, since practitioners could consider constructionism as being too far removed from them. The main argument given by the researcher who led the workshop was that the solution to the problems previously agreed upon could only be socially constructed and thus, the group (policy makers and researchers) needed an explicit shared understanding of what this meant. Based on the work of Berger & Luckmann (1991), the concepts of institutions, social construction, intersubjectivity, externalization, objectivation and internalisation were discussed, as well as their meaning in terms of the problems of the Council and the agencies. We now present the responses of two of the participating policy makers when asked in the evaluation sheet what he/she liked most:

"[What did you like most?]: The concepts and their explanation. Very interesting concepts have been presented, even though they were abstract. This work dynamic motivates me very much"

"[What did you like the least?]": The terminology. The concepts were very abstract and deep. The theory or terminology used were sometimes very technical, though we could understand them when they were explained".

Sharing the constructionist approach in an explicit way with policy makers was what they liked most and the least, but it opened a path for the rest of the process.

The following workshops, from the fourth to the tenth, were used one by one to address the problems detected. Different experts were invited to the sessions.

On the ninth workshop a relevant discussion in terms of governance emerged. The main issue to be addressed was technology watch. A policy maker from a county agency presented a case where they had integrated technology watch and technological knowledge

into the agency, whilst a policy maker from the Council presented a programme where they took for granted that agencies did not have that type of knowledge, which corresponded to technology centres. When an action researcher asked the two of them about what they thought their role was and that of the other, the PCG representative stated that the role of agencies was sensitisation, while the agency representative said that agencies worked together with firms and the role of the Council was to protect that relationship.

Thus, there was conflict on how the Council and agencies interpreted the role of agencies. In the **tenth workshop** the action researcher that had asked the question presented her point of view saying that there were at least two very different interpretations of the roles of agencies among participants in the process. This posed a problem in that how could they collaborate if they understood their roles differently? From the discussions of that day the following analytical framework emerged.
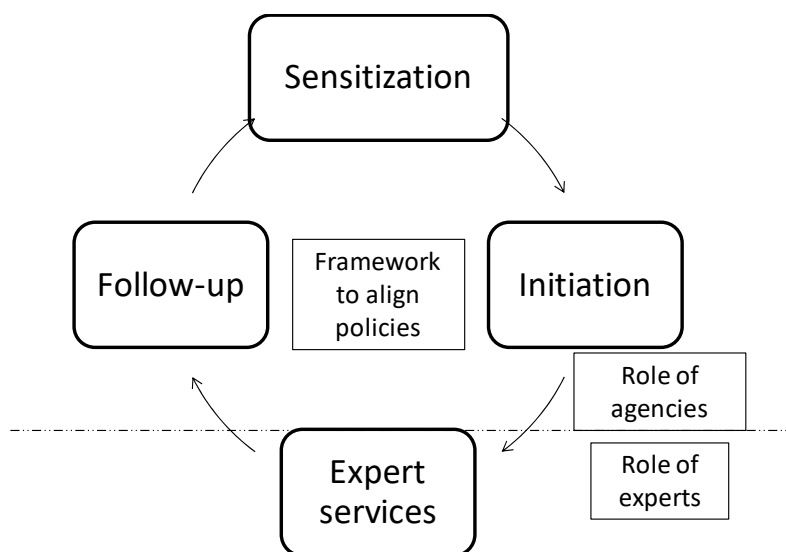
Figure 2. The role of county development agencies when helping SMEs in the new governance

The figure showed that there were actors in the territory with expert knowledge which was relevant for firms (universities, technology centres, vocational training), while also showing that the role of the agencies was not to sensitise (as the PCG representative had said) but was also in the initiation and follow-up phases. This was not only learning or making sense, but also a process of negotiation. By accepting this framework as part of the working tools in the process, they all institutionalised the governance emerging through action research. Definitions of roles were also agreed upon. The role in the *initiation* phase was compared with that of the family doctor, who can refer patients to a specialist, but can also handle certain cases directly and check up on the patient to improve the work of the specialists.

An agency representative wrote the following about this discussion in the evaluation of the workshop, when asked what they liked most:

"To have another chance to reflect on the "grey area". That debate on the basic level which we have not clarified yet: What is the role of agencies"

At this stage of the process discussions on Industry 4.0 emerged in the promoting group and the Director of Innovation of the PCG decided that they would support a process to start working on this issue in collaboration with agencies.

In April 2016 the last workshop of the first stage was held with the staff of agencies and a considerable group of policy makers from the provincial council. The agencies' staff evaluated the process saying there had been five main results in the process of constructing the new governance (extracted from the memo of the workshop held on 6th April 2017):

a) Getting to know and learning from each other
b) Agreed frameworks on roles and relationships
c) Formal agreement on collaboration
d) Closeness between the Council and the agencies
e) More visibility of agencies

With these results they faced the next stage that focused on Industry 4.0.

