ICA

COMBATING MISINFORMATION

An ecosystem in co-creation

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OECD
BETTER POLICIES FOR BETTER LIVES

Acknowledgements

Table of Contents

List of Abbreviations and Acronyms

AFC - Automated Fact Checking

CIO - Chief Information Officer

DGI - Directorate General of Human Rights and Rule of Law, Council of Europe

EU - European Union

ICA - The International Council for Information Technology in Government Administration

IT - Information Technology

MCICM - Multi-Campaign Independence Cascade Model

OECD - Organization for Economic Co-operation and Development

POS - Part of Speech

URL - Universal Resource Locator

WEF - World Economic Forum

List of Figures

Executive Summary

The **International Council for Information Technology in Government Administration (ICA),** the **Organization for Economic Co-operation and Development (OECD), eGovlab at Stockholm University** and the **Open University, UK** have worked together to address the impact that the revolutionized availability of information on the Internet, has on public discourse. Pillar 1 of the OECD's Recommendation on Digital Government Strategies has been used as an overall framework for this paper. More specifically, the recommendation on the need for national governments to create an inclusive, transparent and accountable digital sphere has been used as the initial guideline. From then on and in view of recent developments regarding digital disruption through misinformation, the main challenges and potential solutions for governments and citizens are examined. Today's large flows of information create these new challenges for government administrations. Valuable information about those challenges and potential solutions was also attained through three events held during the past few months. First, In September of 2017, ICA held their annual conference in Tokyo, Japan themed "**Bold Digital Government- Leading through disruption**." During this conference, experts in the public sector took a closer look at how governments can stay in sync and even a step ahead in this technological race which can progress into a course of development and advancement but also one of disruption and vulnerability. Following the ICA conference, in October 10th-13th, 2017, academia, private sector, civil society and public-sector representatives addressed the misinformation challenge during a conference themed "**Managing the public digital sector transformation**" in Thessaloniki, Greece. On March 5th, 2018, Stockholm University and the European Commission's Joint Research Centre organized a workshop with citizen participation on "**The Future of Government 2030**" in Stockholm. During this last conference citizens offered their own perspective on how misinformation is affecting their trust towards institutions. Through the aforementioned workshops and extensive research, this report is designed to provide some guidelines on how public administrations can adopt some practical measures to combat misinformation that can affect public policy.

Given the real-time nature of social media outlets it is not surprising that government agencies as well as non-governmental organisations use these means to ensure immediate awareness in cases of breaking events, such as natural disasters or terrorist attacks. However, along with valid information misinformation has been found to be transmitted in social media even during crisis and emergency situations. Misinformation is a common problem in all media, but is exacerbated in digital social media due to the speed and ease with which it can be spread. Furthermore, at this speed, providing countervailing corrective information in a timely manner is even more challenging. The social web enables people to spread information rapidly without confirmation of truth.

Meanwhile, social media platforms have expressed their commitment to develop tools for better detection and reporting of fake news as well as clickbait posts, to thwart their spread on their platform. Yet, even if these plans do materialise, they are deemed to offer partial solutions to an increasingly complex socio-technical problem. If the social media platforms themselves become the new arbiters of truth then additional ethical dilemmas and technological challenges are raised. Recent revelations related to the political consultancy Cambridge Analytica and how it used Facebook data during the Brexit referendum and the US elections, cast even more doubt on whether social media platforms are reliable to take up that role.

The last decade has seen the emergence of over 100 independent fact-checking groups and organisations around the world aiming to provide an impartial validation of misinformation to the public via fact checking. Their efforts are nevertheless hindered by the high volume of misinformation generated online and lack of tools and strategies for infiltrating social media echo-chambers in order to reach citizens that are mostly in need of corrective information.

Furthermore, the extensive focus on technology-based methods has neglected the importance of education in fighting misinformation.

This is an issue which has implications for public order and democracy and therefore it is established that governments have the ultimate responsibility and ability to deal with the causes and consequences of misinformation. This paper argues that they also have the ability to fill the key area between non-profit organisations (such as fact-checkers) and the private sector (social media platforms) and involve citizens to a greater level. So, what actions should governments take to fill that crucial space?

1. Governments need to take the role of facilitators in the collaboration between private sector, non-profit sector, journalists and citizens. As an established authority governments can carefully oversee the process of tackling effectively misinformation while including all relevant actors.

2. Governments have many regulatory options at their disposal in their attempt to tackle misinformation. As legitimate questions of who is the ultimate authority distinguishing true from false arise, governments should attempt to retain their neutral stance as much as possible. Governments need to find the right balance of intervention.

3. Technology has amplified the spread of misinformation but has also allowed for innovative solutions in order to counter it. Research on misinformation detection and content validation opens up great opportunities in this respect and governments should support it. The reliance on computational solutions alone is not enough though.

4. Create awareness by educating citizens, as this presents the opportunity for the long term effect to battling misinformation. Computational methods to combat misinformation need to be balanced with research on improving citizens' media and information literacy through education.

5. Co-creation is the most adequate method for achieving the right equilibrium between actors and types of solutions against misinformation. By promoting this method governments have the possibility to promote the interaction between researchers, journalists, private sector, non-profit sector and citizens with minimal intervention.

1. Misinformation in the Public sector

People's reliance on misinformation is defined as "any false or inaccurate information that is spread either intentionally or unintentionally "(Antoniadis et al., 2015: 475). Ignorance, refers to "the absence of relevant knowledge" (Lewandowsky et al., 2012). Even though both misinformation and ignorance have detrimental effects on decision making, the negative implications of decisions that arise from reliance on misinformation is found to be more severe than those arising from ignorance. The consequences for decision making are considered greater than mere ignorance because misinformation instils a confidently held false belief (Kuklinski et al. 2000). On the contrary, studies have shown that people tend to have lower level of confidence in the decisions they make when they lack information (De Neys et al. 2011; Glöckner & Bröder, 2011). This justifies the attention given to studies on misinformation and how it affects decision making at personal- as well as societal levels.

Long before the prominence of the concept of misinformation, the value of factual information and how it affects the public has been a topic of discussion. Particularly, since the publication of Converse's book 'The Nature of Belief Systems in Mass Publics' in 1964 to date, researchers as well as social commentators have joined forces in asserting the value of factual information for the well-functioning of the public sector as well as preserving democracy. Even some authors (Carpini et al., 1996) have gone as far as equating the significance of 'right information' to democratic process with 'what money is to economists'. This study aims to highlight the issue of misinformation in the public-sector context. The challenges of misinformation in the public domain as well as solutions that are currently available are presented. The recommendations of IT leaders and citizens expressed during three different workshops for CIOs in the public sectors are also included.
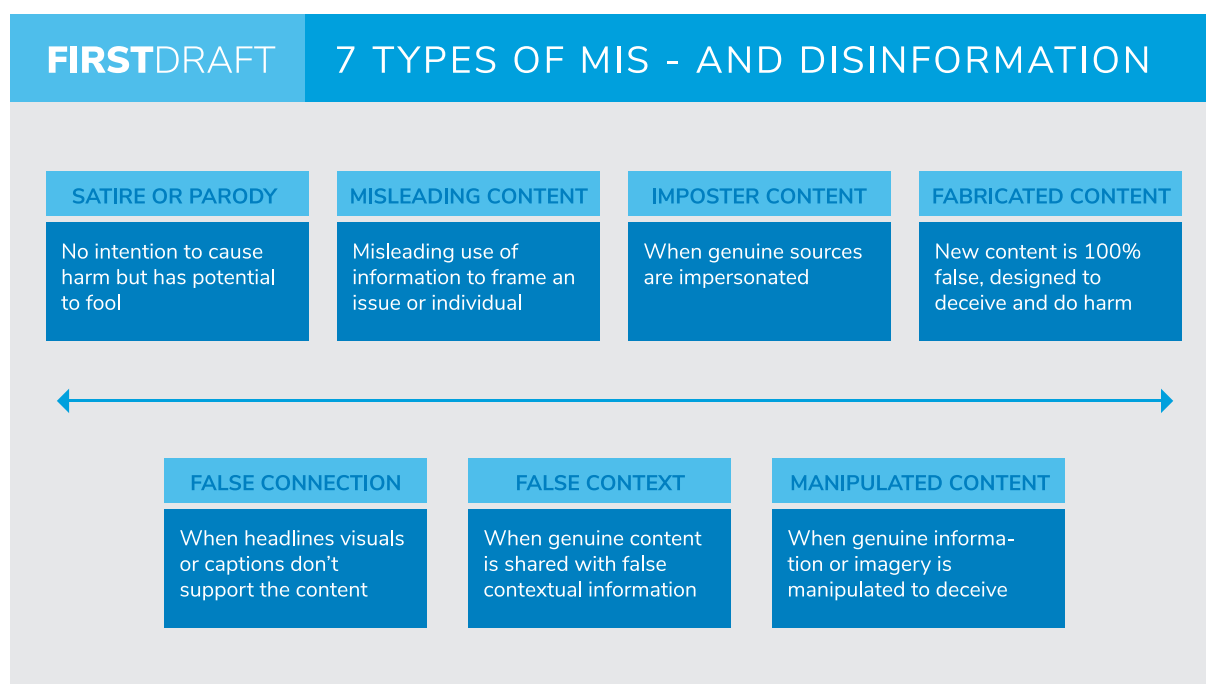
Figure 1. First Draft News, 7 types of Mis- and Dis-information, retrieved from https://firstdraftnews.org/fake-news-complicated

