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Smart Meter as Technical Brick for Ecological Transition, or the New Knowledge Capital for Industries?

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Abstract This article looks at the economy-politico of the *Linky* Smart meter initiatives in France as part of the Ecological Transition campaign proposed by EDF, the State Utility Company. Introducing Linky, EDF brought forward the idea of R&D consortium composed of dozens of industrial companies in home appliances products. Linky is claimed to be digitally eco-friendly and could be the fundamental movement toward the ecological transition. This research, sketched through a qualitative method, an in-depth interview with dozen key informants, empirically proved and argued that despite the ecological campaign of Linky, the device could play a central role as knowledge capital for the R&D industry members. At this point, research results briefly argue at the first place, EDF, as the leading institution, introduced Linky to be generally more reliable to the current digital home appliances market development. In bearing so, this article should provide a critical point of view in which the ecological transition campaign is on the cutting edge of the market development rather than a clear view of the ecological transition.

Keywords Linky, Smart Meter, Ecological Transition, Knowledge Capital

1. Introduction

The development and implementation of smart grids are demanding issues that incorporate the modern view of the energy economy [1]. The idea of the Smart Grid embraces IT infrastructure development, the massive flow of data, and the real-time data to distribute electricity effectively. Smart Grid allows greater control to save energy with real-time quantitative approaches. Reducing the costs and increasing reliability and transparency of energy consumption are at stake.

A common element in most definitions is the application of digital processing and communications to the power grid. Making the data flow and highly interoperable information playing a central issue in the Smart grid in terms of the three layers of electricity activities: production, distribution, and energy storage [2].

The smart grid system consists of varying initiatives ranging from electronic power interface, power control, and grid load. Smart homes, Smart buildings, and electric vehicles also serve as smart grid components [3]. The Smart Grid would allow better understanding of energy consumption based on real-time meter recorded and displayed thanks to the real-time data acquisition [4]. As the study on household energy consumption continues, these new forms would provide a new dimension amidst other architectural and construction engineering innovations to reduce household energy consumption [5].

It is important to note that the birth of the Smart Grid has also brought a new era in the R&D format, trials, experiments, and feasibility tests under living ecosystem circumstances such as urban areas. There is a tendency

where Smart Grid demonstrator views household energy consumption in the urban area as living laboratory ecosystems before developing technical-economic adjustment based on the empirical situations. At the same time, the rise of digital technology in Building Information Modelling (BIM) was determined as an innovation to increase innovation, management, and forecasting of energy consumption pattern and behaviors [6].

Big cities in Europe have become Smart Grid experimentation spaces [7-9]. The R&D vision of Smart Grid considered city ecosystems as a testbed to lay down the feasibility test of technology within an empirical milieu of the city's activities; here, the socio-cultural dynamics of the urban society's living system would be the finest data for the smart meter devices [8]. Harnessing the real socio-cultural environment provided by the household consumption pattern constituted an advantage for industrial actors in doing knowledge management through living experiences related to its novel technologies [10-11].

Given the variety of Smart Grid, The *Electricité de France* (EDF), the State-owned electricity company of France, developed a Smart meter, namely "Linky," the state immediately promoted that as the national banner of the Smart Grid revolution in France toward green and sustainable energy [12-13]. The Linky smart meter was developed as early as 2005-2006 and conducted by EDF. Linky aimed at integrating the latest networked technology embodying Internet of Things (IoT), real-time data interoperability and automation of management system at the demand side [14-15]. Through Linky, the EDF group seeks to replace 36 million units of the conventional electricity meter within 2030. Linky appeared as the main instrument for the French National Ecological Transition, which strengthened the nature of the Linky as a collaborative tool of national stature [16].

The core issue that appeared to be urgently discussed here is the ability of Linky to generate more personalized data generated from household level. To provide a conceptual context to the research problematics, we bring forth the fundamental role of Linky as a national tool of ecological transition. Prior to that national emblem, EDF elaborated Linky R & D in the city of Lyon in which 20.000 units of Linky were tested.

Linky and the real-time data is currently the actual hypothesis. It is argued by many authors to rethink the new epistemology of data and the contemporary society, one of which is the "Quantified self", known as well as data practices of real-time lifelogging of personal informatics [17-19].

