
**HOW DOES INNOVATION INFLUENCE THE RELATIONSHIP
BETWEEN THE SOCIO-TECHNICAL CHANGE AND POLICY
MIX: ACKNOWLEDGING LESSONS FROM THE CAMBRIDGE
ANALYTICA CASE?**

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“...A massa mantém a marca, a marca mantém a mídia e a mídia controla a massa.”

George Orwell

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Abstract

Since 2016, some of the most important political campaigns in the world and the relationship between citizens and the political system have been changing greatly. For this change, the technical innovations promoted by Cambridge Analytica (CA) is in the center of this interaction. This corporation changed the political “game” rules in a new paradigmatic way. These occurrences and their consequences must acknowledge the impact of innovative technologies in the democratic processes.

The present work intends to contribute to innovation studies regarding the relationship between technological innovation and policy studies framing CA’s methodology in the conceptual definitions of innovation. Moreover, this paper will consider the novel conceptual framework presented by the Edmondson et al (2018) studies, which establish a co-evolution of policy mixes and socio-technical systems, to understand in which way CA provoked changes in this dynamic relation. Adopting a qualitative methodology, this work conducts a set of interviews with key figures in the dynamic socio-technical system and proposes a hypothesis that can provide a different perspective of the flow presented by the Edmondson et al (2018) framework. Regarding the influence of innovative technologies such as the one presented by CA, it is not any longer dependent on a physical territory, which represents a detached conception between a classical political system and a new one. This consideration leads to a consequence where the socio-technical systems are more vulnerable to exogenous interferences, provoking unbalances in the traditional system.

Considering three of the six aspects of the relation between the co-evolution of policy mixes and socio-technical systems, this paper argues that the institutional and interpretative effects, such as the socio-political feedback, occur in a bi-directional way and not in a mono-direction way, and that co-evolution is interdependent under positive and negative inputs.

Resumo

Desde 2016, algumas das campanhas políticas mais importantes do mundo mudaram profundamente as relações entre os cidadãos e o sistema político. Para essa mudança, a inovação técnica promovida pela empresa Cambridge Analytica (CA) está no centro dessa interação. Esta empresa mudou o paradigma das regras do “*jogo*” político para uma nova forma. O resultado destas ocorrências e as suas consequências obrigam a reconhecer o poder e profundidade do impacto das inovações tecnológicas nos processos políticos democráticos. O presente trabalho pretende contribuir para o desenvolvimento dos estudos sobre o tema da inovação, no que se refere particularmente à relação entre inovação tecnológica e os estudos políticos, enquadrando a metodologia desenvolvida pela CA nas definições conceptuais de inovação. Além disso, este artigo considera o novo enquadramento conceptual apresentado pelos estudos de Edmondson et al. (2018), os quais estabelecem uma co-evolução nas combinações de políticas e sistemas socio-tecnológicos, para compreender de que maneira a CA provocou mudanças nessa relação. Adotando uma metodologia qualitativa, este trabalho conduziu um conjunto de entrevistas junto de figuras-chave do sistema socio-tecnológico tendo em vista a formulação de uma hipótese que poderá fornecer uma perspectiva diferente do fluxo apresentado por Edmondson et al. Como resultado destas entrevistas, conclui-se que em virtude da influência de tecnologias inovadoras, como a apresentada pela CA, os sistemas socio-tecnológicos não dependem mais de um território físico, o que representa uma mudança no paradigma do sistema político clássico. Essa conclusão tem como consequência que os sistemas socio-tecnológicos passam a ficar mais vulneráveis a interferências exógenas, provando desequilíbrios no sistema tradicional. Considerando três dos seis aspetos da relação entre a co-evolução de misturas de políticas e sistemas socio-tecnológicos proposto por Edmondson et al (2018), o presente trabalho defende que os efeitos institucionais e interpretativos, ocorrem de maneira bidirecional sendo que essa co-evolução demonstra ser interdependente mediante *feedback* positivos e negativos.

Keywords

Policy mix, socio-technical system, micro targeting, Cambridge Analytica, politics, policies, technology, innovation, technological innovation, citizenship, democracy, institutional framework, political science, innovation management, digital person, digital intermediaries, “force of falsity”, fake news, cyber security, OCEAN, Social Network Sites (SNS), GDPR, Time lapse curve, Post-true, deterritorialization, desyntonia

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Most relevant key words definitions

Innovation - concept understood as “new combinations” of new or existing knowledge, resources, equipment and other factors (Schumpeter, 1943).

Technological Innovation - a body of knowledge, tools and techniques, derived from science and practical experience that are used in the development, design, production, and application of products, processes, systems, and services (Abetti, 1989).

Policy Mix – is the combination of different relations and interdependencies related with fiscal and monetary policies, but also understanding the relation between different dimensions of policies, multi-level and multi-actor, that produce tensions and interactions of different kinds across several dimensions (Flanagan, Uyarra, & Laranja, 2011).

Socio-technical systems - are understood as the “connections” between elements in order to answer to the society needs and functions (Geels, 2004). Authors considered socio-technical systems such as transportation, housing, mobility and transport, food production and consumption. As a system, it needs to combine networks, institutions, actors, mechanisms, equipment, infrastructure, markets and practices along with cultural and symbolic views and representations (Geels, 2004).

Social Network Sites - as web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site (Boyd & Ellison, 2007).

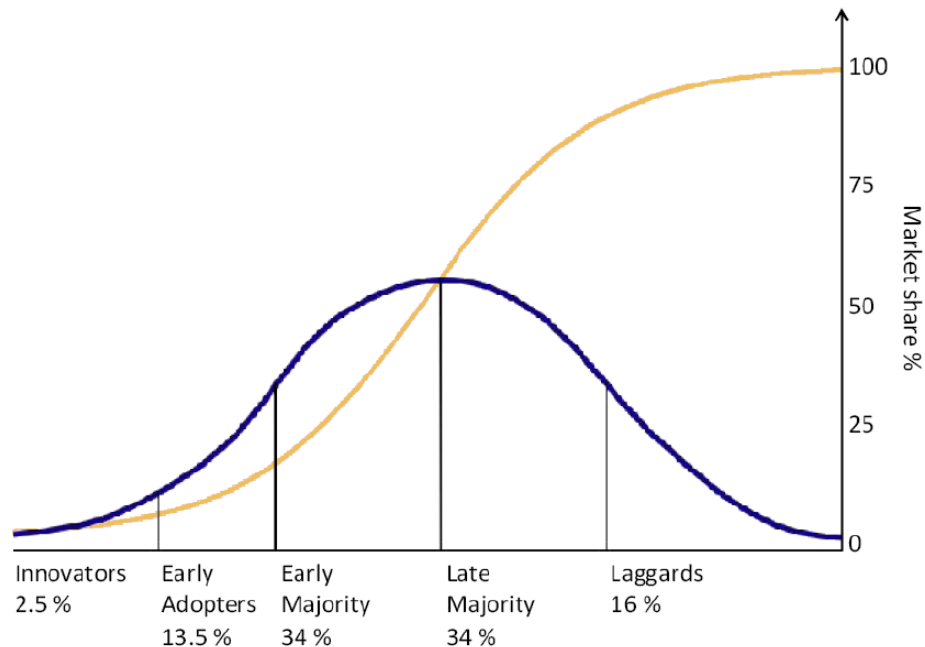
Micro-targeting - is a marketing strategy that uses consumer data and demographics to identify the interests of specific individuals or very small groups of like-minded individuals in order to influence their thoughts or actions (Barbu, 2014).

Digital Person – is the collection of personal data information that is documented in digital dossiers maintained by hundreds (perhaps thousands) of businesses and government agencies. These dossiers are composed of bits of our personal information, which when assembled begin to paint a portrait of our personalities (Solove, 2004).

Digital Intermediaries – the content provider/gatherers emblematic of the symbiotic web—are ethically responsible for information transmitted through their services (Johnson, 2017). They can be big digital corporations that developed the technology users of internet access to navigate in the web, such as Google, Facebook and other SNS (Social Network Sites).

GDPR – General Data Protection Regulation (Council of the European Union 2016).

Diffusion of Innovation or Time Lapse Curve – this theory seeks to explain how, why and at what rate new ideas and technology spread through cultures. (Rogers, 1962)



The diffusion of innovations according to Rogers. With successive groups of consumers adopting the new technology (shown in blue), its market share (yellow) will eventually reach the saturation level. In mathematics the S curve is known as the logistic function.

Figure 1 - Diffusion of innovation (Rogers, 1962)

Post-true – relating to circumstances in which people respond more to feelings and beliefs than to facts (Dictionary, 2016).

Deterritorialization – The new political concept is defined by pluralism, heterogeneous and high differentiation of the political actors with a clear weakening – a *relativization* – of state power. As much in the internal plan as in the external one, the idea of absence became ordinary, from the state disappearing, as the monopoly titular of political authority. (...) The social transformations do not stop being representative of the way we look at constitutional internal law. In its own way, it was designed for homologous states, guardians of its territory and of its sovereignty, and title holders of non-interference in internal affairs (Rangel, 2009).

Desyntonia – refers to a physical and comprehensive gap between the space where people participate by voting, and the space where the decision takes place. There is a place where decisions happen that are dematerialized, which results in a representation problem. Decisions are made in a sphere where there is no representation, which can explain, somehow, part of the democratic crisis (Rangel, interview 2, 2019). Civil participation

happens where there is no formal representation and any consequence at the decision making process.

Blockchain technology – is an incorruptible digital ledger of economic transactions that can be programmed to record, not just financial transactions, but everything with virtual value (Don Tapscott, 2018).

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1. Introduction

“Data is the new oil” - Clive Humby

The 2016 United States (US) presidential elections brought us the Cambridge Analytica (CA) scandal. This corporation, in fact, changed the rules of the political “game” in a way that (nowadays) cannot be ignored or denied. The impact of micro targeting strategy developed by this company, based on sophisticated and innovative methods, establishes a relationship between political science, public choice, mathematic algorithms, data analyses, psychology, and public marketing. The consequences of using this technology or combination of different technologies, knowledge and science, proved to be several years ahead of the existing institutional and regulatory frameworks, influencing the democratic process of US national elections and manipulating public choice to a degree never seen before (Solove, 2004)

In the same year, on the 23rd of June, the same innovative methods were used by the same company in the United Kingdom European Union Membership Referendum supporting Brexit, but the extend of its interference in the campaign remain contested (Cadwalladr, 2017).

In 2018, a similar episode was detected during the Brazilian Presidential campaign according to the Brazilian newspaper *Folha de S. Paulo* (Paulo, 2018). This newspaper reported that during such a period, the Presidential candidate Jair Bolsonaro, who became elected, was considered to have received an illegal “helping hand” from a group of Brazilian entrepreneurs. Allegedly, those entrepreneurs were bankrolling a campaign to bombard electors that use the application WhatsApp Messenger¹ with fake news about Fernando Haddad, the main opponent of Bolsonaro’s campaign. The newspaper claimed that the multimillion-dollar “anti-workers’ party campaign” was designed to flood Brazilian voters with untruths and inventions, by simultaneously firing off hundreds of millions of WhatsApp messages (Mello, 2018)

These occurrences and their consequences seem to acknowledge the impact of innovative technologies in democratic processes, stressing the need for a regulatory, ethical and political

¹ freeware, cross-platform messaging and Voice over IP service owned by Facebook

debate about the impact of innovative technologies in democracies. This debate is opening a completely new file on political regulatory discourse, with public hearings in the European Union (EU) Parliament and the US Senate, whose discourse establishes links between the institutional frameworks and how modern western societies should react to the use of innovative technologies to reach electors, which became a new political institutional paradigm (O'Brien, 2018).

The legal and regulatory requirements of this process and the ethical debate about the limits of technology use, particularly regarding its impact on citizen privacy, namely the interference with their opinions and voting intentions, is an ongoing and important debate. It is expected that the result of this debate will determine how we can protect democratic and liberal societies against internal and external threats.

In the EU this concern is particularly evident in recent actions. On the 15th and 16th of October 2018, The European Political Strategy Center - EPSC² - promoted a conference under the theme *"Election Interference in the Digital Age; Building Resilience to Cyber-enabled Threats"*. The European Union Commissioner for Security, Sir Julian King referred to this conference: *"Free and open elections are the foundation of our democratic societies. They make Europe what it is – a place where you can speak your mind without fear of being arrested or prosecuted. A place where voters trust that election results reflect open and transparent public debate. Protecting the integrity of our elections is therefore an absolute priority; for the European Union, for the Member states, and for all European citizens. But the threat to them has been growing in the past couple of years, which have been marked by a series of attempts to manipulate the electoral process in at least 18 countries, including in the EU."* In addition, he mentioned *"The threat can be split into two vectors: attacks that target systems and data to interfere with the electoral process or voting technology, and threats that manipulate voting behavior. Our work through the Security Union is designed to tackle both."* (EPSC, 2018)

Although the previous analysis might seem relatively harsh, even the suggestion that manipulation has happened or could happen is corrosive to public trust and confidence in the democratic system. Moreover, it can be recognized that these technologies are undermining social integrity using different levels of approaches that can be summarized in three categories: targeted hacks and leaks to change public opinion; fake news to influence

² EPSC is a think tank of European Commission

the results; and the use of psychometrically targeted messaging based on mined user data – such as in the Cambridge Analytica case (Wetherell, 2018).