2. Costs of Misinformation in the Public Discourse

The public sphere, as Habermas (1962) defines it, is a common space for all members of a society. This space plays a vital role as it is where social issues are discussed freely, and opinions are formed. The healthy public sphere needs to be accommodating for rational arguments to occur. In addition to this, scholars have argued that participants of the public discourse need to be provided with factual information to make informed judgement and contribute to the rationality of arguments (Carpini et al., 1996). Election campaigns in the past decades have been the target of misinformation. Papadopoulos et al. (2016) have reported on many "astroturf campaigns"—the malicious use of social media during election campaigns to provide fake support. These messages are delivered in a way which depicts the involvement of genuine grassroots participants. Examples of misinformation and disinformation (deliberate state-driven false information) spread during electoral campaigns have multiplied in recent years with the most prominent examples being the 2016 US election and the 2016 UK referendum on EU membership.

As we entered the age of social media, public institutions such as government agencies, decided to massively adopt their use. Following the 2008 financial crisis and also due to other factors, a decline in public trust towards institutions was observed and social media was seen as a tool allowing for direct interaction between governments and people, thus allowing for an increase in transparency and decrease in complexity (Mickoleit, 2014).
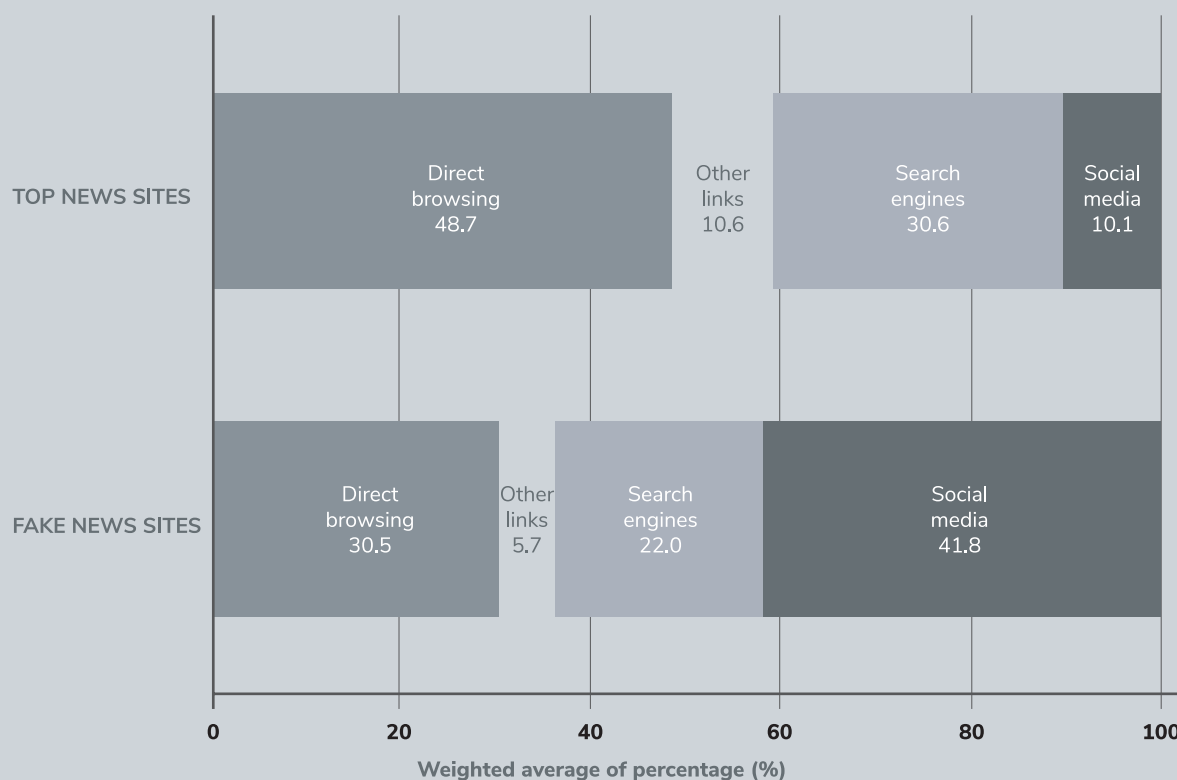
Figure 2. Share of traffic from different sources for the top 690 US news websites and for 65 fake news websites. Sites are weighted by number of monthly visits (Allcott and Gentzkow, 2017).

Since 2016 however, the notion has emerged that we are reaching a point where the costs of social media in the public sphere are catching up and even surpassing the benefits.

Misinformation can be devastating to the smooth functioning of public order. One of the detrimental consequences of misinformation is when it devalues and delegitimises the message and voices of public institutions as well as experts. For instance, the widespread prevalence and persistence of misinformation in contemporary societies, such as the false belief that there is a link between childhood vaccinations and autism, is a matter of public concern. The myths surrounding vaccinations, which prompted some parents to withhold immunization from their children, have led to a marked increase in vaccine-preventable diseases, as well as unnecessary public expenditure on research and public-information campaigns aimed at rectifying the situation.

Objective data has also been altered and presented to the public. This kind of misinformation can undermine the actions of public institutions and governments. For instance, most countries in Europe and across the world are facing the growing challenge of managing more diverse societies, in terms of the origins, culture, ethnicity or religion. The formation of dynamic societies that can maintain equilibrium between social cohesion and respect for diversity on a foundation of democratic values and intercultural coexistence is a substantial challenge. One problematic factor in this context is the appearance of misinformation of various kinds, pointing out specific groups as more dangerous, creating mistrust, intolerance, discrimination and xenophobia. Typically, such claims are provided without reference to serious investigations or facts.

Given the real-time nature of these media outlets it is not surprising that social media have been also used widely in cases of breaking events, such as natural disasters or terrorist attacks. Two such examples where information was spread through Twitter were during an earthquake in Chile where rumours communicated that a volcano became active and a tsunami warning was issued in Valparaiso (Castillo et al. 2013). Both reports were found to be false. Apart from creating unnecessary panic and havoc at the time, the experience might compromise the trustworthiness of the medium. While goals of different malevolent actors of misinformation often vary, their main strategy is to sow mistrust. In cases of an online overflow of misinformation often the goal is not to support a specific position but rather to create division. The consequence of this is that the openness of our societies is threatened by this confusion.

3. Misinformation in the digital era

There is little doubt that the public is blessed with the abundance of information as well as myriads of services being made available through the Internet. At the same time, many concerns have been raised as the availability and openness of the platform may also be a source of problems. For instance, the World Economic Forum listed 'digital misinformation' as a key challenge to modern societies in their 2013 report (WEF, 2013). Indeed, misinformation has become a common part of our digital media environment (Friggeri et al., 2014), and is compromising the ability of our societies to form informed opinions and policies (Flanagin et al., 2000; Rieh et al., 2007; Kata et al., 2010; Castillo et al., 2011; Lewandowsky et al., 2012). In 2016, 'post-truth' was chosen by the Oxford Dictionary as the word of the year, after achieving a 2000% increase "in the context of the EU referendum in the United Kingdom and the presidential election in the United States"("Word of the Year", 2016).