Self and personal quantification explain how people and the more and more personalized gadgets control, measure, and probably govern their daily lives due to the massive amount of individual data -a statistic individual.

The article seeks to illuminate the lack of clarity in the ecological transition. However, the politico-economic of the Smart meter in the event of the industrial development would elucidate the current stream of Smart grid orientation. Figure 1 below is the flowchart of this research to contextualize the aim and the main problem of this research.

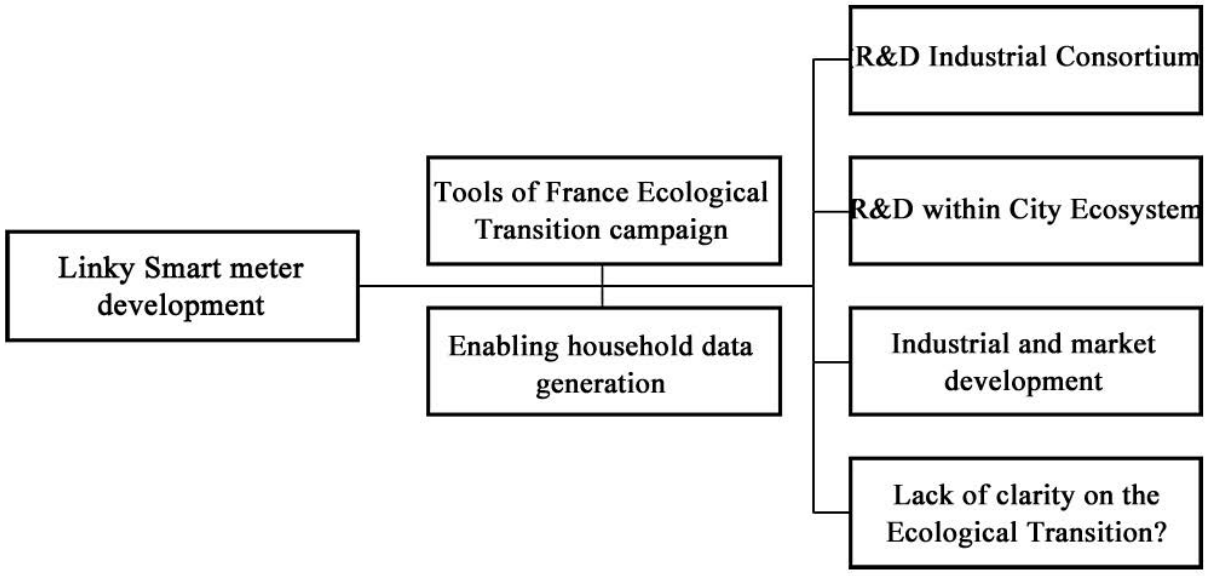

Figure 1. Flow chart of the research

Linky as a concrete device developed by EDF might be single viewed as part of more sustainable and manageable energy consumption. In this case, the even greater trust in personalized measurement based on real-time data enabled by the ICT devices has paved the way toward the capital of knowledge, commercial opportunity, and product development for the industries justified through household data. As household consumers increasingly embrace digital technology, the Linky smart meter would generate a massive amount of household data that helps produce the opportunity for industrial entities to improve their consumer engagement [20]. These data from the household level, the kinds of individually distinguishable information, are enormously valued as new commodity. The research results genuinely dialoguing that the household data did provide novel knowledge to develop the industrial products and thus overshadowed the initial purpose of Linky as an ecological transition instrument.

2. Methodological Approaches

This research is the intersection between social sciences studies and Science and Technology Studies. The interaction between recent technology development *vis-à-vis* of contemporary society is the core principle of this research. The Lyon Metropolis was chosen as the field of intervention in this research thanks to the opportunity to pursue a research program on Smart cities from 2016 to early 2020. The study on the role of the Smart cities and Big Data on the dynamic of urban governance in Lyon Metropolis was essential to gather all the materials. The idea to conduct more profound studies on the field of Smart energy allowed us to harness the different states of Smart Grid implementation at household building energy efficiency based on the perspective of the Linky Smart meter. This work principally benefited the result from qualitative method approaches to induce its scientific materials. In terms of works of literature studies, defining Smart city and Smart Grid from the view of real-time counting of energy consumptions was a substantial step to be able to enlarge the scope of research objects such as identifying key stakeholders.