Stage two: using the territorial governance for Industry 4.0

The second stage of the AR process with facilitators focused on Industry 4.0 with SMEs. It started in May 2017 and is still ongoing. The description of the previous stage focused on sharing how a new governance mode was reflected upon and negotiated between the provincial council and county development agencies through action research. This stage focuses on how this new governance is brought into action with the goal of developing an Industry 4.0 policy. The case aims to show how AR is an efficient strategy to reach small firms to help them advance in Industry 4.0.

Policy makers and action researchers in the council discussed the objectives of the process in the promoting group. Nevertheless, when analysing the PowerPoint presentations used in the **first workshop** of this stage, we can see certain differences on how they presented them. Action researchers described the goals as:

– "To appraise the situation of firms nowadays and their conditions to take advantage of Industry 4.0 in the future"
– "To guide them [firms] to get help from the agencies and the Council to respond to their needs"

The relationship with the firms was dialogue-based (first they listened to what firms needed and then provided them with feedback on how they could receive better help from the public administration) and empowering (they would encourage firms to ask for help from the Council and agencies to respond to their needs together).

The policy maker in charge of the programme did not participate in the previous stage of the process. When he made the formal presentation to the staff of the agencies, the language was only slightly different from that of researchers but these nuances are important

in terms of the change produced through AR. According to his presentation, they wanted to build:

– "a framework for agencies to obtain significant and representative data of the whole of the territory" and that this would be
– "an action in the medium term that would allow us to have a real and comparative picture of firms which will help define and develop measures complementary to the existing ones"

The focus in this discourse was on gathering data, and action was interpreted as the policies the government would define.

Regarding the role of agencies in the process, action researchers shared the framework already agreed upon in the previous stage of the process (see Figure 2) and there was no need to discuss it, as it seemed clear that this was a process to be framed into the *initiation* phase.

In the **second workshop**, one month later, there was a slide that illustrated the agreement made by the agency staff, the policy makers in the Provincial Council and action researchers. The title of the slide was "Dialogue with firms" and it showed there would be two meetings between agency staff and SMEs:

– "The first meeting which will be used to present the initiative and appraise the firms' situation"
– "The second meeting where feedback will be given to firms, first sharing their in-depth analysis in a constructive way and then informing firms about the resources, programmes and actors that they have at hand to move on to the next stage"

The discourse evolved, from gathering data from firms, to entering into dialogue with firms, from focusing on policy, to focusing on the steps firms needed to take and understanding policy as complementary to that. There were also other agreements during the process. First, considering that there were different interpretations of what Industry 4.0 could be, agency staff sought to clarify the term. Departing from the proposal of action researchers, participants discussed and decided to work with the following different definitions of Industry 4.0:

a) "Industry 4.0 from the global perspective: We will use this concept to name the in-depth transformation in work modes that are linked to digital technologies"
b) "Industry 4.0 for firms: when we use this term referring to firms, we will use it to express a strategy, based on digital technologies and oriented to one of the following goals: more efficient processes […]; better quality products, more flexibility […], new services […] and hybridisation between industrial and ICT firms (start-ups)"
c) "Industry 4.0 from the perspective of policy: from the policy perspective, and in the territorial development framework of the Gipuzkoa Sarean project, Industry 4.0 is a territorial strategy where, through the collaboration of different public administrations and dynamising the knowledge system actors, help will be given to firms to develop their Industry 4.0 strategies and guarantee the future of the territory"

We worked out the meaning of Industry 4.0 together, through learning and negotiation processes. The second relevant discussion was about which technologies would be considered

as Industry 4.0. This would determine which firms were included in the process, as the most sophisticated technologies were not within reach of some of the firms. An agreement was made to take a comprehensive approach. A pyramid was drawn and agreed upon, where all technologies were included, the most basic at the bottom and the most sophisticated at the top. We were all aware that the technologies at the bottom were considered too basic in some Industry 4.0 policies. Nevertheless, this Industry 4.0 policy was established as a process to help all firms that wanted to become more technological to take a first step. Those that had nothing would be helped with the basic technologies while the rest would be helped to move up the pyramid. In a nutshell, we created an inclusive definition of Industry 4.0 technologies.

This inclusiveness influenced the conceptualisation of the process which we would help firms through. In addition to a set of requirements that firms should meet for them to be considered as ready to undertake Industry 4.0, we also laid down some preconditions. These were mainly related to the modernisation of firms regarding different spheres of their organisation, products and processes. Thus, the process to help SMEs was outlined, from the development of preconditions to conditions to finally reaching Industry 4.0.