3.1 Social media misinformation: the root of the problem

Today, more than half the world's population have access to the Internet, where they can create, propagate, and consume information instantly and globally. Currently, 28% of time spent online is dedicated to social media (Bennett, 2014). A 2016 survey by the Reuters Institute for the Study of Journalism found that 51% of people use social media as their source of news, with Facebook being the top used social media platform for finding, reading, and sharing news (Reuters, 2016). The European Commission's "Media use in the European Union" survey in 2015 found that social media is growing as the source of news in Europe, whereas TV, radio and written press are on the decline. This demonstrates the high and rapidly growing impact of online media on perceptions of current affairs and policies. In spite of the rising addiction to rapid consumption of online news information, people and current technologies are yet to adapt to the age of misinformation, where incorrect or misleading information is intentionally or unintentionally spread (Antoniadis et al., 2015).

Although misinformation is a common problem in all media, it is exacerbated in digital social media due to the speed and ease in which they are spread, and the difficulty of providing countervailing corrective information. The social web enables people to spread information rapidly without confirmation of truth. Empirical studies have also indicated that people tend to present information after they paraphrased this information to fit their intentions and pre-set beliefs (Nguyen et al., 2012). An example is this public message on Facebook that went viral in Dec 2015: "This is Dearborn Michigan after the radical Islamic attack in California! These are Isis flags and Isis supporter folks, but the media has not reported because of political correctness". The demonstration, however, was anti-Isis. Recent news data analysis showed that more people on Facebook were engaged with fake US election news stories than with all the election stories combined from 19 major news sources, and that fake news spread far more virally than real news; sometimes thousands of times more (Caulfield, 2016). As it is demonstrated in figure 2 above, the majority of fake news is shared through social media in the US. Cambridge Analytica, a political consultancy working for Donald Trump during the US election and accused of harvesting data from 50 million Facebook users without their permission is the prime current example of how prominent social media platforms have become in today's public field (Greenfield, 2018). This type of campaigning is actually copying advertising methods known as targeted messaging and applying them to the political realm. According to Goodman et al, platforms such as Facebook offered to political campaigners the possibility to show paid content only to selected users through so-called "unpublished posts"(Goodman et al, 2017). Therefore, consultancies such as Cambridge Analytica, having been provided with data on Facebook users could adapt their messages to specific audiences. A striking example from the 2016 Trump campaign is the targeting of Haitian-Americans living in the Little Haiti neighbourhood with news about the failure of the Clinton Foundation following the earthquake in Haiti, in order to keep them from voting for Hillary Clinton (Grasseger and Krogerus, 2017).

This methodology is increasing the danger of malevolent actors spreading targeted misinformation and also decreasing trust and accountability towards the political process.

Several social media platforms have recently undergone heavy criticism for becoming a ripe environment for the spread of misinformation, including fake news, mistruths, and hoaxes. There is a strong basis for these accusations. For instance, as previously mentioned, widely shared misinformation is blamed for clouding people's opinions and judgement during major events, such as the US presidential elections, and the UK's Brexit referendum (IPSOS, 2016). Other elections in Western Europe have also been affected by such attempts either by external or internal actors to varying degrees. For example the 2017 French election had seen numerous disinformation campaigns using social media bots which pointed towards unknown actors outside of France (Ferrara, 2017). During the Italian electoral campaign for March 2018 there were also reports of misinformation, especially regarding public attitudes towards migrants (Pellegatta, 2018). In reaction, Facebook and Google announced plans for combating the spread of fake news on their platforms. Google is planning to restrict serving ads on suspicious pages and Facebook stated that they will develop tools for better detection and reporting of fake news and clickbait posts, to thwart their spread on their platform. Youtube has also offered a controversial solution to fight conspiracy theories on its platform by providing links to Wikipedia articles next to disputed videos. All such plans could help reduce the spread of fake news posts and disrupt the economy of ads that supports their sources. However, collaboration with government administrations is necessary. This is an issue where the input of public sector can greatly complement the private sector's actions.

3.2 Fact checkers and technology: existing challenges and solutions

Growth in fact-checking 2014- 2018
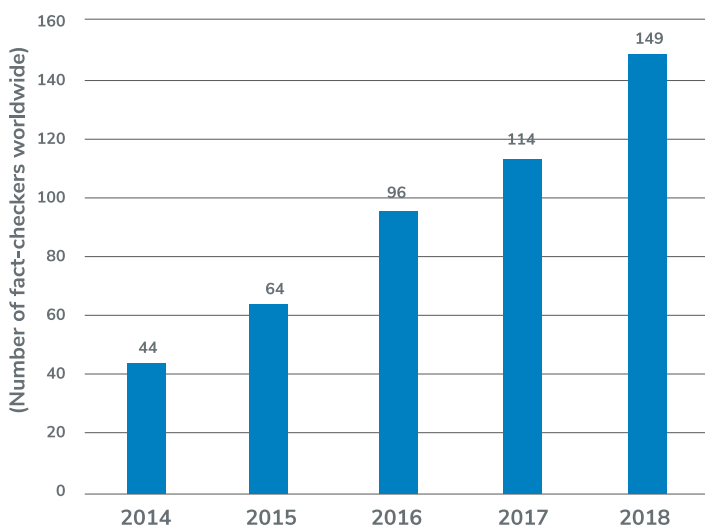
Figure 3. Growth in fact-checking organisations worldwide 2014-2018. Reporter's Lab, Duke University.

On another front, more than 110 independent fact-checking groups and organisations emerged online around the world over the past decade, and half of them were established in European countries (Graves and Cherubini, 2016), (e.g., FactCheckNI.org in Northern Ireland, FullFact.org in the UK, Snopes.com and RootClaim.com in the US, and PagellaPolitica.it in Italy, to name just a few). As it is shown in figure 3 below, according to Duke University's Reporter's Lab the number of fact-checker organisations has tripled from 2014 to 2017, a 239 percent growth (Stencel and Griffin, 2018). The practitioners behind these organisations see themselves as journalists, providing independent professional fact checking to the public on various current news and information (Graves and Cherubini, 2016). These groups and organisations aim to provide an impartial validation of misinformation and to inform the public, governments, and policymakers. Although the work of fact checkers is valuable in correcting misinformation, they are faced with a number of complex challenges which severely limit their ability to change existing misperceptions. For example, fact checking endeavours are often unable to keep up with the high volume of misinformation generated online (Ciampaglia, et al., 2015). They are often disconnected from where the crowds read, debate, and share misinformation with little or no awareness of any invalidations offered by the fact checkers. They lack tools and strategies for infiltrating social media echo-chambers, and thus struggle to draw the attention of the citizens that are mostly in need of corrective information. Furthermore, simply publishing corrective information by fact checkers is often regarded as insufficient for changing misinformed beliefs and opinions (Amazeen, 2013).

Some technologies have been developed to aid in the battle against misinformation. For example, 'Fake News Alert' and 'B.S. Detector' are browser extensions that warn users about hoax news and clickbait sites. Nonetheless, several shortcomings have prevented these kinds of technologies from substantially helping with the issue. For instance, alerts are provided to users with no explanation on how the information is deemed to be 'not factual' or accurate. The technologies have yet to be developed and designed to engage stakeholders rather than regarding them as some mere consumers. Other technology solutions are specifically focused on developing techniques for automatically identifying fake news (Wu et al., 2014), rumour posts (Qazvinian et al., 2011), and disputed arguments (Ennals et al., 2010), measuring posts' credibility (Gupta et al., 2014), validating specific claims (Ciampaglia, et at., 2015), or tracking the spread of misinformation (Ciampaglia, et at., 2015).

4. Combating Misinformation

The two most cited solutions to combat misinformation are technology solutions and legal actions towards those who deliberately misinform the public. The argument here is that while those actions have their merit, they are insufficient if used on their own and even counterproductive at times. Citizens need to have a larger stake in the creation of tools intended to be used by them and for their own benefit. Governments need and can organise better the methods and the actors involved. As mentioned in the OECD's Recommendation on Digital Government Strategies, public engagement is a critical component of open and accountable government. Crowd-sourced solutions reached after informed consultation and citizen participation are deemed better adapted and more efficient compared to a top-down approach by governments (OECD, 2014).