Bearing that Smart Grid as a technical element is being dialogued under the concern of Smart city, big data, and Real-time counting concept, the focus of this research was positioned at the core initiators of Linky, EDF, and Enedis group. The fact that Smart Grid required an R&D process before its mass installation, this enforced circumstance has permitted to magnetize the importance of Smart Grid to be defined as Smart city. Thus, the in-depth interview method with the targeted stakeholders [21] such as State actors, subnational actors, and industrial actors was employed during the fieldwork.

This regular visit to the field allowed us to familiarize ourselves with the subject and to meet directly with the people associated with the heart of the Linky project promoted by the industrial actor EDF and Group Enedis. The exchanges with the actors and the discussions around the subject in the forums and seminars were very constructive. The notes taken in the field, the discussions with the senior management of the EDF & Enedis group and the Lyon Metropolis stakeholders during several seminars, the photographic documentation, as well as the collection of files, handouts, and various brochures, have made it possible to enrich our resources and nourish our research.

After exploring the Linky Smart meter project and being convinced of its eligibility and accessibility to our research field, the next step was to mobilize the contacts that we identified. This rhythm of exchanges and meetings with important people linked to the Linky project and the Lyon Metropolis allowed us to establish the terms of the survey and to choose the "semi-structured" interview method.

Over time, the direct meeting with the actors constituted our main pillar of research. Concerning more specifically the analysis of public action which constitutes the discipline in which our work is linked, the interview process is essential and is part of the methods of selection and production of data, to describe empirical phenomena [22]. The purpose of the field survey by interviews is to collect a specific category of data made up of the "speeches and discourses" of the interlocutors [23]. Their analysis allows the crossing of these "positions" with the "social positions" occupied by the interlocutors, in a sociological perspective consecrated by the sociologist P. Bourdieu who developed a small part of his work on the border with the analysis of public policies [24]. Thus, the direct meetings with a certain number of actors made it possible to maintain the primary quality of the information gathered. The "scientific" value of the production of research in political science as in sociology is based on its empirical density and the originality of data [25]. Although supplemented by desk research or direct observation sessions, semi-structured interviews are our primary source of data in this work. Most of the body of this article would be scaffolded by the citation of an empirical in-depth interview to display the authenticity of the results.

3. The Protocol of Advanced Metering Management (AMM)

Linky is greatly attached to the "Smart Grid" label. Theoretically, the latter covers quite varied fields: the development of the smart meter, the entire infrastructure and distribution system for smart electricity, the development of storage technologies, the smart system for integrating renewable energies, the electricity system for the building sector and the optimization of energy use according to priority needs, etc. [26-27]. On the other hand, the “Smart Grid”, which is designed as all of the city's energy systems, has become synonymous with the “smart city” [28]. The development at the beginning of 2004 of

Advanced Metering Management (AMM), the new technologies linked to a smart meter, is the main fact which marks the birth of the "Smart Grid" [29].

As far as Linky is concerned, it is thanks to its integration of the AMM system that the term "Smart Grid" has been widely used [29]. This meter was the argument that led to the labeling of the EDF group as a player in the "Smart Grid". At the time, we can see the growing role in France of commercial players such as the Atos World Grid group, responsible for the introduction of AMM technology, which is part of the industrial consortium that was set up by EDF to ensure the development of Linky's technological infrastructure. The analysis carried out by the Research Center for the Study and Observation of Living Conditions (CRÉDOC), a study and research body at the service of actors in economic and social life which is made up of professional experts and university researchers, testifies that the first reflection on the Linky meter is at the crossroads between the mandate of the Energy Regulatory Commission at Enedis and the adoption of new technologies driven by the market [30]. The deployment of smart meters began a few years earlier. In Italy and Sweden, the "smart meter" programs dated since 2001 and 2003 respectively. Most European countries have completed their program with AMM technology which was introduced around 2006-2007 [31].

This confirms the hypothesis according to which the deployment of the Linky meter was navigated by the presence of the new technology known as AMM. An interview with one of the managers of Linky at EDF allows us to appreciate the importance of the development of the AMM infrastructure - or CPL (Line Carrier Current) to use the terminology of our interlocutor - in the construction of Linky: The CPL protocol is at the origin of the development of the communicating meter.