These facts reveal how important and opportune it is to understand, reflect and conduct more research about this phenomenon and how it will be fundamental for the new political dynamics. The impact of innovation on public choice and political processes is already a reality and the mechanisms created by such innovation will be increasingly used, will become more economically affordable and will interfere more effectively in the *Digital Person* (Solove, 2004) that almost all of us will be in the near future.

Recent political campaigns have shown that it is probably impossible to stop the impact of this technology and innovation on politics, especially in political campaigns and elections. Consequently, we can only try to study and develop a systemic understanding about it in order to contribute to create new frameworks and promote awareness about how it works and how we can control the impacts of these innovative technologies in our societies.

This dissertation starts with an analysis of relevant literature in order to understand how innovation can be related to politics. To do so, I considered the framework proposed in the paper “*The co-evolution of policy mixes and socio-technical systems: Towards a conceptual framework of policy mix feedback in sustainability transitions*” (Edmondson, Kern, & Rogge, 2018). Considering the relation that those authors defined in their framework, a new approach will be presented here for such relations and feedback, especially considering their occurrence in the dynamics that result from the CA case.

To identify such dynamics, this paper considered the concept of innovation and technological innovation from the literature and related it with the CA case. Regarding the impact of using this technology with its political purpose, this research focused on its consequences in the social context and how it influences the policy mix.

To analyze the reactions that emerged from this case and characterize the impacts of CA in the policy mix and the social context, a set of interviews with key personalities were conducted in order to evaluate how those feedback mechanisms occur, and in which directions, to relate it with a co-evolutionary change of a socio-technical system and policy mix (Edmondson et al., 2018).

This work ends by proposing some updates to the framework presented by Edmondson et al. (2018), regarding the direction of how some feedback mechanisms influence the socio-technical system and the policy mix. Such update frameworks are intended to represent more

accurately the impact of innovative technological methods such as the Cambridge Analytica case. The dissertation closes with some concluding remarks and directions for future work.

2. Literature Review

2.1 Cambridge Analytica as an Innovation

The relationship between economics, policies and politics is deep and one does not exist without the others. The relation between these social sciences has been studied by several authors, and one of the most relevant and fundamental authors is the famous economist Joseph Schumpeter with his important pieces of work of the 1940s (Schumpeter, 1943). Schumpeter defined the concept of “innovation” as “new combinations” of new or existing knowledge, resources, equipment and other factors (Schumpeter, 1943). This author also distinguished *innovation* from *invention*. According to Schumpeter, *innovation* responds to a specific social activity or “function” and has a commercial purpose that is carried out within the economic sphere, while *inventions* can be developed without any commercial purpose or commercial intention.

The need to answer to a problem, or the intent to earn advantage over an adversary or competitor, determines the need to search for different solutions to traditional problems. Very often, this need brings the creation of inventions, which always proceed innovations. In the book “*Technology strategy for managers and entrepreneurs*.”(Shane, 2014), the relation between innovation and invention is distinguished by the following explanation: “[...] *the process of using knowledge to solve a problem. Innovation is different from invention, which is the discovery of a new idea, because it involves more than just coming up with an idea about how to use knowledge to solve a problem. For example, during the Renaissance, inventors came up with the ideas for parachutes, fountain pens, mechanical calculation, and ball bearings. However, these ideas did not become innovations until much later because they were not technically feasible and could not be implemented at the time that the ideas were discovered.*”

This book later defines “*technological innovations*”, as “*the use of knowledge to apply tools, materials, processes, and techniques to come up with new solutions to problems.*”

Another similar, but more detailed definition of “*technological innovation*” is presented by Abetti (Abetti, 1989) who defines technological innovation as “*A body of knowledge, tools and techniques, derived from science and practical experience that is used in the development, design, production, and application of products, processes, systems, and services.*”

Applying this conceptualization and understanding of innovation, and especially technological innovation, to the Cambridge Analytica case, the methods of this corporation fit in with these conceptual definitions. There is knowledge (from psychology, marketing, political science, data and computer science) that is being used by a combination of resources (financial, technical and political), employing the adequate equipment to change a specific social activity (elections and democracy) and create a new business model with a commercial purpose: the digitalization of political campaigns.

It is clear that methods, such as that employed by Cambridge Analytica, are not only inventions regarding the application of those capacities in order to solve a concrete problem, in this case with success, deliver a specific political message to citizens in order to mobilize their support, and potentially vote, in an electoral campaign. In a time where citizens abstain from participating in the democratic political process, this solution to a political communicational and mobilization problem is a powerful innovation.

Studies about *innovation* reinforce this theory. Peter Drucker (1980) in his book “*Innovation and Entrepreneurship*” establishes a direct link between innovation and entrepreneurship considering that: “(...) *innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced.*” (Drucker, 1985).

In this definition, we can again clearly understand that innovation is not only about inventions or new technologies. Innovation is also about new businesses, opportunities created by using new technologies, new services presented to the market that can provide new products or processes, and generating new business models. Moreover, innovation also depends on an intention: it is not something that happens under a certain level of serendipity (even though it can happen because of it) but is a *structured or systematic process that requires discipline* (Drucker, 1985), and consequently can be practiced and learned.

Power achievement and political support are already a product of CA innovation, but it is also important to realize that there is an economic and financial revenue produced by this technical innovation.

According to O’Brien (O’Brien, 2018), web advertising is growing fast compared to traditional advertisement: “*this granular capacity lies at the core of search engines utility their business models, and their associated profits. In revenue terms, for example, digital advertising grew from \$47bn to \$61 bn in US alone between 2016 and 2017 (with mobile advertising comprising two thirds of the total). To put these figures into perspective, total newspaper reported advertising revenue in 2017 was \$16.5bn*”.

These revenue figures show that the digital advertising market, combined with other techniques, can generate new outlets for advertising companies, and the combination of existing and new technological elements represent innovation (EPSC, 2018).

New businesses are being generated by micro-targeting at the same time that the online engine search companies and Social Network Sites (SNS)³ are providing reliable numbers about *where* and *how* those investments have been used to deliver a message (O'Brien, 2018). Another relevant occurrence for this context was the announcement that Facebook was expecting to be fined by the United States Federal Trade Commission with a penalty of up to \$5 Billion over privacy issues (FTC, 2019). This decision established a legal value to data trade operated by Facebook and quantified another economic value for this innovative technology, which use the SNS and citizens personal data to deliver a political message that can influence the vote in democratic elections. As a consequence of this action, there is now a given value by a state official institution for the consequences of the change promoted by this SNS company.

In the case that this fine is imposed, it will be possible to quantify, for the first time, an economic value to the harm that this technology created with such a big social and technological change, interfering in the classical perspective of policy mix. To quantify this amount, the United States Federal Trade Commission needed to attribute an economical value to this technological impact and the radical change it promotes, which can prove that, according to the literature, the result of CA's methodology can be considered as an innovation. This corporation developed new processes, delivering new political campaign products and presented new services to candidates, providing the possibility of creating very new business models and processes for the political system and influencing public choice.

³ Social Network Sites - web-based services, such as Facebook, that allow individuals to connect and interact in internet.

2.2 CA's innovations as socio-technical change

According to Edmondson et al (2018), there are papers that highlight policy change as a response to changes that occur in socio-technical systems, but the policymaking process development is still underdeveloped. As a consequence of technological innovations, the interplay between technological change, politics and the policy making processes remains understudied (Schmidt & Sewerin, 2017).

To address such a gap, Edmondson et al (2018) developed a conceptual framework considering a set of six feedback interactions that relate in a socio-technical system the policy subsystem with the socio-technical change, considering the influence of exogenous conditions.

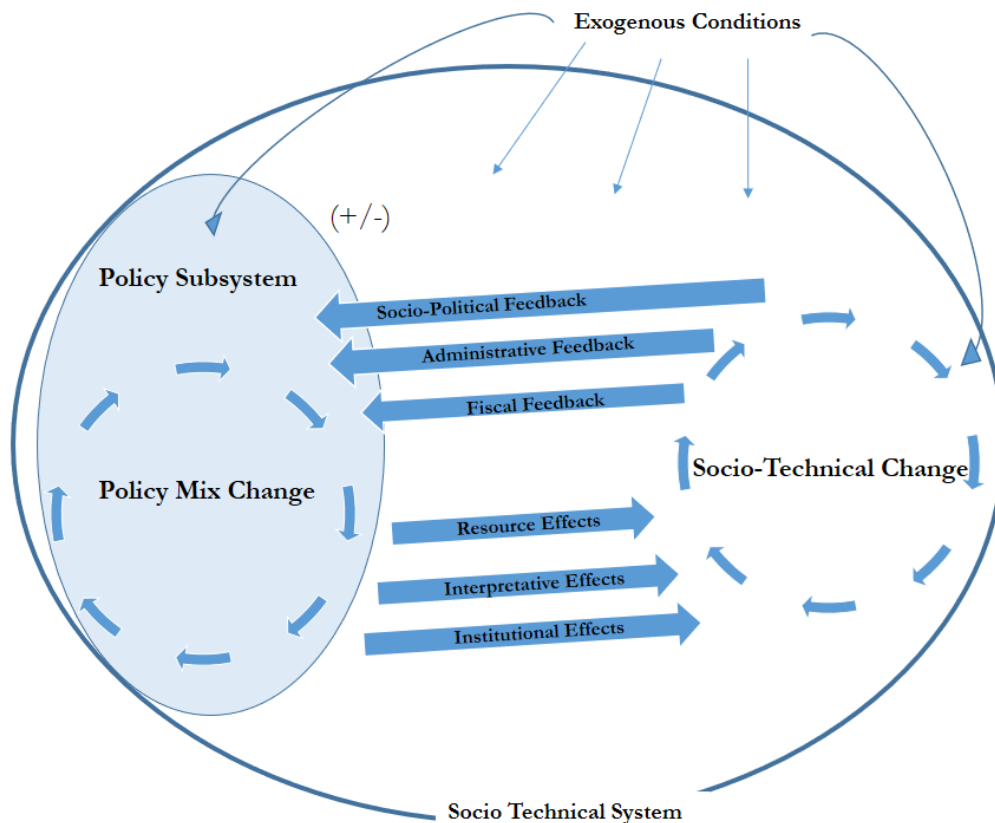


Figure 2 - Dynamic interactions of the policy mix and the rest of the socio-technical system based on Edmondson et al (2018) framework

This work's aim is to understand how an innovation, such as the innovation created by Cambridge Analytica, can be seen as a socio-technical change, and how it influences policy mix change with regards the feedback proposed by Edmondson et al (2018). Moreover, it

intends to reflect how this innovation influences the relationship between society and politics, and how it contributes to the evolution of the socio-technical system.

The relationship between policy mix (defined by the policy subsystem) and socio-technical systems, particularly in the field of data science technology, and the impact of the SNS is still understudied considering how recent those technologies and phenomenon are. However, in the paper *“The co-evolution of policy mixes and socio-technical systems: Towards a conceptual framework of policy mix feedback in sustainability transitions”* (Edmondson et al., 2018), the authors analyze how policy mixes influence socio-technical change and how changes in the socio-technical system shape the evolution of the policy mix.

The present work applies this conceptualization to the case of the innovation delivered by Cambridge Analytica and the impact of this innovation in the feedback mechanisms.

2.3 Analyzing feedback mechanisms produced by CA socio-technical change

These feedback mechanisms reshape society over time in each interaction, redefining policies and socio-political structures. They can influence, in a positive or negative way, the policy subsystem and interfere in the flow of the socio-technical change.

Regarding the feedback interactions, from the six interactions proposed by Edmondson et al. (2018) scheme, the present work will focus in three of them.