4.1 Main challenges

In order to counter misinformation the public has to rely on three influential actors: the private sector, non-profit organisations and governments. As discussed in the previous sections, the private sector, particularly the major players in the social media and news media have attempted to address misinformation following the public outcry. However, most of the solutions proposed so far have been in the form of technology fixes intended to detect contents that are deemed to be 'not factual' and warn the consumers of such information. Furthermore, the private sector needs to provide better access to crucial data in order for researchers to be able to assess fully the impact of misinformation on society. As Samantha Bradshaw and her team from Oxford Internet Institute discovered during their Computational Propaganda Project most companies keep the relevant data firmly closed. The right balance needs to be found between privacy concerns and access to data that will allow researchers to understand how best to improve the accuracy of online information.

Fact-checking organisations and journalists as well need to be more proactive in directly involving citizens in the process. Even though corrective information is becoming increasingly available from numerous fact checking organisations and news outlets, they often prove ineffective in seizing the spread and impact of misinformation on peoples' perceptions. This can lead to a number of issues such as the implied truth effect for example where attaching warnings to a subset of fake news stories increases the perceived accuracy of stories without warnings (Pennycook and Rand, 2017). Policymakers are therefore regularly facing complex challenges in monitoring such dynamics and in collecting the appropriate evidence to support their relevant policy and decision-making processes. The lack of coordination of efforts between the above actors is an important impediment. Misinformation in today's digital era is the complex outcome of various factors at play. Those need to be dealt with input coming from different actors who, more often than not, fail to communicate among them. In this case, governments have the possibility to play a facilitating role in coordinating these efforts through encouraging a multi-actor and multi-disciplinary approach.

4.2 Workshop discussions on government's role

The public sector, academic and research institutions as well as professional societies have acknowledged the significance and timeliness of misinformation, particularly, considering the increased penetration of digital services and social media in the public sector. Several workshops and conferences with the theme of combating misinformation have been organised by government bodies, academic institutions and public-sector CIOs (for instance, Managing the public digital sector transformation, Thessaloniki, Greece; the 51st ICA Conference, Tokyo, Japan; The future of Government 2030, Stockholm, Sweden; Information Society Project, New Haven, US).

The discussions in the workshops mentioned above concluded that there are several factors that have contributed to why misinformation has become a concern for national governments today. Furthermore, during the Stockholm Future of Governance workshop, citizens expressed their concern on how growing online misinformation will affect their trust towards the public sector. The Internet and readily available applications have made it possible for many to produce digital contents that are difficult to ascertain whether they are true/fact or not. Here it is necessary to distinguish contents that can be proven to be factually wrong or those that may be difficult to make assessment because of the nature of the information. One of the challenges for governments is, therefore, to be of any help for the public when information cannot be fact checked. Given the speed and amount of information available, governments are having a hard time communicating the right information to the public. However, citizens are at disadvantage when the governments' standpoint on a controversial topic could not be established.

4.3 Governments: positive or negative action

Governments as bureaucratic institutions are often slow to react when it comes to technological change. As already mentioned by Mickoleit in 2014 the hierarchical structure of governments often makes it clash with the direct structure of information spread on social media and thus very slow to absorb the rapid changes (Mickoleit, 2014). Misinformation is spreading particularly rapidly and as any other issue which has an implication for public order and democracy, governments have the ultimate responsibility to deal with it. Nevertheless, governments have several tools at their disposal to tackle misinformation. One of the conferences addressing the issue presented two distinguished approaches that governments could take— "positive state" or "negative state" (Information Society Project, 2017). As the name implies, "the negative state" refers to what national governments could do in the form of coercive actions. These are legal actions such as fining, taxing, imprisoning, revoking licenses, etc. In 2017 Germany approved a strict legislation forcing social media companies to remove fake news within 24 hours or face fines (Netzwerkdurchsetzungsgesetz). The French government announced its plans to vote for a softer version too (Jérôme Lefilliâtre, 2018). The UK on the other hand is taking a slightly different approach by considering the matter a concern of national security and rather preferred setting up a task force focusing on the matter (BBC, 2018). There is concern that the "negative state" method alone could backfire and questions related to freedom of speech may arise. The omnipresent "fake news" term could also be opportunistically used by governments to potentially stifle dissent. For example the Malaysian government, ahead of elections in August, just passed harsh legislation against "fake news" that could lead to 10-year sentences (BBC, 2018). The question here is who will determine what is 'true' and 'fact' particularly when objective facts cannot be established. We are seeing already aspects of this strategy backfiring in the recent case of three Dutch media sites suing the EU for including them in its EUvsDisinfo database (Funke, 2018). Of course there can be benefits in introducing some degree of regulation and a moderate intervention can encourage tech companies to invest in research which will improve their capacity to deal with misinformation. Governments have many softer regulatory options at their disposal apart from imposing fines in their attempt to tackle misinformation. These might take different forms: accreditation systems for content creators and distributers; technical design that might facilitate critical information analysis; market incentives, etc. More and more governments in modern societies are inclined to take the "positive state" approach.

CONSPIRACY THEORY DETECTOR

By navigating the web, you come across an article or commentaries by internet users who denounce the existence of a plot or a conspiracy theory. Do we need to take them seriously or are they just relaying a conspiracy theory?

Conspiracy Theory

Is it possible to find irrefutable proof for the existence of this conspiracy theory? — **YES**

NO

YES — Does the theory's hypothesis rely upon paranormal or supernatural phenomena, such as extra-terrestrial life forms or U.F.Os?

NO

YES — Does the theory's hypothesis rely upon the actions of a secret society whose existence still remains unproven?

NO

YES — Does the theory's hypothesis rely upon a universal conspiracy involving the entirety of the members of religious or national community?

NO

YES — Does the theory's hypothesis rely upon a conspiracy whose origins date from decades or even centuries (and that has yet to be proven)?

NO

NO — Does the theory's hypothesis sound like a reasonable and coherent explanation? Is it more efficient than another explanation?

YES

Does the theory's hypothesis rely upon a serious information source which is renowned to be serious, rigorous and without any political, ideological or personal interest to defend this hypothesis?

NO

Remain cautious. You might be finding yourself in front of a conspiracy theory.