> *"Linky, it's not just technology. It was about enabling citizens to adapt their behavior. So, the first to be consulted on these subjects are the consumer associations (...) with the regulator who leads the consultation. The Energy Regulatory Commission launched consultations, around 2007 or 2008, perhaps even before, on what was called the AMM (Automated Meter Management) project, which has become Linky, which seeks to respond to issues linked above all to opening to competition and the dynamics of the electricity system. Once there is an agreement on what to expect from the meter and its purposes, the technological part is not the most complicated part (...). We still must agree from the outset. From the outset, we agreed very closely with the regulator, consumer associations, and deputies to say what is expected of the AMM meter (future) Linky. From there, we launched calls for tenders* "[Interview with the department of territorial relations of Enedis, responsible for the project for the deployment of Linky on the territory of Lyon].

The production of the CPL, which is made possible by the new meter, is an essential building block in EDF's commitment to thinking about the Smart Grid. From 2007 to 2009, the main orientations were chosen - the specification of information systems, the modes of communication, the conditions of the experiment - and the consortium responsible for the study of the information system, materials, and specification of communication protocols is designated. The development of the PLC Linky was then confirmed within the framework of the "Modernization of electricity meters" project. This set of devices of a new type would make it possible to monitor and manage the production, distribution, and storage of electricity and guarantee better control of its consumption.

> *"At the time of ERDF, there was an innovative approach that is very old in the company, which means that we have always sought to create a Smarter Grid, first on "medium voltage" networks. 20,000 V than on the low voltage network. We had a very strong desire to deploy a smart meter (...) which was there long before an organization around Smart Grids was institutionalized. There has always been a fundamental reflection at ERDF (which continues to evolve today as with any) industrialist seeking to innovate. The history of Smart Grids follows very long rhythms; they are the heirs of long-term technological innovation. At the same time, there was an extremely strong desire on the part of the public authorities to set up, from 2008 or 2009, investment programs for the future in France coordinated by ADEME. This was the first part of the Smart Grid, which is called "the 1G Smart Grid" for the first generation. We are in the process of setting up new generations of Smart Grid, which combine (...) at the same time technological aspects, societal aspects, and environmental aspects. It's an ongoing story and I don't know where it is. It is also a relatively young story in its current form, but old in its technological (dimension).* [Interview with the department of territorial relations of Enedis, responsible for the project for the deployment of Linky on the territory of Lyon]

The digital services company Atos Origin has been selected by Enedis to participate in the gigantic project to replace 35 million electricity meters in the region with a contract worth 100 million euros. This project is the most important energy transformation program on a European scale. A consortium in charge of the development of information systems and managed by Atos Origin is formed. It brings together manufacturers who are chosen according to the specifications of the PLC and among which there are three major manufacturers - Landis + Gyr, Itron, and Iskraemeco - as well as the French company Trialog [32].

The specifications meet technical specifications defined by EDF. The word "Linky" - derived from "Link", and "connected" in English - characterizes a meter now capable of connecting to other electronic devices, which constitutes a significant change in the technical capabilities of this meter compared to those of the old one.

4. The Market Alliances to Leverage Linky

Since 2011, the Program Innovation for the Future, a French state Funding for Smart Grid has enabled the introduction of Linky Smart meter in nine French cities and metropolis trhough Living Labs Experiment. In the city of Lyon for example, the R & D were carried out by Smart Electric Lyon (SEL) Consortium. The EDF as the principal promotor of Linky collaborated with different R&D stakeholders in the energy and IT sector including municipalities.

It must be underlined; that the democratization of Linky devices through living labs experiment format was meant to test out the capacity of Linky to deal with the household energy consumption behaviors but at the same time the massive geographical coverage allows the test phase would allow an objective justification for the initiators. The cities have taken an important role as proactive players in terms of important stakeholders within the territory [33]. However, the Linky programs remain anchored within the framework objective of quantifying household energy consumption patterns that would become useful to understand how energy reduction.