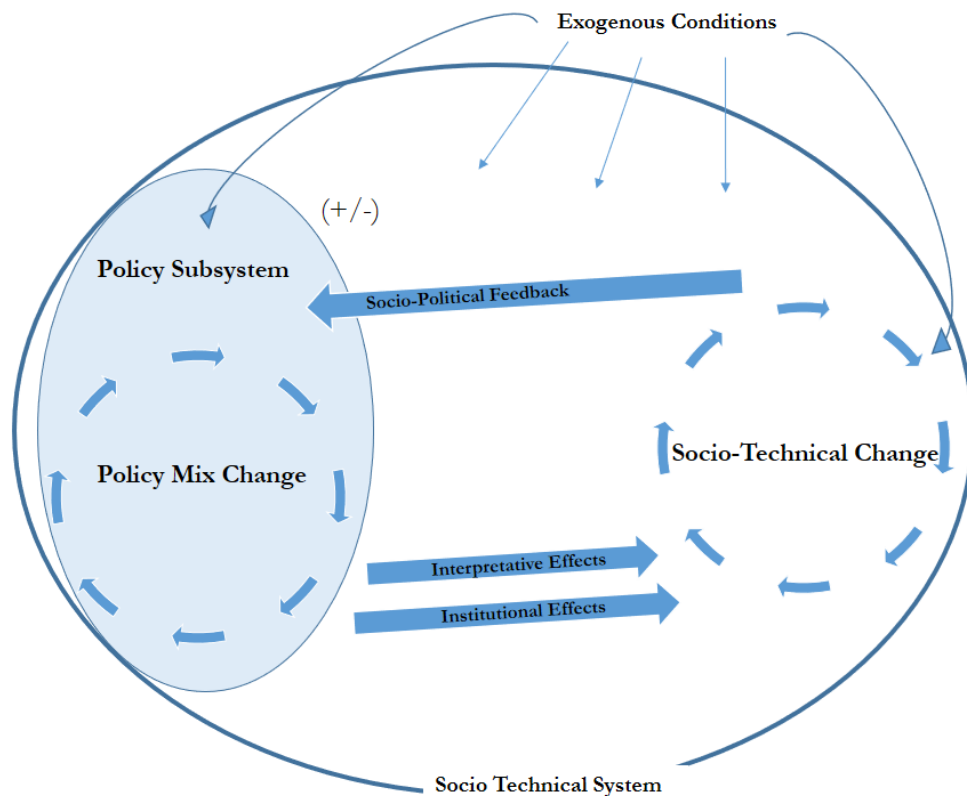


Figure 3 - Dynamic interactions of the policy mix and the rest of the socio-technical system, regarding the effects and feedback under study – based on Edmondson et al (2018) framework

Considering these three interactions, within the socio technical system, it is possible to understand that those effects can expected to be a consequence of CA's innovation:

1. Socio-political feedback – concern whether public and stakeholder support for policy mix, or certain components of it, is reinforced or undermined over time. Such socio-political feedback can involve three dimensions: cognitive, constituency and agenda feedback (Edmondson et al. 2018). These feedback are the aim of this technology: to be able to influence in a direct way citizens and voters in these three dimensions. If the efficiency of this service is so relevant, as it seems to be, the socio-political feedback are maximized.
2. Interpretative effects – the delivery of information which change patterns of cognition, understanding and meaning (Pierson, 1993) thereby creating or changing visions and expectations of actors (Jacobssona & Bergek, 2011). In a time when voters are distant from the decision making process and the democratic system, the capacity to communicate and deliver a message that can mobilize that vote or

intention, according to one specific agenda, is a powerful asset that answers the needs of political actors.

3. Institutional effects – The combining of effects in laws, rules and regulations. After the scandal became public, it produced a roll of changes in institutional framework regulated by the policy mix, with changes that are still ongoing.

Moreover, the consequence of these innovations, when analyzed under the scope of these three effects, does not only seem to be mono-directional, as the dynamic scheme proposed by Edmondson et al (2018).

Inspired by Ward's work (Ward, 2018) about SNS and Cambridge Analytica's behavioral micro-targeting practices, the present research focuses on how CA technology and innovative methods work and how they interfere with the private sphere of individuals. Moreover, this work also aims to understand how these interferences fit in with the three effects (socio-political feedback, interpretative effects, institutional effects) and relate this approach with the socio-political feedback of the framework of Edmondson et al (2018).

2.4 Policy mix changes under digital innovations

From all the recent events mentioned at the beginning of this dissertation, it is possible to understand that in today's society the use of technology is changing the traditional framework of democracies according to an institutional and societal perspective. There is an ongoing process changing from an analogic democracy towards a digital democracy. This concept was presented by Luís Viegas (Viegas, 2018), policy advisor at EPSC, in a Portuguese Parliamentary conference about *"Information and Misinformation in the Digital Era"*, on April 15 2019, and it can be resumed in the following scheme which contrasts traditional socio-technical societies to their present change and future trends:



Figure 4 – From an Analogic Democracy towards a Digital Democracy – based on EPSC graphic

2.5 Digital person as cells that produce feedback mechanisms flows

To address the dynamics under the Cambridge Analytica case and how the socio-technical change is influencing the policy subsystem under the feedback mechanisms, this work considered citizens as units, or cells, which create and react to the flow of feedback mechanisms and effects. According to Edmondson et al (2018), this flux has a specific direction that co-relates policy mix and socio-technical change.

Citizens, or cells, developed a digital condition, creating digital profiles, with a digital behavior and relationship with privacy in the digital web that is different from the physical one. These digital profiles can be manipulated by exogenous conditions of the socio-technical system, interfering in their free will and guiding the effects of their action. Individuals adopt an alter-ego behavior in digital websites that can be called the “*digital person*”.

The concept of the digital person proposed by Solove (Solove, 2004), was explained in his book: *“The Digital Person: Technology and Privacy in the Information Age”*, where the author explores the social, political and regulatory implications of the collection and use of personal information in computer databases. In the information era, our lives are documented in digital dossiers maintained by hundreds (perhaps thousands) of businesses and government agencies. These dossiers are composed of data containing our personal information that, when assembled together, begin to draw a portrait of our personalities. The dossiers are increasingly used to make decisions about our lives - whether we get a loan, a mortgage, a license or a job; whether we are investigated or arrested; and whether we are allowed to fly in an aeroplane or not.

This new paradigm has a deep relation with the socio-technical change, and it is essential under the analysis of the feedback mechanisms and the change they can promote.

2.6 The impact of innovation in the relation between socio-technical change and policy mix

The innovative methods used by CA seem to be highly effective in a political perspective, but also in an economic one, regarding the market where they are included, which is growing every day. (Gonzalez, 2017)

Until recently, the impact of innovation in this relation between social-technological change and policy mix was difficult to make tangible in an economic way.

However, it is being debated whether Cambridge Analytica - and similar technologies - methods can be as efficient as they seem to be. Micro-advertising campaigns, such as the ones provided by Cambridge Analytica's services, offer more sophisticated data-mining techniques than in previous times on the use of internet campaign techniques. Therefore, the market of political digital campaign services can be seen as a spinoff of the digital advertising market which grows every day (Gonzalez, 2017).

The present work analyses CA's case in order to understand changes and multiple faces (and shadows) of this phenomenon. The combination of knowledge and technological skills of CA, created psychological profiles of citizens, allowing this corporation to deliver to their clients the use of data to stratify the SNS users into different types. Such stratification, in

turn, allows targeting a specific political message according the personal profile of each individual, mobilizing their support and, consequently, their vote.

According to recent debates and contributions, some of those changes are linked with the public and private sphere and how we can protect citizens and their digital person against the abusive use of the information that they provide unconsciously when they use SNS.

2.7 The dark side of innovation in the relation between socio-technical change and policy mix

A fundamental dimension to be considered is the financial support of political campaigns, using digital intermediaries (Johnson, 2017). These digital providers/gatherers of information influence the socio-technical system, through the digital person integration within that system, according the three feedback mechanisms under attention.

The socio-political feedback relates with three dimensions: cognitive, constituency and agenda feedback (Edmondson et al., 2018). The aim of CA's innovation is related with these three dimensions in a new way.

The ability of CA's technology is not only under the influence of the cognitive understanding, beliefs and opinion making process according the different types of *digital person* (Solove, 2004) mobilizing them for a political agenda, but is also dependent on the creation of different colligations to change the policy mix. For the latter, financial support is essential, and the means that are available and their efficiency is very relevant for the constituency dimension of socio-technical feedback.

For this reason, every campaign is under scrutiny by an institutional framework with rules, laws and procedures that try to clarify the financial support of colligations, according to a social balance that try to attribute candidates equal and fair chances of mobilizing electors. Feedback mechanisms, which interfere in the socio-technical system, depend on the financial support.

The socio-technical change that is a consequence of CA's innovation is based on digital intermediaries that operate under a specific legal system, under institutional official scrutiny, such as the sponsoring of activity. This reality creates difficulties for authorities to monitor the fairness of the socio-technical feedback mechanism operated by exogenous interests.

Considering this potentially “dark” financial support, huge asymmetries between candidates are introduced, namely due to a complete obscure support of candidates by also unclear interests (which can even be against the democratic system, i.e., serving specific agendas). This situation can sometimes undermine the democratic processes and citizens trust in their societies which is one type of the social-political feedback (Ward, 2018).

Another risk that the use of these innovative technologies brings to the policy mix structure is the impact of the “*force of falsity*” (Eco, 1998). Fake news is a powerful tool to manipulate public opinion and interfere in personal choice and this is one of the major possible interpretative effects for the social-technological system.

Wetherell (Wetherell, 2018) argues that “*The recent revelations about Cambridge Analytica have prompted a new and strange kind of anxiety: What if your political opinions are not actually yours?*”.

It is important to understand how socio-technical systems work, and how the socio-technical change and the policy mix influence each other under the following three dimensions: (1) Socio-political feedback, (2) Interpretive Effects and (3) Institutional Effects.

2.8 A social paradigm change, before CA’s Technological Innovation Catalyst

The innovative methods that use digital micro-targeting and data are efficient because a change in society has already been occurring before, which can be perceived as part of a process that was analyzed by Daniel Innerarity in his book “*The new public space*” (Innerarity, 2006).

Innerarity associates this reality mainly based on two other pieces of work, proposing that we are facing a phenomenon of *correlative privatization of the public and a publicization of the private* (Imhof & Schulz, 1998), together with an “*extroversion of the intimacy*” (Marinas, 2005). This reality is driving society to a non-differentiation between the intimate sphere and the public sphere, and to a lack of tension between those two dimensions.

SNS provide the possibility for anyone to express their intimacy and make public their intimate desires and understandings, which very often are focused on politics (Richterich, 2018)

From this social change, the impact of such technologies and the data of millions of these private intimate desires and understandings provide, in turn, to those that are able to collect

such massive information, the capacity to communicate in a way, honestly or perversely, that can shape individuals' free will, consequently affecting deeply freedom of choice (Ward, 2018).

2.9 Cambridge Analytica as a driver for socio-technical change

According to Cambridge Analytica's CEO, Alexander Nix, in his public statements, the explanation of the Corporation's methodology is based on an individual's personality analyses. The company used voluntary quizzes or individuals' interests published in SNS profiles and classified the participants into five dimensions, defined by the "*Big Five psychological test*". This methodology is also known as OCEAN (the initials of the five dimensions) and includes the flowing dimensions of psychological evaluation: **O**penness, which refers to how readily an individual will have new experiences or accept non-conventional ideas, levels of creativity and attention to inner thoughts and feelings; **C**onscientiousness, which applies to attention to details, vigilance, organization and a desire to complete a task to the best of his/her ability; **E**xtraversion, which relates to assertiveness, enjoyment of human interactions or social settings and risk-taking; **A**greeableness, which tends to be indicative of co-operation, kindness and consideration for others; and, **N**euroticism, which relates to the levels of anxiety, ability to deal with stress and maintaining calm under pressure (Nix, 2017).

Combining the OCEAN personality analysis with information provided by data brokers⁴ such as, Nielsen, Acxiom and Experian, Cambridge Analytica was able to build individuals' personality profiles with knowledge about individual fears, hopes, expectations and ideology among others. Afterwards, using powerful algorithmic tools, the company was able to provide billions of messages that answered the deepest questions of citizens and electors, trying to interfere in their voting intentions.

However, as if George Orwell's Big Brother's description was not already scary enough, the use of fake news, which can manipulate the intention of millions of citizens without any

⁴ Data brokers - data analytics company that provides the most complete and trusted view available of consumers and markets worldwide – (Nielsen)

editor review, helps obscure intentions to lead unsuspecting citizens to decide according to those obscure intentions, undermining public decision and democracy. (Bakshy, Messing, & Adamic, 2015).

Understanding how the socio-technical system can be influenced by exogenous conditions - and how those exogenous conditions are vulnerable to obscure interests - that use innovation and technology as tools to accomplish their intentions, provides a perspective of how politics can develop. This understanding will be fundamental to prevent against those threats and bring the need of understanding about how policy mix will answer to this evolution.

Contemporary western societies are ruled according to a democratic system under an institutional framework, where the rule of law, human rights and regulation depend on a strong State to assure the rights, liberty and guarantees that can provide dignity to human beings. This common agreement is part of chapter one of the Declaration of Human Rights (UNGA, 1948).

“All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.”

The policy mix change happens under the statement of this Declaration, which is based on human reason and the assumption that all humans make use of their own liberty and free will. However, the technological innovation pioneered by CA could call into question these universal dogmas, questioning the capacity of keeping human reason and free will as the basis of policy mix change, depending on majority will regarding minorities representation.

CA delivery can be considered as a technological innovation representing socio-technical change, influencing the policy mix change under feedback mechanisms in a totally new way: This could even change society as we know it, understand how far this innovation can lead us and how this influence happens, and could represent a major contribution for ongoing research and for society in general.