YES

The possibility of existence of a plot cannot yet be removed. Refer to the work of journalists and scientists in order to investigate and dig deeper.
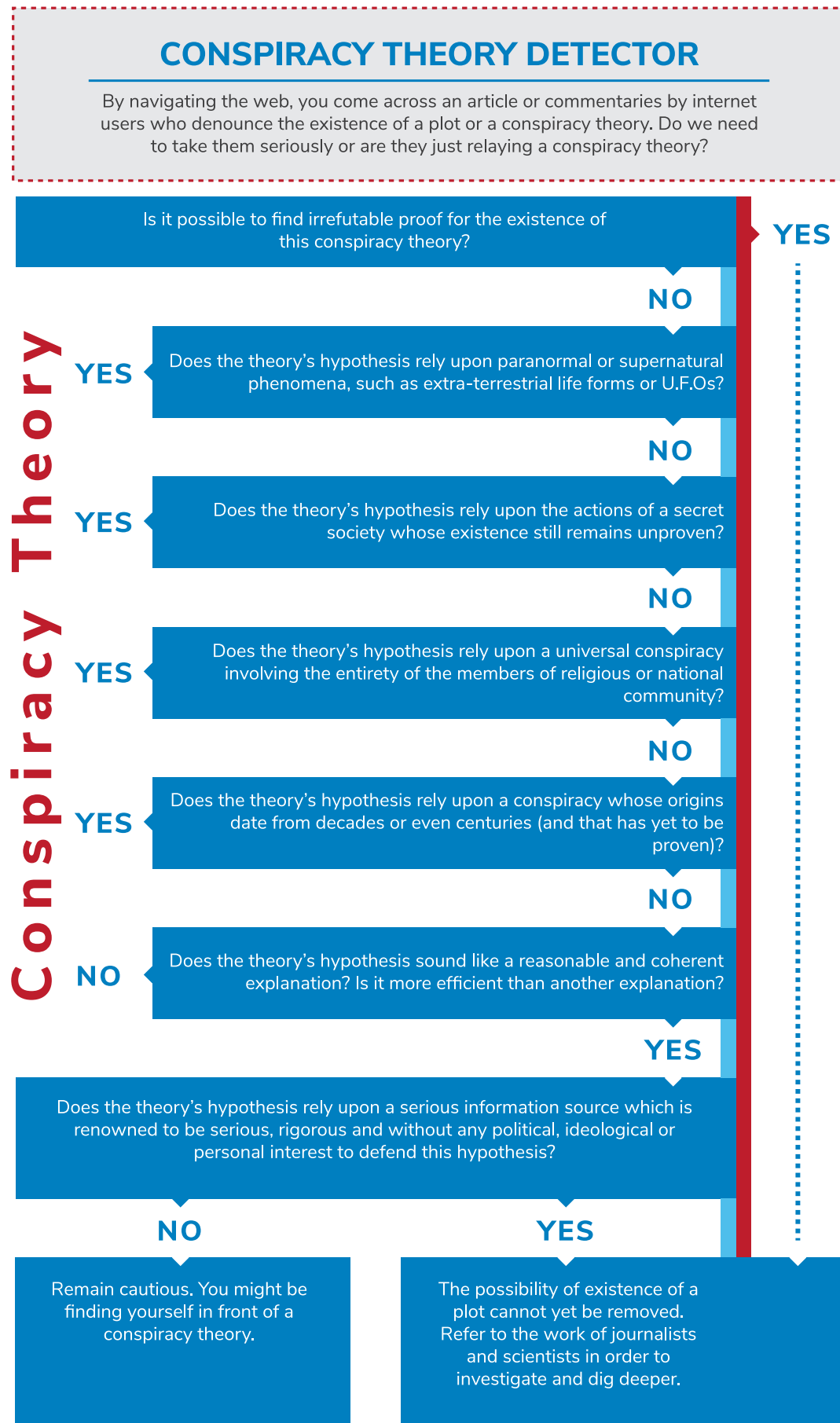
Figure 4. French government's instructions for detecting conspiracy theories, (Ontemanipule.fr, 2016)
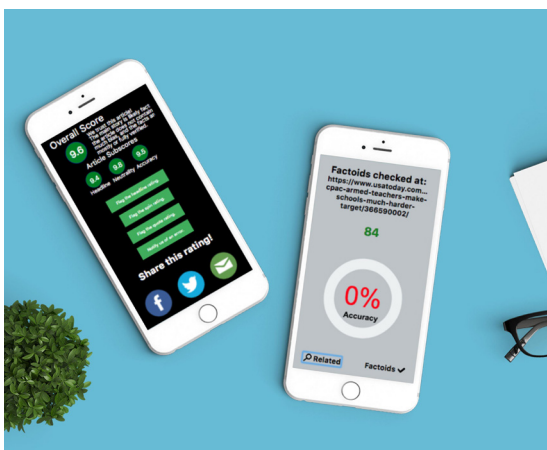
The "positive state" approach means that governments will be taking the role of collaborator or liaison facilitating collaboration between different members of society. Identifying these players and pressure points is often considered to be important for governments to take appropriate measures. For instance, creating awareness, educating the consumers and giving incentives for the guardians might produce good result while moderate legislation might be appropriate for content creators.

4.4 Technology solutions: positive developments and shortcomings

On its annual report, DGI (2017) argued that national governments need to be active participants of the research on misinformation. Even though the private sector is attempting to respond to the public woes after several high-profile misinformation incidents, many studies have shown that these endeavours are fragmented. In the next sections, we present different promising technological initiatives geared towards combating misinformation that are of interest for governments and their shortcomings.

4.4.1 Technology Strategies against Misinformation

Research conducted by Fernandez and Alani (2018) that will be presented in the WWW '18 Companion conference in Lyon reflected on the current socio-technical advancements towards addressing the problem. Works that have attempted to stop the spread of misinformation in social networks generally use two strategies: (i) combating it with facts (Budak et al., 2011; Nguyen et al., 2012; Zhang et al., 2015) and (ii) malicious account detection in early stage. (Webb et al., 2008; Egele et al., 2013; Lee et al., 2014). Among the works that have attempted to combat the spread of misinformation with facts Budak et al. (Budak et al., 2011) introduce the notion of competing campaigns to counteract the effect of misinformation. With this purpose, they introduce Multi-Campaign Independence Cascade Model (MCICM) and study multiple methods to choose the optimal subset of users as seeds to propagate the "good" campaign. Similar efforts include the works of (Nguyen et al., 2012) and (Zhang et al., 2015). The first work aims to find the "Node Protectors", i.e., the smallest set of highly influential nodes whose "decontamination" with good information helps to contain the viral spread of misinformation. The second work aims to identify the most important disseminators of misinformation to "inject correct information" in the diffusion. These models of information propagation present however several limitations. First, they are based on the assumption that once a user is "contaminated" with "good" information she will propagate this information among her network. However, persuading users to adopt certain beliefs, and propagate them is not trivial (Lewandowsky et al., 2012). Secondly, these works assume that the models of diffusion of "good" and "bad" information are coincident, when in reality; they may actually not spread at the same rate. Indeed, several recent works have found that misinformation spreads wider and faster (Zubiaga et al., 2016; Shao et al. 2016).

Regarding the methods focused on the early detection of malicious accounts we can highlight works that aim to identify spammers (Webb et al., 2008), bots (Ferrara et al., 2016), crowdturfing (Wang et al. 2012; Lee et al., 2013; Lee et al., 2014) and malicious accounts in general (Egele 2013; Lee & Kim, 2014). These techniques generally focus on the analysis of various user, temporal, geographical and linguistic features in order to successfully identify these accounts. However, it is unclear what intervention strategies to use in order to stop the spread of misinformation once these accounts have been identified.

Figure 5. Newscracker (left) and FactoidL (right) browsing extensions for automated fact-checking evaluating the accuracy of an article.

Aside from stopping the spreading of misinformation, technologies such as DecideIT, The Bussiness Risk Library or Decision Wizard, enable to carry out reliable risk and decision analyses. These tools are very useful in cases of complex decisions, as they provide the users with a graphical presentation of the decision situation at hand and show the internal relations between options, objectives, and uncertain parameters. These tools can therefore serve as an inspiration on how collect, present and visualise information and misinformation for citizens and stakeholders.

4.4.2 Misinformation Detection

Several approaches and tools have emerged in recent years to automatically or semi-automatically identify misinformation based on the characteristics of the content (text as well as multimedia – images/videos), or the source of the misinformation and the network of that source. Contextual information, including a compiled list of misleading sites and specific microblog-specific features, such as hashtags or mentions in Twitter, are often used to complement the above.

Works of Castillo and colleagues (Castillo et al. 2011; Castillo et al. 2013; Gupta et al., 2014) studied information credibility on Twitter mainly based on content features and created supervised machine learning classifiers to detect this credibility. Their studies concluded that credible tweets tend to include more URLs and are longer than non-credible tweets. Additionally, question and exclamation marks tend to concentrate on non-credible tweets, frequently using first and third-person pronouns. These studies derived on the creation of the TweetCred system, a real-time, web-based system (available as browser extension) to assess credibility of content on Twitter. The system provides a score of credibility for each tweet, based on the previously generated classifiers and it validates this score by asking the user for feedback. Similar tools developed as browsing extensions include Fake News Alert and B.S. Detector, which rely on manually compiled lists of misleading websites, such as the one generated by Zimdars (2016) and Dispute Finder (Ennals et al., 2010), which is based on a database of known disputed claims generated by crawling websites that already maintain a list of disputed claims. Two more recent browsing extensions attempting the automation of the fact-checking process with more or lesser success are Newscracker and FactoidL (McCarthy, 2018). Qazvinian and colleagues (2011) also studied content features for misinformation detection. They concluded that lexical and Part of Speech (POS) patterns are key for correctly identifying rumours. Hashtags can result in high precision but lead to low recall.