Based on all these design decisions and agreements on the spirit and principles of the process, researchers proposed a specific guide to initiate the dialogue process with firms. The guide was then discussed and adapted by the PCG and agency policy makers. The **third workshop** was used as a training session where agency staff themselves took the responsibility to present the tools created together with researchers. A list had been made with all the firms (529 in total) of the targeted size (10-99) for each county and the agency staff committed to starting a dialogue with each of them. They also agreed to upload quantitative and qualitative information from the firms in their counties into a database set up by one of the researchers. This would provide data to establish a typology of firms based on the conditions and preconditions.

The AR process was developed through two monthly workshops and continuous dialogue among policy makers from the PCG, agency staff and action researchers till June 2018. During this period agencies dialogued with firms too. We now look at an episode that will later be used in the discussion. During this stage agency staff realized that a consultancy firm contracted by the Basque Government was also gathering very similar data through telephone calls in order to analyse the situation of firms. Firms demanded more coordination but neither the Basque Government or the Provincial Council wanted to give up their work method and process. A minimum agreement was made to inform each other about agendas so that, although overlapping remained, whichever party was speaking with firms knew if the other party had already been in touch.

The last workshop of this first stage was held in June 2018. The goal was to reflect on the process and the data gathered and decide among all what would be done the next year.

Before the meeting, the Council decided that a budget would be drawn up to continue with the process for one more year and asked researchers to design a voting system where the agency staff prioritised with which firms they wanted to work. The reason was that it was the agency staff who contacted firms and therefore they knew better. Staff prioritised working with firms that met the preconditions and needed to fulfil certain conditions to start the Industry 4.0 process. During the workshop the voting results were presented, and an

agreement was reached to work with the 70 firms that were categorized in this group after the dialogue process. At the time of writing this paper, the third cycle of ARTD is being developed to help these firms evolve to the next level of Industry 4.0.

One of the issues highlighted by policy makers of the provincial council at the beginning of this last workshop was the high number of firms that had participated in the programme, 404 out of 529 existing in the territory. Reflecting over this, one of the members of agency staff said: "I felt more comfortable with this methodology than in previous times, because we developed it together".

We now share another participation in the workshop for the sake of the following discussion. One of the action researchers stated that in the last promoting group meeting she was asked by one of the policy makers: "What is different about this assessment compared to others?" She answered: "From other assessment processes we obtained data. But now in addition to data, we have the pressure from agency staff, who have come face to face with firms and are looking for solutions for firms, and that pressure will force us to move forward".

6.   Discussion

We have written this paper thinking of two academic communities, one is the academics in the field of regional development who aspire to increase the impact of their research on policies. What this discussion offers to them is the possibility to think of AR as a research approach that, despite little being known in their field, could make a difference to it. The second community is that of action researchers. The discussion provides them with the possibility of exploring a context, i.e. regional development, where AR could grow in the following years, creating opportunities for action researchers to contribute with their knowledge to face development challenges. If global societal and economic challenges are to be faced, this type of intersections for cross fertilisation between fields will be relevant.

The discussion responds to the research question posed: how can action research contribute to making Industry 4.0 policies simultaneously beneficial for firms and territorial development? Although the reflection focuses on Industry 4.0, we believe that most of the considerations would be applicable to a wider array of industrial and innovation policies developed in the framework of regional development. Our straightforward answer to the research question is that action research can contribute through the social construction of collaborative governance modes which, in addition to increasing the efficiency of firm-oriented programmes, increase the capacity of the territory, as subject, to decide on its own future.

We develop the previous statement in two steps. First, we argue for collaborative governance as a democratic and efficient path to develop policies which are simultaneously beneficial for firms and territories. Second, we address what we consider to be a question that the literature has not solved: *how* collaborative governance can be developed. This discussion, based on how we used ARTD to accomplish this, contributes to previous reflections on governance for territorial development in the field of action research (Arrona & Larrea 2018; Estensoro & Larrea 2015; Garman Johnsen, Knudsen, & Normann 2014; Vasstrom & Normann 2014).

a) Collaborative governance: is there a trade-off between democratisation and efficiency?

To discuss how ARTD helped develop policies that simultaneously address firm and territorial levels in the case, we must go back to the definition of territorial development. The participants in the case (policy makers and action researchers together) created their own definition of territorial development as the process of mobilisation and participation of different actors (public and private) in which they discuss and agree on the strategies that can guide individual as well as collective behaviour. This definition is not neutral. From this perspective, the policies claiming to contribute to territorial development should dynamise the participation of territorial actors. The case shows a transition from a centralised approach, where the provincial government designed its programmes and later transferred them to agencies for them to implement, to the co-development of policies by both of them.