3. Methodology

As we presented before, this topic is still under study and the real impact of CA in the socio-technical systems is still under investigation. There is a lack of quality and reliable information about this theme. As a consequence, the present work adopted a qualitative methodology.

The present work started by analyzing the literature that relates policy mix and socio-technology systems and how this relation could be influenced by exogenous conditions such as a combination of interests that use technology to manipulate citizens (as part of feedback mechanisms) producing changes under innovative methods of targeting.

Considering the information available about the CA scandal, such as media news, institutional hearings reports, corporation statements and key role personalities hearings, this research has formulated a conceptualization where CA methodology is a technological innovation that influences the socio-technical system.

I conducted set of exploratory interviews with a group of personalities in political and technological contexts about the conceptual relationship between innovation and socio-technical systems and their potential impact on the democratic system, focusing on the CA case.

The interview scripts were semi-structured using open questions that were presented to each interviewee according to the course of the conversation, trying to ensure that all were answered so that information is collected in as much detail as possible⁵.

Under guiding questions, each interview with each personality followed its own path, which motivated suggestions for adapting the course of the interview according to the profile and expertise of the interviewee.

Different personalities with a key role in socio-technical systems were chosen and I focused the interviews on questions focused on evaluating how the feedback dimensions of the relation between policy mix change and socio-technical change occurred in the perspective of each interviewee. Moreover, I assessed the current evolution of the political systems in response to innovations such as the CA methodology.

⁵ See appendix 1

The personalities contribute to this work according to the following political contexts: The Portuguese reality, the European reality, and the institutional framework of policy mix changes and its evaluation.

The use of a qualitative method intends to analyze how this relationship comes about and the different ways in which it occurs, and serve to encourage the questioning of conventional beliefs of how socio-technical systems interact, questioning it in an exploratory way, opening space for further research.

Regarding the implementation of a set of open questions and the semi-structured interview, I analyzed the perception of the following questions that contribute to the present research:

1. What is the perception of those personalities about the impact of innovation in politics?
2. How does innovation influence the political framework?
3. What is the level of conscience of the impact of these technological innovations, namely those developed by Cambridge Analytica, in the socio-technical system?
4. What are the concrete consequences of CA's case regarding the dimensions of the socio-political feedback and interpretive and institutional effects of this relation?
5. What lessons can be learned from the Cambridge Analytica case?

Considering that it was not possible to isolate the socio-technical system of Portugal from the European Union, the unit of analysis of this relation will not be circumscribed by a geographic region.

The present work focuses the unit of analysis on the interactions between socio-technical change and policy subsystem in the three dimensions of the socio-political feedback, the interpretive effects and institutional effects of this relation.

The qualitative methodology helped to identify the situation after the Cambridge Analytica scandal and define clearly the interactions that this case generated.

This qualitative analysis also provides some suggestions about how those interactions will shape in the future, although this was not the aim of the present work.

Another important consideration was the conscience of each interviewee about their role in the framework towards the Cambridge Analytica's case, regarding lessons learned, especially concerned with the interaction that occurred in their sphere of influence. It was relevant to understand the role of conscience of these individuals who have an active role in policy mix change.

Despite the negative perspective that Cambridge Analytica's case brings to the relations and interactions that occur under the socio-technical system, it is possible, and relatively reliable, that innovation also works in favor and in a positive way on those relations.

The interviews also admitted the possibility of personalities to identify a positive impact of the consequent interactions.

3.1 List of personalities interviewed

- Paulo Rangel – Professor of Law at The Catholic University Porto, Member of European Parliament, Vice-President of European People's Party and former leader of Social-Democrat Party parliamentary group;
- Miguel Poiares Maduro – Professor, Director of the Global Governance Program in the European University Institute, former Portuguese Minister for Regional Development from April 2013 to October 2015;
- Diogo Queiroz Andrade – Journalist, former deputy Director of *Jornal Público*, Researcher in public choice field;
- António Cardoso Costa – Professor at ISEP, Researcher at INESC-TEC, Security forensic expert for several courts in Porto metropolitan area;
- Hugo Carvalho – Master in Electronics and Computer Engineering, current manager in start-up accelerator company, President of Portuguese National Youth Council;

Alexander Whalen, Public Policy Manager, EU Affairs at Facebook was also contacted several times to participate in this study. Unfortunately, it was not possible to conduct the interview. In spite of all the efforts that were made the reply was:

“Unfortunately, I am not allowed to speak on behalf of the company on this issue.”

Similarly, Helena Martins, Public Policy Manager at Google, also presented the same answer after my interview request. The Corporation's public policy on this issue was to not comment in any way.

I have been trying to establish contacts using data and SNS firms in order to evaluate the perspective of this sector with regards the theme under study. Considering the time available, all the interviewees were very cautious and uncommitted, which reveals some sensitivity in the industry, lack of openness and very low transparent position with regards their role in

this new paradigm. Therefore, it should be noted that the present study lacks the contribution of these corporate entities, an active and fundamental part of the phenomenon under study.

4. Results - Conclusions from the interviews

1. The process that results from Cambridge Analytica's strategy is the result of a combination of knowledge, experiences, skills, and realities already existing in society, which represent an innovation. This innovation has two outputs: an economical value and the potential to be an important tool to achieve political power.

Digital technology innovation did not have a direct influence on the political systems until recently. Our common social understanding about this relation is new and somehow surprising for the traditional political actors and their stakeholders. This consideration was expressed in several declarations of the interviewees:

Innovation allows people to achieve levels of participation and access to information that have never be seen in the past. There are new challenges in the way that people interact within the internet and one of them is the way we control presence and behaviour. Freedom of speech is one of them. The control of freedom of speech cannot limit social borders already accepted, with the exceptions accepted until now (e.g. society doesn't accept violence or terrorist incitation). The change now is about how we deal with a new dimension of rumor and fake news and the answer is not to impose new limits of debate, but rather to improve the mechanisms for achieving the truth, and those are depending on contradictory and a better debate. The answer is how we can improve pluralism (Maduro, min: 7:42).

The relation between people and the technological innovations presented by SNS demand information to be transparent.

As a society, we need now to guarantee that people have access to the sources of information that is spread in the Internet, if that information is paid for or not, and who paid for it. (Maduro, min: 8:31).

This demand is related to interpretative and institutional feedback. These two feedback effects had a consequence in the way socio-technical change happens, creating new rules and regulatory frameworks, but also changing the policy mix challenging the policy subsystem:

Two of the steps that have been taken about this change were the adoption of a conduct code the in private sector and the legislation adopted at European level (such as the European Directive about private data, GDPR - General Data Protection Regulation, without compromising the freedom of speech (Maduro, min: 9:20).

These effects can occur under exogenous conditions, with a specific agenda that can compromise the conventional socio-technical system that works under democratic values.

Those exogenous interests can be related with economic revenue or power revenue:

It is also important to recognize that the methods used by CA just remind us that data and data analysis for political or social purposes is business (Carvalho, min 23:11).

This case makes us think of the dark side of SNS and Facebook for the first time. Until then, all of us were a bit dazzled with the features of Facebook (Carvalho, min 33).

The innovation created by these technologies is also social, referring to the way communication happens:

When we reflect about Cambridge Analytica, we realize that there is also another innovation that is a consequence of the combination of different sciences or disciplines, and that could be a communicational innovation (Carvalho, min 55).

The new paradigm delivered by this company is a new way to reach the audience and deliver a message, forcing its reception if necessary, for those who might not be so interested in the kind of message that the sender wants to deliver before. From the several innovations that are a consequence of the methods of CA, innovative communication can be one of those. This change fits under the feedback mechanisms and effects presented by Edmondson et al. (2018).

2. This innovation affects the policy mix and Socio-technical change in a bidirectional way.

Socio-technical change had always been changing (and shaping) relations in society, leading to consequences in the policy mix:

It is not news that innovation has always been changing society (e.g.: the washing machine, women liberation, abolition of slavery was also because of technology). This phenomenon is also happening in a permanent way: there are structural changes of course happening right now, depending on innovation processes (Rangel, min 2:00, interview 1).

According to the interviewees, Cambridge Analytica produced an innovation, with several aspects to take into consideration, which can influence the socio-technical system:

This relationship occurs when politicians need to answer to the challenges of innovation, regulating innovation. However, there are also ways of how innovation influences politics, for instance, in a communicational way and their impact. Cambridge Analytica reveals the intimacy, when people surf on Google, creating a digital

profile that offers information about how people think, react, what people's identity is, and what people desire. This information is extraordinarily powerful because it allows directing the political message to each individual. In a political field, these powerful tools make it quite easy to spread political messages according to each individual. Another powerful tool is the ability to direct an individual message using artificial intelligence to millions of people at the same moment. If we associate these two phenomena, the political change produced by this technology will bring new realities. (Maduro, min 3:45)

This technology is affecting the socio-political feedback under positive and negative inputs, similar to that presented by Edmondson et al. (2018). One of the effects of this technology can be seen under perspective of the use of SNS by citizens, and how it is happening. The technology used on these websites allows people to be part of communities, according to their own interests, collected by personal suggestions that depend on the history of the interests of each individual. This is changing human relations itself and influencing how humans behave:

The consequence of this leads people to aggregate under communicational bubbles, which reinforces their prejudice in closed circular message debate (Maduro, min 4:03).

This fact decreases opinion diversity in the public space, suggesting new opinions to people or choices of options similar to the ones people already search for or like, according their search record. (Carvalho, min: 37:15).

Therefore, there is a new paradigm for people's interactions, which has consequences on how innovation is influencing socio-technical change and public consciousness

. The new paradigm reinforces the theory that effects and feedback, when seen under the CA innovation, can occur in both ways:

There is no doubt about the fact that a bi-directional influence occurs between social-technical change and policy mix (Andrade, min. 10:28).

One interesting consequence of this phenomenon is how this scandal also influenced the SNS to develop new tools in order to contain practices of political campaigns, clarifying who is the digital sponsor of the content that is being shown on the platform. (Carvalho min 45:10).

These results seem to lead to the conclusion that a bi-directional way seems to occur in a dynamic relation, where one action leads to another, representing part of a complex system or process and not only a mono-dimensional and static relation.

The socio-technical change promoted by CA in SNS drives policy mix changes, but because of regulation or public awareness, SNS Corporations, such as Facebook, also felt the need to produce new technology to fit the practices under the SNS dynamics in order to adapt to

policy mix new demands. This cycle of adaptations, once started, seems to be a continuum where the phenomenon happens, permanently, and in both ways.

- 3. The impact of this innovation and their consequences can only now be felt and understood by the general society. Consequently, new fields of socio-economic impact can be perceived by society. This behaviour can be compared to the “time lapse curve” of the Diffusion of Innovations theory in the adoption of innovative technologies.**

There are interesting benefits on the use of technology to influence policy mix, but there are also risks that need to be mitigated. One of the most relevant relations of technology and policy mix are the modern digital vote systems that have been used in elections.

This could be one potentially positive socio-political feedback that is a consequence of socio-technical change.

However, the reliability of these digital voting systems has not yet assured the political system.

The social-technical change promoted by the electronic vote systems didn't provide the reliability needed for the political sphere. (Costa, min. 3:51).

This perception drives the process a step back in the modernization of elections from digital systems to paper bullets systems again. This interesting phenomenon can be observed and explained under the *Diffusion of Innovations* theory.

The risks of using this system are still so high that states remain reluctant to adopt this technology in their electoral processes. Once again, the rhythm of socio-technical change created by these innovative voting systems influence the policy mix, but the reaction of policy mix also drives socio-technical change, decreasing the investment, for example, on new voting systems. The effects and feedback are bi-directional when we consider the political system as a socio-technical system.

- 4. Innovation has value, but as with a coin there are two sides: one as an opportunity and the other as a threat.**

The impact of innovation, considering the time lapse curve observed and the lack of understanding of this phenomenon by political stakeholders, confirms a risk that needs to

be tackled between the decision-making process and the socio-technical change promoted by the innovation.

One of the positive effects is the creation of the opportunity for protagonists, in theory better prepared to understand the impact of technological innovations in the system, and so answer in a better way to the challenges society faces:

“It opens space to new protagonists of policy mix, more prepared to understand and deal with this reality” (Andrade, min. 3:00).

However, there is no option to accept the fact that technology is and will be changing these relations. There is no way to stop this progress, it would be like *“stopping the wind with the hands”* (Rangel, Min 7:43, interview 2).

Technological innovation brings a sort of convenience to citizens in different ways, however, in this case, it also collects information surreptitiously which can be mobilized to interests that are not being perceived by citizens when they are sharing personal data. (Costa, min. 2:58)

The case under analysis also alerted the users to the importance of privacy on the Internet and the use of their personal data.

The socio-technical change and the policy mix relation that we can realize when we study this process lead us to increase our collective awareness of what a single “tick” in a box represents about personal data use consent. (Carvalho, min: 35:19)

The communicational change is deep and can be seen under a paradox perspective: there is more freedom of speech but somehow it costs our privacy.