In addition to the analysis of content, other works and systems focus on the use of network analysis techniques to detect misinformation (Ratkiewicz et al., 2011; Seo et al, 2012; Gupta et al., 2014; Friggeri et al., 2014). The studies show that different diffusion patterns exist that characterise misinformation vs. legitimate memes, with misinformation patterns propagating in a more viral way (Friggeri et al., 2014) and often being generated by bots and not humans (Ratkiewicz et al., 2011). On the other hand, credible news tends to originate from a single or a few users in the network, have many re-posts and propagate through authors who have previously written a large
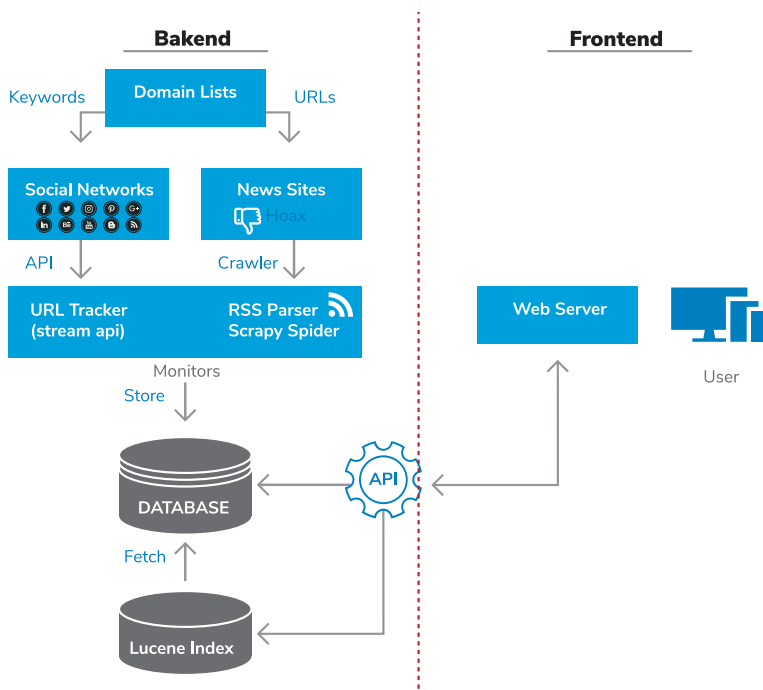

Figure 6. Hoaxy System Architecture, (Shao et al,2018)

number of messages and register more friends (Gupta et al., 2014).

Tools to detect and display the diffusion of misinformation include Truthy (Ratkiewicz et al., 2011), RumorLens (Resnick et al., 2014) and Twitter trails (Metaxas et al., 2015). These tools are based on a semi-automatic approach where users can explore the propagation of a rumour with an interactive dashboard. However, they do not monitor the social media stream automatically in order to detect misinformation but require the user to input a specific rumour to be investigated. Aiming to address this issue Shao and colleagues developed Hoaxy (Shao et al., 2016), a platform that automatically monitors the social stream, detects, and analyses online misinformation. Following this trend Facebook has recently released new tools in Germany to help combat the spread of fabricated news stories (BBC, 2017). As opposed to Hoaxy, Facebook tools not only use a combination of content and network analysis but also include user feedback to accurately identify fake news. This system is currently under testing.
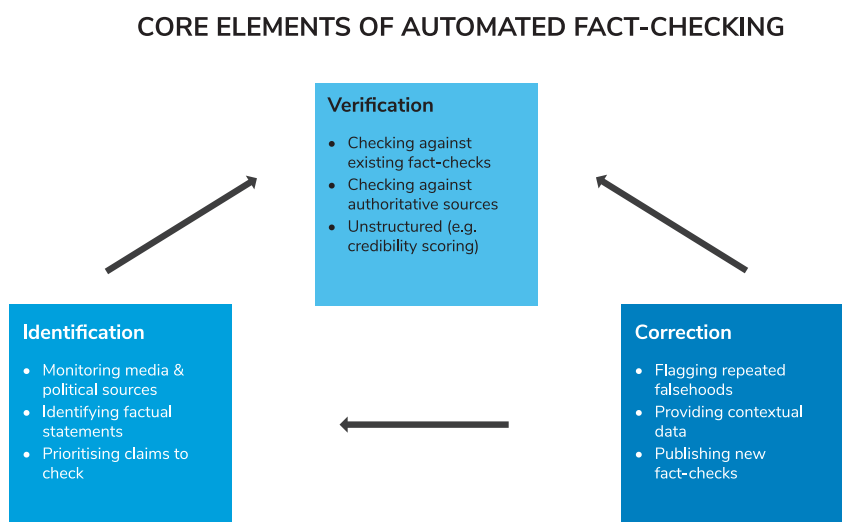
As it can be observed, some of the limitations of current systems for misinformation detection include: (a) only alerting to manually created lists of hoax sites, (b) providing alerts without any rationale or explanation of their decisions and (c) generally disengaging users by regarding them as passive consumers rather than active co-creators and detectors of misinformation.

4.4.3 Content Validation

Computational fact-checker initiatives have also emerged in the last few years with the aim of enhancing our ability to evaluate the veracity of dubious information. Among these works Ciampaglia et al. (2015) exploited implicit information from the topology of the Wikipedia Graph. Their results show that network analytics methods, in conjunction with large-scale knowledge repositories, are effective towards automatic fact-checking methods. Shi and Weninger (2015) follow a similar approach but propose a path mining approach over large-knowledge graphs (DBpedia and SemMedDB) to leverage a collection of factual statements for automatic fact-checking. Besides the analysis of textual sources, works like the one of Boididou and colleagues (2014) focus on the automatic verification of unreliable media content by building classifiers from multiple user and content features.

An additional problem of fact-checking initiatives is that they are often disconnected from where the crowds read, debate, and share misinformation with little or no awareness of any invalidation offered by the fact checkers. To address these issues several initiatives have emerged that aim to bring the results of fact-checking initiatives closer to the public. Such an example is TruthTeller, developed by the Washington Post, which transcribes political videos and checks them against a database that draws on PolitiFact and FactCheck.org. The program tells viewers which statements are true or false. Hoaxy (Shao et al., 2016) also aims to integrate the efforts of fact-checking with a continuous monitoring of the social stream, making the social media information and the fact-checking information simultaneously available for the user. FactWatcher (Hassan et al., 2015) complements previous approaches by considering different types of facts, including situational facts, one-of-the-few facts, and prominent streaks. As opposed to previous tools that are oriented to the general public, FactWatcher is focused on supporting journalists with the creation of news stories.

Figure 7. Core elements of automated fact-checking (Graves, 2018)

CORE ELEMENTS OF AUTOMATED FACT-CHECKING

Verification
- Checking against existing fact-checks
- Checking against authoritative sources
- Unstructured (e.g. credibility scoring)

Identification
- Monitoring media & political sources
- Identifying factual statements
- Prioritising claims to check

Correction
- Flagging repeated falsehoods
- Providing contextual data
- Publishing new fact-checks

Crowdsourcing initiatives have also been considered to validate and verify information (Zubiaga et al., 2015). One of the most recent initiatives by Facebook aims to integrate crowdsourcing with fact-checkers (Poynter and Politifact, among others) to fight fake news. Facebook won't remove "fake news" or prevent people from sharing it. However, users can mark stories as fake and will see warnings that indicate the story has been disputed by third-party fact-checkers. Systems like TweetCred and Truthy use crowdworkers to annotate data and train machine learning algorithms that can learn from human annotations when assessing the credibility of tweets. While we see major advances in automated fact-checking (AFC) technology, human intervention and critical thinking is necessary. According to Lucas Grave from the Reuters Institute automatic verification still depends greatly on human intervention in order to appropriately fact-check claims and will continue to do so in the mid-term (Grave, 2018).Critical thinking and judgment will remain crucial components of the fact-checking process.

4.5 Media Literacy in the age of Social Media

Despite the numerous research efforts and measures that are being in place, it has been proven that combating misinformation is a fight yet to be won. Both governments as well as tech giants have indicated that the pace of technological advancements and legislative measures could not catch-up with the amount of information and spread of misinformation. Lupia and McCubbins (1998) argue that accurate prediction or better decision requires not only right data and facts. The fight against misinformation needs the participation of citizens. As the author puts it, governments need to encourage people to be 'active information gatherers'. Citizens (consumers of information) must be educated to be able to make sound assessment on credible sources of information as well as 'factual information'. Media literacy is the "active inquiry and critical thinking about the messages we receive and create" (Hobbs & Jensen, 2009). Recent research on young people's evaluation of political posts has shown that those with higher levels of media literacy training were more likely to rate evidence-based posts more accurately than posts containing misinformation (Kahne and Bowyer, 2017). Educating citizens about the threat of misinformation to the society should be given a priority as it is the best long-term solution to the problem. Apart from including curriculum at all levels of the education system, research institutes as well as think-tanks and technology companies should be encouraged to take part in informing the public. Critical information consumption could be taught to citizens through instilling critical views on information, teaching about actors and stakeholders. Impact on critical sectors of their lives such as public health should be emphasized. A4 - fold increase of measles cases in Europe due to low levels of immunization is partly attributed to misinformation on vaccination (WHO, 2018).