The Linky project demonstrates a profound idea of the leverage effect of the "data revolution" in the energy sector. This project led by EDF brings together dozens of companies from industrial sectors. This project aimed to experiment with a wide range of interactive services and equipment by offering technical solutions (energy management systems, displays, controlled electric heating, etc.) associated with tariff offers, to around 25,000 individuals and hundreds of industrial buildings. The arrival of the Linky meter with its automated systems and its ability to generate new data has enabled the initiation of several continuous experiments in smart grids. This interactive meter also allows consumers to precisely monitor their consumption and control their electrical devices. Customers will be able to access real-time power consumption monitoring as regularly as they wish. It makes possible "Energy Demand Control" actions both for the customers themselves and for all the suppliers who rely on metering data to build their offers.

At the heart of the SEL consortium's mission, two experimental strategies are being developed. One of them, which consists of testing the reception, by 20,000 urban households of consumption data produced by the Linky meter, concerns very directly EDF and the way in which the deployment of this competitor could, in the long term, modify its pricing policies, or even, more improbably, its production planning policies. But it is the second experimental strategy developed within the framework of SEL that interests us here, that which concerns the experimentation of technologies associated with Linky and developed by the partner companies of the consortium.

Different profiling of industrial sectors is involved in the Linky project consortium. Each one is specialized in a particular sector covering quite varied fields: intelligent building (BIM), intelligent household products, or the production of automatic products equipped with sensors and wireless networks. Some products would be able to interact directly with the Linky and individual consumer equipment such as smartphones or tablets. One of the members, the Atlantic Group, which followed the stages of the experiment from the start of the creation of SEL, is a company producing electric radiators, heat pumps, boilers, electric, solar, and thermodynamic water heaters, air conditioning and ventilation. Its role in the Linky project is characterized by its commitment to the various solutions, by testing and validating the interoperability of its equipment with that of other actors to promote standards compatible with the meter. Another example is the company "Fifthplay France", an SME based in *St Priest Bron - Grand Lyon*, which offers connected thermostats and its *Fil Pilote* modules. This device provides consumption monitoring, control, and programming of existing pilot wireless heating transmitters. Also, the Scientific and Technical Center for Building (CSTB) is involved in the Linky project according to its main field, with the aim of developing a calculation measuring the impacts on energy consumption, power, emissions of CO_2 and the comfort of automatic systems [Maintenance carried out 2015-2016].

As noted at the national level of France, Linky will represent a new margin of maneuver in the sector of energy networks of the future in France. This device was part of a national strategy which has resulted in it being extended to all French households, with a target of 80% of equipped households over the coming years. The industrial players who are leading the experiment can take advantage of the Linky system and test its operation on an individual scale as well as on a larger scale, urban life including the city.

> *For the members of the consortium, the Linky project is an opportunity to interact with the EDF networks as well as to test the compatibility of their products, to promote them on a large scale. The deployment, enhancement and mobilization of the digital data called up are the keystone in the SEL project. The transformation of data by connected and automated objects is becoming the new source of data in the digital age. These data have great potential for managers of the electricity sector, for companies linked to automated systems, both in terms of energy efficiency and for an economic perspective including the development of new services and new products. compatible as of now the moment of experimentation* [Interview carried out with the member of the consortium, 11/2016].

We propose the hypothesis that by developing this strategy, EDF is moving in the direction of strengthening the protection of the internal market as has very often been observed by researchers [34]. Linky's experimentation has become a multi-dimensional arena of innovation where EDF, regional representatives, industrial players and university players compete against each other.

"First of all, am I learning a lot from working with EDF and its Linky tool to identify the specificities of these companies that supply energy? But what is the point of companies that are like ours and with which we work? Conversely, what are the interests of companies that are not like ours, namely manufacturers of heating, boxes, etc.? It is interesting, with this type of approach to assume the needs, to identify the different visions. We then experiment, and beyond, we specify, that is, to say that the interfacing between the building and the exterior is configured and becomes virtually operational after many phases of testing. These steps also allow us to test many other new things that we are capitalizing on. We have made the elements of the structure; we have tested them, and we are ready to carry it out even if the market conditions are not right to guarantee the launch. The most important thing is to be able to achieve". [Interview with a member of the SEL Consortium, Enterprise Legrand]

However, the arrival of Linky and as an enabler at the household level to generate data did not precede the industrial development of automated home appliances products. In this case, Linky must be regarded as the flagship product of the EDF and ENEDIS Group which are the state company owned. The concrete alliance with the industrials partner is organically bounded in view of market compatibility of Linky.