There is no doubt that at a communicational level, the Internet and SNS bring more free speech spaces for common citizens, even if the quality of speech is not so high, and the quality of information spread is not good. (Andrade, min. 23:26).

Another interesting perspective of these two sides of the coin is about the digitalization of the state and its relationship towards citizens, such as for fiscal duties: in a way, the *“digital person”* and a citizen’s digital profile in the state contribute to more equality in tax collecting, in a more efficient and simple way. *This relation is positive, and innovation brings improvements to it.* (Andrade, min. 34:00). However, when the state collects information about personal habits of citizen’s consumption, regarding how far the state goes, there is a threat to the individual’s free will boundaries. One of the potential risks being debated is the access of health insurance or public healthcare delivery institutions to information about citizens that have continually adopted a non-healthy life, perceived by the state by tax declarations.

This reality represents a potential downsize of citizen's free will and questions the sphere of what is public and what is private in social and individuals' lives. This is a negative feedback that results from this innovation

Considering the several examples mentioned above, technological innovation is not good or bad to democracy: it always depends on the use that we make of it. In CA's case, there is also this double perspective. There are facts considered negative, such as the ability of this firm to collect, process, transform and create new information without any legitimacy, which is also *advantageous* (Costa, min, 7:16). Collecting personal data, and exploring it, as a product that serves a market, being harmful to privacy, is very negative. *This drives modern societies to mistreat privacy and creates new policy mix, such as the attempts of regulation as GDPR.* (Costa, min, 7:41).

However, with regards this innovative phenomenon, the interviewees seemed to have a level of tolerance of the innovative process's risks. The problems around privacy and intimacy are serious but they are described as part of a progressive and natural process.

Another interesting topic that emerged is about the financial founding, using crowdfunding tools. In recent times, when there was a long-term nurses strike in the public health system in Portugal, many doubts were expressed about the way that strike was being financially supported. Answering that question, the union stated that the financial support of the strike was made using crowdfunding mechanisms (Observador, 2018). *These technological mechanisms are promoting social-technical changes, which are influencing new political expressions, besides the political parties, such as this strike* (Andrade, min. 24:04). This brings one more issue that is paradigmatic: *it is good that a crowdfunding tool can sponsor a strike, but it is fundamental to know who has been funding it: transparency is a capital value of democracies* (Andrade, min. 24:26).

The financial perspective under the socio-technical feedback and their institutional effects, is related with the new paradigm of the relation between state and citizens, as individuals.

According to the news presented by the Spanish newspaper Expansion the Spanish tax authority, the Hacienda, is using the SNSs, such as Facebook, to evaluate whether Spanish tax payers who move their fiscal address to Portugal are entitled to the benefit of a reduction in their tax duties or not (Serraller, 2019).

The complex notion of territory where states are founded and the institutions are deeply connected, with their legal (and fiscal) framework, are now changing and the use of SNS are again in the center of the new relation between state and individual, which represents a socio-

technical system new paradigm. The political system, as part of the socio-technical system, was founded under a territorial physical space.

5. The policy mix stakeholders have a time-lapse delay behavior to face this new paradigm, starting to wake now to this reality.

Institutions of democracy, such as the courthouse, parliament or government, are affected in a slower and more superficial way by innovation. However, the political parties, which can be defined as “*infrastructures*” of democracy, are under a quicker and extremely dynamic change. *This can be seen in the political party representation spectrum like in Italy, France and Germany, where the traditional representation of the parties has been deeply changing in the recent times.* (Maduro, interview 1).

Although we cannot say that the only reason for this political rainbow change is a consequence of advances in the digitization system, the fact is that technology is both directly and indirectly influencing political and social dynamics. There is a direct relationship between economy and technology (Schumpeter, 1943), which affects the political system.

The change that has been ignited by CA’s technology has a time lapse considering the general comprehension of the politicians responsible

Realizing that political actors do not have the technical preparation and the knowledge to understand the development provided by innovation and technology (Andrade, min. 1:30).

This time lapse had consequences:

The consequences of this is the difficulty to understand the change promoted by artificial intelligence, and so how to regulate this topic helping society to deal with this new paradigm? (Andrade, min. 2:40)

Once the frontier of knowledge has been crossed, it’s a matter of time until other companies will start using similar methodologies of CA, and deliver a similar product to CA. (Carvalho, min 59:00).

Regarding these comments, it is reasonable to assume that companies will adapt to the conditions, such as the legal framework, which will be part of the new policy mix paradigm, as a consequence of the change that this technology promoted.

6. The change that this technology personifies amplifies the impact, going deeper into the concretization of aspects that already exist in daily life reality.

The speed of this change will be faster depending on artificial intelligence developments:

The use of artificial intelligence combined with the data sources of personal searching preferences of individuals' profiles, allows spreading millions of messages directed to each individual, according to their personal interests. This totally changes the way in which political communication works, reaching more voters (Maduro,min 2:33).

Votes will be mobilized in a easier way than in the past:

The fact that information that is posted on social network sites became part of a time lapse tape, increases the syndication of political actors lives much more than in the past, increasing the level of moral and civic commitment of political actors towards the ones whom their acting has affected. (Carvalho, min 39:24).

Political communication as we know, will change:

The conventional ways of communication between parties, need to change if they want to use SNS to gain electors and supporters. People are now more available to follow conceptual ideals than institutions such as parties or associations (Carvalho, min 52:27).

The representation crisis that we are facing in modern societies with the increase of abstention and a large and structural number of people that do not vote or participate in conventional representative platforms, has different behavior to SNS, where people have the perception that to participate and express their opinion is to be part of something in a parallel reality. This is where people are and participate now, and not in the streets, cafes, or markets where they were before.

This represents a change promoted by technology, when communities are generated in the SNS more than in a real daily life.

CA's technology enables communicating a concept, or analyzing how public choice will react towards a political proposal to become more accurate and precise. Furthermore, this is a powerful mechanism, which again, amplifies, and becomes more efficient in the political game.

Those methodologies of data collection and business intelligence are already used by the Portuguese National Association of Pharmacies or in the groceries shopping client cards, where users' habits are collected and analyzed in order to adapt the product to each consumer (Carvalho, min 60:40) and raise profit opportunity. It is a matter of time that political dynamics will turn into data users to influence the public choice in a wide and regular way.

7. The concept of “*digital person*” is central and crucial in the new paradigm that this change promotes.

The time lapse that this technology brings let contemporary societies understand that times are changing, but there are no abilities to acknowledge in absolute what is happening in real time as well as what should be done mitigate those transformations.

One consequence of this socio-technical change is the definition of what is *public* and what is *private* and how citizens deal with these new concept boundaries. There is an exposure of personal life, very often intimately, in a naïve way, that lets the door open to the illegitimate use of this information by exogenous interests, effecting the will of citizens.

Therefore, citizens, politicians and the modern societies are now feeling the consequences of this phenomenon and waking up towards this. However, personal behaviour did not change to a level to force the majority of people to adjust their life towards this societal change.

A new perspective emerges considering classical notions of privacy: *what is the public and the private dimension of people's life?* (Rangel, Min. 34:33, interview 2). *If public figures (such as politicians, actors, football stars) have a smaller sphere of privacy, if citizens expose their own privacy in social media sites, it is the person himself that is alienating their privacy or, at least, mixing the dimension of their own sphere of privacy and public.* (Rangel, Min. 34:38, interview 2).

Law, law philosophy and social understanding of common good rule society. They are the institutional effects that interfere in socio-technical change, which lead to socio-political feedback in policy the subsystem model of Edmondson et al. But the impact of this technology will also be changing the conventional understanding of how courts and justice rule people's lives. So, the institutional change effects itself and changes the direction of those effects. Intimacy and privacy is one of these dimensions of influence in institutional and interpretative effects. The direction of it suggest that policy mix will be influenced by social-technical change promoted by SNS.

However, there is a sense of citizens' unprotection towards the manipulation of personal data, especially when citizens share their personal information that then is mobilized in order to promote directed and aggressive political advertisement (Rangel, min. 36:12, interview 2).

Interpretative effects and their consequence to what will become the socio-political feedback is also under influence:

Considering the Yuval Harari message (author of books like “Homo Deus”), the political campaign for Brexit reveals that, with technology, man’s free will doesn’t exist any longer (Andrade, min. 22:00).

The major risks presented by the CA case is the notion that we are not in charge of our own electoral decision making process, which are exposed to external influences in our own democracies. These kinds of risks had never be seen in the past. (Andrade, min. 32:07).

This notion of socio-technical system, and its vulnerability under exogenous conditions can be perceived under the directions of how the system behaves when experiencing the interference of those exogenous interests. If we want to prevent the integrity of the democratic system as we know it, the protection of the digital person is crucial:

A consequence of a dynamic process in the bi-directional relation between the social-technological change and the Policy mix, is the way SNS developed new algorithms that try to clarify the category of each profile, according the political participation in the SNS. (Carvalho min 45:56).

This technology theory of reaching people is not new:

In spite of these new forms of aggregation and community living on the Internet, the idea of testing messages, political proposals or evaluating how the public reacts towards an idea or product is not completely new. Marketing firms and political parties already used focus groups. (Carvalho, min 59:30).

To prevent democracies from the vulnerability of exogenous interests, the technological innovations can also work in favor, and in a positive way face the integrity of the system. Understanding who is investing or sponsoring a political campaign and clarifying the community about my choice and political preference is possible and desirable. This clarification of the profile’s transparency of “digital person”, which is also and now a “political digital person”, is also a transformation that happens in the social-technological field to respond to the policy mix rules and procedures after the scandal that resulted from CA methods.

8. Fake news is a problem considering its impact and consequent influence, but the notion of rumor (its use and dissemination) has always been a weapon in the battle for power. What changes now is the scale and intensity of this phenomenon;

This reality imposes a social paradox: although the technology involved in this new digital era is highly complex, the antidote towards what it presents is based on ancient wisdom. The way new societies and citizens defend themselves against the threats that the use of technology can promote, is to increase the levels of personal and social consciousness based

on ethics and critical thinking. In this plan, one of the fundamental tasks is to bring *new digital literacy against manipulation* (Rangel, min. 26:00, interview 2), based on moral and ethical principles. These new ways of communication bring a sense of digital anesthesia where word and image play different roles that may confuse citizens at the moment to distinguish what is true or false. There are then interpretative effects under the socio-technical change that influence the policy mix (in a different direction proposed in the Edmondson et al (2018) scheme).

Until recent times, citizens, even the ones with a certain level of education, considered as facts all information collected in newspapers. In current times, our “facts spreader” is commonly the internet, where sometimes the information source lacks a supervisor editor or ethical conduct which, in the past, assured the reliability of some information.

It is the time of “*Post-true*”, where facts do not need to be proven, imposing themselves under the mantle of faith. If the Internet brings new threats, its fundamental people get conscience about that: and one of the biggest is to take as facts and information that is not true.

There is a sense of pedagogical approach to the risks of internet use that needs to be part of social education. The socio-political feedback of this educational improvement will influence the socio-technical change dynamic.

Another challenge is of the institutional effect: states need to protect themselves from new kinds of threats (under exogenous influences), in the same way they have been doing, for example, towards cybercrime. This paradigm brings a classical dilemma of politics, presented by Plato in his book *Republic* “*who guards the guards*”.

So, when we have the guardians of the technological system’s fidelity under the complexity of these digital systems, who can assure that their work is done with the guarantees we demand?

Back to the paradox conception, it seems we are again towards classical dilemmas. *The human dilemma is the classic one and maybe now it is under a new scale dimension* (Rangel, min. 30:00, interview 2).

However, it is also relevant to take into consideration the kind of responses that need to be tackled against threats that innovation brings to policy mix. *It is highly important to assure that the answer to give against fake news, just to give an example, doesn’t flow to new mechanisms of censorship, where public, or even with less legitimacy private authorities, have the role to define what is true or not* (Maduro, min 6:33).

If we consider fake news as information pollution, in the same way policy mix rules the environment, an efficient protection of society demands citizenship awareness. Consequently, fake news cannot be lightened only by regulation: *as in environmental behaving change, there is a need of digital citizenship to become effective in this new paradigm.* (Andrade, min. 26:00). Therefore, there is a need to protect journalism; defining what it is and what is news, and what is just information, without verification of truth and with values commitment. Socio-technical change is then producing interpretative and institutional effects which demand a policy mix change.