Number of confirmed measles cases, 2010-2017
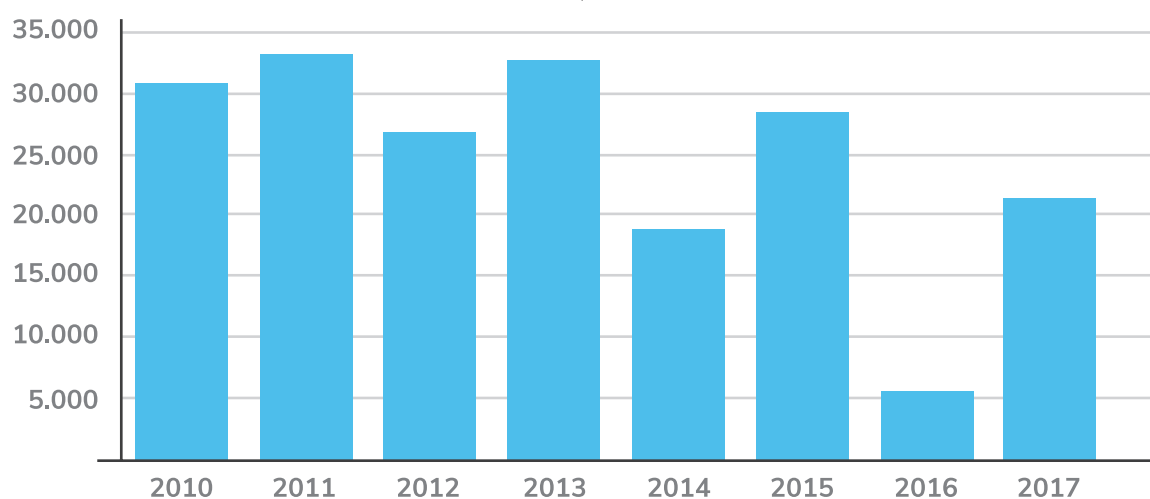
Figure 8. Number of confirmed measles cases in Europe, 2010-2017, (WHO, 2018)

Two parallel strategies dominate the discussion on the most adequate methods for combating misinformation and minimise the effects that arise as a result of misinformation. First, studies in the field of psychology focus on individual-level cognitive processes that are responsible for the acquisition as well as persistence of misinformation (Lewandowsky et al., 2012). The key issue here is to use theories and findings from studies in the area to help citizens detect information which is not factual. At the same time, there is consensus in psychology literature that simply presenting people with corrective information is likely to fail in changing their salient beliefs and opinions, or may, even, reinforce them (Flynn, 2016; Nyhan 2010; Nyhan and Reifler 2010). People often struggle to change their beliefs even after finding out that the information they already accepted is incorrect (Cobb et al., 2013; Thorson 2016). Nevertheless, some strategies have been found to be effective in correcting misperceptions, such as providing an explanation rather than a simple refute (Nyhan and Reifler 2015), exposing to related but disconfirming stories (Bode and Vraga 2015) and revealing the demographic similarity of the opposing group (Garrett et al., 2013). Recent work by Cambridge University is also considering the use of "fake news vaccine" to immunise users against the problem by "pre-emptively exposing" readers to a small "dose" of the misinformation (Cambridge, 2017). An alternative approach for dealing with pervasive misinformation is to seek more direct behavioural interventions that encourage people to make certain decisions over others (Thaler & Sunstein, 2008). The ubiquitous nature of social media makes the endeavour of improving media literacy more complicated than in the past. In order to overcome this hurdle, the use of a bottom-up strategy, involving all the relevant actors has been deemed necessary. In the recent workshop in Stockholm University, citizens from a diverse background have also reached this conclusion.

Traditional Media: a key player

An important player in improving media and news literacy are traditional media. They are institutions with experience and the appropriate knowledge and instruments to counter misinformation and to provide the public with educational tools. They first need to adjust to the new digital world and the competition by social media but more importantly to find a way to reobtain the lost public trust. As public trust towards institutions in general had greatly decreased so had trust towards traditional media in 2016. According to the Edelman 2017 Trust Barometer, trust in media fell to an all-time low in 17 of the 28 countries polled (Edelman, 2017). Journalists across the Western world have also been victims of the rise of anti-establishment sentiment that followed the unexpected 2016 electoral results in the US and the UK. The public initially turned to social media and hyper-partisan online news for information. The acknowledgement and numerous reports related to the role social media platforms have played in disseminating misinformation seems to be slowly changing this. The Edelman 2018 Trust Barometer is signalling a change compared to the previous year. For example, there was a 13 percent rebound in trust towards traditional media in the UK (Edelman, 2018). The European Broadcasting Union's (EBU) Trust in Media 2018 report is also signalling an increase in trust towards traditional media in European countries and a simultaneous drop of trust towards social media (EBU, 2018). According to surveys conducted by The Verge magazine in October 2017 and a poll by Reuters/IPSOS conducted in March 2018 trust in Facebook in the US has decreased significantly (Newton, 2017) (Reuters/IPSOS, 2018). The main reasons behind this decrease in public trust are the role Facebook is accused to have played in misinformation dissemination and also, more recently, the data breach revelations. Therefore what we see currently taking place is the, albeit slow, re-emergence of traditional media as an anchor of relative trust among the overwhelming confusion of social media. Eurobarometer findings following a Europe-wide survey on fake news and online disinformation mention that respondents still considered that journalists (45%), national authorities (39%) and the press and broadcasting management (36%) should be the main responsible for stopping the spread of fake news (Eurobarometer, 2018). This is a key moment that traditional media need to seize and reclaim their role as gatekeepers of news. But to achieve this they need to take a self-critical stance and look to regain the public's trust by working more closely with them. Transparency and interactivity are indispensable to achieve this according to Professor Charlie Beckett, director of the LSE's Truth, Trust and Technology Commission.

Newsrooms need to reflect the diversity of the audience and not be "out of touch" and thus accused of bias which in turn could feed into conspiracy theories (Beckett, 2018). Traditional media need to open up to citizens, mutually provide ideas and together work out solutions in order to improve media and news literacy. Given the importance of social innovation, particularly in the context of misinformation and policy development, embracing and further researching the method of co-creation by including in the process policy makers, citizens, journalist, and researchers is particularly timely.

4.5.1 Co-creation methodology

In the last few years co-creation has spread rapidly in the business sector (Prahalad & Ramaswamy, 2002), the application of the co-creation method is fairly recent in the public sector, particularly for policy development, and multiple challenges still need to be overcome (Bason, 2010; Gouillart & Hallet, 2015) including: (i) the rigidity of public sector entities, which have a duty to ensure compliance with laws and regulations, (ii) the ideological division, which commonly emerge from multi-stakeholder collaborations, and (iii) the scale (pursuing co-creation in a city or state wide fashion requires not only workshops and in-person discussions, but the use of tools to accommodate civic participation at a large scale). Similar challenges and barriers are also identified by (Voorbeg et al., 2015) in an extensive literature of review of co-creation and co-production for social innovation. These challenges involve the context of co-creation (different cultures and traditions in different regions/countries could influence the success of co-creation initiatives), the organisational factors (particularly resistance to change and low financial sustainability), and the citizens/stakeholders (users should feel ownership of the initiative). However, while citizen/stakeholder engagement is key for co-creation (Kristensson et al., 2008), uncontrolled engagement can become unmanageable, hence the need for a careful selection of the users involved in the co-creation process.

Despite these barriers, co-creation and co-design are perceived as key strategies to design better policies and public services (European Data Portal, 2016) but the process of co-creation needs to be constructive, participatory, inclusive, open and transparent. In this process users can adopt different roles (i) explorer – discovering a problem - (ii) ideator – conceptualising a solution – (iii) designer – designing and developing the solution and (iv)diffuser – implementing the solution. Different mechanisms can be used to engage with users (online communities, workshops, engagement tools, etc.). Regarding the process of co-creation for policy development Gouillart and colleagues (Gouillart & Hallet, 2015) have proposed five key steps: (i) identify target communities (and sub-communities), (ii) build engagement platforms that will attract community members, (iii) foster interactions among stakeholders, (iv) enable individual experiences that emerge from the new interactions between the stakeholders and the communities and, (vi) assess the obtained value as result of the co-creation efforts.