During the nine years of the project, the ARTD process had to overcome two issues that strengthened the status quo. On the one hand, the fear expressed by policy makers that participation would make the policy process less efficient since participatory decisions take more time. On the other hand, that co-design of policies required a redistribution of power, i.e. the regional government had to give up part of its power on behalf of the other participants (agencies and firms).

Our argument is that although it took time to construct the new governance, once operating, it was precisely participation that made the Industry 4.0 process efficient. In 2018, through collaboration the provincial council, the county agencies and researchers from Orkestra together reached out to 404 firms. There was face-to-face dialogue between agency staff and firm managers and together they reflected on the situation of firms regarding Industry 4.0. The Council alone would never have been able to directly reach and dialogue with that number of firms.

Reaching 404 firms was deeply satisfying for members of the Council, the agencies and researchers. Especially since at the beginning of the process, two years earlier, the problem had been defined as "the Council is not reaching small firms and small firms are not reaching the Council". We therefore argue that policy efficiency is not in contradiction with developing more democratic policy processes where different territorial actors decide together on their future. In the case, there was no trade-off between efficiency and democratising the process.

b) How can a collaborative governance structure for Industry 4.0 be created?

We now move on to the second part of the argument about how this more participatory and still efficient governance structure was created. We focus this part of the discussion on the two different approaches identified to reach firms, when we discovered that the Basque Government was also conducting a diagnosis of small firms. The process by the Basque Government represents how a relevant part of data gathering in regional development research is conducted. Comparing both processes can be illustrative of some of the specificities of the contribution that action research can make in the field.

Data gathering for the diagnosis process of the Basque Government was conducted by a consultancy firm through telephone calls. The government obtained data faster than the

Provincial Council, but our argument is that all the government obtained was data. In the ARTD process we decided that the meetings were not for data gathering but were the initiation of a dialogue process between agency staff and firms in their county. We saw this dialogue as part of a structural relationship with firms as we wanted to incorporate firms into the collaborative governance structure already operating among the Council, agencies and action researchers.

The provincial council and agencies obtained data, but we argue that they obtained much more than mere data. What was most important in the process was that every firm had a contact person in the agencies, and these firms had expectations that something would come out of this process. Consequently, one of the most recurring phrases of agency staff in email correspondence and workshops was "now the pressure is on us to go back to them and offer them something worthwhile". The interaction and trust attained with firms had put pressure on policy makers to respond, which is absent in data gathering processes that are not dialogue-based.

This pressure to do something about the diagnosed problems brings action research closer to action. Dialogue generates not just data and a rational understanding of the problem, but tension and an emotional engagement with the solution.

It had taken years to build this collaborative governance and to have everyone on board. Once that was achieved, a new programme was designed in a few weeks after the last workshop described. This programme has two main strengths. First, it builds directly on the problems and situations shared by firms with agency staff. Second, there is no question about how the programme will reach firms, which was the biggest problem at the beginning of the period. Every firm has a contact person among agency staff, that acts on their behalf in the policy design process, and will immediately bring the programme to the firm once it is running. This governance is what makes the process both more efficient and more democratic.

We now address the answer to the research question on how this governance was developed, to argue that it was a process of social construction through action research. Participants constructed a shared interpretation of what territorial development is, what Industry 4.0 meant for them, what the role of each actor was to help small firms take the step into Industry 4.0, and what dialogue meant when approaching firms. Collaborative governance exists, to the extent that the different actors participating in the process acknowledge the agreed concepts, frameworks and procedures. What keeps collaborative governance going is the sense of belonging of the participants to the same process of territorial development. Two relevant features of this process of social construction were the importance of co-generated analytical frameworks that helped keep track of what was being built together, and an explicit discussion on social construction, so that everybody could be aware of what the rationale was behind concrete discussions and their corresponding analytical frameworks.

Consequently, the answer to the research question is that action research can contribute to making Industry 4.0 policies simultaneously beneficial for firms and territorial development through the social construction of collaborative territorial governance. Such governance increases efficiency in public policy responses to firms while also creating the collective capability of the territory to become the subject of its own development process.

7.   Closing reflection

As we wrote this paper, we were challenged to reflect on how digitalisation had affected our own research process. The process had a very relevant face-to-face component, but the open database where we gathered all the information on firms played a relevant role too.

     The database created by researchers and fed by agency staff after each dialogue session with firms contributed to maintaining constant dialogue between researchers and agency staff, as well as building a link between researchers and firms. Combined with email correspondence, it created a virtual space for a relationship that emerged from the face-to-face interactions in workshops. This demonstrates how digital technology, as is the case of our database, can also contribute to the social construction processes of territorial governance.

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