In recent years we have been facing very effective downsizing of quality information, at the same time the fake news spread is more and more intense. This can be observed by the following graphic:

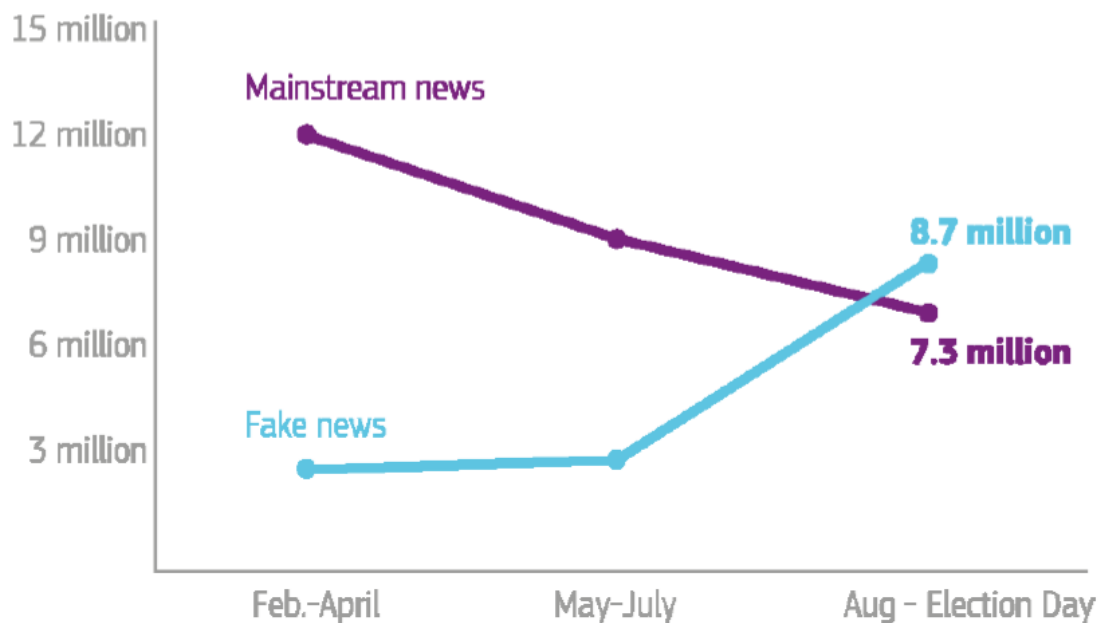


Figure 5 - Total of Facebook engagements for top 20 US elections – Source by BuzzFeed, 2016

After the Second World War, policy mix in Europe was shaped under the values of the Council of Europe, such as democracy, free speech, rule of law, human rights and peace. *The role of the media and journalism is connected with those values, regarding the commitment to truth and reliable information accessible to citizens* (Carvalho, min 38:25).

The SNS brings to the debate the role of journalism and the value of quality information to democracy structure. The spread of fake news on those SNS, generate a crisis of information, which had, as consequence, the need to improve citizens' awareness about democracy and

the individual and collective role of society towards it. The interpretative effects can change the patterns of cognition, understanding and learning (Pierson, 1993), with consequences on the reliability of policy mix production.

This shadow over the truth, also has a financial perspective: *the economic value of journalism and the need of a payment for that important task in our society is something that arises again, after society acknowledge the risks of the data and information being distorted under unclear or obscure interests.* (Carvalho, min 38:43).

9. Technology may help citizens to get closer to politics and democracy and they certainly do: but there are risks that need to be tackled, considering the use of these technologies within this propose.

Technological innovation has positive and negative feedback under the relation between socio-technical change and policy mix.

One of the potential positive evolutions that technology offers to the political system is the electronic vote, with evident improvements on people's mobility in the voting process, but with high risks of security (Rangel, min 0:58, interview 2).

In other hand, those options also change the how political systems are built: they have been organized under a geographical approach. *The vote is a citizen's expression of the people under a certain regional constituency. Technology brings a completely new paradigm, ending the geographic understanding of the politics paradigm. In this order of ideas, we can start to consider that there is a "deterritorialization" since a large number of decisions that affect people's lives are not connected to a regional geography but in a "nowhere" place, which happens in the spaces provided by technology.* (Rangel, Min 1:19, interview 2). In this sense, we can witness a kind of "*desyntonia*" between the vote place and the space where the decisions take place. There is a place where decisions happen that are dematerialized.

This leads to a representation problem: decisions take place in a sphere where there is no representation, which can explain somehow part of the democracy crisis.

In other hand, technology brings new ways for parties to reinvent themselves, to spread their message and get closer to the people.

However, there is a big issue: SNS bring the illusion of direct democracy and this is a huge threat to democracy itself: direct democracy, since ancient times, is patently the biggest perversion of democracy, transforming it into dictatorships.

SNS always promotes the opportunities of direct representation, without any mechanism of check and balance; they are threatening representation models of political participation, which are the base of modern liberal democracies. (Rangel, min 6:41, interview 2).

The use of those technologies, such as Facebook, can underline the gap in technology literacy, which, once again, threatens democracy. *This could be one of the lessons from Cambridge Analytica: how does a group of citizens understand if they are, or not, under manipulation of their conscience by their own means?* (Rangel, Min 7:05, interview 2).

The socio-technical change, in a general dimension, can also be the answer towards these negative socio-technical feedback on policy subsystem.

One of the answers could be the technology Blockchain: it can help the elected and electors to get closer, or even approximate the political decision making process to citizens. *If we consider that this technology is reliable, and it can assure levels of trust in the system that until now we could not assure, this can lead to safe electronic vote systems, which make voting safer and easier for citizens, decreasing the level of abstentions in elections.* (Carvalho, min 14:37).

Regarding this, socio-technical systems are under a mutation, as a consequence of technological innovations, and the answer towards the system unbalances are provided by new technical innovations.

10. Innovation values: a new paradox policy mix in Europe

Faced with this innovative technological phenomenon, Europe aspires “*to continue to be*” as a field where European values are still prevented, assuming more restricted regulation, funding and monitoring public and private institutions in order to prevent harmful impacts from these technological advances.

Innovation also promotes a game changer in political approach or, even deeper, in a political ideology, of how policy mix deals with the socio-technical change and this new technological paradigm. Until recent times, innovation policy was about not interfering with innovative processes, giving the maximum of freedom to innovation, especially by the private sectors of society.

Acknowledging the results that seem to be a consequence of CA’s case regarding the socio-political feedback, interpretative and institutional effects under study, there is a sense of a need to interfere in this face of political technological innovation. *Today, these political technology*

innovations conquest achievements at such a level of success that need to be ruled. The classical example is the SNS, whose impact on democracy is so high that it needs to be prevented (Andrade, min. 5:42).

Another paradox is that the regulation of technology and innovation in Europe (especially about the use of technological businesses that use private data) can't still be the same. *This will drive the market to open new fronts of business to surround the legislation and political regulation* (Andrade, min. 6:30). *Regulation of this field itself, can be an innovation that will change the social-technical status* (Andrade, min. 8:09). One potential interpretation of the declarations of those interviewed is that policy mix change will be different considering the interpretative and institutional effects that are a consequence of socio-technical change, and it will reshape the socio-political feedback with consequences on the framework of how socio-technical change happens, considering future technical innovations.

The fact that technology development is promoted by multinational companies working in different parts of globe with different political contexts brings some different misconceptions of what the role of technology is. *Nowadays, technology is more than a simple technical solution of daily life problems: it brings values with them and can change the policy mix in different regions of globe.* (Andrade, min. 9:33).

In China, innovation does not conceive democracy or liberalism; in U.S. innovation doesn't comprehend the welfare state. Regarding a regional dimension at European level, regulation or policy mix, will also change the social-technological change in order that it will force big companies to deal with European values or promote the creation of new firms that respect them (Andrade, min. 10:11).

The fact that there is no longer a physical territory attached to the socio-technical systems increases the influence of the exogenous conditions and it interferes in feedback and effects under the closed model presented by Edmondson et al (2018).

11. Deterritorialization

The conception of state has always been deeply connected with the territory. Nations fight for more land in order to provide more supplies for their citizens or achieve more or better goods for their needs. Since then, the state's political organization depended on territory and the authority to administrate their power according to a region, with physical borders: a state's political organization was dependent on this conceptualization of society's organization.

However, the Internet changed this entire conception.

The socio technical systems related with the Internet and SNS have different understandings despite each territorial policy subsystem we are considering. By this, we considered the states conception. However, because the Internet is not under a single jurisdiction or territory, under specific and hermetic socio-technical systems, they play an active role in exogenous conditions of a global connection of different socio technical change.

Even if the relation of politics and the digital world changes from country to country (Carvalho, min 2:00), there is no country in modern society that had an internet referendum (Carvalho, min 5:00), in spite of the change this technology brings to the power management.

A lack of effects and feedback unbalanced the relation between policy mix and socio-technical change in the political field.

Therefore, the development of technology under the Internet, such as the Blockchain and the use of SNS, allow to “Deterritorialize” concepts that until now were under the state authority, such as property rights.

With this kind of technology, such as Blockchain, it is now possible to register the property of one good in several different places in the world, with a global jurisdiction and not only under the authority of one state (Carvalho, min 2:30). On the other hand, the concept of privacy today is less viable to be protected by national law, once personal data falls into the world wide web (Carvalho, min 2:59). The authority to rule society is no longer a matter of one single state or one regional ideological alliance but is dependent on a global scale. If not, the exogenous conditions, which interfere in the socio-technical systems, will become more and more relevant and powerful.

This loss of authority from the state due to globalization is not just a matter of the relation between the citizen and the state - and the political mechanism between them – it is a new concept of social-technological change, which, as we can perceive, can truly influence the policy mix.

One good example of those consequences nowadays, are the threats that states suffer from external cyber-attacks. According EPCS (Viegas, 2018), democracy in the western world has been suffering several attacks inside their borders, but from an organization that does not have a fiscal or institutional shape and which does not have frontiers: the Internet and social media sites.

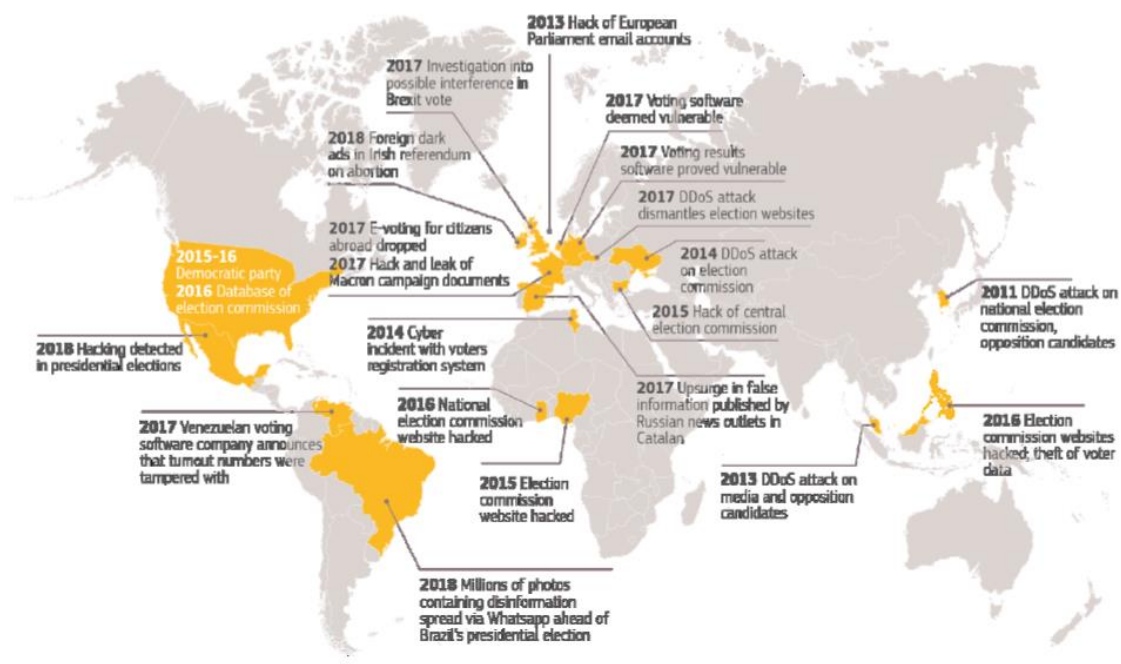


Figure 6 – Selection of recent electoral cyber incidents around the world (EPSC, 2018)

This reality changes the game of how democracy happens in each country, considering the “inception” of national electors, based on external influences (exogenous conditions).

The debate and the power battle does not depend any longer on a region, but is now occurring in a digital space, parallel to the formal physical platforms where policy mix used to take place.

There is a difficulty of the democratic parliaments to rule or discipline the citizens' interactions that happen in cyber space. (Carvalho, min 25:14).

The use of digital platforms understands some trade of concepts: *in order to have an easy life, people make random use of thousands of apps, where personal data is stored somewhere and there are entities that will use this information, with or without our consent, for proposes that we are not always aware about.* (Carvalho min: 1:06:63).

Another lesson that we can perceive is related to the notion of “deterritorialization” and “desyntonia”. *It was funny to observe the national or European Parliament trying to claim for an hearing of those responsible from Facebook and CA, although this phenomenon is not under any national jurisdiction or authority, being a consequence of globalization.* (Carvalho, min 67:31). Because of this “desyntonia”, at the time that the institutions could act: *The consequences of the influence of the innovation promoted by CA had already happened, such as the election of Trump, Bolsonaro or even the result of Brexit.* (Carvalho, min 68:34).