"Manufacturers did not wait for Linky to work on smart heating. Manufacturers have long been working on the connected thermostat (...). If we are seeing a wave of home automation today, in 2010, manufacturers were also thinking of the next generations of intelligent heating capable of adapting to the outside temperature as well as to the presence of people in the home. That's why they agreed to join the project; Linky offered them the opportunity to make their heating compatible with the new constraints of the electricity network and to develop interior equipment (...) that is Smart grid compatible. I think that this is what manufacturers went to look for in Linky, the possibility of interfacing their equipment, of understanding that language. Today, we still speak in the conditional, we do not really know where we are going (...) ". [Interview with the scientific coordinator of the University of Lyon].

Direct interaction with resource persons shows that the development of household digital products from knowledge capitalization based on personal data has taken place. The existence of Linky with the concept of fine-grained data is a medium that connects the EDF Group with other business and commercial entities that are engaged in the same aspect. From this empirical evidence, it strengthens the hypothesis that the change in compartmentalized society in the digital era where personal data is a commodity that continues to be developed as part of product development.

5. The Quantified-Self as Industrial Capital Knowledge

The second quality of Linky in the eyes of EDF and Enedis lies in experimenting with the use of big data in the management of electricity networks. Linky is the first device that seeks to test the capacities of new technologies at the domestic-household scale in the urban arena. The regional director of EDF had the opportunity to present his vision in which the heart of his activity consists in making the most of the data from the Linky meter as materials contributing to the achievement of energy savings which are themselves the target objective in the energy, transition starting from the household to the territory. This confidence in the efficiency of this real-time data collection by Linky is the argument of the director of SEL:

"*The deployment of meters responds to several challenges: an issue of efficiency for the distribution network, in its management, operation and maintenance, and an issue of making data available to the customer who can thus better understand his electricity consumption. and adapt it [...]. This implies that the deployment of the smart meter also responds to the challenge of the energy transition for local communities. What changes with the smart meter is that in terms of electricity consumption data, we are going from a state where we had one, see two, data per customer, the index of consumption, a volume of consumption recorded once a year. We are moving to a world where data is refreshed every half hour, every 10 minutes, or even every two seconds which makes us pass on volumes that are thousands of times greater. Indeed, from this point of view, we are switching to big data*". [Interview with the Director of Smart Electric Lyon].

Smart meters were thought to be largely linked to consumer behavior. A study that was carried out on smart meters showed that consumers are mobilized by having instant data on their consumption and examine their electricity bills more, monitor their consumption habits and the resulting costs better [35]. Studies in economics defend the smart meter as a "behavioral economics" or behavioral economics (BE) tool presented by the STS as evolving into a "sustainable habit". These dynamics and their complementarity constitute a conceptual framework in the development of Linky.

The prospect of associating new industrial products and services with the Linky network is one of the vocations of the consortium, whose operation follows an R&D model which is characterized by transversal collaboration between the various industrial players. In this type of partnership, which is carried out grouped within a consortium, these actors seek what Management Science calls a new knowledge-based on territorial-oriented, "a new knowledge based on the territory" [39] which several researchers consider to be a fundamental transformation in the practice of innovation. Linky's commitment as the

compatible device and technology for the household aims here to translate hypothetical technological solutions into their operative physical materialization which is a function of local characteristics to lead to what is called the "intellectual capital" often recognized as a "specification" of smart meter".

In recent years, almost all "smart" program has invited industrial players to develop local innovation patents [36-38]. This shows the growing importance of urban life as well as the family unit as an extraordinary resource. As indicated by our interlocutor in the in-depth interview, this industrial actor took the advantage of the arrival of Linky as an opportunity to test their home automation product subject to the dynamics of the data generated by Linky.