Following a very similar life cycle to the one proposed by Gouillart and Hallet (2015), the aim is to apply co-creation to understand the stakeholder ecosystem and the life cycle of misinformation. The first step towards co-creation will be to identify relevant stakeholders (citizens, journalists, policy makers) and build the environment considering contextual and cultural variances, to assess the needs of each stakeholder group and create something together that would be useable and useful to each stakeholder. Co-creation efforts will specifically target design engagement and resilience methods with respect to misinformation. Governments have an important role to play in facilitating these processes and coordinating efforts between the relevant actors in order to ensure that the public interest is served as efficiently as possible.

4.5.2 Cooperation with other governments and international organisations

Apart from the debate among practitioners and public commentators, the issue of misinformation and the devastating consequences on national security and public health have been documented (Broniatowski, 2017).

Several governments, for instance the UK, have categorised misinformation as one of the major issues for national security that needs to be addressed in an immediate effect (Guardian, 2018). The Australian government has also listed misinformation as a national security issue and courses are being organised for those in the public sector (National Security College, 2018). A literature search for this study has revealed that governments in different continents have acknowledged the seriousness of the consequences of misinformation at different levels. As the concern is shared by many, it is in the best interest of governments to join forces and combat misinformation. The cooperation could take different forms. For instance, standardising curriculum, participating in collaborative research, and collaborate in cyber-security training. The EU and the World Health Organisation (WHO) already have task forces for the issue. Robust institutions such as national statistics agencies are important in assisting citizens in forming informed opinions. However, as mentioned previously these should keep a fine balance in order to avoid becoming politicized and risk being discredited.

5. Conclusions and Recommendations

The aim of this work is to point out the significance of misinformation in the public domain and suggest alternative course of actions from the existing ones in order to combat it more efficiently. Starting from the concepts raised during the discussions on the issue, we have identified previous studies that revealed how misinformation can be spread and how it affects the democratic process. Based on the OECD's Recommendation on Digital Government Strategies, the need for open, inclusive, accountable and transparent processes by national governments is the necessary framework in order to start looking for solutions. During the workshops that took place in Japan, Greece and Sweden public and private sector practitioners as well as citizens from diverse backgrounds and nationalities agreed that a more coordinated approach needs to be taken to effectively address the issue. The digital transformation in the public sector as well as the increasing accessibility rate of the internet has exacerbated the problem. Given the importance of factual information against misinformation in the public arena, governments need to take collaborative action with stakeholders and invest in innovative ways to deal with misinformation. A combination of a number of specific actions has been proposed to deal with this societal challenge. Empowerment of citizens, encouraging engagement, education, moderate legislative actions, as well as investment on new technologies are invaluable elements to tackle misinformation. For fragmented technological and innovative solutions to succeed in tackling misinformation at the broader scale, they need to be integrated, and embedded into a co-creational ecosystem of policies. More collaborative and effective management of misinformation needs to be supplemented with informed behaviours of citizens. Creating a trusted environment for citizens with the adequate educational instruments are necessary steps as we enter an era of big technological advances that have the potential to disrupt even more than it already has.

These actions can be complemented by 5 recommendations below

- Implementing short public information campaigns with quick tips for citizens on how to conduct research themselves on news articles when in doubt.
- Organising media and news literacy workshops bringing together professional journalists with citizens.
- Reinforcing legislation towards technology companies to put pressure on greater transparency concerning the use of data and the origin of information.
- Creating diverse and cross-sectorial teams tasked to spot misinformation and warn the public by providing clear explanations.
- Introducing media and news literacy classes in school curricula in parallel with computer science.

Appendix 1

Nationalities and occupation-based categorisation of conference participants
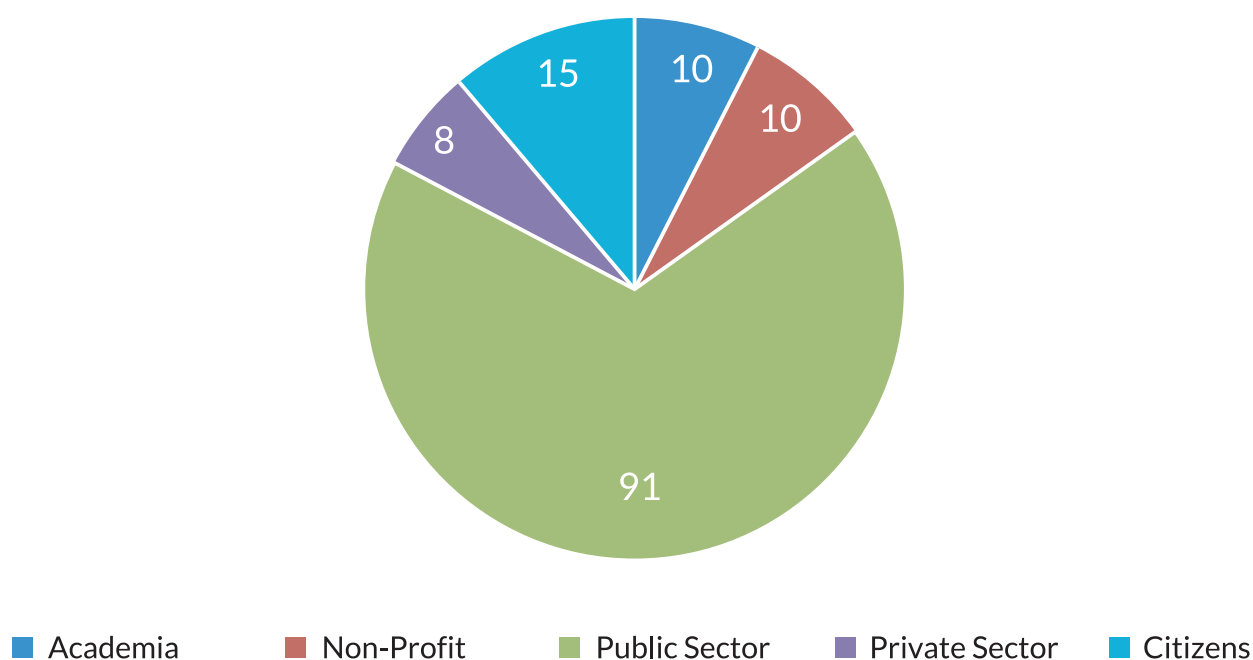
The map below displays the countries represented by the participants who attended the conferences held in Greece and Japan respectively titled "Managing the public digital sector transformation" and "Bold Digital Government- Leading through disruption". The wide variety of nationalities allowed for a fair representation of existing issues and potential solutions voiced from all continents.

Azerbaijan
Public Sector
Belgium
Academia, Public Sector
Bulgaria
Non-profit
Canada
Non-profit, Public Sector
Denmark
Public Sector
Estonia
Public Sector
Finland
Public Sector
Greece
Academia, Non-profit, Public Sector
India
Non-profit, Public Sector
Israel
Non-profit, Public Sector
Japan
Academia, Non-profit, Private Sector, Public Sector
Luxembourg
Public Sector
Malta
Public Sector

Mexico
Public Sector
Mozambique
Public Sector
New Zealand
Public Sector
Portugal
Public Sector
Romania
Public Sector
Singapore
Public Sector
Spain
Public Sector
Sweden
Academia
Taiwan
Academia, Public Sector
Tanzania
Public Sector
The Netherlands
Academia, Non-profit
UK
Non-profit
USA
Private Sector, Public Sector

The chart below illustrates the numbers in participation reported from each sector. As it can be observed the largest proportion of participants came from the public sector followed by citizen stakeholders. The fact that there is a clear majority of public sector participants in the conferences is explained by the necessity to give a central role to public administrations in the improvement of digital governance for the benefit of citizens.

Participants

Legend:
- ■ Academia
- ■ Non-Profit
- ■ Public Sector
- ■ Private Sector
- ■ Citizens

Values shown: 10 (Academia), 10 (Non-Profit), 91 (Public Sector), 8 (Private Sector), 15 (Citizens)

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