12. The lessons of Cambridge Analytica are directly related towards a global need to develop a more inclusive and wide relation of citizens with digitalization, regarding more digital literacy.

The way that policy mix deals with the phenomenon of innovation and socio-technical change demands a society that understands the need of politicians and political actors well prepared to deal with the complex system promoted by this change. For that, society itself, needs to develop a new level of conscience, which requires an educated and prepared political class. *It will take time to achieve this level in Portugal: a relatively recent democracy, inside a nation with huge literacy problems* (Andrade, min. 3:48).

This literacy needs to be based on common and conventional notions used in daily life, but now applied to the digital person of each other. This conceptualization demands a level of conscientious awareness about several values, such as safety and security, identity, critical conscientious, privacy, intimacy and ethical behavior.

The Cambridge Analytica case can also be seen as a call to action of policy mix to wake up to the socio-technical change that has been promoted by industry. (Andrade, min. 12:46). On other hand, the consequence of this case is that part of industry's claim for self-regulation, *which represents an absolutely socio-technical change at private economy* (Andrade, min 13:00).

For a long time, we have been looking at technology innovation as something good. CA is the first case that opened our eyes to the fact that it can be harmful. This is also something new in our common understanding (Andrade, min 14:00).

The consideration of the socio-technical system regarding the influence of technological innovations such as the one delivered by CA is the cynical perception, or beliefs, that in the end the final decision is always the people's, even if there are influences during the decision making process. This is why it is so relevant to invest in people's digital literacy.

People are the lords of their own lives. The message needs to be about the empowerment of the freedom of choice of people and for the consequence of the personal data sharing acts (Rangel, min 38:17, interview 2).

Nowadays, people can't prescind of a smart phone, a bankcard or a fiscal number where taxes are collected in digital systems.

In capitalist societies, Marx claimed that personal dignity depends on a certain level of economic freedom, where people are no longer under permanent subjection. In present societies of knowledge, people's dignity depends on a certain level of education and knowledge - digital literacy is for sure one of them. There is a need

of selfness. Towards new technologies, whom have a critical capacity are users, whom don't are used. (Rangel, Min 41:43 interview 2).

Regarding this, if we consider a minimal income guaranteed in order to provide people with a certain level of dignity; *we need to understand that modern societies depend on providing citizens a minimal critical conscience guaranteed. In next future, this will allow to provide people a decent level of dignity when the digital society is a reality in people's life's* (Rangel, min 43:42, interview 2).

5. Discussion of results and conclusions

The Cambridge Analytica scandal exposes a service, which fits into the concept of innovation, or more specifically technical innovation.

This innovation promotes socio-technical changes and it influenced relations in socio-technical systems. The use of innovative technology is changing the traditional framework of these systems and threatening the policy subsystem dynamics of liberal democracies.

The technological innovation that has been used in this system is affecting the socio-political feedback, interpretative and institutional effects of the relationship between policy mix change and socio-technical change.

CA could mobilize a collection of understandings and knowledge which relates towards socio-political feedback, interpretative effects and institutional effects.

One central protagonist to this change is the concept of the digital person, which every web user has and can influence these technologies but is also highly vulnerable to exogenous conditions.

Those exogenous conditions represent interests, which can threaten the democratic systems. What the literature seems to suggest is that the relation that occurs inside a socio-technical system is mono directional when we consider the dimensions of the socio-political feedback, the interpretive effects and the institutional effects, as Edmondson et al (2018) represent. However, the present work intends to propose a theory where the feedback mechanism, such as the interpretative and institutional effects, are bi-directional and not depending on a single direction, influencing either the policy subsystem or the socio-technical change.

The red arrows, which I add in the Edmondson et al. (2018) diagram, intend to explain this hypothesis:

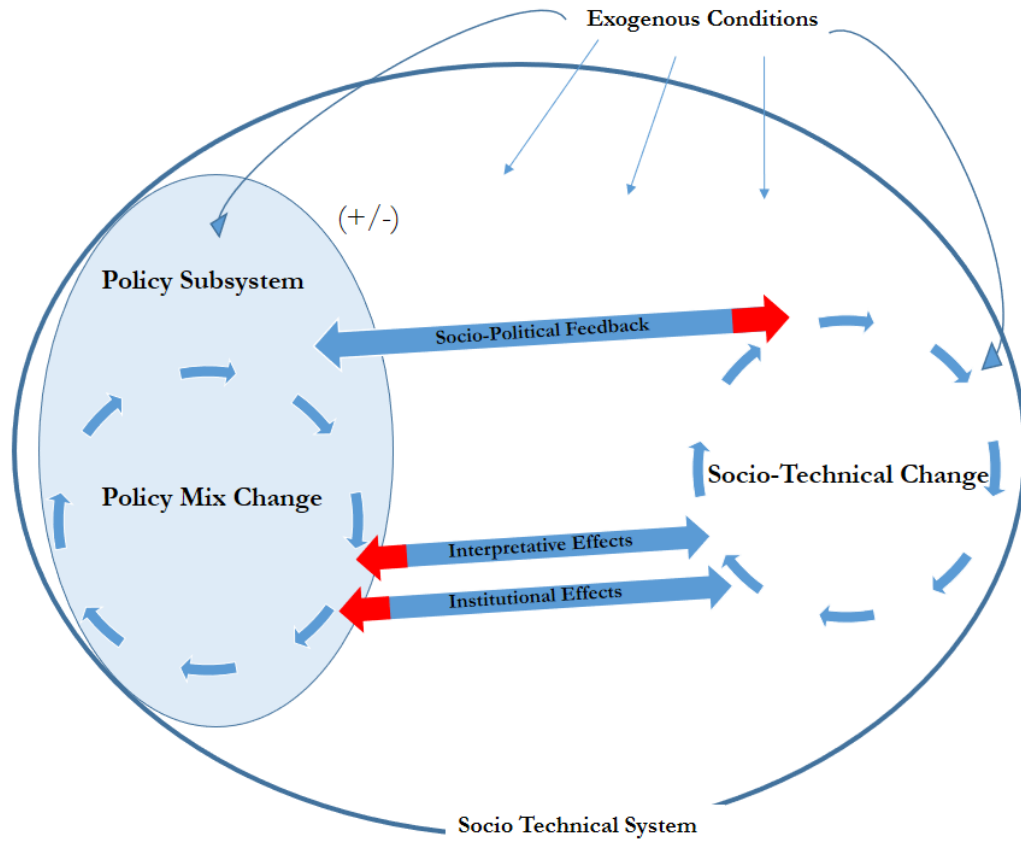


Figure 7 - Dynamic interactions of the policy mix and the rest of the socio-technical change, regarding a bi-directional influence – based on Edmondson et al (2018) framework

The present work intends to understand how innovation influences the relationship between the socio-technical change and policy mix: acknowledging lessons from the Cambridge Analytica case.

Considering the facts in studied literature about this relationship, and the timeframe to conduct the research, the present work adopted a qualitative methodology using open questions. These questions have been presented to key role personalities which allows us to open new questions related with this phenomenon. However, the sampling is small, very much focused on the European or Portuguese perception and lacks the contribution of the private sector.

Regarding the Edmondson et al (2018) scheme that represents the interactions of policy mix and the rest of the socio-technical systems, the present contribution argues that its relation can be applied towards the Cambridge Analytica Case.

Cambridge Analytica provided a service, which is the result of sophisticated and innovative methods, which establishes a relationship between political science, public choice,

mathematic algorithms, data analyses, psychology, and public marketing. This circumstance provoked a socio-technical change.

This innovation has a set of revenues that can be economic, political or power achievement, that seem to be very profitable. The company's methods benefit from the diffusion of technology interfering in the socio-technical systems, provoking a game changer in how those interactions occurs.

This service had allegedly interfered in electoral processes, undermining the policy mix change that resulted in the citizens will, expressed, in normal conditions under a democratic electoral process.

That interference unbalanced the socio-technical system presented by Edmondson et al (2018).

For this interference, the concept of the digital person is crucial. People have a digital profile with a personification that can be influenced by exogenous agents.

That *digital person* (Solove, 2004) is a means and essential part of socio-political feedback, and has an active role in the interpretative effects and institutional effects.

According the interviews, the exogenous conditions are favored in their intentions under a *detrterritorialization*, which affects the way feedback occur.

The present work conducts a set of interviews to understand how key personalities in the socio-technical system understand how this technical innovation fits or changes the socio-technical systems.

Considering the three relations under study between socio-technical change and policy subsystem, it seems that the interpretative and institutional effects, not only affect the socio-technical change as a consequence of the policy mix change, but also the opposite happens. In another way, the policy mix also seemed to produced socio-political feedback which are influencing the socio-technical change.

As mentioned before, socio-political feedback can involve three dimensions: cognitive, constituency and agenda feedback.

After the CA scandal, news about this firm and their methodology brought the corporation under the public attention and with it a negative perception of this methodology (Cadwalladr, 2017). Furthermore, the campaign against CA, using innovative technologies, such as the

Netflix documentary “*The Great Hack*” (Karim Amer, 2019) and TED Talks⁶ (Cadwalladr, 2019) have created a conscious awareness to the mass public which imposes a negative reputation on CA and determines the end of the corporation and with her their methods (Solon & Laughland, 2019).

According literature, this public awareness leads to interpretative effects, providing information and changing patterns of cognition, understanding and meaning (Pierson, 1993). This represents a turnover of the CA methods against itself, considering a cognitive feedback, when the public perception of the influence of technical innovation in the policy subsystem reproduce a responsive feedback. This cognitive feedback imposes losses in the *status quo* of the firm reproducing another social-technical change: the end of a technology firm and its methods. This negative feedback is a consequence of exogenous interferences in the mass that composes the flux of the social-political feedback from policy subsystem to socio-technical change. Again, those interferences are not dependent on physical borders.

Another important consideration about this bi-directional relation is related towards the interpretative effects. The common sense generated about the potential risks of the use of innovative technologies in political campaigns reproduces changes in how political stakeholders deal with this phenomenon, creating major attention on policy subsystems, not only by voters, but also by the regulators,. The interpretation made about political advertisement and political stakeholder behavior now has a new scope: the SNS behaviour and their practices. (CNE, 2019).

Concerning the constituency feedback, once again, it seems to reproduce consequences in both sides of the relationship. Socio-political feedback seemed to have consequences on socio-technical change, generating a set of laws and regulation under the policy subsystem, which are part of the policy mix, but their consequence influenced the development of political advertisement business on the Internet, and especially in the SNS. This represents a mobilization of opponents of socio-technical change (Oberlander & Weaver, 2015) in what concerns the use of technical innovations within political campaign propose.

According to Edmondson et al (2018) framework, institutional effects had a flux of interference that starts in the policy subsystem and influences the socio-technical change.

⁶ TED Talks are influential videos from expert speakers on education, business, science, tech and creativity, with subtitles in 100+ languages

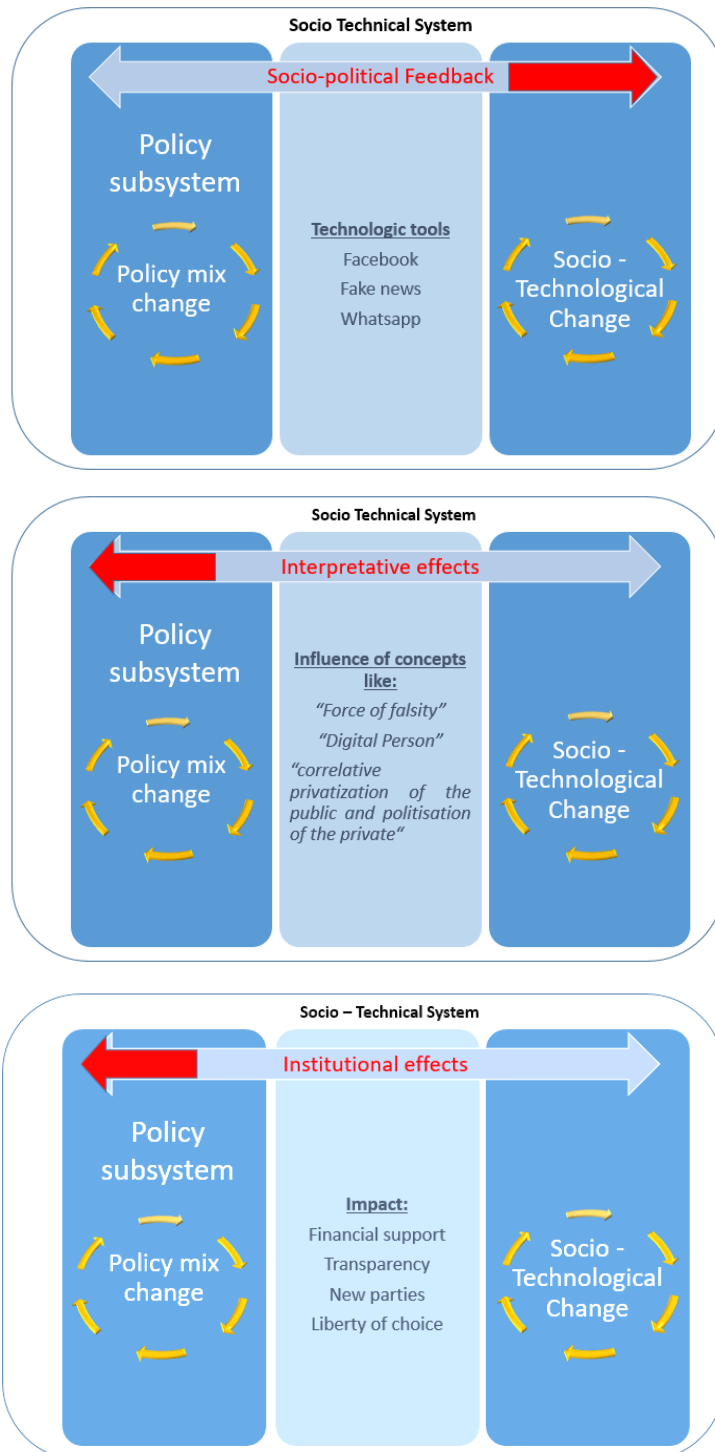
However, the rules, and legislation produced about this topic, seem to also affect the policy mix itself.