"*It is with the Fifthplay solution that we have chosen to respond to the issue of Smart Energy from Linky at the individual level. Our expectations were as follows: today we sell solutions in new housing, but at the time, it was in anticipation. We wanted to have confirmation of what was going to happen. What will Linky meters be used for? How and what data will be available? Etc., to anticipate solutions that we can develop and offer to our customers and users in the Metropolis from the moment they all have a Linky meter at home. Was it time to do some testing to find out exactly what we could do with it? How was it all going to go? How did it set up? What were the users' expectations (...) to enrich our solution and make it compatible with Linky the day the meters were to arrive in the homes of our current users* ". [Interview with the member of the SEL Consortium, president of PME Fifthplay]

However, the information gathered through a series of interviews with consortium members testified, that these relationships through the development of the Linky network of the "Fifthplay" home automation device which was designed by the eponymous company specializing in so-called Smart Homes products and which is committed alongside the consortium. As part of the partnership, this SME proposed the "fifthplay cube", a modular tool capable of measuring electricity consumption, detecting smoke, the level of carbon monoxide, but also water leaks and which alerts the owner of the seriousness of the situation instead of real-time observation of these parameters in "normal" time.

The "Cube" has been given the title of "brain of the smart home" which connects the house with its owner through a smartphone. The cube Fifthplay is a concrete sample of how Linky is being elaborated as a source of knowledge capital for the development of the industrial product.

The industrial players who are leading the experiment can take advantage of the Linky system and test its operation on a city scale. This important aspect solidifies the fact that the arrival of Linky as a household gadget lay down an important commercial and marketing agenda behind it by capitalizing on personalized data, in this case within the household space.

"*In detail, two types of equipment were installed in the experiment that was carried out: equipment that monitors the general consumption of the home (in parallel with Linky as a comparison element for the data collected) and equipment which makes it possible to monitor, when possible, the specific consumption of heating in the house and which makes it possible to control the radiators. Generally, we are on installations where the heating is electric and suddenly, a connected thermostat makes it possible to control all that. The tests which are carried out on Smart Electric Lyon are carried out with users who benefit from specific tariffs. There are two types of tariffs. The first tariff is demand response at peak times between 6 and 8 p.m., 22 or 21 days a year, to simulate more expensive electricity for the user. During these two hours, the chosen solution will automatically lower the heating setpoint (...) so that the house consumes less during these two hours, and to avoid the consumer from paying more. The downside is that the rest of the time, electricity is a little cheaper than with conventional subscriptions. The goal is for consumers to be alerted automatically the day before there is going to be these two rush hours. We say that without there being anything to do, the thermostat setpoint will drop to 3 or 4 °less, the heating will not consume during this period and suddenly, there will be savings in energy that will be realized*". [Interview with the member of the SEL Consortium, president of PME Fifthplay]

Participation in the experiment which is set up in the Metropolis constitutes a major challenge to be taken up for the industrial sector. The efficiency of the network requires full compatibility of the integrated modules with the technical protocols that have been validated for its development.

Linky offers manufacturers the rare opportunity to test their products in the field during their development phase and to guarantee the most suitable functionality even before they are put on the market. We imagine here the economic orientation which is that of data generated by Linky through its presence at the household level. This opens a reflection on the fact that Linky revived a model of "individual data" practices and the growing faith that follows on personal data constitutes an essential resource in the economic practice of industrial actors [39]. Thus, in this case, the shift toward the data revolution reflected enormously by the quantified-self culture of the digital society era fundamentally paved the way for the valuation of personal data as a commodity for industrial product development.

6. Conclusions and Insight for Future Research

The case study of the Linky Smart meter in the city of

Lyon, France, is a trial stage that is a Living Laboratory, namely a direct trial on an urban scale. The Linky event, which was organized by a state company, Enedis - EDF Group, turned out not only to show a new era related to technology in the field of electrical energy in the Smart city era. This research argues that the Linky Smart meter is not neutrally only aimed at achieving sustainability in the energy sector through IT products, as previous studies have said. Behind the automation of technology, it is concluded from this research that there is a very strong economic attraction through the granularity of data that Linky can display, transfer, and communicated namely data on consumption patterns and consumer behavior from the household level. From the results of the Linky case study in the City of Lyon, it is proven that Linky has compatibility with household products that are already circulating in the market such as home automation gadgets, so at this stage, we can justify that the Linky smart meter will have a bigger role as a proxy in collect more detailed data about daily activities in a household, based on real-time basis. It is recommended in further research to review how Linky can generate an open market for industrial products affiliated with EDF or products that are fully compatible with Linky.

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