The understanding that the Portuguese Nacional Electoral Commission made about the Portuguese electoral law is proof of it (CNE, 2019), not allowing any paid political campaign advertisement in the SNS. Regarding this, the policy mix is affected by these institutional effects, but there are some effects in the socio-technical change and business in what concern the development of change and innovative methods to political campaigns on the Internet (CNE, 2017).

The agenda feedback under this tension will also generate the objection of political candidates who know that technical innovations can help them to deliver their political message in a more effective way than traditional ones, but under the objections of law that socio-technical change is not allowed to help them. Therefore, it is reasonable to consider that, in the near future, the private sector and the political stakeholders will stand for changes in the regulation, which will open the system to new socio-technical changes.

It allows us to present a potential conclusion regarding the scheme of Edmondson et al (2018), where the directions and the flux of the relation of socio-technical change and policy mix occurred in a bi-directional way.

The diagrams below try resume this relationship:



The use of new technologies, such as SNS, combined with other sources of knowledge, influence the policy subsystem, **but also** influence the socio-technical change (red arrow).

The use of those technologies contribute the materialization of societal conceptions that are changing in society, which seems to drive interpretative effects in both directions too.

The impact of these innovations in Socio-Technical Systems generates institutional effects, which affect not only on the socio-technical change, **but also** on the policy subsystem.

Figure 8 - Dynamic interactions of the policy mix and the rest of the socio-technical change, regarding a bi-directional influence

In what concerned the case in analysis, considering the CA innovation, the Resource effects, Administrative feedback and Fiscal feedback, proposed by Edmondson et al (2018) in their framework, seemed not to have enough relevance to prove the bi-directionality under the Socio Technical system.

The present research also identifies the kind of feedback and effects which occur under this innovative technology. Until the Edmondson et al. (2018) research, and the previous literature with which they supported their work, there was a focus on policy mix paradigm, in the case of Edmondson et al. (2018), the zero carbon home policy mix in the UK, the present research in more focus on the socio-technical change, regarding the CA innovative methods.

During the present research, one consideration became relevant in the debate: the socio-technical system, dependent on the political subsystem, used to be dependent on a territory (in Edmondson et al. (2018) research the socio-technical system was under the UK territory). The present work detached this conceptual relation from a physical territory, as a consequence of the use of technology. That territory had always been an aim for exogenous interests which resulted in the past in wars and power achievement. However, nowadays, regarding the case under study, technology underlines the fact that territory and physical conceptions are no longer attached to socio technical systems.

Regarding this, there are different interests that are mobilized by exogenous conditions in a different way than in the past.

To minimize the influence of the exogenous conditions on the socio-technical system, the awareness of the mass public towards the potential harmful influence of using technology is crucial. The new paradigm demands digital literacy as an important capacity of people and the public in the new era, and there is a long way to go to achieve a comfort level in order to decrease the influence of those exogenous conditions, rebalancing the relation within this co-evolutionary system.

This digital literacy will allow our common *digital person* (Solove, 2004) to be more aware of the influence of exogenous conditions, protecting social conscience regarding external agendas, giving more freedom for people's thoughts and rescuing their free will.

This will have a consequence on the relation of societies with truth and the truth spread in the Internet, under the "*force of falsity*" (Eco, 1998) promoted by fake news.

This digital literacy is relevant for the public, which are part of the feedback and effects fluxes, but is also crucial regarding the role of the policy mix key figures and stakeholders.

Technical innovations are then in the center of this new social and political paradigm, provoking changes in the digital system, by creating innovations, but also in the classic framework of policy subsystem, designed in a time where the Internet and SNS does not exist.

This perception relates classical dilemmas with new ones, which can be perceived under the interpretation of the interviews and their graphic representation.

After the interviews, and the evaluation of contributions, the present work resumes graphically in Figure 9 how innovation can be related with politics and the shade of this relation, acknowledging the influence of CA in the Socio-technical change.

In the following scheme, the research compares the interpretation of the interviewed contributions towards some major aspects of socio-technical system, considering the CA case, regarding the relative position between the ideal relation and the average perception of them towards the reality.

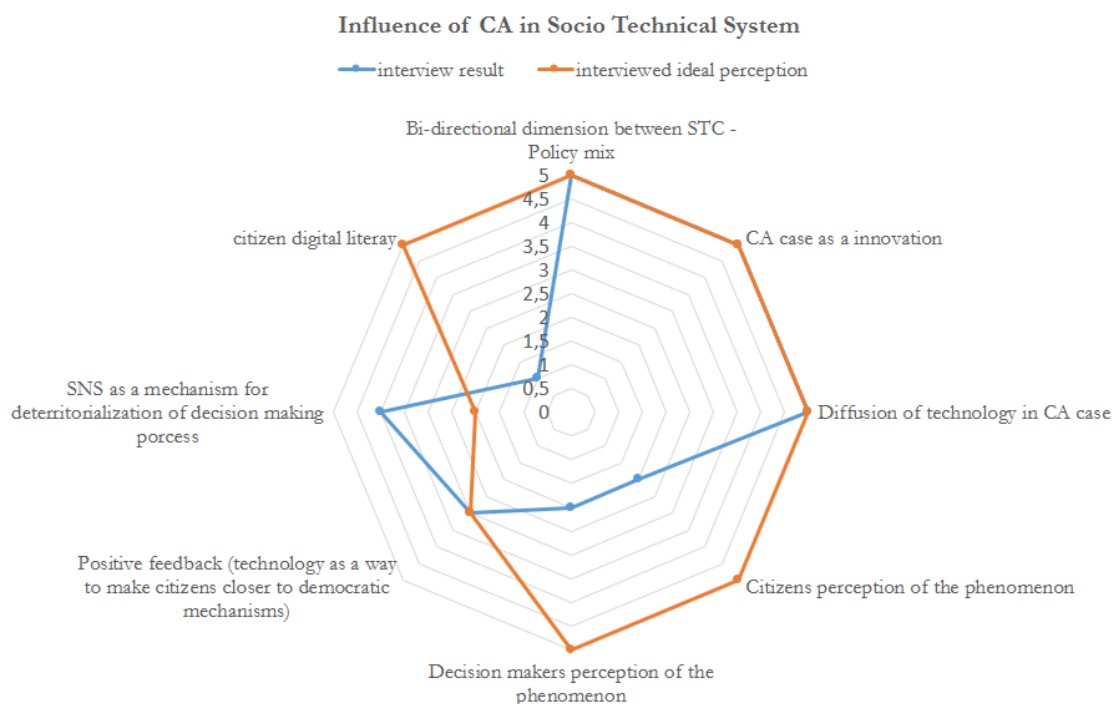


Figure 9 - Influence of CA in Socio-technical system - empirical representation

It would be very interesting for future work to analyse if this graphic has any correspondence to a data work, where the result of surveys could prove this scale one way or the other and the shadow of this relation.

6. Direction for future research

It is predictable that in the future, further research will analyze the dynamic interactions proposed by Edmondson et al (2018). The co-evolution of policy mixes and socio-technical systems, considering the impact of technical innovations, such as CA services provide, will need more focus. The present research suggests several perspectives which recommend further analysis:

- It would be interesting to apply a survey to citizens and political stakeholders that use SNS in order to evaluate their perception about the phenomenon under study and face those results with the interpretation of the interviewed conducted.
- The first level of analysis could consist of regarding the conceptual dynamic between policy mix (defined by policy subsystem) and socio-technical systems, how deep and with which intensity we can measure how innovation affects in a bidirectional way the policy mix and the socio-technical change?
- Does this bi-directional relation promote innovations by themselves?
- Is there any ideology promoted by innovation? How will it happen/develop?

Can it try to evaluate the role of socio-technical change, considering the effects that affect it:

- How does industry react to new regulation? In addition, how does industry and their technology change policy mix dynamics? Can we identify a pattern of influence?
- Another field of study is how people and societies will react towards this system dynamics: People seem to be available to exchange their privacy in order to get commercial advantages - such as discounts or information according to their interests - how can this openness affect the balance between private and public interests? According to the present work, we need to invest in social digital literacy. How can this be developed?
- What will be the consequence of that literacy in the socio-technical system? Will it work in favor of a dynamic mutation or will it decrease the democratic changes that technology is producing?

Appendix 1: Interview Script

Innovation, Technology and Socio-technical systems

1. Innovation is often associated with technological progress and economic development. However, it also seems to affect social relationships. Do you recognize an influential relation between innovation systems and socio-technical ones?
2. Recognizing a relation between innovation and socio-technical systems, how does politics and, in particular democracy, relate to innovation?
3. Should this relationship be faced as a threat or as an opportunity for political systems?
 - 3.1 How is it an opportunity?
 - 3.2 How is it a threat?
4. What type of innovation do you identify as influencing political systems?
5. What about technological innovation?
6. How are political systems dealing with the changes brought by innovation in their institutions?

Democracy, Rule of Law and Innovation

7. Regarding democracy, what is the relationship between innovation - in particular technological innovation - such as artificial intelligence, data analysis and social networks, with the following entities:
 - a) Institutions (Rule of Law, Parliament and Government...);
 - b) Political Parties;
 - c) Candidates and the elected;

Citizens

8. How has the scandal associated with the Cambridge Analytic Company influenced the relationship between the political system and the influence of technology companies at the service of political processes?
9. How does the institution you represent, observe and relate to the alleged interference in electoral processes using technology-based tools, at the level of:
 - a) Legislation making?
 - b) Creation of new political process monitoring entities?
 - c) Increasing the skills of existing technology entities?
 - d) Party and electoral financing?
10. What kind of providence can be taken to regulate the interference of external entities in electoral processes using technological tools?
11. How do you evaluate the risk of interference and manipulation of elections in European Union countries, particularly in Portugal, by external entities using technological innovation tools?
12. Do you think that public decision-makers are sufficiently aware to take action against this reality?

Citizens

13. What guarantees do citizens have about the protection of their freedom and rights, regarding the use of technological innovation mechanisms in democratic processes and procedures?
14. Can we guarantee that citizens' decisions will remain theirs and technological threats to democratic systems will not succeed? Alternatively, is this a kind of guarantee that cannot continue to be assured?
15. Can technological innovation bring citizens closer to politics? How?

16. What is the role of Facebook (or other social networks) in this domain?
17. Regarding Fake News: What mechanisms can be found to regulate “rumours” and combat a “post-truth” reality?
18. Cambridge Analytica has developed algorithms that enhance “psychographics” tools, namely population stratification by profiles and interests, communicating to these social groups using public profiles on Facebook. Is there a way to guarantee that other companies will not do the same tomorrow?

Future

There is strong evidence of external interference in the electoral process in the 2016 American elections. Similarly, the influence of technology on opinion making of British citizens was very relevant to the decision in the UK referendum on the European Union permanence, the Brexit. Already this year, the use of the WhatsApp mobile app in the elections for Presidency of Brazil raised questions about the regulation and limits of using technological tools in electoral processes.

19. With European elections in May 2019 and Legislative elections in October 2019, what measures are being taken to safeguard the integrity of these electoral processes?

Alternative

20. With European elections in May 2019 and Legislative elections in October 2019, what measures should be taken to safeguard the integrity of these electoral processes?
21. What lessons can we draw from the Cambridge Analytica case?
22. As a final question of this interview, how do you see the future of political systems about their relationship with technological innovation: as an opportunity or a threat?

23. How do you position yourself - in the institution role you represent - in the relational framework where innovation influences the relationship between social-technological change and policy mix?

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